CANADIAN MALARTIC GP
PROJET NO : 171-08287-03

# MODIFICATION DU PROJET DE LA MINE CANADIAN MALARTIC (DÉCRETS 914-2009, 388-2017 ET 1370-2018) - EXPLOITATION DES ZONES SOUTERRAINES MINÉRALISÉES DU PROJET ODYSSEY

## RÉPONSES AUX QUESTIONS ET COMMENTAIRES DU MELCC

8 NOVEMBRE 2021

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DATE : 8 NOVEMBRE 2021

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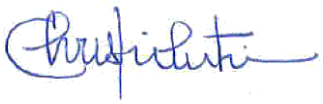

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Les conclusions présentées dans ce rapport sont basées sur le travail effectué par du personnel technique, entraîné et professionnel, conformément à leur interprétation raisonnable des pratiques d'ingénierie et techniques courantes et acceptées au moment où le travail a été effectué.

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Les bornes et les repères d'arpentage utilisés dans ce rapport servent principalement à établir les différences d'élévation relative entre les emplacements de prélèvement et/ou d'échantillonnage et ne peuvent servir à d'autres fins. Notamment, ils ne peuvent servir à des fins de nivelage, d'excavation, de construction, de planification, de développement, etc.

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*Référence à citer :*

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# AVANT-PROPOS

Le 11 février 2021, la Direction générale de l'Évaluation Environnementale et Stratégique (DÉES)-du Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) a reçu une demande de modification aux décrets 914-2009, 388-2017 et 1370-2018 afin d'ajouter 2 zones minéralisées à exploiter dans le cadre du projet Odyssey. Afin de poursuivre la révision technique de l'ÉIE, la DÉES a préparé et transmis, le 9 juillet 2021, une liste de questions et commentaires à laquelle Canadian Malartic GP (CMGP) doit fournir un document de réponse.

Les questions et commentaires de la liste de la DÉES (QCM-1, QCM-2, etc.) sont présentés intégralement **en encadré et en caractère gras** pour les distinguer aisément dans le texte des réponses qui sont fournies par CMGP (RCM-1, RCM-2, etc.). Les annexes supportant les réponses sont également numérotées en fonction des codes et numéros auxquels elles font référence (annexe QCM-1, QCM-2, etc.).

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# 1 DESCRIPTION DU PROJET ODYSSEY

## 1.1 GESTION DES RÉSIDUS

| | |
|---|---|
| **QCM-1** | **L'étude d'impact déposée pour l'extension de la mine Canadian Malartic (2015) comportait, à l'annexe 8-3 un mémorandum technique sur l'utilisation de la fosse Canadian Malartic comme aire d'accumulation, incluant une figure illustrant le niveau atteint par les résidus selon divers scénarios de remplissage (figure 1, p. 13). À ce moment-là, le projet Odyssey était en cours de développement et le mémorandum technique n'abordait que le dépôt des résidus générés par l'exploitation de la fosse Barnat.**<br><br>**Le projet Odyssey se caractérise à ce jour par la mise en exploitation de quatre zones minéralisées, dont les résidus d'usinage seront en grande partie entreposés dans la fosse Canadian Malartic. Une figure, semblable à celle du mémorandum mentionné précédemment, illustrant les élévations atteintes après remplissage avec les résidus du projet Odyssey en fonction de l'élévation du niveau d'eau anticipé dans la fosse (308,5 m) doit être présentée. Ceci nous renseignera sur la hauteur d'eau libre devant permettre d'assurer le confinement des résidus.** |

**RCM-1 :**

La figure 1 illustre les élévations atteintes dans la fosse Canadian Malartic après remplissage avec les résidus issus du projet Odyssey et en fonction du niveau d'eau anticipé dans la fosse. Cette figure montre que la hauteur d'eau libre permet d'assurer le confinement des résidus en considérant l'élévation maximale des résidus, qu'ils soient issus du projet Odyssey ou des autres fosses exploitées sur le site.

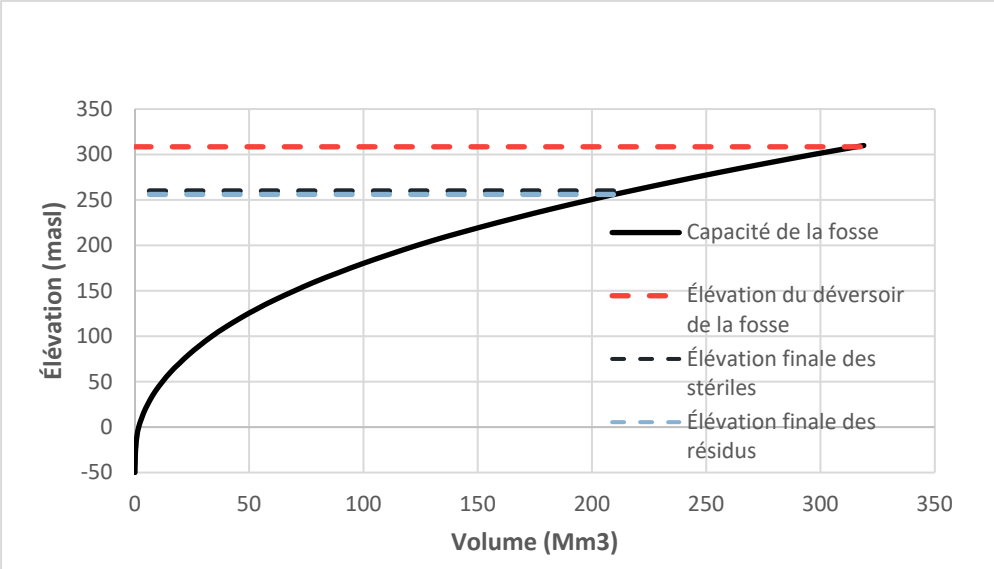


**Figure 1** **Élévation atteinte après remplissage de la fosse Canadian Malartic (169 Mt de stériles et 108 Mt de résidus miniers)**

# 2 ANALYSE DES IMPACTS DU PROJET

## 2.1 DESCRIPTION DES IMPACTS

### *2.1.1 CARACTÉRISATION GÉOCHIMIQUE DU MINERAI ET DES RÉSIDUS MINIERS DES NOUVELLES ZONES MINÉRALISÉES DU PROJET ODYSSEY*

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|---|---|
| **QCM-2** | **Le rapport de caractérisation géochimique (EcoMetrix 2017 et 2019) utilisé dans le cadre de la présente demande de modification inclut les résultats de caractérisation des matériaux miniers provenant des zones Odyssey Sud, Odyssey Nord, East Malartic et Sheehan.**<br><br>**a) L'initiateur doit préciser si le rapport d'EcoMetrix traite également les résultats obtenus pour les matériaux échantillonnés dans la nouvelle zone minéralisée incluse au projet sous le nom de East Gouldie et préciser sous quel nom cette zone est présentée dans le rapport. Dans le cas contraire, les résultats de caractérisation géochimique des matériaux miniers provenant de cette nouvelle zone minéralisée doivent être présentés par l'initiateur.**<br><br>**b) Les résidus miniers d'usinage n'ont pas été caractérisés dans le cadre de la présente demande de modification. En l'absence d'échantillons des résidus d'usinage, à l'étape d'avant-projet, des conclusions préliminaires concernant les caractéristiques géochimiques de ce type des résidus miniers peuvent être faites en se basant sur les résultats obtenus pour les échantillons du minerai. Cependant, dès que possible, la caractérisation des échantillons des résidus d'usinage doit être réalisée afin de vérifier la validité des conclusions préliminaires. Dans ce contexte, l'initiateur doit s'engager à réaliser et fournir au ministère une étude de caractérisation des résidus miniers d'usinage générés à partir du minerai du projet Odyssey, au plus tard lors du dépôt de la première demande d'autorisation en vertu de l'article 22 de la LQE afin de confirmer que ces résidus peuvent être gérés de façon sécuritaire dans les aires d'accumulation existantes de la mine Canadian Malartic.** |

**RCM-2 :**

**a)** Le rapport présenté à l'annexe QCM-2a présente la caractérisation géochimique du secteur de East Gouldie.

**b)** Des échantillons de résidus ont été générés à la suite des travaux rapportés par EcoMetrix (2017 et 2019), dans le cadre d'un projet de valorisation des futurs rejets miniers de la mine Canadian Malartic. Cette étude étant toujours en cours, l'annexe QCM-2b présente les résultats clés par rapport au potentiel acidogène et de lixiviation pour chaque lithologie, type de matériel pour les secteurs Odyssey, East Malartic et East Gouldie. Dans tous les secteurs, les échantillons ultramafiques sont généralement non PGA, avec le potentiel pour la lixiviation. Les échantillons sédimentaires et porphyriques sont légèrement moins homogènes entre les secteurs, mais les différences n'affectent pas leur classification géochimique. Les caractéristiques géochimiques d'intérêt, nommément le potentiel acidogène et de lixiviation, sont similaires entre les résidus de chacune des lithologies et chacune des lithologies est généralement similaire entre les différentes zones et divers secteurs. Tous les résidus lixivient peu en condition de tests cinétiques de laboratoire.

La cohérence des résultats analytiques suggère que les propriétés géochimiques de ces matériaux sont suffisamment comprises, à cette étape du projet, pour élaborer les plans de gestion des matériaux minés qui s'appliqueront à tous les matériaux qui seront rencontrés.

CMGP s'engage à déposer les résultats de la caractérisation géochimiques des résidus miniers du projet Odyssey lors de la première demande d'autorisation en vertu de l'article 22 de la LQE.

## 2.1.2 GESTION DES EAUX MINIÈRES DU PROJET ODYSSEY – BILAN D'EAU DE LA MINE CANADIAN MALARTIC

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| **QCM-3** | **L'initiateur présente à la section 4.4 de la demande de modification de décret les méthodes de gestion des eaux d'exhaure et de ruissellement d'Odyssey. Toutefois, le plus récent bilan d'eau de la mine Canadian Malartic fourni dans la présente demande (bilan de 2018) ne prend pas en considération les eaux d'exhaure d'Odyssey. L'initiateur doit démontrer que la capacité des bassins est suffisante pour gérer de façon sécuritaire les eaux supplémentaires générées par le projet Odyssey. À cet effet, l'initiateur doit fournir une mise à jour du bilan d'eau de la mine, qui prendra en compte l'ensemble des eaux minières générées par le projet Odyssey, les effets possibles des changements climatiques ainsi que la capacité des installations de gestion des eaux de la mine actuelle.** |

**RCM-3 :**

Le mémorandum technique à l'annexe QCM-3 présente un bilan hydrique qui démontre que la capacité des bassins est suffisante pour gérer les flux d'eau du projet Odyssey avec la mise en place des recommandations. Celui-ci prend en considération les eaux d'exhaure d'Odyssey ainsi que les changements climatiques. Les résultats du bilan démontrent que la capacité des bassins sera suffisante pour gérer les eaux supplémentaires générées par toutes les zones du projet Odyssey avec la mise en place des recommandations.

## 2.1.3 GESTION DES EAUX D'EXHAURE

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| **QCM-4** | **L'initiateur précise, à la section 4.4.2 de la demande de modification, que les eaux d'exhaure des zones Odyssey Sud et East Malartic seront traitées par un système de type Mudwizard (ou un autre système équivalent) avant d'être acheminées au bassin Nord-Est. Les eaux d'exhaure des zones Odyssey Nord et East Gouldie seront cependant pompées directement vers le bassin Nord-Est sans traitement. Le mélange des eaux non traitées avec des eaux potentiellement de meilleures qualités grâce au traitement préalable ne correspond pas tout à fait aux recommandations de la Directive 019 sur l'industrie minière (2012) qui préconise d'éviter la dilution des eaux minières. Dans ce contexte, l'initiateur doit :**<br>**a. Présenter de plus amples explications concernant cette différence dans la gestion des eaux d'exhaure provenant de différentes zones minées et justifier le mode de gestion impliquant le mélange des eaux déjà clarifiées avec des eaux non traitées, incluant les eaux de ruissellement.**<br>**b. Présenter de quelle manière la gestion des eaux pourrait être optimisée afin de limiter la dilution et réduire la charge de contaminants rejetés dans l'environnement. Par exemple, par pompage des eaux d'exhaure traitées des zones Odyssey Sud et East Malartic directement au bassin de polissage, ou par le traitement préalable de toutes les eaux acheminées au bassin Nord-Est incluant les eaux d'exhaure des zones Odyssey Nord, East Gouldie et les eaux de ruissellement. Si aucune solution n'est envisageable, l'initiateur doit présenter les justifications nécessaires.** |

**RCM-4 :**

**a) et b)** Contrairement à ce qui a été présenté à la section 4.4.2 de la demande de modification, les eaux d'exhaure en provenance des quatre zones exploitées d'Odyssey (Odyssey Sud, East Malartic, Odyssey Nord et East Gouldie) seront traitées sous terre avant d'être acheminées au bassin Nord-Est.

## 2.1.4 IMPACT SUR LES ÉMISSIONS ATMOSPHÉRIQUES

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| **QCM-5** | **L'initiateur présente à l'annexe C de la demande de modification, les schémas de procédé de deux dépoussiéreurs pour les silos d'entreposage principaux de liant et quatre autres dépoussiéreurs associés aux silos de jour. L'initiateur doit indiquer pourquoi les quatre dépoussiéreurs associés aux silos de jour ne font pas partie des sources modélisées et/ou apporter les justifications nécessaires si celles-ci sont jugées négligeables. Le cas contraire, une mise à jour des sources modélisées devra être apportée.** |

**RCM-5 :**

L'identification et la caractérisation des sources ponctuelles de l'usine de remblai considérées dans l'étude de modélisation de la dispersion atmosphérique présentée à l'annexe K étaient basées sur l'information la plus précise disponible au moment de la modélisation. Deux sources ponctuelles avaient alors été considérées, soit un dépoussiéreur pour chacune des phases de construction de l'usine de remblai. Pour le scénario 1 (année 2024), seuls les équipements de la première phase étaient considérés en opération, alors que pour le scénario 2 (année 2035), les deux phases étaient considérées actives. Des débits de 1 150 cfm avaient été considérés pour chacune des sources, ce qui correspond à des émissions journalières de 1,41 kg/jour et 2,81 kg/jour de particules totales pour chacun des scénarios respectivement.

Le design le plus récent de l'usine prévoit maintenant l'utilisation de quatre lignes identiques de procédé, chacune comptant deux dépoussiéreurs. La mise en service de la première ligne est planifiée en 2022, alors que la mise en service des trois autres lignes est planifiée en 2026. Le scénario 1 (année 2024) compte une ligne active et les quatre lignes seraient actives dans le scénario 2 (année 2035). Les débits prévus des deux dépoussiéreurs correspondent à 1 000 cfm et 550 cfm. Toutefois, l'utilisation prévue du second dépoussiéreur est d'au plus 7,5 heures par jour selon les arrivages des livraisons par camions. L'estimation des émissions journalières conséquentes chiffre à 1,43 kg/jour et 5,73 kg/jour de particules totales pour chacun des scénarios respectivement. En comparaison avec les taux d'émission estimés dans la modélisation précédente, ceci correspond à un ajout de moins de 2 % pour le scénario 1, donc négligeable, et à une augmentation d'environ 100 % pour le scénario 2. Néanmoins, pour les deux scénarios, les émissions de l'ensemble des dépoussiéreurs sont faibles en comparaison des émissions globales. En effet, celles-ci représentent moins de 1 % des émissions de l'ensemble des sources associées au projet Odyssey.

Enfin, les modifications apportées à ces sources ont été intégrées dans la modélisation et une révision du rapport est disponible à l'annexe QCM-5.

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|---|---|
| **QCM-6** | **L'initiateur présente à l'annexe K de la demande de modification, l'étude de modélisation de dispersion atmosphérique.**<br>**a. Selon le tableau A-1-16 qui présente une description et les taux d'émissions calculés pour les véhicules hors route utilisés dans la mine souterraine, quatre véhicules ont des certifications TIER 4. Comme les facteurs d'émissions reliés à ces certifications ont été utilisés pour calculer les émissions de contaminants des principaux équipements de production additionnels, l'initiateur doit s'engager à utiliser des équipements ayant minimalement ces certifications.**<br>**b. L'initiateur indique à la section 4.1.2.4 que pour les sautages souterrains, le facteur d'émission utilisé pour le monoxyde de carbone (CO) est de 2,3 kg/tonne d'explosif (selon la référence citée du *National Pollutant Inventory*), soit le facteur d'émission pour un explosif en émulsion avec le plus petit diamètre. L'initiateur doit préciser pourquoi le facteur d'émission pour ce type d'explosif avec le plus grand diamètre, soit 17 kg/tonne d'explosif, n'a pas été utilisé. Si l'initiateur n'est pas en mesure de justifier son choix, le facteur d'émission avec le plus grand diamètre devra être utilisé et les impacts de ce changement sur les résultats de la modélisation devront être détaillés.** |

**RCM-6 :**

**a)** Parmi les véhicules de certification Tier 4 ciblés au tableau A-1-16, les plus importants correspondent aux équipements de production minière (chargeuses et camions). Ceux-ci présentent les puissances, le nombre d'unités et l'utilisation les plus élevés. Leur potentiel de contribution aux émissions totales est donc le plus important. CMGP s'engage donc à sélectionner des équipements de production certifiés Tier 4 lorsque disponibles. Selon l'information la plus récente disponible aujourd'hui, les équipements prévus seront majoritairement de certification Tier 4 et une partie sera électrique.

Il est important de préciser que la liste d'équipements considérés dans la modélisation est basée sur l'information du projet la plus à jour disponible au moment de caractériser la modélisation et que le choix des modèles des véhicules n'est pas alors définitif. Des modèles équivalents peuvent être considérés selon la disponibilité. Ainsi, les certifications Tier considérées dans la modélisation consistent en une hypothèse effectuée généralement de façon conservatrice. Les émissions considérées pour ces sources dans la modélisation sont donc surestimées.

**b)** Le facteur d'émission à utiliser pour le monoxyde de carbone (CO) des sautages avec un explosif en émulsion est bien de 2,3 kg/tonne d'explosif. Selon le tableau 7 de l'annexe C de la référence du *National Pollutant Inventory*, ce taux correspond au forage de plus grand diamètre (>150 mm), tandis que le facteur d'émission de 17 kg/tonne d'explosif correspond au forage de plus petit diamètre (<150 mm). Les diamètres des forages prévus pour les sautages de production souterrains sont de 152 mm, soit au-dessus du seuil du plus grand diamètre. Le facteur de 2,3 kg/tonne d'explosif utilisé dans la modélisation est donc conforme à la documentation.

D'ailleurs, pour un projet minier, la taille des forages pour des sautages de production est typiquement au-dessus de ce seuil. Par exemple, pour les sautages de production de la fosse Barnat (section 4.1.1.1 du rapport de modélisation), le diamètre prévu des trous de forage est de 229 mm. Pour ces sautages, le même facteur d'émission est donc considéré pour la portion de l'explosif en émulsion.

**QCM-7** **Selon les résultats de l'étude de modélisation de dispersion atmosphérique, le projet Odyssey augmenterait la concentration de silice cristalline au récepteur « Résidences Nord » dans les scénarios 1, où on prévoit déjà un dépassement du critère.**

**Selon les informations transmises par l'initiateur, le suivi de la qualité de l'air révèle des dépassements au critère annuel de silice cristalline pour les années 2019 et 2020, comme le montre le tableau suivant :**

| | Station A2 | Station A3 |
|---|---|---|
| 2019 | 0,122 | 0,073 |
| 2020 | 0,119 | 0,079 |

**Ainsi, comme des dépassements sont déjà mesurés à proximité de ces récepteurs sensibles, il est important que la modification au projet n'augmente pas la concentration annuelle de la silice cristalline au-delà de ce qui est déjà autorisé. Pour évaluer convenablement l'impact de la modification demandée et de statuer sur l'acceptabilité du projet en regard de la qualité de l'air ambiant, un scénario représentatif des conditions d'opérations de la mine comme autorisées par le plus récent décret (décret numéro 1370-2018 du 28 novembre 2018) doit être soumis par l'initiateur, c'est-à-dire un scénario qui inclut le projet Odyssey comme il est présentement autorisé afin de vérifier que le nouveau projet n'entraînera pas d'augmentation de la silice cristalline aux récepteurs sensibles comme le suggèrent les résultats de l'étude de modélisation de 2018. Le scénario de référence doit inclure l'optimisation des opérations dans le cadre de la présente modification de décret.**

**RCM-7 :**

Afin de bien quantifier l'augmentation de la concentration annuelle de silice cristalline par le projet Odyssey, un bref résumé de l'historique des modélisations de la dispersion atmosphérique est présenté.

Au cours des demandes d'autorisation passées, trois modélisations de la silice cristalline ont été effectuées pour le site de CMGP, soit :

1. Étude d'impact 2016 : Une modélisation des activités d'exploitation de MCM a été réalisée lors du projet de l'extension de la mine aurifère Canadian Malartic (WSP, 2016). Cette modélisation a été effectuée dans le cadre de l'évaluation qui a mené au décret numéro 388-2017 du 12 avril 2017.
2. Projet Odyssey 2018 : Une modélisation des activités d'exploitation de MCM et des activités du projet Odyssey a été réalisée en 2018 (WSP, 2018). Cette modélisation a été effectuée dans le cadre de l'évaluation qui a mené au décret numéro 1370-2018 du 28 novembre 2018.
3. Projet Odyssey 2021 : Une modélisation des activités d'exploitation de MCM et des activités du projet Odyssey a été réalisée en 2021 (WSP, 2021a, 2021b)[1]. Il s'agit de la modélisation effectuée dans le cadre de la présente évaluation.

Uniquement, les modélisations 2018 et 2021 incluent les activités liées au projet Odyssey, la modélisation 2016 donne néanmoins un comparatif des activités autorisées avant l'ajout du projet Odyssey. Cependant, les activités d'exploitation CMGP considérées diffèrent pour chacune des études, selon l'objectif d'évaluation. Par exemple, les scénarios de modélisation ne correspondent pas aux mêmes années d'exploitation. De plus, des modifications sur les méthodes de modélisation ont été effectuées entre chacun des exercices. Parmi les changements les plus importants, les modifications au niveau des données météorologiques et l'utilisation de l'option « adjusted u* » sont à noter et influencent les résultats d'une étude de dispersion. La comparaison entre les études doit donc être effectuée avec prudence. Néanmoins, celles-ci étaient conformes à la méthodologie du MELCC au moment où elles ont été effectuées. La comparaison entre les scénarios d'une même étude demeure la méthode d'évaluation à privilégier.

Les résultats de modélisation de la concentration annuelle de silice cristalline aux récepteurs sensibles sont résumés au tableau suivant. Ces résultats correspondent à la concentration maximale modélisée pour les activités minières uniquement, soit sans considérer la concentration initiale; qui est constante pour les trois études. En ce qui concerne les études qui présentent plusieurs scénarios, seule la concentration du scénario maximal est retenue dans ce tableau.

1 Une première version du rapport de la modélisation 2021 a été déposée au MELCC en février 2021 (WSP, 2021a). Dans le cadre des réponses à la présente série de questions et commentaires du MELCC, une révision du rapport de modélisation a été préparée (WSP, 2021b) et est disponible à l'annexe QCM-5. Pour la présente réponse, les résultats de la version la plus à jour du modèle sont utilisés, soit ceux de la révision 1 de la modélisation en préparation (WSP, 2021b). Néanmoins, les mêmes conclusions peuvent être tirées à partir des résultats de la version de février 2021 (WSP, 2021a).

**Tableau 1 Résultats de modélisation de la concentration annuelle de silice cristalline aux récepteurs sensibles selon les contextes de modélisation**

| CONTEXTE DE MODÉLISATION | CONCENTRATIONS MAXIMALES DE SILICE CRISTALLINE MODÉLISÉES SUR UNE PÉRIODE ANNUELLE POUR LES ACTIVITÉS MINIÈRES UNIQUEMENT [A] (µG/M³) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Secteur résidentiel nord (Ville de Malartic) | | | | | | Résidences sud (Chemin des Merles) | | | | | |
| | Scénario de base | | | Scénario optimisé | | | Scénario de base | | | Scénario optimisé | | |
| | Sans Odyssey | Avec Odyssey | Différence par l'ajout d'Odyssey | Sans Odyssey | Avec Odyssey | Différence par l'ajout d'Odyssey | Sans Odyssey | Avec Odyssey | Différence par l'ajout d'Odyssey | Sans Odyssey | Avec Odyssey | Différence par l'ajout d'Odyssey |
| Étude d'impact 2016 | **0,330** | - | - | **0,125** | - | - | **0,120** | - | - | 0,028 | - | - |
| Projet Odyssey 2018 | **0,096** | **0,103** | +0,008 | **0,0380** [B] | **0,0383** | +0,0003 | **0,031** | **0,034** | +0,003 | 0,026 [B] | 0,027 | +0,0010 |
| Projet Odyssey 2021 | **0,080** | **0,083** | +0,003 | **0,0563** [B] | **0,0567** | +0,0004 | 0,017 | 0,017 | +0,001 | 0,013 [B] | 0,014 | +0,0002 |

[A] Les valeurs en caractère gras représentent des valeurs supérieures au seuil du critère de 0,07 µg/m³ lorsque la concentration initiale de 0,04 µg/m³ est considérée.

[B] Ces valeurs ont été compilées lors de l'exercice de modélisation, mais elles n'ont pas été présentées sous forme de tableau dans les rapports de modélisation correspondants.

Pour le scénario de base, l'augmentation de la concentration modélisée par l'ajout du projet Odyssey est plus faible suivant la modélisation 2021 que suivant la modélisation 2018, et ce, autant au secteur résidentiel nord et qu'aux résidences sud. En effet, au secteur résidentiel nord, l'ajout du projet Odyssey induit une augmentation de 0,008 µg/m$^3$ selon de la modélisation 2018, tandis qu'une augmentation de 0,003 µg/m$^3$ est modélisée en 2021.

De plus, les concentrations modélisées au scénario de base du projet Odyssey 2021 sont les plus faibles d'entre toutes les modélisations. Les résultats de 2021 montrent une concentration maximale de 0,083 µg/m$^3$ au secteur résidentiel nord ce qui est inférieur à la concentration de 0,103 µg/m$^3$ modélisée en 2018.

Pour le scénario optimisé, l'augmentation de la concentration liée à l'ajout du projet Odyssey est légèrement supérieure lors de la modélisation 2021 que lors de la modélisation 2018 au secteur résidentiel nord, tandis qu'elle est inférieure aux résidences sud. L'ajout du projet Odyssey induit une augmentation de 0,0003 µg/m$^3$ au secteur résidentiel nord, soit 0,8 % de la concentration, lors de la modélisation 2018, tandis qu'une augmentation de 0,0004 µg/m$^3$, soit 0,7 % de la concentration, est modélisée en 2021. Ces deux augmentations sont similaires et demeurent faibles par rapport aux concentrations modélisées avant l'ajout du projet Odyssey, d'autant plus que celles-ci sont obtenues dans le contexte du scénario d'optimisation, où la concentration modélisée est fortement influencée par le nombre d'arrêts d'opérations déterminé dans la modélisation.

Les concentrations modélisées pour le scénario optimisé au secteur résidentiel nord pour le projet Odyssey 2021 sont cependant plus élevées qu'en 2018, mais celles-ci demeurent considérablement plus faibles que lors de l'étude d'impact en 2016. De plus, cette augmentation entre les modélisations 2018 et 2021 provient de la caractérisation des sources de l'exploitation de MCM et non de celles du projet Odyssey. En effet, la concentration au secteur résidentiel nord du scénario optimisé « sans Odyssey » pour 2021 correspond à une augmentation d'environ 0,0183 µg/m$^3$ par rapport à celle de l'étude de 2018. Cette augmentation est près de 50 fois plus grande que la différence découlant de l'ajout du projet Odyssey 2021. Sur la base de ces faibles variations, il est jugé que l'ajout du projet Odyssey est non significatif. Enfin, les concentrations modélisées aux résidences sud pour le projet Odyssey 2021 sont les plus faibles de toutes les études.

En conclusion, la situation de modélisation de la silice cristalline du projet Odyssey 2021 sur une période annuelle aux récepteurs sensibles est similaire à celle de 2018 et, en outre, les augmentations modélisées sont plus faibles ou similaires à celles modélisées en 2018. Dans tous les cas, les concentrations modélisées pour les projets Odyssey 2018 et 2021 sont considérablement plus faibles que celles modélisées lors de l'étude d'impact 2016.

**QCM-8** **L'initiateur présente des résultats du suivi de la qualité de l'air pour les particules totales et fines de janvier 2019 à septembre 2020 au chapitre 8 de l'étude de modélisation de dispersion atmosphérique (annexe K).**

**a. Le respect des normes de particules ne garantit pas le respect des critères de silice cristalline. Considérant que des dépassements sont obtenus dans les différents scénarios exposés, l'initiateur doit présenter les résultats de suivi concernant la silice cristalline pour la période de janvier 2019 jusqu'à aujourd'hui (données les plus récentes).**

**b. L'initiateur indique que, comme lors de la modélisation de 2018, la méthode employée pour évaluer les émissions de particules fines à l'atmosphère évacuées par la ventilation des mines souterraines est basée sur les résultats de l'étude citée de McDonald ainsi que sur différentes hypothèses. Cette méthode est jugée acceptable par le ministère, car il n'existe pas de facteurs d'émission reliés aux activités souterraines. Cependant, l'initiateur doit s'engager à réaliser un échantillonnage réel des émissions à l'atmosphère des sorties d'air vicié de la mine souterraine pour valider les taux d'émission des différents contaminants. Le programme de surveillance devra être déposé pour approbation dans le cadre de la première demande d'autorisation en vertu de l'article 22 de la LQE.**

**Il est recommandé que l'échantillonnage soit minimalement effectué selon les modalités suivantes :**

**i. L'échantillonnage doit être effectué dans les 6 mois suivant le démarrage et ensuite, au moins une fois par année, pour chaque source.**

**ii. Dans l'éventualité où certains taux d'émission seraient supérieurs à ceux utilisés dans la présente étude, l'initiateur devra mettre à jour la modélisation de la dispersion atmosphérique des contaminants avec les nouveaux taux d'émission. S'il y a dépassement de normes et/ou de critères, il devra démontrer à l'aide de mesures d'atténuation supplémentaires le respect de ceux-ci et soumettre ces résultats au ministère sous forme d'un rapport complet. Suite à l'analyse de ce rapport, le ministère pourrait exiger la mise en place de mesures d'atténuation supplémentaires ou une modification du plan de surveillance.**

**RCM-8 :**

**a)** Les résultats actuellement disponibles sont présentés à l'annexe QCM-8. Ils couvrent les années 2019, 2020 et 2021 jusqu'à la fin du mois de juin.

**b)** CMGP s'engage à réaliser un échantillonnage des émissions à l'atmosphère des sorties d'air vicié de la mine souterraine. L'échantillonnage sera effectué dans les 6 mois suivant le démarrage et ensuite, au moins une fois par année, pour chaque source. Celui-ci pourra être révisé selon les résultats de caractérisation obtenus. Ce suivi sera intégré au programme de surveillance, lequel sera déposé pour approbation dans le cadre de la première demande d'autorisation.

Les résultats de l'échantillonnage seront comparés aux taux d'émission de la modélisation de la dispersion atmosphérique, et ce, afin de valider les hypothèses considérées et d'évaluer leur impact potentiel sur les résultats de modélisation. Dans l'éventualité où certains taux d'émission seraient supérieurs à ceux utilisés dans la présente étude et que leur impact sur les résultats de modélisation serait significatif, la modélisation de la dispersion atmosphérique des contaminants sera mise à jour. S'il y a dépassement de normes et/ou de critères, des mesures d'atténuation supplémentaires seront proposées afin de démontrer le respect de ceux-ci. Cette évaluation sera soumise au ministère sous forme d'un rapport complet.

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| **QCM-9** | **L'application du plan intégré de gestion des émissions atmosphériques est un engagement de la part de l'initiateur. L'initiateur s'est engagé à procéder à la modification ou l'interruption de certaines activités lorsque les concentrations dans l'air ambiant indiquent une tendance vers un dépassement des normes de la qualité de l'atmosphère. Ainsi, le plan intégré de gestion des émissions atmosphériques doit être mis à jour dans le cadre de la présente modification de décret. L'initiateur doit notamment y ajouter l'échantillonnage à la source des sorties d'air vicié.** |

**RCM-9 :**

Le plan de gestion de gestion des émissions atmosphériques (août 2021) est présenté à l'annexe QCM-9. Ce plan est applicable autant au projet Odyssey qu'à l'ensemble des opérations de Mine Canadian Malartic et celui-ci inclut l'échantillonnage à la source des sorties de ventilation de la mine souterraine.

## *2.1.5 IMPACT SUR LE MILIEU HUMAIN*

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| **QCM-10** | **L'initiateur mentionne à la page 60 de la demande de modification de décret que les activités peuvent générer des matières particulaires qui affecteront la qualité de l'air et qu'elles pourraient entraîner la perturbation de la circulation locale pouvant augmenter les risques d'accident. L'initiateur doit préciser les impacts anticipés sur la circulation locale et les risques d'accidents sur la route, et s'il y a lieu, présenter les mesures qui seront mises en place pour atténuer les impacts évalués.** |

**RCM-10 :**

Les mesures d'atténuation présentées dans le plan de gestion des émissions atmosphérique de CMGP (annexe QCM-9), qui visent à contrôler les émissions de particules à la source, sont aussi valables pour les opérations d'Odyssey. Les mesures actuellement en place prévoient que, advenant une dégradation de la qualité de l'air en lien avec les conditions climatiques, l'arrêt des opérations sera effectué bien avant que la qualité de l'air ne devienne un problème pour la sécurité des automobilistes.

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| **QCM-11** | **Le projet Odyssey s'éloigne légèrement du noyau urbain de la Ville de Malartic par rapport à la fosse à ciel ouvert Canadian Malartic, limitant ainsi les sources de nuisances (bruits, vibrations, poussières) et leurs effets sur la qualité de vie des citoyens de Malartic. Comme indiqué dans la demande de modification, les infrastructures de surface nécessaires à l'exploitation des zones minéralisées du projet seront situées à environ 3 km à l'est de l'entrée de la Ville de Malartic. De plus, la nature du projet (souterrain) devrait limiter les nuisances dues au bruit. Néanmoins, l'initiateur mentionne à la page 60 de la demande de modification que les activités de construction et d'exploitation du projet Odyssey sont susceptibles de causer de telles nuisances. Ainsi, en plus des choix de gestion et de conception intégrées au projet pour réduire l'exposition aux bruits, aux vibrations et aux matières particulaires présentés à la page 63 de la demande, l'initiateur doit s'engager à mettre en place ou à maintenir, le cas échéant, un système de réception, de traitement et de suivi des plaintes et des commentaires de la population. Il est d'ailleurs indiqué à la page 75 de la demande qu'il entend poursuivre ses engagements, dont celui de réagir avec diligence en cas d'impact non prévu et ressenti par les résidents.** |

**RCM-11 :**

Comme mentionné à la page 75 de la demande, CMGP entend poursuivre ses engagements en matière de minimisation des nuisances reliées à ses opérations. Le suivi se poursuivra tout au long de la vie de la mine et le système de réception, de traitement et de suivi des plaintes sera également maintenu. Bien entendu, CMGP réagira avec diligence à tous impacts relevés et ressentis par les résidents.

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| **QCM-12** | **L'initiateur présente, au chapitre 11 de la demande de modification de décret ainsi qu'à l'annexe T, la démarche d'information et de consultation réalisée dans le cadre de son projet auprès des parties prenantes concernées, notamment la communauté de Malartic et les citoyens à proximité. Selon le rapport de consultation, les résultats obtenus au cours de la démarche auraient permis à l'initiateur de tenir compte de préoccupations exprimées par les acteurs rencontrés, d'y apporter des réponses et de rassurer la population quant à l'efficacité des mesures d'atténuation actuellement en place (pp.79-82; 85). Considérant le nombre de demandes successives de modifications de décret depuis 2009 et dans un souci de clarté, l'initiateur doit présenter une synthèse de tous les moyens et mécanismes d'échanges avec la population concernée actuellement en place pour l'ensemble des activités du projet Canadian Malartic.** |

**RCM-12 :**

Dans le but de diversifier ses moyens de communication, de permettre une plus grande accessibilité aux conseillères aux relations avec la communauté et de créer un lieu d'échanges avec les citoyens, CMGP a ouvert, en 2016, un local de relations avec la communauté ayant pignon sur rue au centre-ville de Malartic.

Les citoyens peuvent également communiquer avec l'équipe par courriel ou par téléphone en tout temps.

Le Comité d'échanges et de suivi Canadian Malartic (CES-CM) est également un lieu privilégié d'échanges entre CMGP et la communauté. Son rôle est de :

- Constituer un espace de dialogue et de partage d'information entre CMGP, les personnes et les organisations concernées par les activités de CMGP.
- Développer une compréhension commune, complète et nuancée des impacts et des enjeux environnementaux, sociaux et économiques liés aux activités de CMGP.
- Relayer l'information découlant des activités du CES-CM aux organismes et aux citoyens.
- Faire des recommandations à CMGP dans le but d'influencer et de bonifier ses pratiques, de proposer des solutions concertées et de maximiser les retombées dans la communauté.

En mars 2020, CMGP a mis en ligne un tout nouveau site Internet afin de mieux informer ses parties prenantes. Il est désormais possible de transmettre un message directement via le site Internet.

L'équipe de relations avec la communauté effectue à l'occasion des campagnes de porte à porte pour aller à la rencontre des citoyens, des mémos sont laissés aux portes des citoyens n'ayant pas pu être rencontrés lors des visites.

Des bulletins d'informations trimestrielles sont également envoyés par la poste à tous les citoyens de Malartic et du chemin des Merles de Rivière-Héva. Ces bulletins permettent à CMGP de partager des informations sur ses activités et de mettre en lumière ses réalisations en matière d'implication communautaire.

Selon le besoin et l'actualité, d'autres outils de communication, ex. des communiqués de presse, sont partagés avec nos parties prenantes dont la liste de distribution est continuellement mise à jour.

CMGP entend poursuivre ses engagements en matière de consultation et d'échange avec la population tout au long de la vie de la mine en continuant d'appliquer les mécanismes en place.

| | |
|---|---|
| **QCM-13** | **L'initiateur n'a pas précisé au chapitre 11 ou à l'annexe T de la demande de modification si la MRC de la Vallée-de-l'Or avait était consultée sur le projet. L'initiateur doit bonifier cette information en présentant un résumé des rencontres qui ont été tenues en indiquant la date de la consultation et faire mention des principales préoccupations soulevées, si applicable. Dans le cas où aucune consultation n'aurait été réalisée, l'initiateur devra prévoir une rencontre à ce sujet avec les responsables de la MRC et fournir un résumé de cette rencontre dans le cadre de la première demande d'autorisation en vertu de l'article 22 de la LQE.** |

**RCM-13 :**

La MRC de La Vallée-de-l'Or n'avait pas été spécifiquement ciblée comme une partie prenante à consulter pour le projet. Rappelons qu'une plateforme Web avait été élaborée pour rejoindre la population en général et était également accessible à tout organisme qui jugeait pertinent de s'informer sur le projet. Toutefois, à la suite des commentaires reçus, CMGP a contacté la MRC de La Vallée-de-l'Or qui a précisé qu'une rencontre individuelle avec CMGP n'était pas nécessaire, puisque deux personnes de l'organisation participaient déjà aux rencontres avec le CES-CM et la Ville de Malartic, soit le préfet et le directeur du service de l'aménagement. Cette lettre est présentée à l'annexe QCM-13.

## 2.2 ATTÉNUATION DES IMPACTS

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|---|---|
| **QCM-14** | **L'initiateur présente, à l'annexe R de la demande de modification, les tassements potentiels dus au rabattement des eaux souterraines. Des affaissements de sol ponctuels ont été rencontrés avant et lors de la construction du nouveau tronçon de la route 117 et, selon les études présentées, certains sont attribuables aux activités de la mine Canadian Malartic.**<br>**a. Puisque le projet Odyssey pourrait potentiellement avoir un effet de rabattement à l'est de la déviation de la route 117, le consultant recommande l'ajout de trois puits d'observation au suivi régional des eaux souterraines. L'initiateur doit confirmer qu'il intégrera ces trois puits au suivi régional.**<br>**b. L'initiateur doit s'engager à procéder à des investigations approfondies si une déformation devait être observée sur la route 117 (ex : tassements différentiels ou des affaissements de sol) dans le secteur de la mine Canadian Malartic. Si la situation se présente, la méthodologie employée devra faire l'objet d'une validation préalable par le MTQ. Ces études devront notamment comprendre des recommandations sur les travaux correctifs. Finalement, dans la mesure où les déformations seraient influencées par les activités de la mine, l'initiateur aura la responsabilité d'assumer les coûts et la réalisation des travaux correctifs recommandés, sur approbation du MTQ et à sa satisfaction.** |

**RCM-14 :**

**a)** CMGP suivra les recommandations du consultant qui sont actuellement d'ajouter trois puits d'observation au programme de suivi régional des eaux souterraines.

**b)** Dans le cadre de sa demande de modification, CMGP n'a présenté aucune étude relative à des affaissements de sol ponctuels rencontrés avant et lors de la construction du nouveau tronçon de la route 117 et pouvant être attribuées « aux activités de la mine Canadian Malartic », puisque sa demande de modification ne porte pas sur la mine Canadian Malartic ou son extension Barnat, mais sur le projet souterrain Odyssey. CMGP comprend que ses obligations et sa responsabilité, relativement aux activités de la mine Canadian Malartic, sont déjà régies par des autorisations déjà délivrées et le droit commun et qu'il n'est pas requis de prendre de nouveaux engagements à cet égard dans le cadre de sa demande de modification pour le projet Odyssey.

**QCM-15 L'initiateur présente à l'annexe S de la demande de modification, l'étude de la résilience climatique.**

**a. L'initiateur doit préciser quelles mesures de contrôle et d'adaptation (listées dans le tableau 23) seront mises en place par l'initiateur.**

**b. Il est recommandé que la conception des stationnements suive la norme BNQ 3019-190 Lutte aux îlots de chaleur urbains – Aménagement des aires de stationnement. Lutte aux îlots de chaleur urbains - BNQ.**

**c. L'initiateur doit confirmer qu'il révisera l'analyse de la résilience climatique du projet périodiquement (tous les cinq ans) comme recommandé par l'équipe de résilience climatique de WSP (annexe S).**

**RCM-15 :**

**a)** Les mesures de contrôle et d'adaptation qui seront mises en place sont :

- mise en place d'une réserve de personnel en cas d'urgence et de hauts taux d'absentéisme en cas d'accidents;
- maintien des mesures de prévention et de sensibilisation soutenues aux employés liées à la santé et sécurité;
- révision du plan d'urgence pour y intégrer l'évacuation pendant les feux de forêt, et ce, pour une préparation optimale;
- respect strict des recommandations émises par les institutions de santé publique;
- réorganisation du calendrier de construction en dehors des heures les plus chaudes en cas de besoin;
- surveillance accrue de la qualité de l'air (collaboration d'un partenaire externe possible);
- mesures de contrôle pour vérifier la charge de neige sur le toit et capacité suffisante de déneigement à l'interne.

**b)** La norme BNQ-3019-190[2] ne constitue pas un règlement, mais certainement une bonne pratique à adopter dans le cadre de l'aménagement de nouveaux espaces de stationnement. CMGP prend bonne note de ce commentaire et l'information sur l'existence de cette norme sera communiquée à l'équipe responsable de la conception qui pourra s'en inspirer.

**c)** Aux 5 ans, CMGP révisera l'analyse de la résilience climatique du projet sans que celle-ci soit systématiquement mise à jour. Advenant que de nouvelles projections climatiques soient disponibles et que des impacts potentiels sur les activités soient identifiés par CMGP, une mise à jour de l'analyse de la résilience climatique sera alors effectuée.

2 https://bnq.qc.ca/images/pdf/environnement/3019-190_document_synthese.pdf

| | |
|---|---|
| **QCM-16** | **Les mesures d'atténuation proposées par l'initiateur aux fins de limiter les émissions de GES doivent être bonifiées.**<br>**a. L'initiateur doit préciser s'il participe à l'initiative Vers le développement minier durable (VDMD) de l'Association minière du Canada (AMC) qui inclut un protocole de consommation énergétique et de gestion des émissions de GES visant à promouvoir des systèmes exhaustifs pour la réduction de la consommation d'énergie et des émissions connexes. Sinon, il devra indiquer quels sont les moyens envisagés pour diminuer les émissions de GES.**<br>**b. L'initiateur doit présenter une étude détaillée des possibilités d'électrification pour ses activités minières reliées à la présente demande de modification de décret. Un plan d'électrification précisant si des équipements électriques sont prévus doit également être présenté.**<br>**c. L'initiateur ne semble pas avoir inclus au calcul des émissions d'exploitation du projet les émissions de GES associées au transport par camion du minerai à partir de la mine Odyssey jusqu'à l'usine de traitement du minerai sur une distance de 5,6 km. Afin d'obtenir un calcul des émissions de GES le plus exact possible, cette source doit faire partie du bilan GES du projet. L'initiateur doit donc fournir ce calcul en détail et les résultats obtenus doivent être additionnés au bilan GES du projet. Les mesures d'atténuation doivent également être revues en fonction de cette évaluation et présentées à l'appui de la modification de décret.** |

**RCM-16 :**

**a)** Depuis 2016, CMGP se conforme aux principes du programme Vers le développement minier durable (VDMD) de l'Association minière du Canada (AMC). La participation à l'initiative VDMD démontre un engagement à agir de manière responsable et à adopter des pratiques sociales, économiques et environnementales correspondant aux priorités et aux valeurs de nos parties prenantes. Parmi les protocoles du programme VDMD, CMGP a entre autres, intégré celui relié à la gestion de l'énergie et des émissions de GES.

**b)** Le projet Odyssey profitera d'équipements déjà acquis et en opération sur le site de mine Canadian Malartic. Aucune étude détaillée sur les possibilités d'électrification n'est actuellement disponible et ne sera réalisée à court terme. Toutefois, dans le document principal de la présente demande de modification de décret, il a été précisé que :

1. CMGP étudie la faisabilité de l'électrification de certains équipements et reconnaît que les véhicules électriques offrent des avantages, notamment la diminution des émissions de GES, la réduction des besoins de ventilation souterraine, une consommation moindre en carburant et huiles, une maintenance réduite, etc.

2. Si le projet est autorisé, l'acquisition des premiers équipements de la flotte d'équipements électriques de production se fera vers la fin de la deuxième année du projet. Les avancées dans le domaine de l'électrification des équipements miniers sont constantes. CMGP se tient au fait de l'évolution technologique et continuera de considérer la possibilité d'acquérir, voire même de privilégier certains équipements s'ils offrent les capacités requises. Si un équipement est équivalent en termes de sécurité, de performance et de coûts, alors l'équipement électrique sera favorisé. D'ailleurs, dans la flotte sélectionnée pour les travaux de la rampe d'exploration, on compte déjà un véhicule de service électrique.

3. Actuellement, les projections de l'ingénierie préliminaire du réseau électrique du projet souterrain tiennent compte des structures requises pour permettre le déploiement d'une flotte d'équipements électriques. Elles prévoient également l'extension du réseau télécom de communication de données pour maximiser les opportunités d'automatisation et de télé opération des activités sous terre.

4. Les bénéfices d'une telle structure d'électrification et d'automatisation se répercutent non seulement sur les performances d'opération en optimisant l'utilisation des équipements, mais également sur la santé et la sécurité des travailleurs. Ils permettent entre autres le travail depuis la surface en environnement contrôlé.

5. Privilégier l'utilisation d'équipement électrique lorsque les options disponibles sur le marché répondront aux exigences techniques et économiques du projet.

Depuis, des discussions ont eu lieu avec des manufacturiers d'équipements électriques. Aucune décision n'a encore été prise pour remplacer l'ensemble des équipements en fonction, ce qui ne serait pas réaliste d'un point de vue économique. Toutefois, à la fin de vie desdits équipements, la possibilité de les remplacer par des équipements électriques est actuellement envisagée et peut donc être considérée comme le plan d'électrification des équipements.

**c)** L'exploitation des deux zones minéralisées supplémentaires n'entraine pas une augmentation de la flotte de camions de transport actuellement en fonction ailleurs sur le site minier. Ce sont les mêmes équipements qui seront déplacés (réaffectés) et effectueront le transport de la mine Odyssey vers l'usine de traitement, tout comme dans le projet autorisé au décret pour l'exploitation des deux premières zones minéralisées.

Ces camions sont donc de facto inclus dans la catégorie *Sources existantes* dans la section 3 de la note technique détaillant les émissions de GES du projet Odyssey. Les émissions de GES de ces camions sont incluses au tableau 9 de cette même section. Ces émissions sont évaluées en fonction de la consommation réelle de carburant dont l'inventaire est réalisé dans le cadre de la quantification et déclarations annuelles d'émissions des installations de CMGP à l'inventaire québécois des émissions atmosphériques (IQEA). Cette approximation est jugée plus exacte qu'un calcul théorique dans lequel la consommation serait estimée. Les mesures d'atténuation précisées applicables à l'utilisation de machinerie mobile s'appliquent de facto aux machineries utilisées dans le cadre de l'exploitation des fosses. Cette méthode prend comme hypothèse que, d'une manière globale et considérant tous les transports réalisés en exploitation, les distances de parcours sont similaires.

# 3 PLAN PRÉLIMINAIRE DES MESURES D'URGENCE

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| **QCM-17** | **L'initiateur mentionne, au chapitre 7 de la demande de modification de décret, qu'un plan de mesures d'urgence adapté au projet Odyssey est en cours d'élaboration et sera disponible en 2021. Il traitera, entre autres, des risques liés à l'effondrement des chantiers souterrains, des risques d'incendies, d'accidents majeurs, etc. Toutefois, ces informations concernant les risques d'accident (analyse de risques technologiques) et les mesures d'urgence (plan préliminaire) qui leur sont associées sont requises pour que le ministère puisse compléter l'analyse de l'acceptabilité de la modification demandée, l'initiateur doit donc soumettre ces informations. Le plan final devra être déposé pour approbation dans le cadre de la première demande d'autorisation en vertu de l'article 22 de la LQE.** |

**RCM-17 :**

Une révision du plan de mesures d'urgence (PMU) comportant les informations demandées et disponibles est jointe à l'annexe QCM-17. Cette nouvelle version comprend les risques d'accident identifiés aux activités souterraines d'Odyssey. Le PMU final sera déposé au moment de la demande d'autorisation en vertu de l'article 22 de la LQE pour l'exploitation.

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| **QCM-18** | **L'initiateur mentionne, au chapitre 7 de la demande de modification, qu'il présentera le plan des mesures d'urgence au ministère de l'Énergie et des Ressources naturelles (MERN). En plus de ce qui est déjà prévu, l'initiateur doit s'engager à présenter ce plan des mesures d'urgence à la municipalité ainsi qu'à la sécurité civile.** |

**RCM-18 :**

CMGP s'engage à présenter la version mise à jour du PMU à la Ville de Malartic ainsi qu'à la sécurité civile.

# 4 CONFORMITÉ AU SCHÉMA D'AMÉNAGEMENT ET À LA RÈGLEMENTATION MUNICIPALE

**QCM-19** **L'initiateur mentionne, à la section 10 de la demande de modification, que le pourtour du bail sera ajusté afin d'intégrer les zones géologiques souterraines pouvant présenter un potentiel économique futur et que le projet Odyssey se situe dans les zones d'exploitation des ressources et industrielle (règlementation municipale et schéma d'aménagement de la MRC de la Vallée-de-l'Or (MRCVDO)). L'exploitation contrôlée des ressources est autorisée dans ces zones, il n'y aura aucun changement de zonage nécessaire. Dans le but d'illustrer ces affirmations à l'aide de documentations officielles l'initiateur doit :**

- **a. Fournir trois cartes supplémentaires :**
  - **i. une carte présentant l'ajustement du pourtour du bail prévu;**
  - **ii. une seconde présentant les limites des zones inscrites dans la réglementation municipale qui démontre le respect du zonage;**
  - **iii. une troisième qui représente le projet avec les affectations du territoire du secteur de la Ville de Malartic dans le Schéma d'aménagement et de développement révisé (SADR) de la MRCVDO.**
- **b. Démontrer comment le projet respecte les orientations du SADR de la MRCVDO, entre autres, en fournissant les extraits auxquels il se réfère.**

**RCM-19 :**

**a)** L'annexe QCM-19a montre le pourtour du bail minier ajusté (i). Les limites des zones inscrites au règlement de zonage de la Ville de Malartic sont illustrées à la figure 19A (ii). Quant aux affectations du territoire issues du Schéma d'aménagement et de développement révisé (SADR) de la MRC de La Vallée-de-L'Or, elles sont présentées à la figure 19B (iii).

Ainsi tel qu'illustré à la figure 19A, les limites du bail minier sont à l'intérieur de la zone ER-2 du plan de zonage de la ville de Malartic et adopté par le Règlement de zonage 917 (Ville de Malartic, 2019), zone vouée à l'exploitation contrôlée des ressources et où sont permis les usages reliés notamment l'extraction à ciel ouvert ou souterraine des ressources minérales en incluant notamment le traitement et la transformation; les dépôts à ciel ouvert de matériaux, déchets, rebuts en vrac ou parcs à résidus miniers et autres usages et activités similaires en termes de caractéristiques.

Le plan de zonage et les règlements municipaux de la ville de Malartic reflètent également les choix et sont aussi conformes aux orientations et objectifs du SADR de la MRC. En ce sens, la figure 19b illustre que les limites du projet Odyssey sont à l'intérieur de l'affectation forestière. Les explications quant aux orientations du SADR sont présentées au point suivant.

**b)** Par son SADR, la MRC de La Vallée-de-l'Or (2005) oriente ses grandes orientations selon trois éléments :la réalité géographique du territoire, les potentiels de développement et la recherche du mieux-être de la collectivité. Le SADR met d'ailleurs en évidence que l'économie régionale repose en grande partie sur l'activité minière s'exerçant le long de la faille de Cadillac et qui est localisée dans l'axe Louvicourt-Val-d'Or-Malartic. Elle entend d'ailleurs promouvoir la mise en valeur de ce potentiel minier tout en limitant les conflits avec les autres activités coexistantes sur son territoire.

Par ailleurs, Le SADR fournit les choix d'aménagement à l'échelle de la MRC dont les extraits pertinents sont présentés à l'annexe QCM-19b.

Avec l'adoption de son SADR, la MRC énonce des grandes orientations d'aménagement auxquelles correspond particulièrement le projet, à savoir :

- favoriser le développement et la diversification des activités industrielles sur le territoire de la MRC, dont les activités de 2e et de 3e transformation et les entreprises à valeur ajoutée;
- privilégier une utilisation rationnelle et une mise en valeur intégrée des ressources naturelles;
- contribuer à la protection de l'environnement, au bien-être et à la sécurité des citoyens.

Telles que déjà présentées, les limites du projet Odyssey sont à l'intérieur de l'affectation forestière. L'affectation forestière concerne presque la totalité des terres publiques sous contrat d'approvisionnement et d'aménagement forestier (CAAF) et est principalement destinée à la production et au prélèvement de la matière ligneuse. L'application d'usages compatibles à l'intérieur des grandes affectations du territoire permet toutefois l'exploitation des substances minérales dans l'affectation forestière (voir section 3.3 du SADR).

Ainsi, par sa localisation dans une affectation du territoire compatible, le projet Odyssey s'inscrit dans la conformité des orientations du SADR de la MRC. Il est aussi à rappeler qu'en tant que document de planification, le SADR de la MRC de La Vallée-de-l'Or, en vertu de la Loi sur l'aménagement et l'urbanisme, reflète la vision du territoire préconisée par la MRC, le Gouvernement et les ministères.

D'ailleurs, la lettre de la MRC présentée à l'annexe QCM-13 indique que le projet n'entre pas en conflit avec le SADR, de même que la réponse du MERN présentée à l'annexe QCM-19a qui nous informe qu'aucune problématique majeure n'a été soulevée quant à l'approbation préliminaire du bail minier envisagé.

715 000
717 500
720 000
722 500
5 337 500
5 335 000
5 332 500

ER-3

Lac Ponson

Voir feuillet 2/2

117

RURI-1

RUR-1

ER-2

Périmètre préliminaire du bail minier du projet Odyssey
Zonage
Exploitation des ressources (ER)
Protection (P)
Rurale (RUR)
Rurale industrielle (RURI)
Récréation extensive (REX)

MINE CANADIAN MALARTIC

*Réponses aux questions et commentaires pour la modification du projet de la mine Candian Malartic - Exploitation des zones souterraines minéralisées du projet Odyssey*

**Figure 19A**
**Limite de zones selon le Règlement de zonage 917 de la Ville de Malartic**

*DOCUMENT DE TRAVAIL*

*Sources :*
*BNDT, 1/250 000, RNCan, 2007*
*AQréseau+, réseau routier, MERN Québec, 2020-03*
*Plan de zonage: Règlement de zonage 917, Ville de Malartic, 2019*

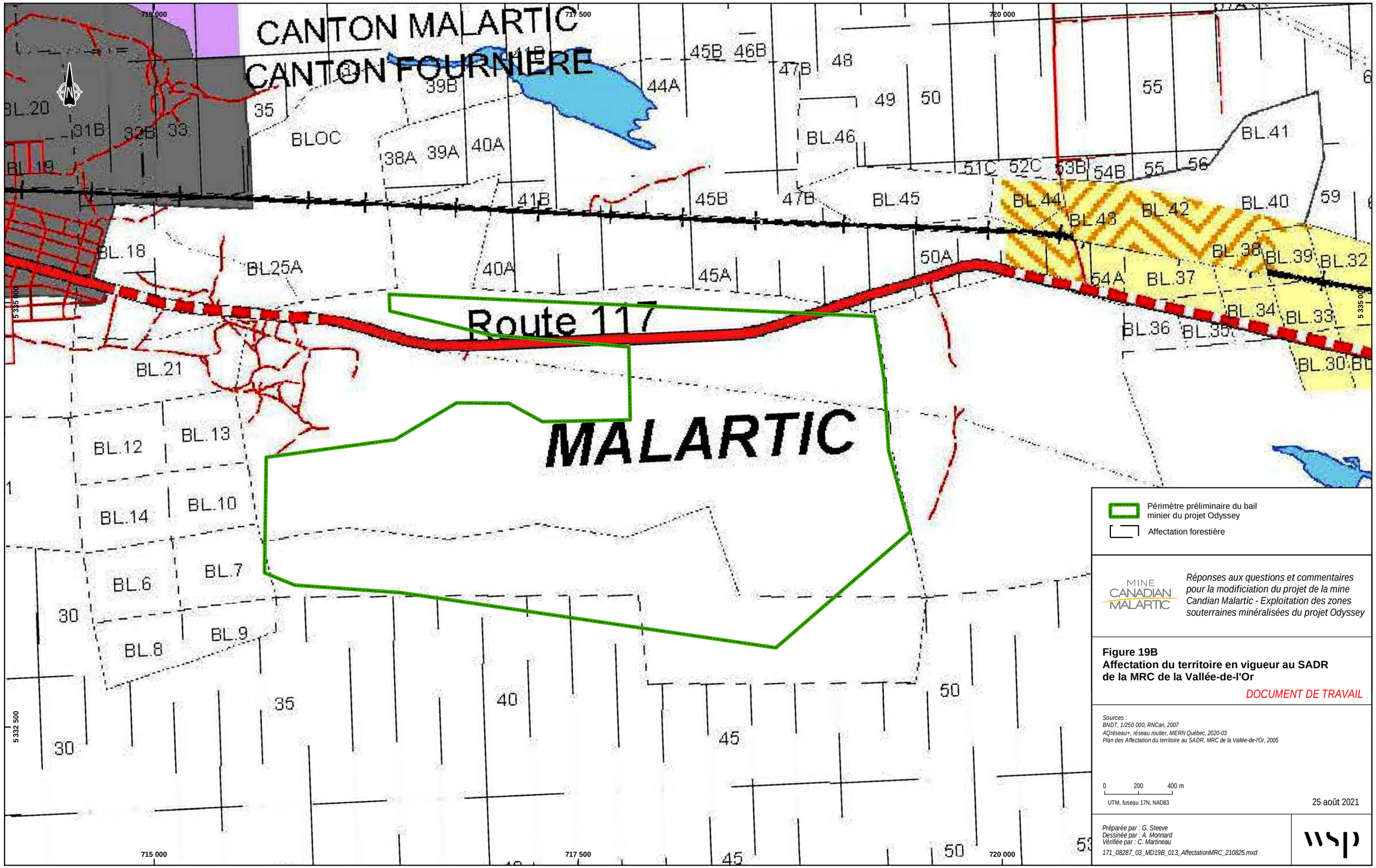
0 250 500 m
UTM, fuseau 17N, NAD83

25 août 2021

*Préparée par : G. Steeve*
*Dessinée par : A. Monnard*
*Vérifiée par : C. Martineau*
*171_08287_03_MD19A_012_Zonage_210825.mxd*

wsp

*La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre.*

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# 5 ACCÈS À LA ROUTE 117

**QCM-20** **L'initiateur mentionne, à la section 4.1 de la demande de modification, que des démarches ont été entreprises auprès du MTQ concernant l'aménagement d'un nouvel accès à la route 117. Par ailleurs, le projet d'aménagement de ce nouvel accès a fait l'objet d'une entente entre l'initiateur et le MTQ (Entente). L'accès temporaire octroyé par le MTQ sur la route 117 est limité à la durée de l'exploitation des quatre zones minéralisées qui font l'objet de la présente demande de modification.**

- **a. L'initiateur doit s'engager à aviser le MTQ advenant l'ajout d'autres zones minéralisées qui pourraient prolonger ou modifier l'utilisation de ce nouvel accès à la route 117. Si une telle situation se présente, un avenant à l'Entente entre l'initiateur et le MTQ devra être produit.**
- **b. Puisque l'information n'est pas précisée dans la demande de modification, le MTQ rappelle que, selon les dispositions prévues à l'Entente, l'accès à la route 117 ainsi que la voie de virage à gauche doivent être démantelés dans les 24 mois qui suivent la fin de l'exploitation de la mine souterraine Odyssey, soit suivant la fin des opérations d'extraction du minerai. De plus, toujours selon l'entente, l'initiateur doit aviser le MTQ dans les 60 jours qui suivent la fin de l'exploitation souterraine. Cette précision doit être ajoutée au plan de restauration présenté à l'annexe J de la demande de modification.**
- **c. L'initiateur doit préciser s'il entend utiliser l'accès via la route 117 lors du démantèlement décrit à la section 4.5 de la demande de modification pour le transport hors site des bâtiments et toutes les infrastructures qui ne seront pas utiles pour la réalisation des suivis post-exploitation et post-fermeture. Dans l'affirmative, ce devra être fait selon les dispositions prévues à l'Entente avec le MTQ.**

**RCM-20 :**

**a)** CMGP s'est déjà engagée auprès du MTQ au respect de l'ensemble des modalités et conditions de l'accès du projet Odyssey sur la route 117 et de la voie de virage à gauche. Vu que CMGP est déjà liée par l'entente avec le MTQ, il n'est pas nécessaire de réitérer les engagements qui y figurent.

**b)** Le délai de 24 mois et l'avis de soixante jours ont été précisés dans le plan de restauration (annexe QCM-20A) au sujet de l'accès du projet d'Odyssey sur la 117, considérant que le plan de restauration couvre les infrastructures situées sur un bail minier (page 43 du plan de restauration révisé. Le plan de restauration a été approuvé par la direction de la restauration des sites miniers du MERN (annexe QCM-20B).

**c)** CMGP s'est déjà engagée auprès du MTQ au respect de l'ensemble des modalités et conditions de l'accès du projet Odyssey sur la route 117 et de la voie de virage à gauche. Vu que CMGP est déjà liée par l'entente avec le MTQ, il n'est pas nécessaire de réitérer les engagements qui y figurent.

**QCM-21** **L'initiateur mentionne à la page 37 de la demande de modification que le transport des matériaux se fera en grande partie à partir de différents sites situés sur la propriété ou quelquefois par des accès directs à partir de la route 117.**

- **a. L'initiateur doit s'engager à appliquer les modifications à l'accès à la route 117 qui pourraient être exigées par le ministère des Transports du Québec (MTQ) en cours d'utilisation pour des raisons de sécurité et de fluidité du transport.**
- **b. L'initiateur doit s'engager à prioriser, dans la mesure du possible, le transport par véhicules lourds en dehors des heures de pointe pour l'entrée et la sortie de l'accès à la route 117 afin de réduire les impacts du projet sur la circulation de la route 117.**

**RCM-21 :**

**a)** CMGP s'est déjà engagée auprès du MTQ au respect de l'ensemble des modalités et conditions de l'accès du projet Odyssey sur la route 117 et de la voie de virage à gauche. Vu que CMGP est déjà liée par l'entente avec le MTQ, il n'est pas nécessaire de réitérer les engagements qui y figurent.

**b)** CMGP s'engage à prioriser, dans la mesure du possible, le transport par véhicules lourds en dehors des heures de pointe pour l'entrée et la sortie de l'accès à la route 117 du projet Odyssey afin de réduire les impacts du projet sur la circulation de la route 117.

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# ANNEXE

# QCM-2A

## RAPPORT INTÉRIMAIRE – CARACTÉRISATION GÉOCHIMIQUE DU SECTEUR DE EAST GOULDIE (GOLDER, 2021)

GOLDER

**CONFIDENTIEL**

# Rapport Intérimaire - Caractérisation géochimique du Secteur East Gouldie

*Mine Canadian Malartic*

Soumettre à :

**Mine Canadian Malartic**
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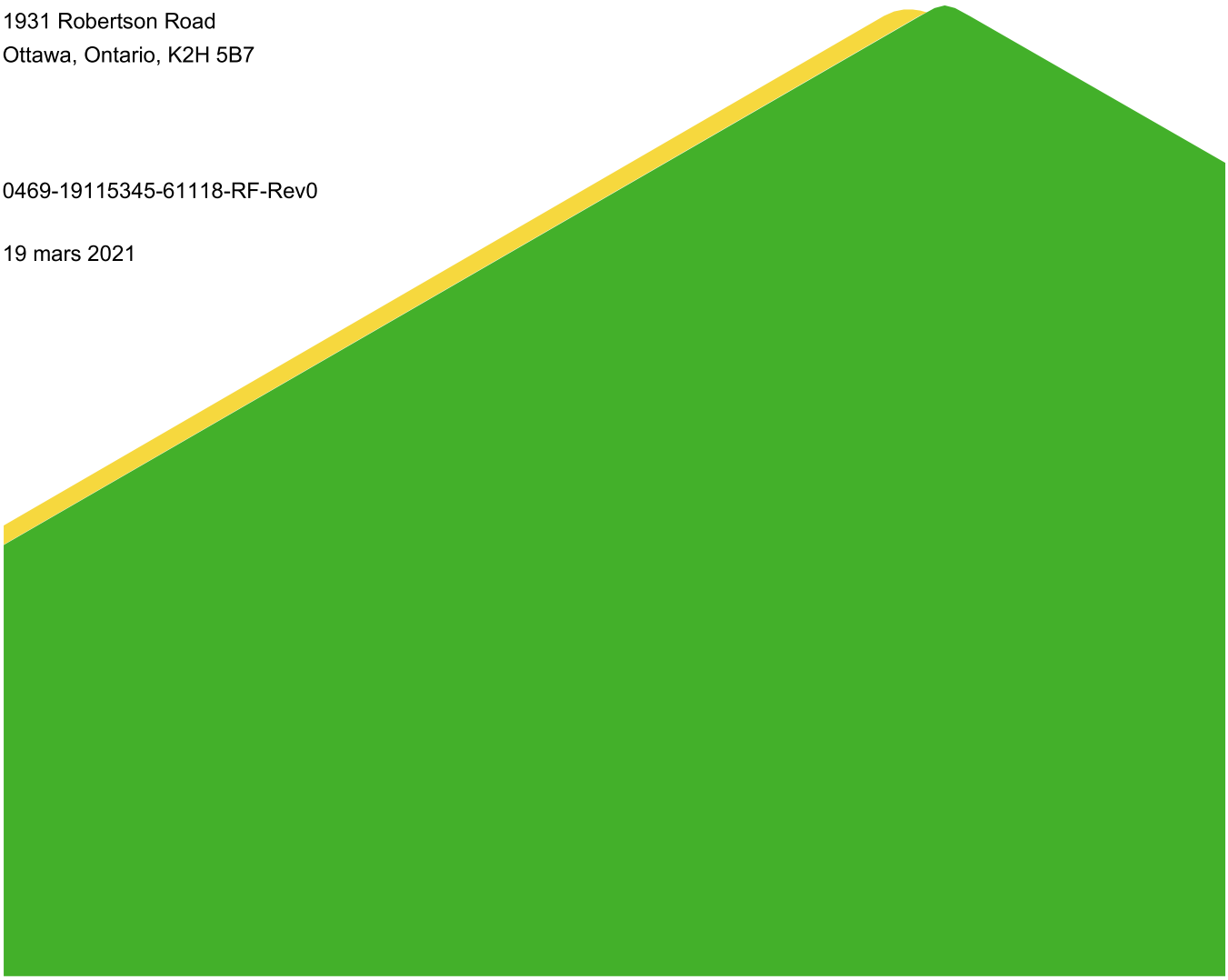
0469-19115345-61118-RF-Rev0

19 mars 2021



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Les descriptions d'échantillons présentées dans ce rapport ont été formulées uniquement pour des fins de caractérisation géoenvironnementales. Ces informations ne doivent pas être utilisées à des fins géotechniques dans la planification et l'élaboration de projets de construction, ou à d'autres fins quelles qu'elles soient, à moins que cela ne soit clairement indiqué dans le texte de ce rapport ou formellement autorisé par Golder.

À moins d'avis contraire, les interprétations, commentaires et les recommandations présentés dans ce rapport ont été formulés à la suite d'une évaluation des conditions du site conformément à la portée de l'étude et aux limitations générales décrites sur cette page, de même qu'à la lumière de nos connaissances concernant l'utilisation courante et/ou prévue du site, selon les règlements, normes et critères environnementaux en vigueur ainsi selon que les règles et pratiques professionnelles reconnues et acceptées au moment de l'étude, en tenant compte dans tous les cas de l'emplacement du site. Les références aux lois et règlements contenues dans ce rapport sont fournies à titre indicatif, sur une base technique, et ne représentent pas une description exhaustive des lois et règlements en vigueur. Conséquemment, et comme les lois et règlements sont susceptibles d'être interprétés, Golder recommande au client de consulter directement les lois et réglementations applicables ainsi que ses conseillers juridiques afin d'obtenir les avis appropriés.

Golder ne pourra être tenue responsable de dommages résultant de conditions qui lui seraient inconnues, de l'inexactitude de données provenant d'autres sources que Golder et de changements ultérieurs aux conditions du site à moins d'avoir été prévenue par le client de tout événement, activité, information, découverte passée ou future susceptible de modifier les conditions décrites dans ce rapport et d'avoir eu la possibilité de réviser les interprétations, commentaires et recommandations formulés dans ce rapport. De plus, Golder ne pourra être tenue responsable de dommages résultant de toute modification future aux règlements, normes ou critères applicables, de toute utilisation faite du présent rapport par un tiers et/ou à des fins autres que celles pour lesquelles il a été rédigé, de perte de valeur réelle ou perçue du site ou de la propriété, ni de l'échec d'une quelconque transaction en raison des informations factuelles contenues dans ce rapport.

Les travaux d'investigation effectués par Golder et décrits dans ce rapport ont été réalisés conformément aux règles et pratiques professionnelles reconnues et acceptées au moment de leur réalisation. À moins d'avis contraires, les résultats de travaux antérieurs ou simultanés, provenant d'autres sources que Golder, cités et/ou utilisés dans ce rapport ont été considérés comme ayant été obtenus en respectent les règles et pratiques professionnelles reconnues et acceptées et, conséquemment, comme étant valides.

Les mesures et observations consignées dans ce rapport ne sont valables que pour les échantillons auxquels elles font référence. Les conclusions et recommandations présentées dans ce rapport sont limitées par la quantité et la portée des données utilisées et sont susceptibles d'être modifiées à la lumière de nouvelles informations ou de données supplémentaires, si le mandat en est subséquemment octroyé à Golder.

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**ANNEXES**

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**Annexe B**
Histogramme sur la distribution des échantillons

**Annexe C**
Programme de sélection des échantillons des tests cinétiques

**Annexe D**
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# 1.0 INTRODUCTION

Golder Associés Ltée. (Golder) a été retenue par Mine Canadian Malartic (MCM) pour réaliser une évaluation géochimique des matériaux qui seront minés du Secteur East Gouldie dans le complexe minier Canadian Malartic. Le gisement aurifère de Canadian Malartic est situé à proximité de la ville de Malartic, au Québec.

La teneur en or du gisement est faible mais le tonnage est important. L'or y est contenu dans la pyrite disséminée au sein d'intrusions porphyriques felsiques à intermédiaires et de métasédiments altérés.

Le programme de caractérisation géochimique des matériaux qui seront minés d'East Gouldie a été entrepris en 2020. Il comprend le minerai, la dilution, le stérile de la zone de développement et du puits d'accès. Le principal objectif du programme est d'évaluer le potentiel de drainage minier acide (DMA) et de lixiviation de métaux (LM) de ces matériaux à l'aide d'une suite d'essais statiques et cinétiques et de classifier les matériaux selon leur risque environnemental potentiel. Les résultats analytiques sont comparés aux critères prescrits par la Directive 019 sur l'industrie minière du ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC[1] 2012) (la Directive), le Guide d'intervention du ministère de l'Environnement et de la Lutte contre les changements climatiques (le *Guide d'intervention*, MELCC 2019), le *Guide de caractérisation des résidus miniers et du minerai* (MELCC 2020) (le *Guide 2020*) ainsi que les critères spécifiques au site de MCM.

Une première série d'échantillons a été sélectionnée et prélevée par les géologues de MCM pour une première phase analytique, suivi par le mandat de Golder pour poursuivre l'étude géochimique, se basant sur les résultats de la première phase. Ce rapport intérimaire présente les résultats de toutes les analyses réalisées à ce jour. Certains tests sont en cours et seront incorporés dans une version ultérieure du rapport lorsqu'ils seront disponibles.

Les tâches suivantes ont été réalisées par Golder :

- Une revue de la géologie du site et des informations géochimiques disponibles;
- Une phase 2 du programme analytique comprenant la sélection d'un sous-groupe d'échantillons dont la composition est représentative de la phase 1 pour l'analyse de la série de tests préconisés par le MELCC;
- L'élaboration du plan analytique pour les échantillons sélectionnés en Phase 2, comprenant des essais statiques en laboratoire; une phase 3 du programme analytique comprenant des essais statiques additionnels et des essais cinétiques en laboratoire sur un sous-groupe d'échantillons choisis et représentatifs de chaque lithologie;
- L'évaluation et l'interprétation des résultats et la classification de chaque type de résidu en vertu de la Directive 019, du *Guide 2020*, des critères du MELCC et des critères spécifiques au site MCM;
- Une comparaison aux résultats d'études antérieures sur les autres secteurs de MCM;

[1] MELCC : ministère de l'Environnement et de la Lutte contre les changements climatiques du Québec depuis 2018, anciennement connu sous les appellations ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du 0Québec (MDDELCC, de 2012 à 2017), ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP, 2013), ministère du Développement durable, de l'Environnement et des Parcs du Québec (MDDEP, 2008 à 2011), ministère de l'Environnement du Québec (MENV, 2003) ou ministère de l'Environnement et de la Faune du Québec (MEF, 1995).

# 2.0 GISEMENTS DE LA MINE CANADIAN MALARTIC

Le complexe de MCM comprend le gisement et la fosse originale Canadian Malartic ainsi que d'autres secteurs minéralisés, à diverses étapes de développement (Figure 1 et Figure 2), dont les suivants :

- Secteur Canadian Malartic
- Secteur Barnat
- Secteur Odyssey : Zones Odyssey Nord, Odyssey Sud
- Secteur East Malartic : Zones East Malartic et Sladen (côté sud), Zones Sheehan et Barnat (côté nord)
- Secteur East Gouldie

Cette étude porte sur la géochimie environnementale du minerai, des stériles, de la dilution (roches dont les propriétés se situent entre celles du minerai et des stériles), des zones de développement et du puits d'accès et ses galeries du Secteur East Gouldie (voir Annexe A).

## 2.1 Géologie

Ci-dessous est présenté un bref résumé de la propriété et de chaque Secteur, basé principalement sur le dernier rapport NI 43-101 sur la propriété Canadian Malartic (MCM, 2014) et sur les informations publiques d'Agnico Eagle (Agnico Eagle, 2020).

La propriété Canadian Malartic est située en contact et au sud de la Faille de Cadillac-Larder Lake, à la limite sud de la sous-province de l'Abitibi, dans le craton archéen de la Province du Supérieur (Figure 2). Les lithologies présentes sur la propriété sont regroupées dans trois groupes principaux :

- Le groupe Porphyre : Monzodiorite de quartz porphyrique à granodiorite.
- Le groupe de Pontiac : un groupe de sédiments clastiques altérés (métasédiments) comprenant des grauwackes, des schistes et des conglomérats mineurs.
- Le groupe de Piché : un groupe ultramafique de schistes métavolcaniques formé principalement de volcanites basaltiques à komatiitiques fortement déformées et altérées.

La figure 1, illustre l'emplacement de chaque Secteur sur la propriété. Le gisement du Secteur East Gouldie est principalement constitué de roches sédimentaires plus ou moins minéralisées (pyrite) et altérées (silicifiées ou carbonatées) du groupe de Pontiac, comme illustré sur la figure 2.

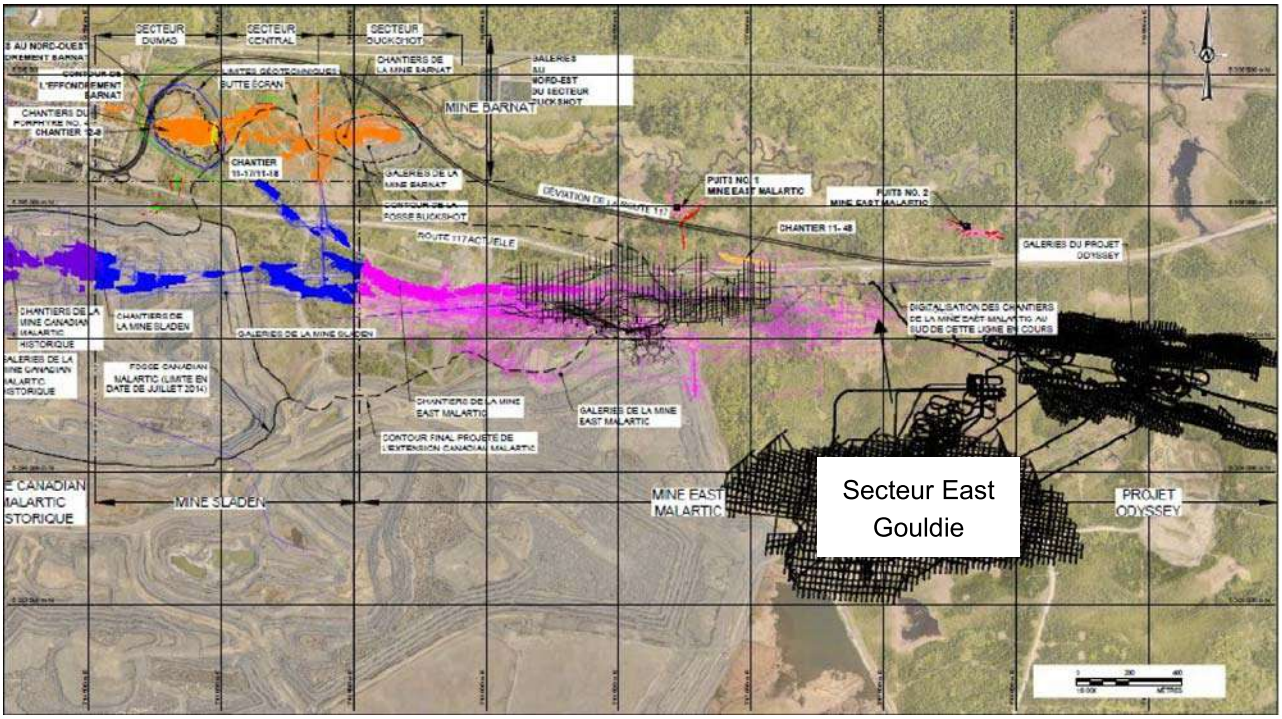



**Figure 1 : Localisation du Secteur East Gouldie (Golder, 2020d)**

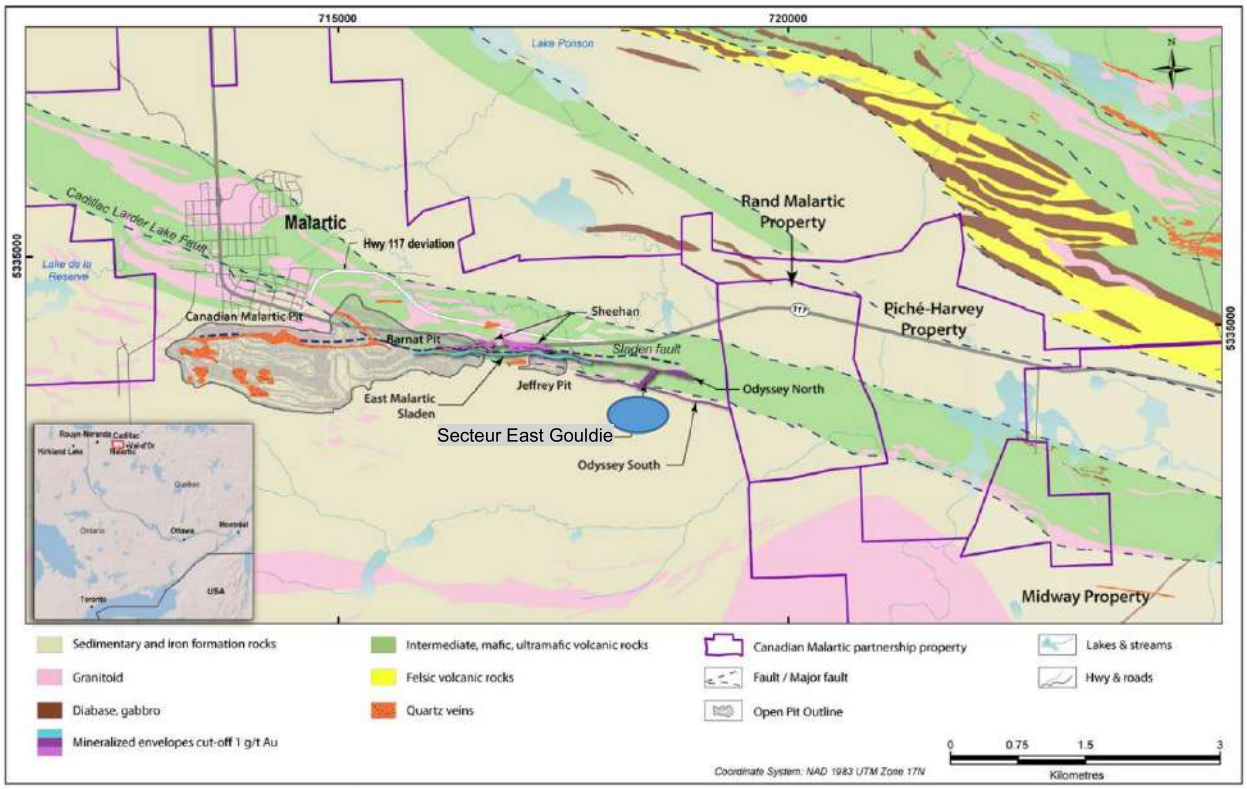



**Figure 2 : Géologie locale de la propriété Canadian Malartic (Agnico Eagle, 2020)**

# 3.0 MÉTHODOLOGIE

## 3.1 Sélection des échantillons

Le programme d'échantillonnage et d'analyse a été réalisé par étape et en trois phases au total afin d'obtenir d'emblée certaines caractéristiques géochimiques importantes (contenu en soufre et en métaux) des matériaux, permettant d'établir les distributions statistiques de ceux-ci et de distinguer différents domaines lithogéochimiques. Ces informations ont permis d'optimiser les phases subséquentes de la caractérisation géochimique par une sélection d'échantillons basée sur les résultats analytiques en main. Les trois phases sont décrites ci-dessous.

### 3.1.1 Première phase

Un groupe de 237 échantillons de 1-2 kg a été prélevé par un géologue de MCM à partir de carottes de forage obtenues dans le cadre du programme d'exploration dans le Secteur East Gouldie. Ces échantillons ont été concassés, homogénéisés et un sous-échantillon a été pulvérisé (maille 150) pour les analyses suivantes, au laboratoire Bureau Veritas Québec:

- Soufre total et carbone total (fournaise LECO)
- Contenu en métaux disponibles par la méthode MA. 200 (CEAEQ, 2014b)
- Analyses chimiques « roche totale » par fluorescence des rayons X (FRX)

MCM a sélectionné les échantillons visant une représentativité de la variabilité des teneurs en or et une distribution spatialement uniforme à travers chaque source de roche extraite. La distribution des échantillons est présentée à l'Annexe A. Les échantillons proviennent du minerai, de la dilution et des stériles et de l'emplacement prévu du puits et de la rampe d'accès. Les lithologies échantillonnées sont présentées dans le tableau 1.

**Tableau 1 : Lithologies des échantillons analysés lors de la première phase de caractérisation, Secteur East Gouldie**

| Type | Code | Lithologie | Nombre d'échantillons |
|---|---|---|---|
| Minerai | AGR | Grauwacke altéré | 39 |
| | SGR | Grauwacke faiblement silicifié | 62 |
| | SGR+ | Grauwacke moyennement silicifié | 25 |
| | SGR++ | Grauwacke fortement silicifié | 6 |
| | s.o. | autre | 3* |
| Dilution | AGR | Grauwacke altéré | 57 |
| | SGR | Grauwacke silicifié | 18 |
| | s.o. | autre | 1* |
| Stériles | AGR | Grauwacke altéré | 22 |
| | s.o. | autre | 1* |
| Rampe d'accès, galeries/ ventilation et Puits | AGR | Grauwacke altéré | 3 |
| Total | | | 237 |

* échantillons exclus du processus de sélection pour la caractérisation complète parce qu'ils représentent une lithologie mineure.
'+' représente l'intensité de l'altération qui est plus forte pour SGR++ que SGR+ et que SGR.

Pour chaque groupe d'échantillons, une analyse statistique de la première phase d'analyse a été réalisée sur les données suivantes : le contenu en soufre (paramètre déterminant pour le potentiel de génération d'acide) et les métaux qui présentent typiquement des dépassements de critères applicables dans d'autres secteurs du complexe minier MCM (Ag, Ba, Cr, Cu, Ni). Les échantillons ont été classés selon leurs centiles, relativement à la distribution de chacun de ces paramètres. Des graphiques montrant la distribution des paramètres considérés sont présentés à l'Annexe A.

Cette évaluation a démontré que les contenus en métaux d'intérêt environnemental (dont la concentration dans au moins quelques échantillons est supérieure au critère provincial de Sol A : argent, baryum, chrome, cuivre, nickel) sont généralement homogènes (peu de variabilité entre les échantillons). Ils possèdent néanmoins une variabilité dans leur contenu en soufre. Les valeurs du potentiel neutralisant et du ratio du potentiel de neutralisation (RPN) n'ont pas été prises en compte, car la majorité des échantillons possédaient une teneur en carbone total (qui infère le potentiel de neutralisation des minéraux carbonatés) inférieure à la limite de détection analytique. Cette analyse sera répétée à une limite de détection plus basse sur les échantillons choisis pour la deuxième étape de caractérisation.

### 3.1.2 Deuxième phase

Des 237 échantillons (5 échantillons ont été exclus du processus de sélection pour la caractérisation complète parce qu'ils représentent une lithologie mineure), un sous-groupe de 80 échantillons a été sélectionné pour l'analyse plus complète des propriétés géochimiques en tenant compte de trois principaux aspects :

1) la représentativité compositionnelle des échantillons pour les éléments clés préalablement identifiés,

2) les proportions de tonnages anticipés pour chaque lithologie et/ou type d'échantillon et

3) la représentativité spatiale des échantillons.

Ces échantillons ont été prélevés de la fraction concassée de l'échantillon original, représentant ainsi le même matériel que les pulpes soumises à la première phase d'analyse, sauf pour cinq échantillons qui ont été prélevés à l'emplacement anticipé du puits d'accès.

Le tableau 2 présente la distribution lithologique des 80 échantillons sélectionnés. Tous les échantillons de stériles disponibles ont été sélectionnés afin de maximiser la représentativité spatiale. Un minimum de six échantillons par type de matériel et lithologie a été retenu pour l'analyse. Les échantillons sélectionnés représentent la gamme de contenu en soufre de chaque lithologie (ce qui comprend des valeurs du premier quartile, des valeurs moyennes et des valeurs du quartile supérieur), et sont distribués spatialement de la façon la plus homogène possible, selon les autres contraintes. Des histogrammes montrant la distribution des contenus en soufre et d'autres paramètres d'intérêt des échantillons sélectionnés sont présentés à l'Annexe B. L'histogramme présentant la distribution des contenus en soufre est également présenté à la figure 3.

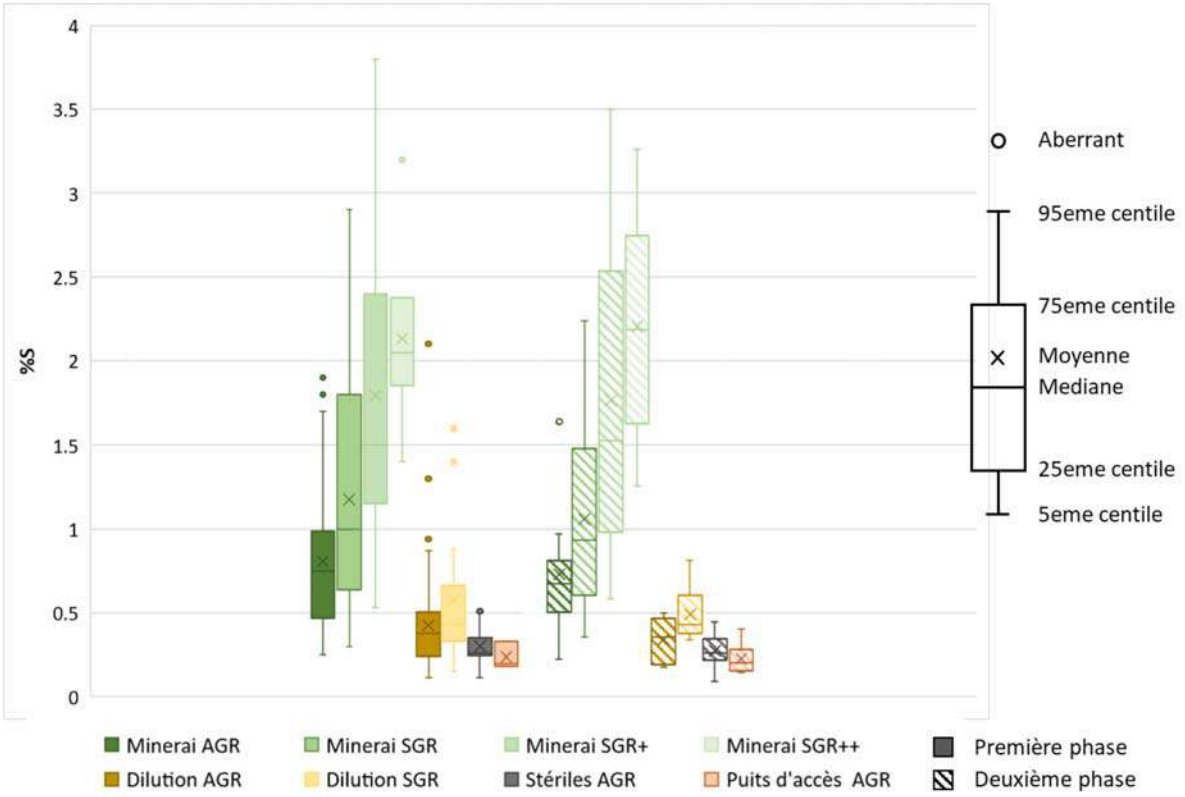



**Figure 3 : Composition chimique en soufre de la phase solide du Secteur East Gouldie**

**Tableau 2 : Sommaire des échantillons sélectionnés pour la deuxième phase d'analyses selon le type d'échantillon et les lithologies**

| Type | Tonnage anticipé (millions de tonnes) | Pourcentage du tonnage total | Échantillons sélectionnés pour la caractérisation complète | Lithologies | |
|---|---|---|---|---|---|
| | | | | Lithologies | Nombre d'échantillons sélectionnés |
| Minerai | 60 | 79,9 % | 38 | Minerai AGR | 10 |
| | | | | Minerai SGR | 12 |
| | | | | Minerai SGR+ | 10 |
| | | | | Minerai SGR++ | 6 |
| Dilution | 8 | 10,7 % | 12 | Dilution AGR | 6 |
| | | | | Dilution SGR | 6 |
| Stériles | 7 | 9,3 % | 22 | Stérile AGR | 22 |
| Puits/Galeries | 0,1 | 0,1 % | 8 | Stérile AGR | 8 |
| Total | 75,1 | 100 % | 80 | - | 80 |

Les échantillons pour les essais de désulfuration ont été sélectionnés pour un projet différent afin de réduire le potentiel de génération d'acide et le taux de lixiviation des métaux des résidus miniers produits à la suite de l'extraction d'or du minerai. La méthodologie retenue pour la sélection de ces cinq échantillons n'est pas présentée dans ce rapport.

### 3.1.3 Troisième phase

***Essais statiques***

Sur les 80 échantillons de la deuxième phase, un sous-groupe d'échantillons (Tableau 3), a été sélectionné pour l'analyse bilan acide-base (BAB, 20 échantillons) et DRX (10 échantillons), en tenant compte d'aspects principaux énumérés ci-après, soit 1) la sélection d'échantillons en concentration médiane et/ou du quartile supérieur en carbone et soufre pour évaluer la minéralogie en carbonate et sulfure; 2) le nombre d'échantillons sélectionnés durant la deuxième phase, sélection basée sur les proportions de tonnage pour chaque lithologie et 3) la représentativité spatiale et la disponibilité des échantillons. Lors de la troisième phase, les échantillons ont été sélectionnés plus précisément selon la méthode décrite dans l'Annexe C et représentés sous forme de graphique dans la même annexe.

Ces échantillons ont été prélevés de la fraction concassée de l'échantillon original, représentant ainsi le même matériel que les pulpes soumises durant la première phase d'analyse.

***Essais cinétiques***

Sur la base des résultats des 80 échantillons, six (6) échantillons de minerai, de stérile et de dilution de 1 kg chacun ont été retenus pour des essais cinétiques de lixiviation en cellules humides. Cinq (5) autres échantillons de minerai ont été prélevés par la suite pour des essais cinétiques additionnels.

Les échantillons ont été retenus en fonction de leur composition, en sélectionnant des échantillons ayant une concentration moyenne et/ou du quartile supérieur (ou inférieur pour le PN) et présentant des paramètres d'intérêt environnemental (le potentiel de production d'acidité et de lixiviation de métaux), comme présenté dans l'Annexe C. Des échantillons composites (totalisant 1 kg) des lithologies SGR+ et SGR++ ainsi que de dilution AGR et SGR ont été utilisés. L'analyse minéralogique par DRX décrite ci-dessus sera réalisée sur chacun des échantillons soumis au test cinétique.

Le principal objectif de ces essais cinétiques est d'évaluer la réactivité des matériaux (génération d'acide et taux de lixiviation de métaux) dans le temps, à l'aide de rinçages répétés de façon à simuler l'exposition des matériaux empilés à des précipitations naturelles.

**Tableau 3 : Sommaire du nombre d'échantillons sélectionnés pour la troisième phase d'analyse selon le type d'échantillon et les lithologies**

| Lithologies | Phase 1 | Phase 2 | Phase 3 | | | |
|---|---|---|---|---|---|---|
| | Tests statiques | | | | Essai cinétique | |
| | Nombre d'échantillons | | Nb de BAB | Nb de DRX | Essai cinétique standard[1] | Essai cinétique autres[2] |
| Minerai AGR | 39 | 10 | 3 | 1 | 1 | 2 |
| Minerai SGR | 62 | 12 | 3 | 2 | 1 | 2 |
| Minerai SGR+ | 25 | 10 | 3 | 1 | 1 | 1 |
| Minerai SGR++ | 6 | 6 | 1 | 1 | | |
| Dilution AGR | 57 | 6 | 2 | 1 | 1 | 0 |
| Dilution SGR | 18 | 6 | 2 | 1 | | 0 |
| Stérile AGR | 22 | 22 | 5 | 2 | 2 | 0 |
| Puits d'accès AGR | 3 | 8 | 1 | 1 | 0 | 0 |
| Total | 232 | 80 | 20 | 10 | 6 | 5 |

Notes :
1. Ces échantillons ont été prélevés pour des essais de lixiviation en cellule humide initié le 15 septembre 2020.
2. Ces échantillons ont été prélevés pour un autre projet et ne sont pas décrits dans ce rapport, se référer à la Section 3.1.2.

Les essais ont débuté le 15 septembre 2020 et sont toujours en cours. Ils sont prévus pour une période de 40 semaines au minimum et l'arrêt des tests devrait être déterminé selon l'atteinte des objectifs pour chacun d'entre eux.

## 3.2 Programme analytique

La figure 4 illustre le schéma décisionnel qui a guidé le procédé d'analyse de données et la sélection d'échantillons.

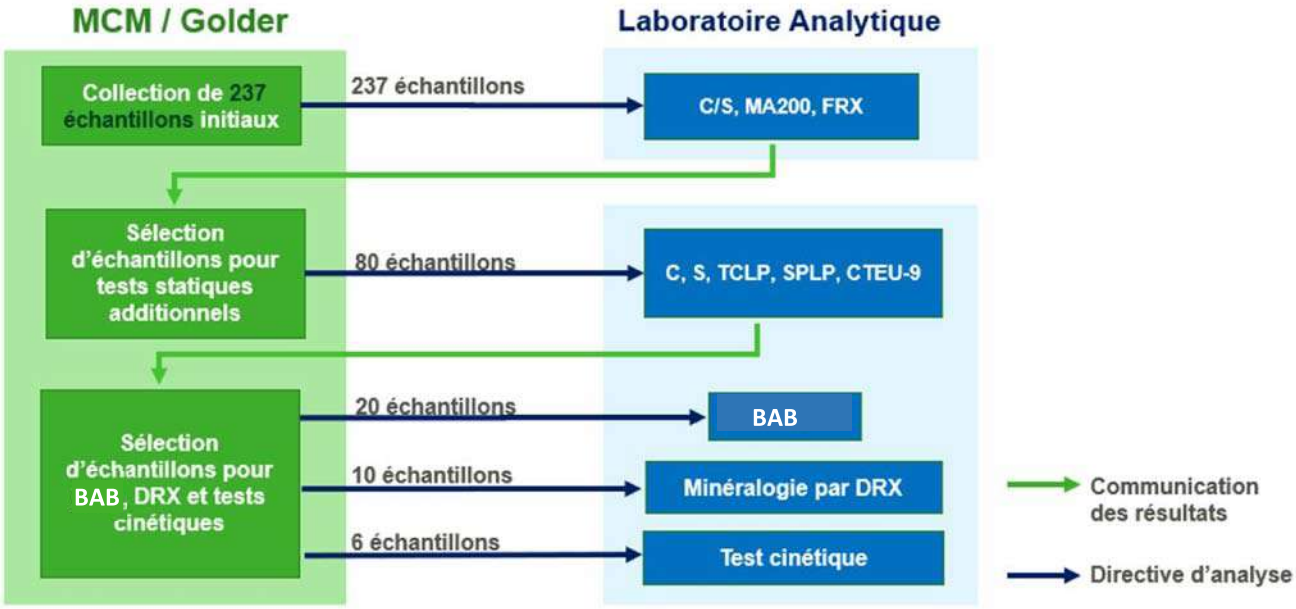



**Figure 4 : Schéma décisionnel du plan analytique**

### 3.2.1 Essais statiques

Les 237 échantillons prélevés par MCM ont été analysés au laboratoire Bureau Veritas Québec selon les paramètres suivants :

- Soufre total et carbone total par la méthode MA.310 - CS 1.0 (fournaise LECO; CEAEQ, 2013);
- Métaux extractibles par spectrométrie de masse à plasma inductif (ICP-MS) sur les échantillons solides par la méthode MA. 200 - Mét.1.2 (CEAEQ, 2014b) Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, Pb, Sb, Si, Se, Sn, Sr, Th, Ti, Tl, U, V, W, Zn;
- Analyses chimiques « roche totale » par fluorescence des rayons X (FRX).

Sur la base des résultats analytiques des 237 échantillons, 80 échantillons de composition représentative de la tendance centrale et du quartile supérieur des paramètres d'intérêt environnemental ont été choisis pour les analyses additionnelles suivantes au laboratoire SGS :

- Soufre total et carbone total par la méthode MA.310 - CS 1.0 (Fournaise Horiba) (CEAEQ, 2013);
- Essais de lixiviation TCLP (*Toxicity Characteristic Leaching Procedure*) par la méthode MA. 100 – Lix.com.1.1 (CEAEQ, 2012) : conductivité, alcalinité, acidité, pH, Cl, Br, F, SO4, nitrites, nitrates et métaux dissous (Al,

Sb, Ag, As, Ba, Be, Bi, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Hg, Mo, Ni, P, Pb, K, Si, Se, Na, Ti, Tl, U, V, Zn);

- Essais de lixiviation SPLP (*Synthetic Precipitation Leaching Procedure*; simulation de pluies acides) et CTEU-9 (à pH neutre) par la méthode MA. 100 – Lix.com.1.1 (CEAEQ, 2012): conductivité, alcalinité, acidité, pH, Cl, Br, F, $SO_4$, nitrites, nitrates et métaux dissous (Al, Sb, Ag, As, Ba, Be, Bi, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Hg, Mo, Ni, P, Pb, K, Si, Se, Na, Ti, Tl, U, V, Zn).

Sur la base des résultats des essais statiques réalisés sur les 80 échantillons, et en tenant compte de la base de données des 237 échantillons, un sous-ensemble de 20 échantillons a été retenu pour l'analyse du potentiel acido-basique, incluant : potentiel acidogène (PA), potentiel de neutralisation (PN) des carbonates et PN en vrac par la méthode MA. 110 ACISOL 1.0 préconisée dans la Directive 019 (CEAEQ, 2014a), sulfates et sulfures. Les deux méthodes de détermination du PN permettent de vérifier leur équivalence. Plusieurs méthodes de détermination du PN existent (NEDEM 2009, MELCC 2012 et 2020). Deux d'entre elles sont utilisées dans cette étude :

- La méthode MA.110 – ACISOL 1.0 du CEAEQ (2014a) utilise de l'acide chlorhydrique et de l'acide sulfurique.
- La méthode PN des carbonates ou PN-$CO_3$ préconisée à MCM pour une approche conservatrice de l'évaluation du PN (Golder 2016, Ecometrix 2017), est basée sur la teneur en carbonate d'un échantillon, en supposant que tous les carbonates sont sous forme de minéraux carbonatés réactifs tels que la calcite et la dolomite. La teneur en carbone est mesurée et utilisée pour calculer la valeur du PN-$CO_3$.

Des études précédentes, dont celle de East Malartic, ont conclu que pour les échantillons à faible PN, la méthode PN-$CO_3$ basée sur la concentration en carbonates est la plus conservatrice des deux méthodes (donnant les valeurs de PN plus basses que les valeurs de l'autre méthode) (Golder 2020c; 2016 et Ecometrix 2017).

De plus, un sous-ensemble de 10 échantillons des 80 sélectionnés a été retenu pour l'analyse minéralogique par diffraction des rayons X (DRX). Cette analyse focalise sur l'identification des minéraux susceptibles de neutraliser l'acide et de contribuer à la génération d'acide et à la lixiviation de métaux d'intérêt.

### 3.2.2 Essais cinétiques

Les essais cinétiques ont été réalisés sur six (6) échantillons dans le but de confirmer le potentiel de génération d'acide de certains échantillons classifiés comme PGA durant les essais statiques ainsi que d'évaluer le taux de lixiviation de certains métaux durant 40 semaines. Seulement les résultats des tests cinétiques jusqu'à la dixième semaine sont présentés dans ce rapport.

Les essais cinétiques en cellules humides ont été menés selon la méthode ASTM D5744-13 (2018) au laboratoire SGS situé à Lakefield, en Ontario. L'échantillon est soumis à une alternance de cycles d'air sec et humide pour simuler les cycles de précipitations par période de 7 jours pour les premières 20 semaines de test, puis aux 14 jours pour les 20 semaines suivantes, pour une durée totale de 40 semaines, a priori, ou jusqu'à ce que les objectifs du test aient été atteints. L'eau désionisée est versée sur l'échantillon et est ensuite recueillie puis analysée. Pour les paramètres suivants : le volume, la conductivité électrique, l'alcalinité, le pH, le fluorure, le sulfate, le chlorure, le nitrite, le nitrate et les métaux dissous suivants : Al, Sb, Ag, As, Ba, Be, Bi, B, Cd, Ca, Cr, Co, Cu, Sn, Fe, Li, Mg, Mn, Hg, Mo, Ni, Pb, K, Se, Na, Sr, Sn, S, Ti, Tl, U, V, W, Zn.

## 3.3 Critères applicables

### 3.3.1 Potentiel de génération d'acide (PA)

Le potentiel de génération d'acide des échantillons est évalué à partir des critères du *Guide 2020* (MELCC 2020), qui classifie un échantillon potentiellement générateur d'acide (PGA) s'il atteint les critères suivants :

- Son contenu en soufre total est supérieur à 0,04 % en poids et au moins un des énoncés suivants est vrai :

  a) Potentiel de neutralisation net (PNN) est inférieur à 20 kg $CaCO_3$/tonne (où PNN = PN – PA), ou

  b) Ratio du potentiel neutralisant (RPN) est inférieur à 2 (où RPN = PN / PA)

Le critère spécifique au site MCM a été développé préalablement et il considère un échantillon est PGA si :

- Le RPN calculé à partir du PN-$CO_3$ est inférieur à 2 (<2), peu importe son contenu en soufre.

Le critère de RPN spécifique au site MCM exclut les minéraux non carbonatés potentiellement non réactifs, mais qui sont compris dans l'analyse du PN-ACISOL recommandée dans le *Guide 2020*. Ainsi, le RPN propre au site est plus conservateur dans l'évaluation du PGA que le RPN qui utilise la méthode ACISOL.

Tous les résultats de bilans acide-base (BAB) sont interprétés en utilisant le critère du potentiel acidogène spécifique au site de MCM. Néanmoins, les résultats obtenus dans le cadre de la Directive provinciale (le *Guide 2020*) sont présentés dans le Tableau récapitulatif D-4 de l'Annexe D en guise de comparaison.

### 3.3.2 Potentiel de lixiviation

Le potentiel de lixiviation des échantillons est évalué selon les critères de la Directive 019, du *Guide d'intervention* et du *Guide 2020*. Les échantillons sont tout d'abord évalués en fonction de leur composition chimique et de la province géologique dans laquelle ils ont été prélevés; le site de la MCM se trouve dans la Province du Supérieur. Les échantillons sont classifiés comme étant à faible risque si :

a) toutes les concentrations de constituants chimiques dans les analyses MA-200 sont inférieures aux critères de sols A (du *Guide d'intervention*) pertinents pour la Province du Supérieur et,

b) l'échantillon n'est pas acidogène.

En cas de dépassement des critères de sols A du GIPSRTC, l'échantillon peut néanmoins être classifié comme étant à faible risque si les composants chimiques qui dépassant le critère A du GIPSRTC et dans les lixiviats SPLP, ou CTEU-9 ont une concentration des essais cinétiques inférieure aux critères applicables de qualité des eaux souterraines, sans toutefois être acidogène, ni avoir des minéraux problématiques peu solubles, ni être classifiée à risque élevé selon le résultat du test TCLP.

Un échantillon est classifié lixiviable si des dépassements à la fois des critères de sols A et des critères de qualité des eaux souterraines dans les lixiviats SPLP et CTEU-9 ou lors des essais de lixiviation cinétiques sont présents pour le même constituant chimique, sans toutefois être acidogène. Les résultats des essais cinétiques ont préséance sur les résultats d'essais statiques à cet effet : un échantillon potentiellement lixiviable selon ses résultats SPLP ou CTEU-9, mais ne montrant aucun dépassement en essais cinétique n'est pas classifié come lixiviable.

Finalement, un échantillon sera considéré à risque élevé si :

a) un constituant chimique est présent en concentrations supérieures au critère de sols A > de la Province du Supérieur, et

b) ce constituant chimique est présent dans le lixiviat TCLP en concentration supérieure à son critère du tableau 1 de l'annexe 2 de la Directive 019 (T1-A2-D019).

Les matériaux minés de MCM ne sont pas aptes à contenir des composés organiques, radioactifs ou inflammables, les échantillons n'ont pas fait l'objet de tests à cet effet.

Les critères RES (résurgence dans les eaux de surface) et EC (eau de consommation) du GIPSRTC sont applicables car les eaux souterraines pourraient résurger à proximité du site et les puits d'eau souterraine sont présents à proximité du site de la mine MCM.

**Tableau 4 : Classification des échantillons à faible risque, lixiviables ou risque élevé de lixiviation**

| Type d'essai | Faible risque de lixiviation | Lixiviable | Risqué élevé de lixiviation |
|---|---|---|---|
| Essais statiques | | | |
| BAB | Non acidogène | Acidogène ou non | Acidogène ou non |
| MA-200 | Analyse(s) MA-200 < aux critères de sols A (du *Guide d'intervention*)[1] | Analyses MA-200 > aux critères de sols A (du *Guide d'intervention*)[1] | Analyse(s) MA-200 > aux critères de sols A (du *Guide d'intervention*)[1] |
| TCLP | non applicable | | Concentrations dans le lixiviat TCLP du même constituant > au critère du Tableau 1 de l'Annexe 2 de la Directive 019 (T1-A2-D019) |
| SPLP ou CTEU-9 | non applicable | Concentration en lixiviat SPLP ou CTEU-9 > aux critères applicables (EC et/ou RES) de qualité des eaux souterraines pour un échantillon classifié PGA ou non PGA | non applicable |
| Essai cinétique (si présent) : les résultats des essais cinétiques priment sur les résultats des essais statiques (SPLP, CTEU-9) | | | |
| Test cinétique | Concentration en lixiviat d'essai cinétique < aux critères applicables (EC et/ou RES) de qualité des eaux souterraines pour un échantillon classifié non PGA | Concentration en lixiviat d'essai cinétique > aux critères applicables (EC et/ou RES) de qualité des eaux souterraines pour un échantillon classifié PGA ou non PGA | non applicable |

Notes :1. Pour la Province du Supérieur au MCM.

Tout dépassement portant sur les critères SPLP et/ou CTEU-9 a été noté comme pouvant présenter un effet potentiel sur la qualité des eaux de contact des stériles et du minerai. Cependant, il faut noter qu'un dépassement des critères de la qualité de l'eau dans les essais de lixiviation statiques ne veut pas nécessairement dire que la qualité des eaux de contact des matériaux miniers dépassera également les critères, mais indique que les constituants lixiviés sont susceptibles d'être libérés en quantité pouvant potentiellement affecter la qualité de l'eau.

Il est important de noter que tous les tests de lixiviation statique et cinétique réalisés en laboratoire ne reproduisent pas exactement les conditions réelles de lixiviation sur le site minier. La qualité de l'eau de contact des matériaux minés est non seulement influencée par la composition chimique et la réactivité de ceux-ci, mais également par les conditions climatiques, les précipitations, l'infiltration et le ruissellement, le gel et le milieu hydrodynamique du plan d'eau récepteur. Ces aspects doivent être pris en compte lors de l'évaluation de la qualité future de l'eau de contact des matériaux minés.

# 4.0 RÉSULTATS

Dans le cadre de cette étude réalisée par MCM, les résultats des 237 échantillons recueillis en fonction du type d'échantillon et de leur lithologie, ainsi que de la phase, sont fournis dans les tableaux D-1 à D-8 de l'Annexe D et tableaux E-1 à E-8 de l'Annexe E :

- Tableau D-1 : Liste des échantillons et analyses
- Tableau D-2 : Analyse chimique en roche totale (FRX)
- Tableau D-3 : Analyses minéralogiques par DRX
- Tableau D-4 : Bilans acide-base (BAB)
- Tableau D-5 : Métaux extractibles (MA-200)
- Tableau D-6 : Essais de lixiviation TCLP
- Tableau D-7 : Essais de lixiviation SPLP
- Tableau D-8 : Essais de lixiviation CTEU-9
- Tableau E-1 : Résultats des tests de cellule d'humidité-Minerai AGR
- Tableau E-2 : Résultats des tests de cellule d'humidité-Minerai SGR
- Tableau E-3 : Résultats des tests de cellule d'humidité-Minerai SGR+/SGR++
- Tableau E-4 : Résultats des tests de cellule d'humidité-Minerai Dilution AGR/SGR
- Tableau E-5 : Résultats des tests de cellule d'humidité-Minerai Stérile AGR #1
- Tableau E-6 : Résultats des tests de cellule d'humidité-Minerai Stérile AGR #2

Les résultats de la présente étude sont également représentés graphiquement de la figure 7 à la Figure 23 dans le rapport et à l'annexe E, de la figure 1 à la figure 13, plus en détail, pour les essais cinétiques.

Les certificats d'analyse de laboratoire pour les essais statiques et cinétiques pour cette étude seront fournis à l'annexe F, dans la version finale de ce rapport.

## 4.1 Résultats du bilan acide-base

### 4.1.1 Potentiel de neutralisation (PN)

L'affirmation selon laquelle le PN carbonate (PN-$CO_3$) est la valeur la plus conservatrice est évaluée en comparant les résultats du PN des méthodes ACISOL et PN-$CO_3$ à la figure 5, et à l'annexe D-4.

- Le PN-$CO_3$ est calculé pour 20 échantillons de la phase 3, selon le contenu en carbonates, et pour les 60 autres échantillons de la phase 2, en se basant sur la teneur en carbone, selon l'hypothèse où le C% serait représentatif du contenu en carbonates réactifs (calcite et dolomite plutôt que sidérite ou ankérite).
- Pour tous les échantillons pour lesquels sont mesurés le PN-$CO_3$ et le PN-ACISOL, les valeurs du PN-$CO_3$ sont inférieures aux valeurs du PN-ACISOL, et ce pour tout type d'échantillon (minerai, dilution et stériles) et sans différence entre le PN-$CO_3$, évalué à partir du contenu en carbonate ou en carbone (Figure 5).

La classification des échantillons, selon le critère spécifique au site MCM (PN-$CO_3$ et PNN <20) ou selon le critère du Québec (PN), donne la même classification pour la plupart des échantillons (Tableau D-4 de l'Annexe D).

Ainsi, le PN évalué par la méthode PN-$CO_3$ demeure la méthode la plus conservatrice (donnant les valeurs les plus basses) et donc la plus appropriée pour minimiser le risque associé à la détermination du potentiel acidogène pour cette étude, à défaut d'avoir d'autres informations qui pourraient potentiellement bonifier l'évaluation de la source minéralogique du PN. Par conséquent, les résultats des bilans acide-base sont évalués d'après leur PN-$CO_3$ et RPN-$CO_3$, suivant la méthode de classification spécifique à MCM.

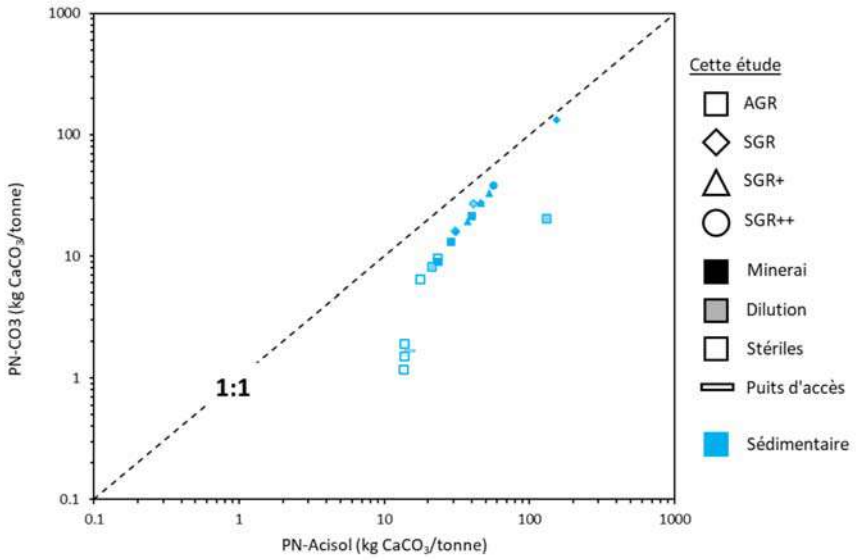
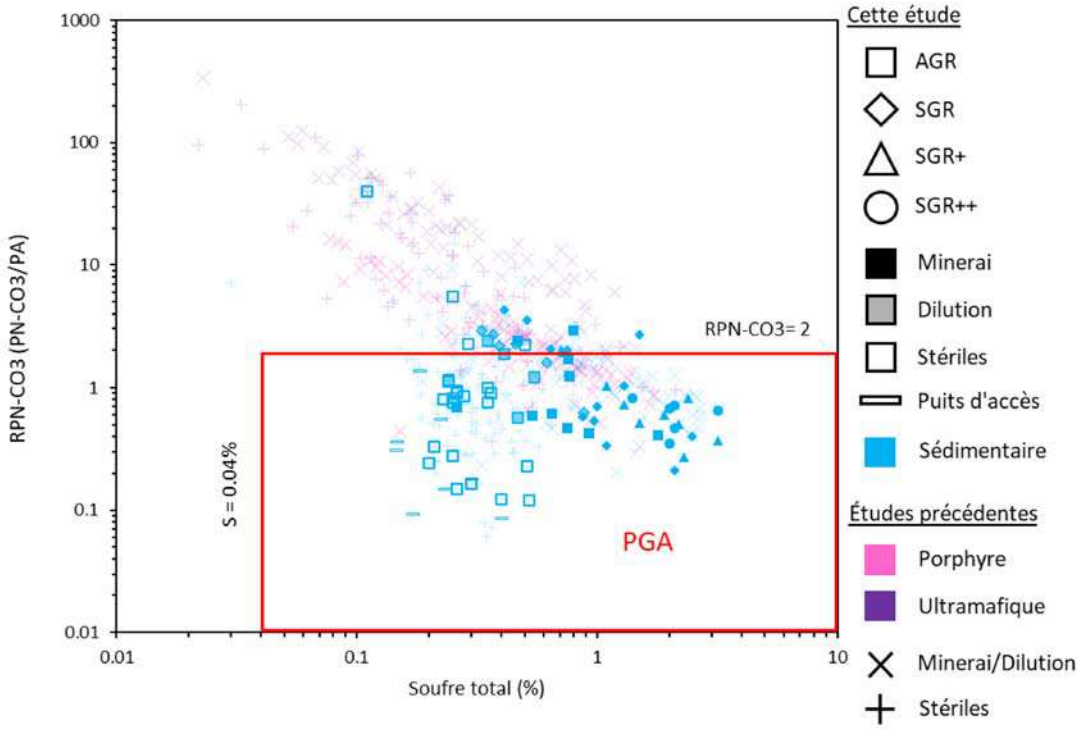



**Figure 5 : Relation entre le PN-$CO_3$ et le PN-Acisol**

### 4.1.2 Potentiel de drainage minier acide

Les résultats de l'analyse du potentiel acido-basique sont résumés au tableau 5 et présentés en détail dans le Tableau D-4 de l'Annexe D.

Les résultats de la classification du potentiel de génération d'acide des échantillons selon les critères propres au site de MCM sont présentés à la figure 6.




Une partie des 237 échantillons de la phase 1 sont classifiés comme étant potentiellement acidogène bien que plusieurs valeurs de carbonates soient inférieures à la limite de détection (0,5 %) du laboratoire Bureau Veritas**.** La propriété PGA pour les 80 échantillons de la phase 2 est illustrée à la figure 6 où 70 sont classifiés PGA et 10 non PGA. Un sommaire des résultats est présenté au tableau 5. Il indique que la teneur en soufre augmente en fonction du degré d'altération dans les échantillons de minerai.

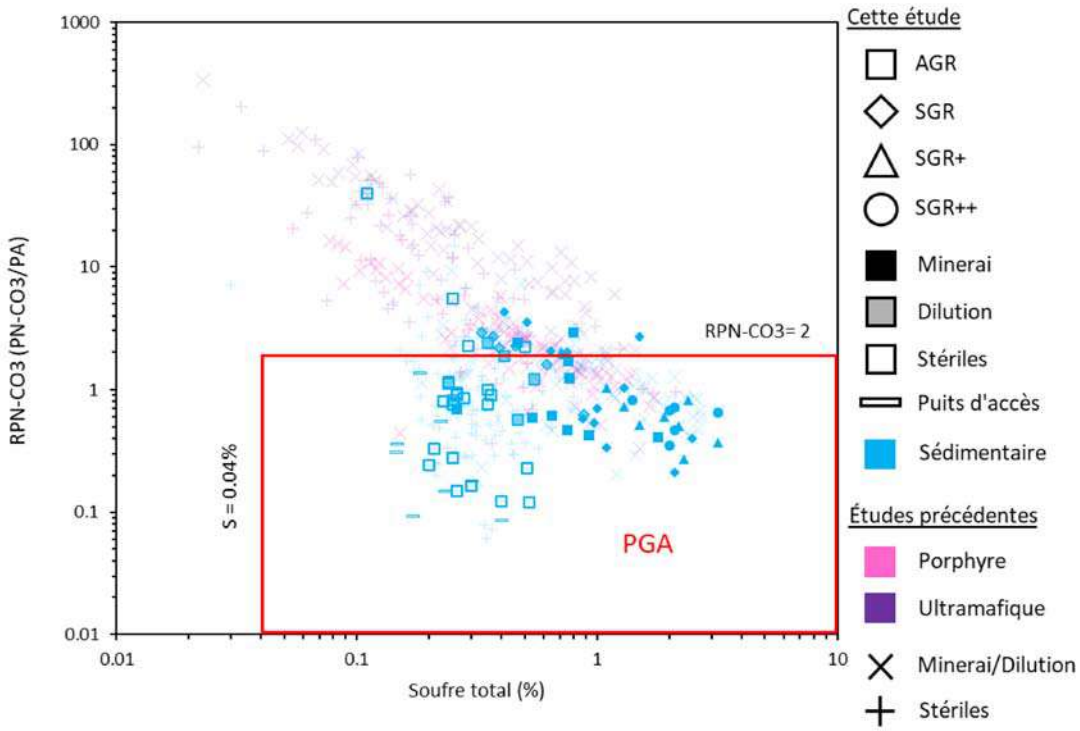



**Figure 6 : Relation entre le RPN-$CO_3$ et le soufre total (%) pour les 80 échantillons de la phase 2 et de la phase 3. L'encadré rouge illustre la classification potentiellement acidogène (PGA), selon les critères de MCM et du *Guide 2020* (la limite inférieure de 0,04 % soufre total pour classifier un échantillon de PGA).**

**Tableau 5 : Résultats des bilans acide-base du Secteur East Gouldie**

| Type | Lithologie | Nb. d'échantillons analysés Phase 2 | Nb. d'échantillons analysés Phase 3 | Soufre total (%) | PN et PA (kg $CaCO_3$/t) | | | PNN-CO3 (kg $CaCO_3$/t) | RPN-Acisol (Phase 3) | RPN-$CO_3$ | RPN-$CO_3$ cumulatif | Potentiel de génération d'acide[1] (nombre d'échantillons) | Classification lithologique |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PN-Acisol (Phase 3) | PN-$CO_3$ | PA | | | | | | |
| | | | | Moyenne | Moyenne | Moyenne | Moyenne | Moyenne | Moyenne | Moyenne | | | |
| **Minerai** | AGR | 10 | 3 | 0,73 | 30,8 | 23,5 | 22,8 | 0,7 | 1,08 | 1,14 | 1,03 | PGA (8) Non-PGA (2) | PGA |
| | SGR | 12 | 3 | 1,06 | 77,2 | 37,5 | 33,2 | 4,2 | 1,61 | 1,53 | 1,13 | PGA (8) Non-PGA (4) | PGA |
| | SGR+ | 10 | 3 | 1,76 | 45,7 | 36,6 | 55,3 | -18,7 | 0,78 | 0,88 | 0,66 | PGA (10) | PGA |
| | SGR++ | 6 | 1 | 2,20 | 56,5 | 41,9 | 69,0 | -27,2 | 0,69 | 0,61 | 0,61 | PGA (6) | PGA |
| **Dilution** | AGR | 6 | 2 | 0,34 | 76,7 | 14,5 | 10,8 | 3,7 | 4,75 | 1,33 | 1,34 | PGA (6) | PGA |
| | SGR | 6 | 2 | 0,49 | 36,2 | 28,1 | 15,4 | 12,7 | 1,83 | 2,04 | 1,82 | PGA (4) Non-PGA (2) | PGA |
| **Stériles** | AGR | 22 | 5 | 0,27 | 16,5 | 13,1 | 8,6 | 4,5 | 1,94 | 0,96 | 0,95 | PGA (20) Non-PGA (2) | PGA |
| **Puits d'accès** | - | 8 | 1 | 0,23 | 15,1 | 2,4 | 7,1 | -4,7 | 1,63 | 0,38 | 0,26 | PGA (8) | PGA |

Notes :
1. Selon le critère spécifique au site de MCM, basé sur le RPN-$CO_3$
%- Pourcentage
kg CaCO3/t – équivalent kilogramme de $CaCO_3$ par tonne
PGA, potentiellement générateur d'acide
NPGA – potentiellement non générateur d'acide

## 4.2 Composition d'éléments majeurs

Les résultats des analyses FRX sont présentés en détail dans le Tableau D-2 de l'Annexe D.

Les échantillons de minerai AGR, SGR, SGR+ et SGR++ ont des teneurs généralement similaires, élevées en $SiO_2$ (44 - 66%) et en $Al_2O_3$ (12-15 %), et des teneurs modérées en $Fe_2O_3$ (4,3- 8,7 %), MgO (1, 7- 8,2 %), CaO (2,6- 9,4%), $Na_2O$ (4-5,5 %) et $K_20$ (2,2-5 %), à l'exception de l'échantillon de minerai SGR (X19156-1768.60-1296), qui varie légèrement en composition avec moins de $SiO_2$ (44%) et plus de CaO.

Les échantillons de dilution AGR et SGR ont des compositions similaires avec la même variabilité de composition que ceux des minerais, avec des concentrations élevées en $SiO_2$ (61-66 %) et $Al_2O_3$ (14-15 %), et des concentrations modérées en $Fe_2O_3$ (5,3-6 %), MgO (2,2-2,8 %), CaO (2,6-3,3 %) et Na2O (3,7-3,9%).

Les échantillons de stériles AGR, du puits d'accès et de ses galeries ont eux aussi des compositions similaires avec la même variabilité de composition que ceux des minerais, et des dilutions avec des concentrations élevées en $SiO_2$ (65-67 %) et $Al_2O_3$ (14-15 %), et des concentrations modérées en $Fe_2O_3$ (5,5 %), MgO (2,6-3,4 %), CaO (2,3-3,1 %) et $Na_2O$ (3,4-4,1%).

Ces concentrations sont conformes à celles attendues des lithologies dont les descriptions figurent à la section 2.1. Il n'y a pas de différence significative de composition entre les lithologies pour chaque type d'échantillon.

## 4.3 Contenu en métaux extractibles

La composition chimique des échantillons en métaux extractibles (résultats d'analyse MA-200) est présentée au Tableau D-5 de l'Annexe D et sont comparés aux critères de sol A pour la Province du Supérieur. Les dépassements des critères sont résumés dans le tableau 6 :.

Les constituants qui dépassent le critère de sol A sont similaires à ceux identifiés dans l'étude précédente pour le Secteur East Malartic, concernant la lithologie sédimentaire (Golder, 2020c). En effet, les échantillons sédimentaires dans le minerai présentent le plus grand nombre de dépassements pour l'argent, le chrome et le nickel, ainsi que dans ceux de la dilution et les stériles qui ont également un nombre de dépassement en baryum, chrome et nickel, qui sont les mêmes métaux identifiés au secteur East Malartic.

Les échantillons sédimentaires présentent donc le plus grand nombre de dépassements pour l'argent, le chrome, le nickel et le baryum.

**Tableau 6 : Sommaire des dépassements des critères de sols A des différents types d'échantillons en fonction de leur lithologie**

| Type | Lithologie | Nb. d'échantillons analysés par MA-200 | MA-200 > critère A [1] |
|---|---|---|---|
| **Minerai** | AGR | 39 | Ag (20) Ba (9) Cr (38) Cu (4) Mo (1) Ni (38) |
| | SGR | 62 | Ag (40) As (1) Ba (8) Co (3) Cr (61) Cu (7) Mn (3) Mo (4) Ni (62) Pb (1) |
| | SGR+ | 25 | Ag (24) As (1) Ba (5) Co (1) Cr (25) Cu (2) Mo (2) Ni (25) |
| | SGR++ | 6 | Ag (6) As (1) Cr (3) Ni (3) |
| **Dilution** | AGR | 57 | Ag (5) As (1) Ba (32) Co (2) Cr (55) Cu (3) Mo (3) Ni (55) Pb (1) |
| | SGR | 18 | Ag (5) Ba (4) Co (1) Cr (17) Cu (2) Mo (1) Ni (17) |
| **Stériles** | AGR | 22 | Ag (1) Ba (20) Co (1) Cr (22) Mn (1) Mo (1) Ni (22) Pb (1) |
| **Puits d'accès** | AGR | 8 | Ba (8) Cr (8) Mo (1) Ni (8) |

Notes : :
1. Critères A du sol selon le GIPSRTC (Province du Supérieur).

## 4.4 Essais de lixiviation TCLP et classification

Les résultats des analyses MA-200 et des essais de lixiviation TCLP effectués sur les échantillons sont résumés au tableau 7. Un résumé détaillé des résultats des essais de lixiviation TCLP est fourni dans le Tableau D-6 de l'Annexe D.

Le test TCLP sert principalement à évaluer le niveau de risque du potentiel de lixiviation, soit, si le matériel est à risque élevé. Il peut également être utilisé pour identifier les paramètres aptes à être mobilisés en condition acide, bien que l'acide du test TCLP (acide organique) soit différent de celui d'un DMA (acide sulfurique), et donc, peu représentatif des conditions d'un site minier. Les dépassements des concentrations en phase solide (critères sol A) et des lixiviats TCLP (critères EC ou RES du GIPSRTC) sont présentés à titre indicatif dans le tableau 7. Un comparatif de la concentration en phase solide dans les lixiviats TCLP, pour les éléments d'intérêt du test TCLP en dépassement des critères EC et RES (le baryum, le chrome et l'arsenic), est illustré aux figure 7, figure 8 et figure 9.

Aucun échantillon du Secteur East Gouldie n'est classifié comme étant à risque élevé.

Le baryum dépasse de deux fois le critère de concentration en phase solide et en lixiviat TCLP. Des dépassements moins fréquents en arsenic et en chrome sont observés pour quelques échantillons de minerai SGR++ et/ou de stériles AGR (Tableau 7).

Les résultats des analyses MA-200 et des essais de lixiviation TCLP effectués sur les échantillons sont plus ou moins similaires à ceux obtenus dans des échantillons de lithologie sédimentaire dans d'autres secteurs de la mine, dont celui de East Malartic.

Cependant, les limites de détection analytique des paramètres suivants dans les essais TCLP sont plus élevées que les critères RES ou EC applicables :

- TCLP
  - RES : Nitrites, Hg
  - EC : As, Sb

Ainsi, le respect des critères ne peut pas être évalué avec certitude pour ces cas, même lorsque le paramètre n'est pas détecté en laboratoire.

La lixiviabilité des matériaux est discutée ci-après, selon leur résultat aux tests SPLP et CTEU-9.

**Tableau 7 : Sommaire des dépassements des analyses MA.200 et TCLP dans les échantillons du Secteur East Gouldie soumis aux deux essais**

| Type | Lithologie | Nb. d'échantillons analysés pour MA-200 et TCLP | MA-200 > au critère de sol A[1] | Dépassements du lixiviat TCLP | | Dépassements MA200/TCLP |
|---|---|---|---|---|---|---|
| | | | | > RES | > EC | |
| **Minerai** | AGR | 10 | Ag (4) Ba (3) Cr (10) Ni (10) | Ba (3) Cd (6) Hg (1) Mn (8) | Al (7) As (2) Mn (10) Na (10) Pb (7) | Ba (2) |
| | SGR | 12 | Ag (9) As (1) Ba (1) Co (1) Cr (11) Cu (1) Mn (1) Ni (12) | Ba (3) Cd (9) Hg (1) Mn (11) Pb (1) Zn (1) | Al (5) As (2) Ba (1) Cd (1) Mn (12) Na (11) Pb (8) | Ba (1) |
| | SGR+ | 10 | Ag (10) As (1) Ba (3) Cr (10) Cu (1) Ni (10) | Ba (4) Cd (9) Mn (10) Pb (4) | Al (3) Ba (3) Mn (10) Na (10) Pb (8) | Ba (3) |
| | SGR++ | 6 | Ag (6) As (1) Cr (3) Ni (3) | Ba (1) Cd (6) Cr (1) Hg (2) Mn (6) Pb (3) Zn (1) | Al (2) As (2) Mn (6) Na (5) Pb (5) | As (1) Cr (1) |
| **Dilution** | AGR | 6 | Ba (4) Cr (6) Ni (6) | Ba (1) Cd (2) Hg (1) Mn (5) | Al (6) As (2) Mn (6) Na (6) Pb (4) | Ba (1) |
| | SGR | 6 | Ag (1) Ba (2) Cr (6) Ni (6) | Ba (3) Cd (2) Mn (6) Pb (1) | Al (3) As (1) Ba (1) Mn (6) Na (6) Pb (3) | Ba (1) |
| **Stériles** | AGR | 22 | Ag (1) Ba (19) Co (1) Cr (21) Mn (1) Mo (1) Ni (21) Pb (1) | Ba (9) Cd (5) Cr (1) Cu (1) Mn (12) Pb (1) | Al (20) As (2) Ba (2) Mn (21) Na (20) Pb (13) | Ba (7) Cr (1) |
| **Puits d'accès** | AGR | 8 | Ba (8) Cr (8) Mo (1) Ni (8) | Ba (3) Cd (1) Cr (1) Hg (1) Zn (1) | Al (8) As (1) Ba (1) Mn (8) Na (8) Pb (2) | |

Notes :
[1] Critère de sols A pour la Province du Supérieur.

EC – Critère d'eau souterraine - eau de consommation.
RES – Critère d'eau souterraine – résurgence dans les eaux de surface.

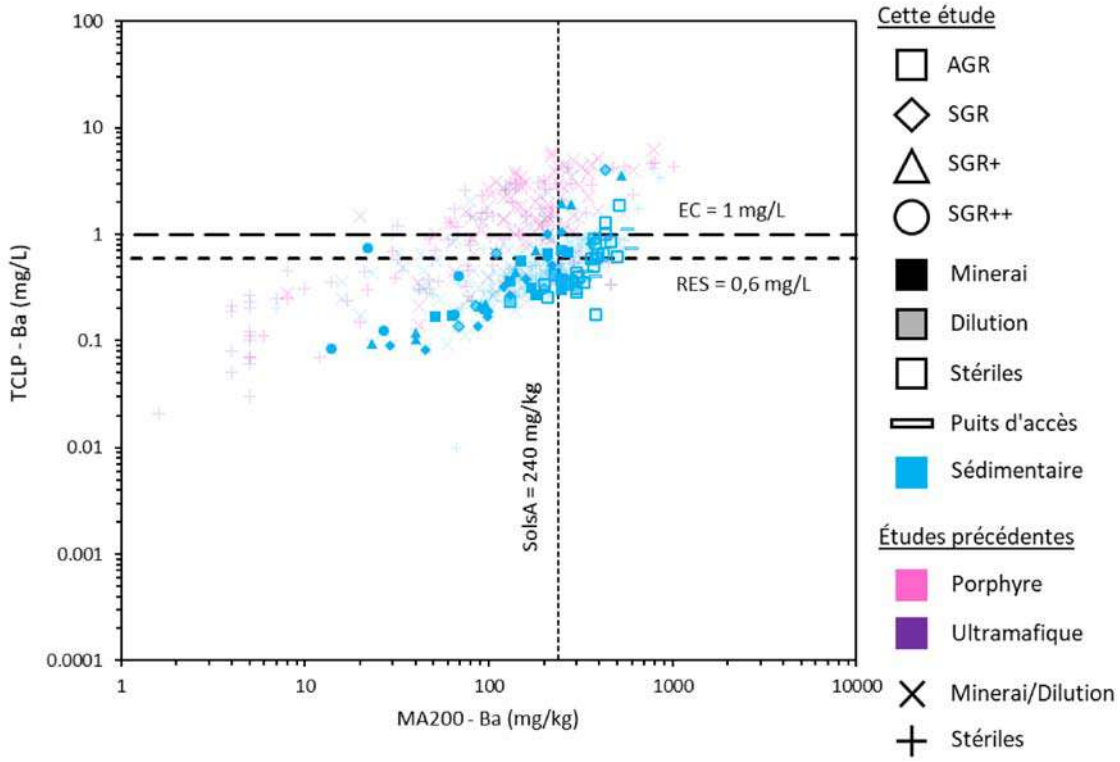



**Figure 7 : Concentration en baryum du lixiviat TCLP comparée à la concentration en phase solide (MA200)**

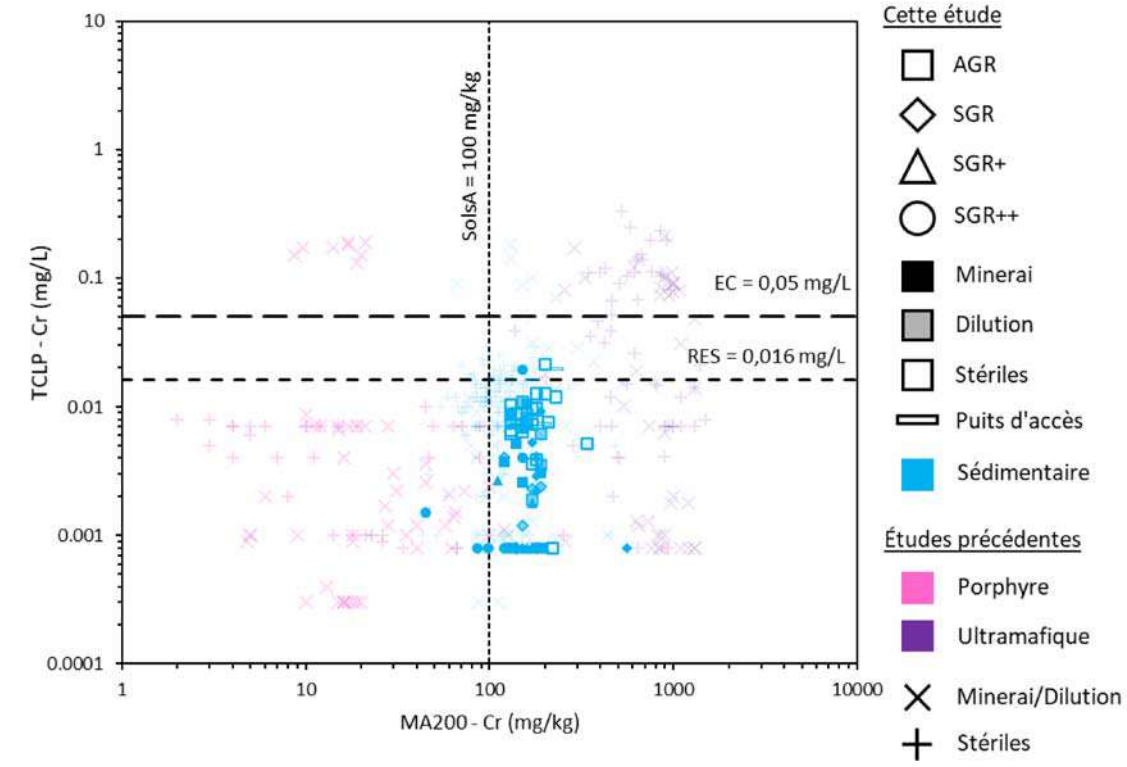



**Figure 8 : Concentration en chrome du lixiviat TCLP comparée à la concentration en phase solide (MA200)**

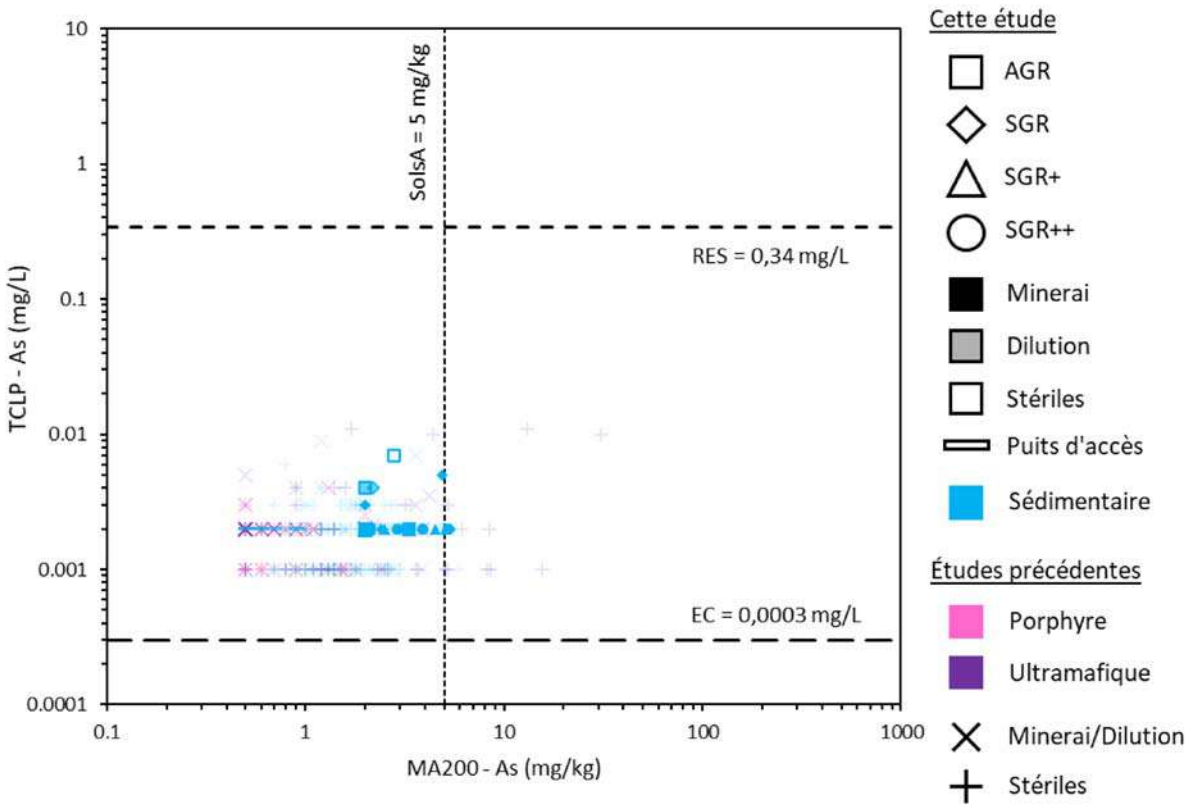



**Figure 9 : Concentration en arsenic du lixiviat TCLP comparée à la concentration en phase solide (MA200)**

## 4.5 Résultats des essais SPLP et CTEU-9

Les résultats des essais de lixiviation SPLP et CTEU-9 sont résumés au tableau 8 et tableau 9 respectivement, et présentés en détail dans les tableaux D-7 et D-8 de l'Annexe D.

Le nombre et la proportion d'échantillons PGA et lixiviables, ainsi que les métaux pour lesquels cette classification s'applique sont présentés dans les tableaux. Un échantillon de minerai AGR est classifié lixiviable uniquement pour l'argent alors que les autres échantillons de minerais de type SGR à SGR++, pour un total de 19 échantillons, sont considérés lixiviables majoritairement pour l'argent et minoritairement pour l'arsenic et le manganèse. Plus le degré d'altération est élevé pour les échantillons de minerais, plus leur taux de lixiviation est élevé.

Les principaux dépassements de critères de l'eau souterraine EC dans les tests SPLP ou CTEU-9 sont l'aluminium et l'arsenic. En ce qui concerne les dépassements des critères RES pour le test CTEU-9, ce sont l'argent, le mercure et le zinc qui sont identifiés, comme présenté dans le tableau 8. Les dépassements de la concentration en phase solide MA-200 et dans les lixiviats SPLP et/ou CTEU-9, par rapport aux critères RES et EC, sont utilisés pour statuer sur le potentiel de lixiviation des échantillons.

Aucun dépassement de critères des tests SPLP et CTEU-9 n'est observé dans les échantillons de dilution, de stériles et du puits d'accès.

Cependant, les limites de détection analytique des paramètres suivants dans les essais SPLP et CTEU-9 sont plus élevées que le critère RES applicables :

- SPLP, CTEU-9
  - RES : Nitrite, Hg

Ainsi, le respect des critères ne peut pas être évalué avec certitude pour ces cas, même lorsque le paramètre n'est pas détecté en laboratoire.

Les résultats des essais cinétiques en cours sont à prendre en compte dans la classification finale du potentiel de lixiviation des échantillons. Les résultats des essais cinétiques en cours sont présentés dans la Section 4.8 jusqu'à la vingt-deuxième semaine.

Les sections suivantes résument les résultats de chacun des essais SPLP et CTEU-9.

**Tableau 8 : Sommaire des dépassements de critères des lixiviats SPLP et CTEU-9 dans les échantillons du Secteur East Gouldie**

| Type | Lithologie | Nb. d'échantillons analysés pour SPLP et CTEU-9 | Dépassements SPLP [1] | | Dépassements CTEU-9 [1] | |
|---|---|---|---|---|---|---|
| | | | > RES | > EC | > RES | > EC |
| Minerai | AGR | 10 | | Al (9) As (9) | Ag (1) | Al (9) As (9) |
| | SGR | 12 | | Al (12) As (10) | Ag (4) Hg (1) | Al (12) As (10) |
| | SGR+ | 10 | | Al (10) As (8) | Ag (6) | Al (10) As (8) |
| | SGR++ | 6 | | Al (6) As (5) | Ag (5) Hg (1) | Al (6) As (5) |
| Dilution | AGR | 6 | | Al (6) As (5) | | Al (6) As (5) |
| | SGR | 6 | | Al (6) As (5) | | Al (6) As (5) |
| Stériles | AGR | 22 | | Al (21) As (14) | Hg (2) Zn (1) | Al (21) As (14) |
| Puits d'accès | AGR | 8 | | Al (8) As (3) | Hg (1) | Al (8) As (3) |

Notes :
EC - Critère d'eau souterraine - eau de consommation.
RES - Critère d'eau souterraine – résurgence dans les eaux de surface.

[1] Les nombres entre parenthèses indiquent le nombre d'échantillons classifiés comme lixiviables pour l'élément en question

.

**Tableau 9 : Potentiel de lixiviation de métaux des lixiviats SPLP et CTEU-9 dans les échantillons du Secteur East Gouldie**

| Type | Lithologie | Nb. d'échantillons analysés pour SPLP et CTEU-9 | Nb. d'échantillons PGA | Dépassements MA200/SPLP ou MA200/CTEU-9[1] | Pourcentage d'échantillons PGA lixiviables | Nb. d'échantillons Non-PGA | Dépassements MA200/SPLP ou MA200/CTEU-9 | Pourcentage d'échantillons PGA lixiviables | Potentiel de lixiviation de métaux total [2,3] |
|---|---|---|---|---|---|---|---|---|---|
| **Minerai** | AGR | 10 | 8 | Ag (1) | 13 | 2 | - | 0 | Ag (1) |
| | SGR | 12 | 8 | Ag (4) As (1) | 50 | 4 | Mn (1) | 25 | Ag (4) As (1) Mn (1) |
| | SGR+ | 10 | 10 | Ag (6) As (1) | 60 | 0 | - | - | Ag (6) As (1) |
| | SGR++ | 6 | 6 | Ag (5) As (1) | 83 | 0 | - | - | Ag (5) As (1) |
| **Dilution** | AGR | 6 | 6 | - | 0 | 0 | - | - | - |
| | SGR | 6 | 4 | - | 0 | 2 | - | 0 | - |
| **Stériles** | AGR | 22 | 20 | - | 0 | 2 | - | 0 | - |
| **Puits d'accès** | AGR | 8 | 8 | Mo (1) | 13 | 0 | - | - | Mo (1) |

Notes :
EC - Critère d'eau souterraine - eau de consommation.
RES - Critère d'eau souterraine – résurgence dans les eaux de surface.

[1] Les nombres entre parenthèses indiquent le nombre d'échantillons classifiés lixiviables pour l'élément en question.

### 4.5.1 Résultats des essais SPLP

Les résultats des essais de lixiviation SPLP pour les paramètres d'intérêt (dont des dépassements des critères de qualité d'eau sont identifiés) sont illustrés de la figure 10 à la figure 12. À titre de comparaison et de perspective, ces figures montrent également les résultats de ces mêmes analyses sur les échantillons prélevés des autres secteurs de MCM, identifiés par lithologie (en utilisant les mêmes codes de couleurs lithologiques, mais en symboles plus pâles).

Les dépassements de critères RES et EC sont énumérés au tableau 8. Des dépassements du critère EC pour l'aluminium (0,1 mg/L) et l'arsenic (0,0003 mg/L) sont constatés dans presque tous les échantillons de tout type (minerai, dilution, stérile et puits d'accès). Aucun échantillon ne dépasse le critère RES de l'arsenic (0,34 mg/L) (il n'existe aucun critère RES pour l'aluminium). Aucun dépassement des critères RES n'est observé. La concentration maximale pour l'argent et le manganèse ne dépasse pas leurs critères EC applicables.

Le baryum dépasse le critère A du sol, surtout dans les stériles, mais ces échantillons respectent les critères RES et EC dans les lixiviats des tests SPLP.

Les échantillons qui sont classifiés lixiviables selon les deux critères décisionnels (leur composition chimique et leur concentration dans le lixiviat), n'incluent que quelques échantillons de minerai pour l'arsenic seulement.

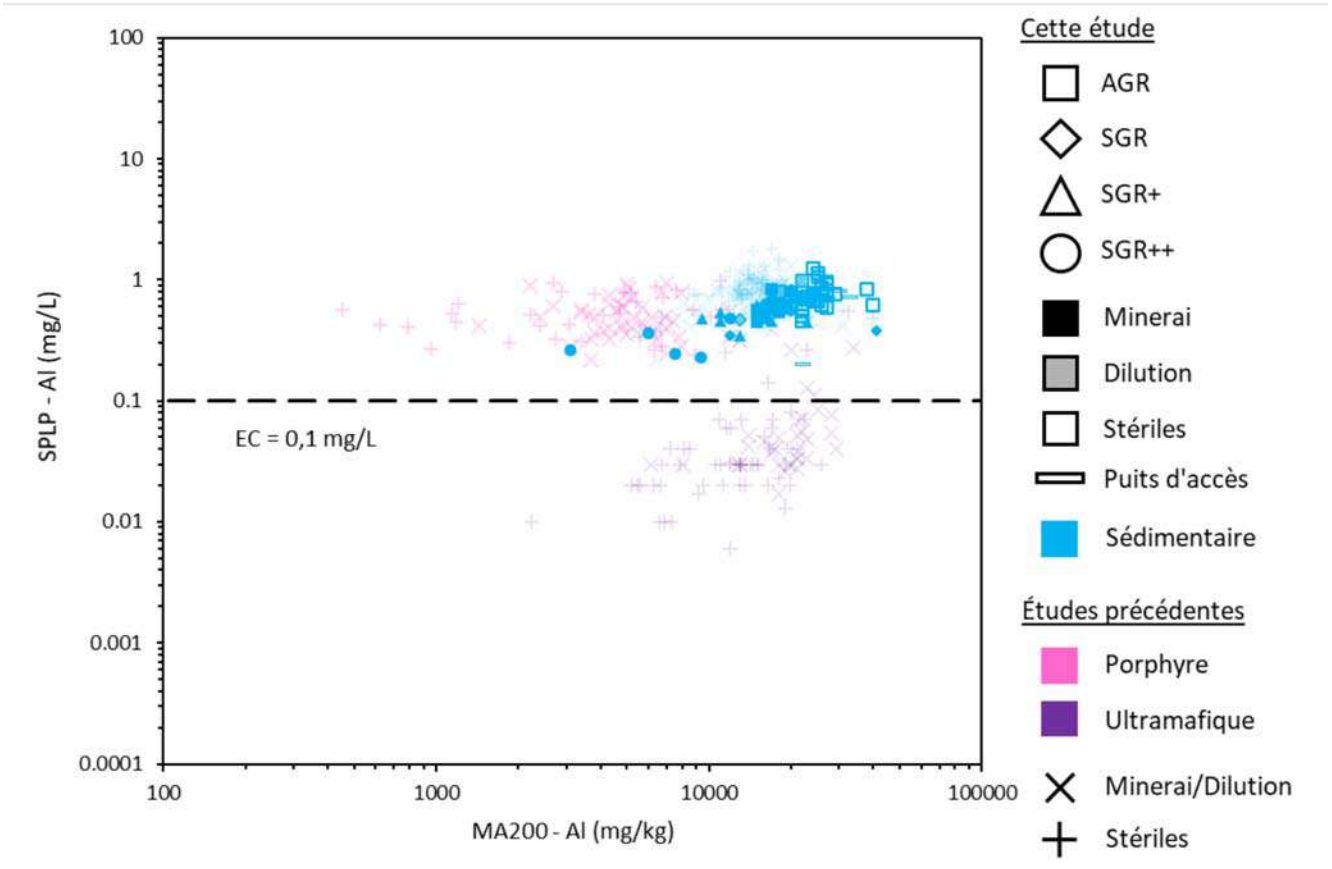



**Figure 10 : Contenu en aluminium en phase solide (MA200) et dans les lixiviats SPLP**

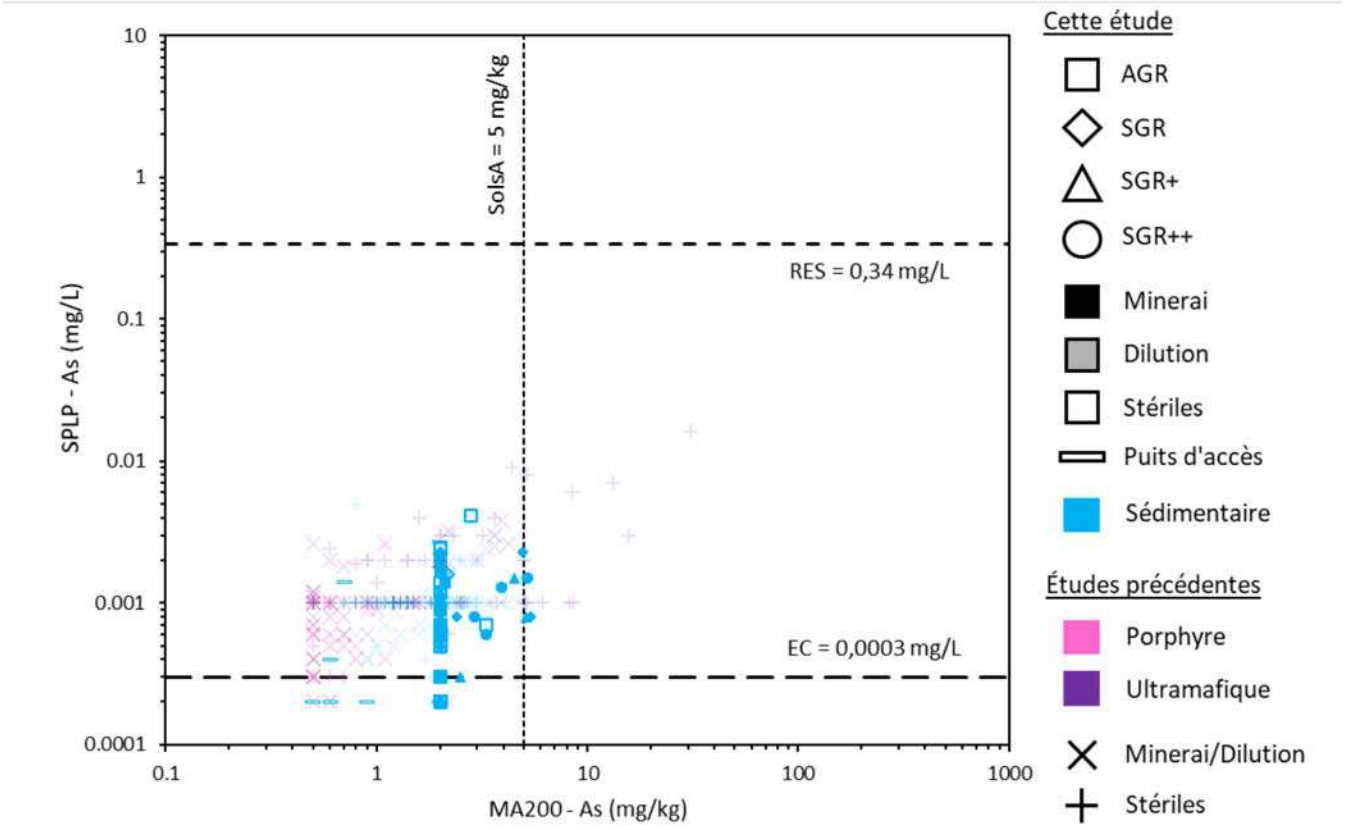



**Figure 11 : Contenu en arsenic en phase solide (MA200) et dans les lixiviats SPLP**

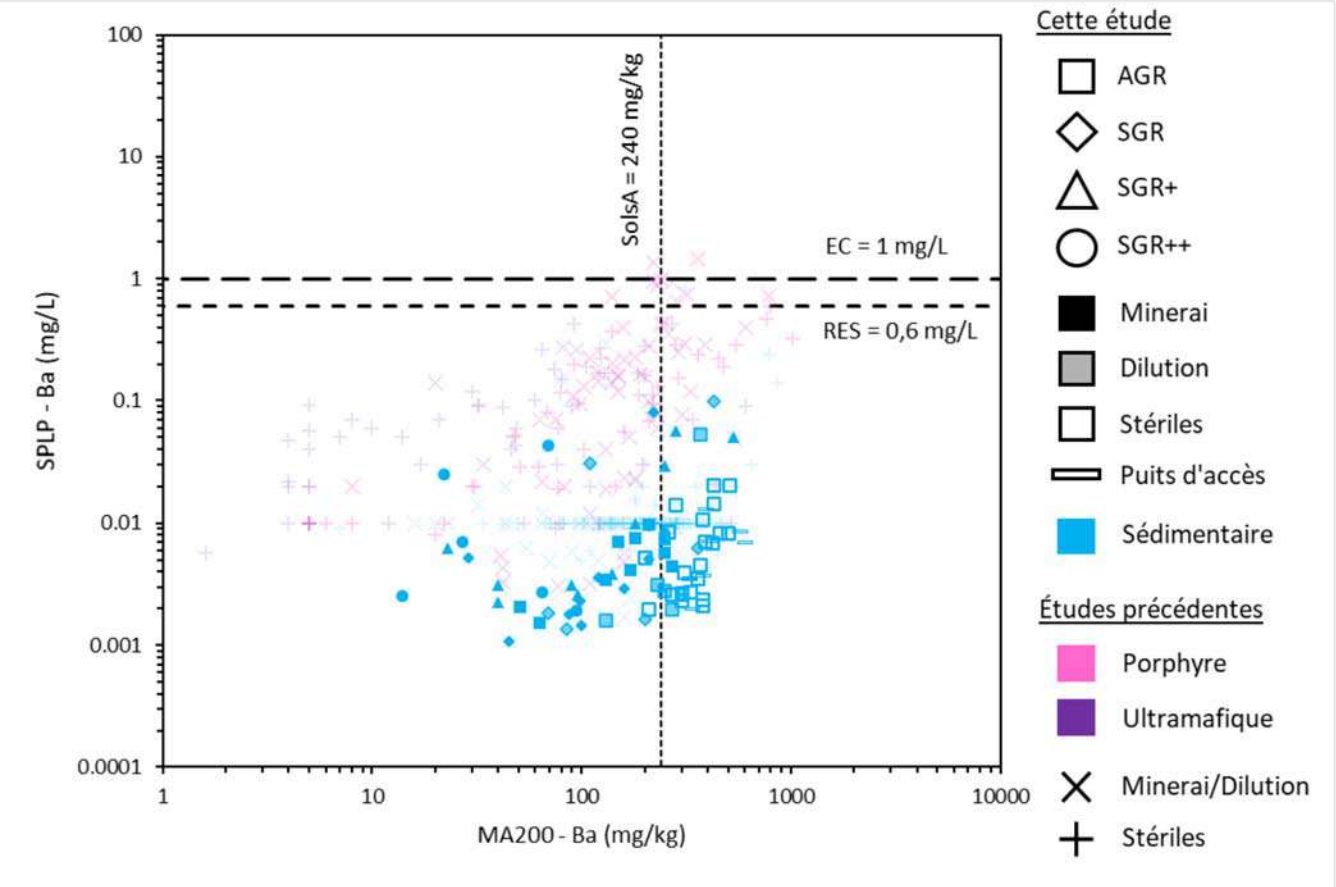



**Figure 12 : Contenu en baryum dans la phase solide (MA200) et dans les lixiviats SPLP**

### 4.5.2 Résultats des essais CTEU-9

Tous les éléments montrant des dépassements des critères RES et EC dans les essais de lixiviation CTEU-9 sont illustrés de la figure 13 à la Figure 18. Les résultats de l'essai CTEU-9 reflètent la lixiviation provenant de la granulométrie fine, le test étant réalisé sur un échantillon pulvérisé à une granulométrie très fine.

Les dépassements des critères RES et EC sont énumérés au tableau 8. Des dépassements du critère EC pour l'aluminium (0,1 mg/L) et l'arsenic (0,0003 mg/L) sont constatés dans presque tous les échantillons, de tout type (minerai, dilution, stérile et puits d'accès) comme dans les tests SPLP. Des dépassements du critère RES pour l'argent et minoritairement pour le mercure et le zinc sont également observés pour les essais CTEU-9, bien que leur composition en zinc dans la phase solide ne dépasse pas le critère A du sol.

Les échantillons qui sont classifiés lixiviables, selon les deux critères décisionnels (leur composition chimique et leur concentration dans le lixiviat), incluent des échantillons de minerai pour l'argent et pour l'arsenic.

Les résultats des essais CTEU-9 et SPLP sont tous les deux cohérents.

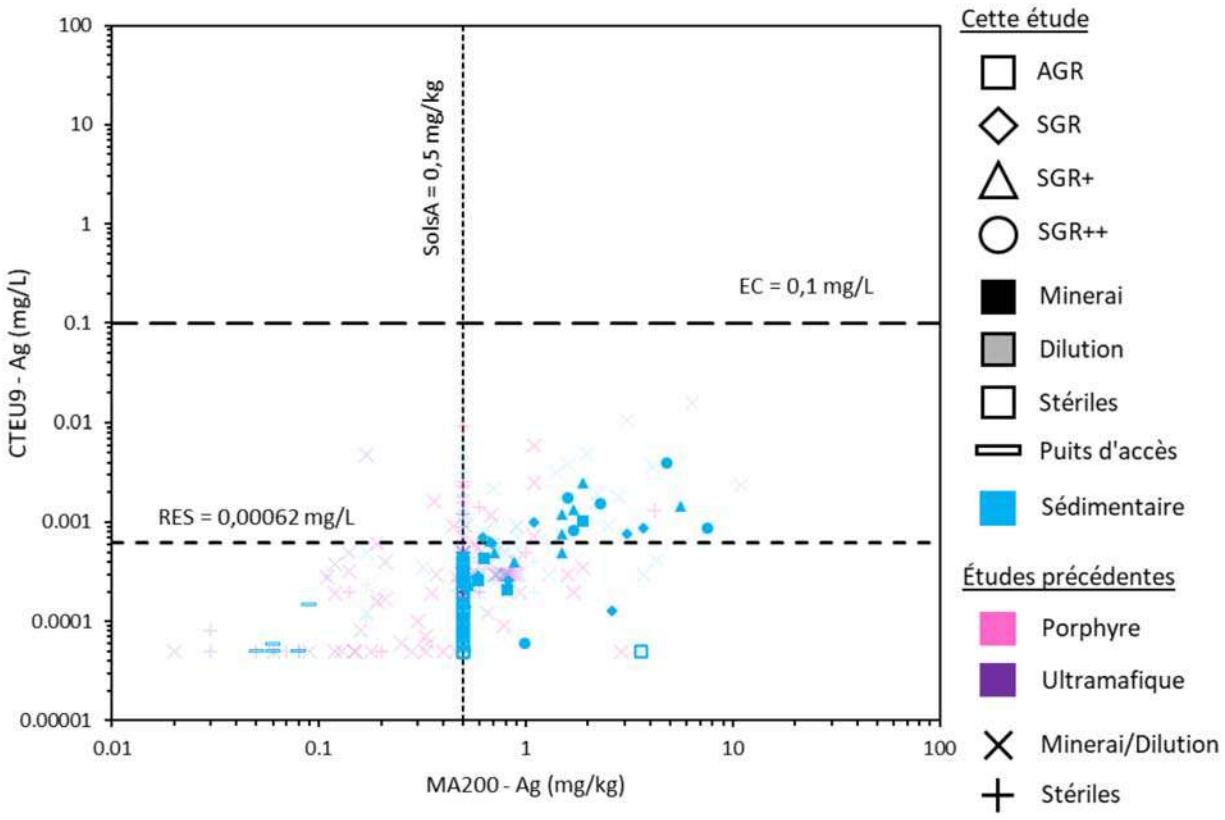



**Figure 13 : Contenu en argent dans la phase solide (MA200) et dans les lixiviats CTEU-9**

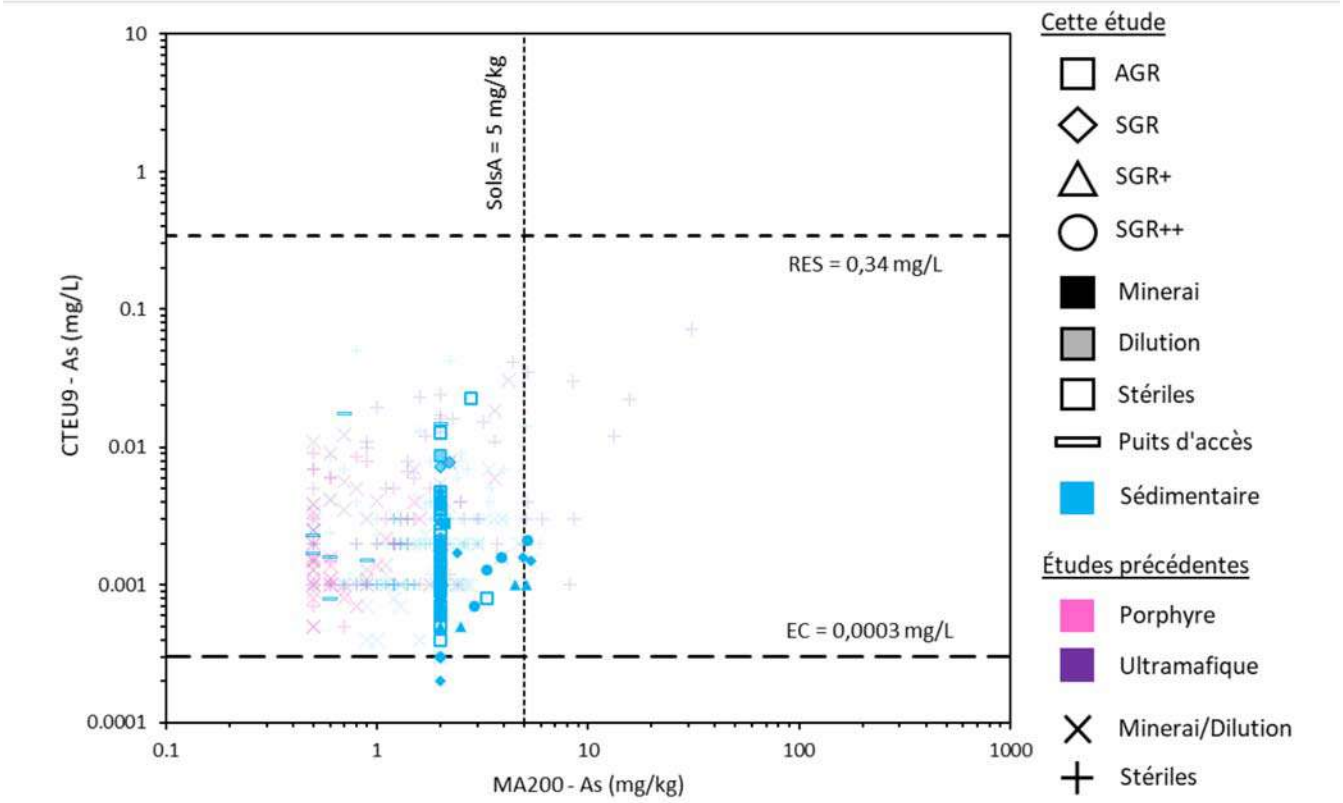



**Figure 14 : Contenu en arsenic dans la phase solide (MA200) et dans les lixiviats CTEU-9**

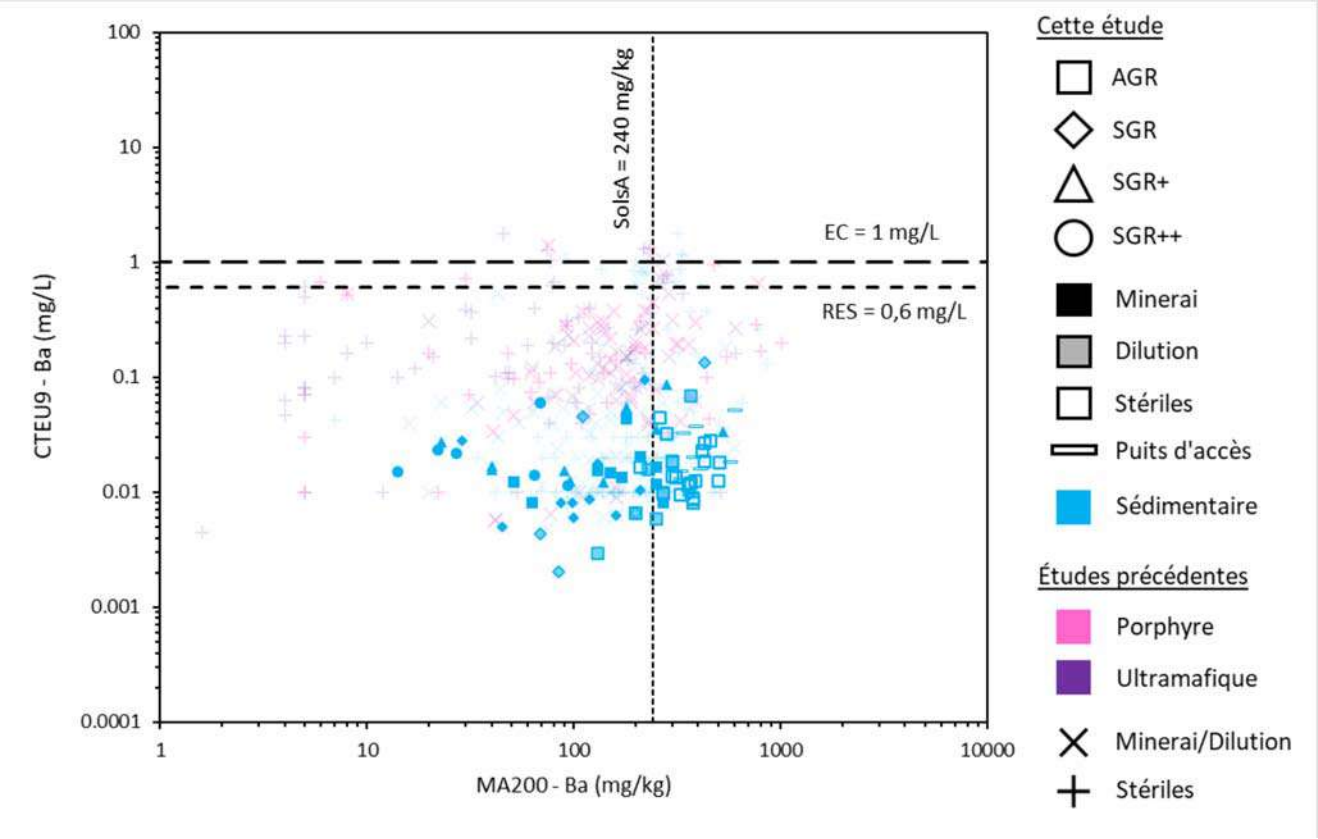



**Figure 15 : Contenu en baryum dans la phase solide (MA200) et dans les lixiviats CTEU-9**

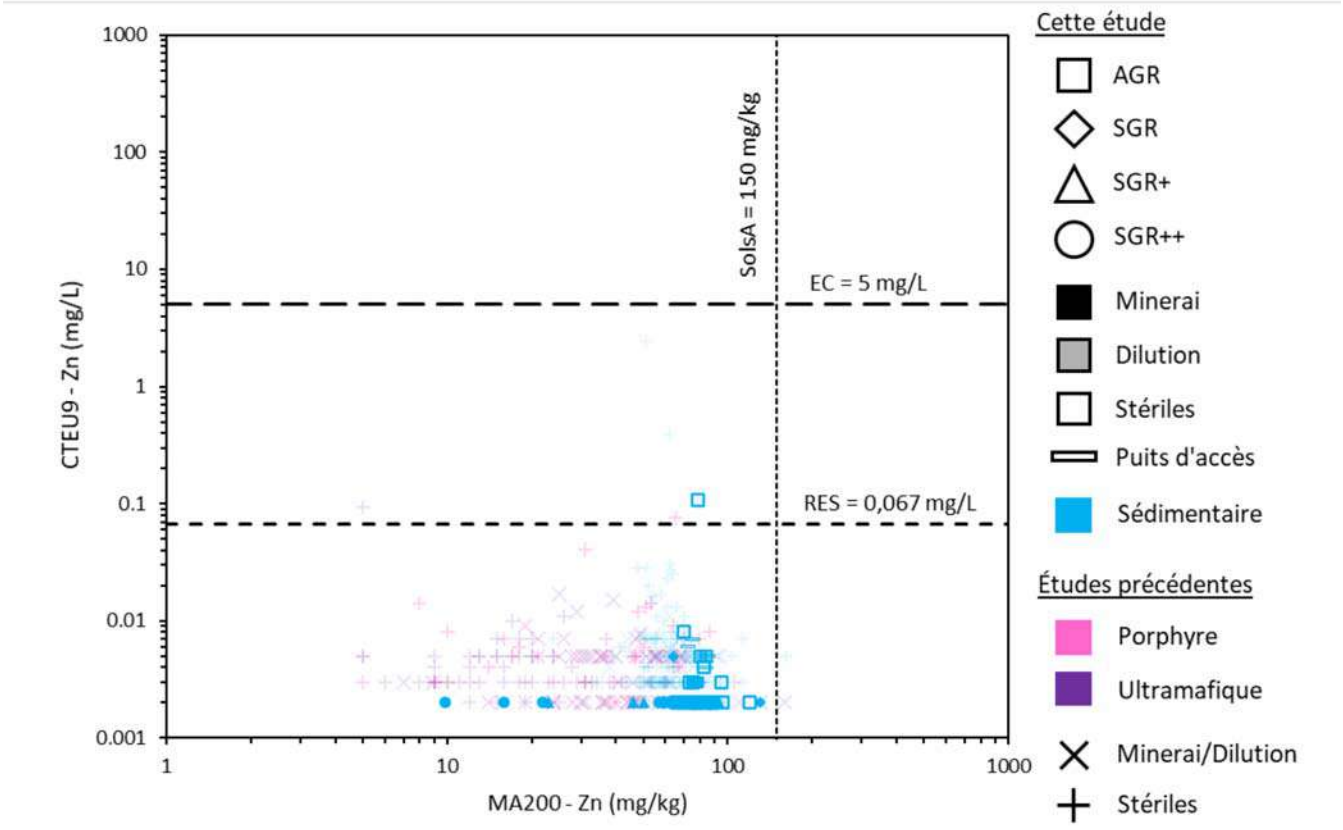



**Figure 16 : Contenu en zinc dans la phase solide (MA200) et dans les lixiviats CTEU-9**

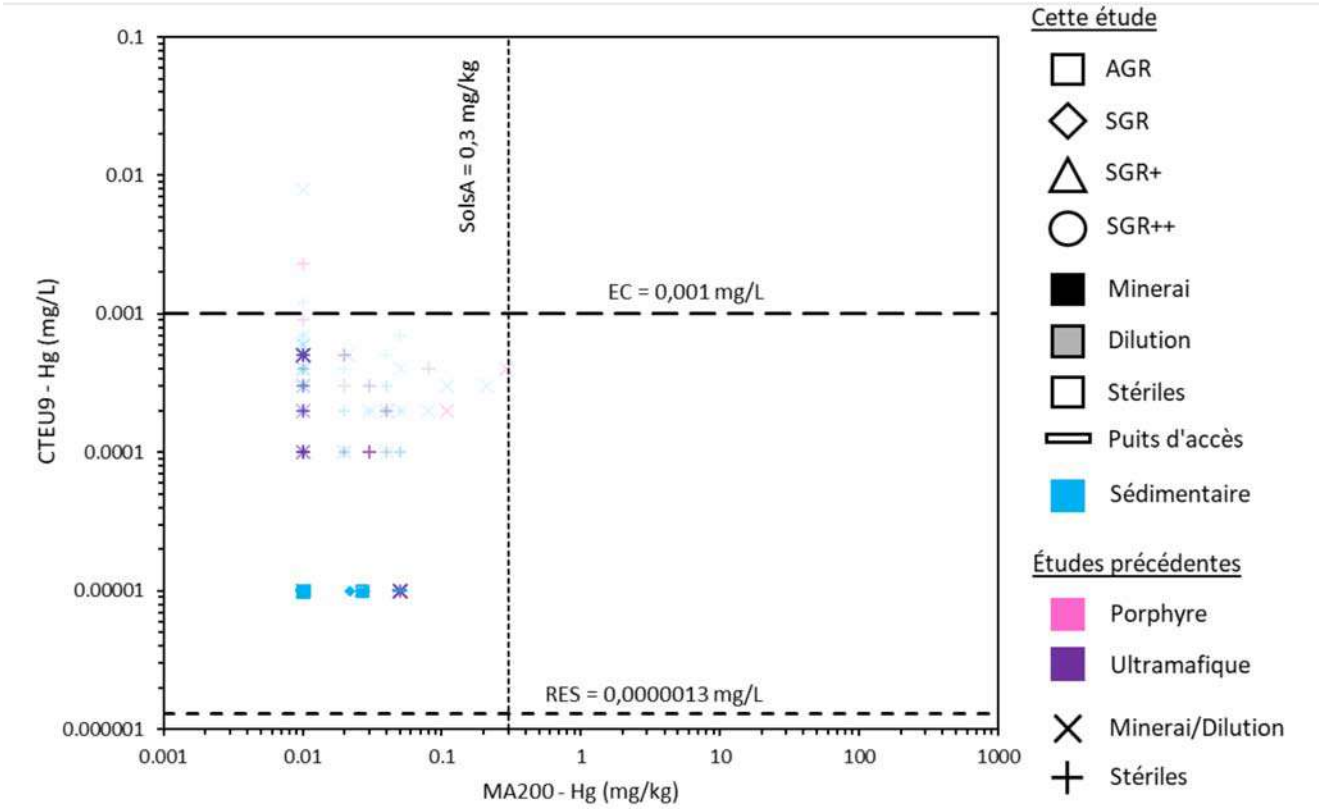



**Figure 17 : Contenu en mercure dans la phase solide (MA200) et dans les lixiviats CTEU-9**

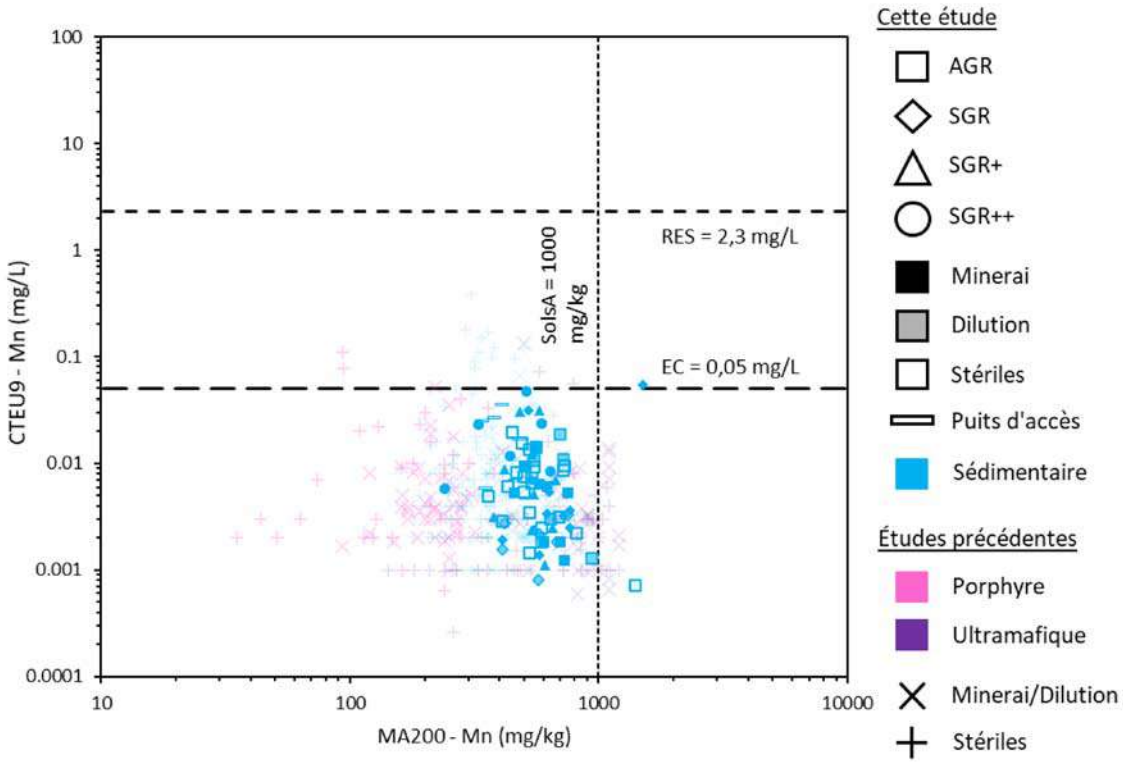



**Figure 18: Contenu en manganèse dans la phase solide (MA200) et dans les lixiviats CTEU-9**

## 4.6 Observations minéralogiques par diffraction de rayons X

Les résultats des analyses minéralogiques par DRX sont présentés en détail dans le Tableau D-3 de l'annexe D et un sommaire de la présence de minéraux carbonatés et sulfurés est présenté au tableau 10.

Les principaux minéraux présents dans les échantillons collectés sont l'albite, le quartz, le microcline et la biotite. La principale source de potentiel de neutralisation est la calcite et celle du potentiel d'acidification est la pyrite.

Les concentrations en calcite sont les plus élevées dans les échantillons de minerai, plus particulièrement le minerai SGR, avec une moyenne de 11%. Les échantillons de dilution, stériles et du puits d'accès présentent une moyenne <2,3% de calcite. Les abondances de calcite sont bien corrélées avec les valeurs de C(%) et le PN-$CO_3$, dans les échantillons de minerai. Ceci suggère que la quantité de carbone est majoritairement présente sous forme de calcite.

Le seul sulfure identifié est la pyrite, dont la plus haute teneur est dans le minerai, particulièrement le minerai SGR+. Les échantillons de type dilution, stérile et du puits d'accès présentent une moyenne <0,91% de pyrite.

La quantité de pyrite est corrélée avec le potentiel acidogène (PA), bien que cette corrélation ne soit pas exacte : en effet, la minéralogie sous-estime le contenu en sulfure, comme démontré au tableau 10, selon le calcul du contenu en soufre, d'après la quantité de pyrite. Ceci est probablement provoqué par le seuil élevé de contenu pour permettre la détection et l'identification de minéraux par DRX (qui est de 0,1 -1%). Les échantillons observés au DRX pourraient contenir plus de pyrite et/ou d'autres minéraux sulfurés que ce qui a été initialement rapporté.

**Tableau 10 : Minéralogie des carbonates et sulfures des échantillons du Secteur East Gouldie**

| Type | Lithologie | Nombre d'échantillons | Pyrite (%) | S calculé d'après le contenu en Py (%) | Bilan acide-base | | Calcite (%) | C calculé d'après le contenu en Calcite (%) | Bilan acide-base | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | S total (%) | PA ($kgCaCO_3/t$) | | | C (%) | $PN\text{-}CO_3$ |
| Minerai | AGR | 1 | 1,5 | 0,80 | 1,6 | 52 | 4,0 | 0,48 | 0,40 | 21 |
| | SGR | 2 | 1,8 | 0,95 | 1,9 | 59 | 11 | 1,3 | 1,20 | 80 |
| | SGR+ | 1 | 2,5 | 1,3 | 2,9 | 90 | 4,4 | 0,53 | 0,63 | 33 |
| | SGR++ | 1 | 2,0 | 1,1 | 2,6 | 82 | 4,8 | 0,58 | 0,64 | 38 |
| Dilution | AGR | 1 | 0,43 | 0,23 | 0,46 | 14 | 1,6 | 0,19 | 0,14 | 8,1 |
| | SGR | 1 | 0,91 | 0,48 | 0,82 | 26 | 2,3 | 0,28 | 0,28 | 16 |
| Stériles | AGR | 2 | 0,3 | 0,16 | 0,32 | 9,8 | 1,1 | 0,13 | 0,07 | 4,0 |
| Puits d'accès | AGR | 1 | 0,33 | 0,17 | 0,30 | 9,3 | 0,4 | 0,048 | 0,039 | 1,7 |

Notes :
ND – Non détecté.

## 4.7 Discussion sur les résultats des essais statiques

Les principales caractéristiques du potentiel acidogène et de lixiviation du Secteur East Gouldie sont similaires pour tous les types d'échantillons (stérile, minerai, dilution et rampe d'accès). Un résumé de la classification du potentiel acidogène et du risque de lixiviation des échantillons de minerai, de dilution, de stérile et du puits d'accès est présenté au tableau 11.

Tous les échantillons (minerai, dilution et stériles et puits d'accès) sont classifiés comme PGA. Les échantillons de minerai SGR, SGR+ et SGR++ sont légèrement lixiviables avec un dépassement en argent et en arsenic pour les trois catégories d'altération de minerai ainsi qu'en manganèse pour le minerai SGR.

Les résultats d'essais cinétiques obtenus à la date de ce rapport, présentés à la section 4.8, permettent de valider les résultats d'essais statiques.

**Tableau 11 : Résumé de la classification des échantillons du Secteur East Gouldie**

| Type | Lithologie | Nombre d'échantillons Phase 1 | Nombre d'échantillons Phase 2[1] | Potentiel acidogène (MCM) | Potentiel de lixiviation de métaux[2,3] | Classification |
|---|---|---|---|---|---|---|
| **Minerai** | AGR | 39 | 10 | PGA (8)<br>Non-PGA (2) | Ag (1) | PGA |
| | SGR | 62 | 12 | PGA (8)<br>Non-PGA (4) | Ag (4) As (1) Mn (1) | PGA |
| | SGR+ | 25 | 10 | PGA (10) | Ag (6) As (1) | PGA |
| | SGR++ | 6 | 6 | PGA (6) | Ag (5) As (1) | PGA |
| **Dilution** | AGR | 57 | 6 | PGA (6) | | PGA |
| | SGR | 18 | 6 | PGA (4)<br>Non-PGA (2) | | PGA |
| **Stériles** | AGR | 22 | 22 | PGA (20)<br>Non-PGA (2) | | PGA |
| **Puits d'accès** | AGR | 8 | 8 | PGA (8) | Mo (1) | PGA |

Notes : :

[1] Le nombre total d'échantillons soumis aux analyses MA-200 et TCLP, si PGA, ou, MA-200, TCLP, SPLP et CTEU-9, si non PGA, et prélevés des mêmes échantillons que ceux de la phase I.

[2] Selon les critères du *Guide* 2020.

[3] Le nombre entre parenthèses indique le nombre d'échantillons classifiés lixiviables pour chaque paramètre.

## 4.8 Essais cinétiques

Les essais cinétiques ont été réalisés sur six (6) échantillons décrits dans la section 3.1.3, dans le but de vérifier le potentiel de génération d'acide de certains échantillons classifiés comme PGA durant les essais statiques ainsi que d'évaluer le taux de lixiviation de certains métaux durant 40 semaines. Les tests sont en cours; les résultats jusqu'à la vingtième semaine sont présentés dans ce rapport.

Les résultats des essais cinétiques sont présentés dans les Tableaux 1 à 6 de l'Annexe E et aux figures E-1 à E 16 de la même annexe. Les dépassements pour les paramètres d'intérêt (dont des dépassements des critères de la qualité d'eau sont notés) sont présentés de la Figure 19 à la Figure 23. À titre de comparaison, l'intervalle de la

qualité de l'eau souterraine du site MCM dans le roc, pour chaque paramètre analysé, est également illustré sur les figures E-1 à E-16.

Les principaux résultats intérimaires (provisoires) des essais cinétiques sont résumés ci-dessous :

- Le pH a une tendance à baisser par rapport aux premières semaines où celui-ci était basique. À la vingtième semaine, un pH neutre est maintenu pour les six échantillons, à l'exception de ceux dans le minerai qui présentent un pH légèrement basique. De plus, ce pH se situe dans l'intervalle de pH mesuré sur le site MCM entre 6,9 et 8 pour les dernières semaines.
- La concentration en sulfate est plus ou moins stable avec une légère tendance à la baisse et se situe également dans l'intervalle des concentrations de la qualité de l'eau souterraine sur le site MCM entre 1,3 et 140 mg/L. La concentration en sulfate et celle mesurée pour l'alcalinité sont utilisées pour calculer le délai de consommation du sulfure et du potentiel de neutralisation.
  - Le délai de consommation du sulfure est beaucoup plus long que celui des minéraux neutralisants (voir tableau 12), ce qui signifie qu'une éventuelle génération d'acide pourrait avoir lieu une fois que le potentiel de neutralisation (PN-CO3) sera consommé.
- Des dépassements du critère EC pour l'arsenic, lors du début des essais cinétiques pour tous les types d'échantillons, sont identifiés. Cependant, tous les échantillons sont en dessous du critère EC à la vingtième semaine d'analyse.
- Aucun dépassement de concentration en argent n'est observé à la vingtième semaine.
- Aucun dépassement de concentration en manganèse, avec des concentrations plus ou moins stables, en dessous et à la limite du critère EC, n'est noté. Ces concentrations sont à surveiller avec la continuation des tests.
- Les concentrations des lixiviats des essais des cellules humides en alcalinité, en calcium, en chlorure, en baryum, en magnésium, et en sodium sont inférieures à celles de l'eau souterraine dans le roc du site MCM pour ces mêmes paramètres. Les concentrations des lixiviats de tests cinétiques se situent dans la plage des concentrations de l'eau souterraine pour les paramètres suivants : pH durant seulement les deux dernières semaines sauf pour un échantillon de minerai AGR et un échantillon de stérile AGR, l'arsenic, l'aluminium, le bore, le cadmium, le cuivre, le fer, le fluorure, le nickel, les nitrates et nitrites, le plomb, le sélénium, le sulfate et le zinc.

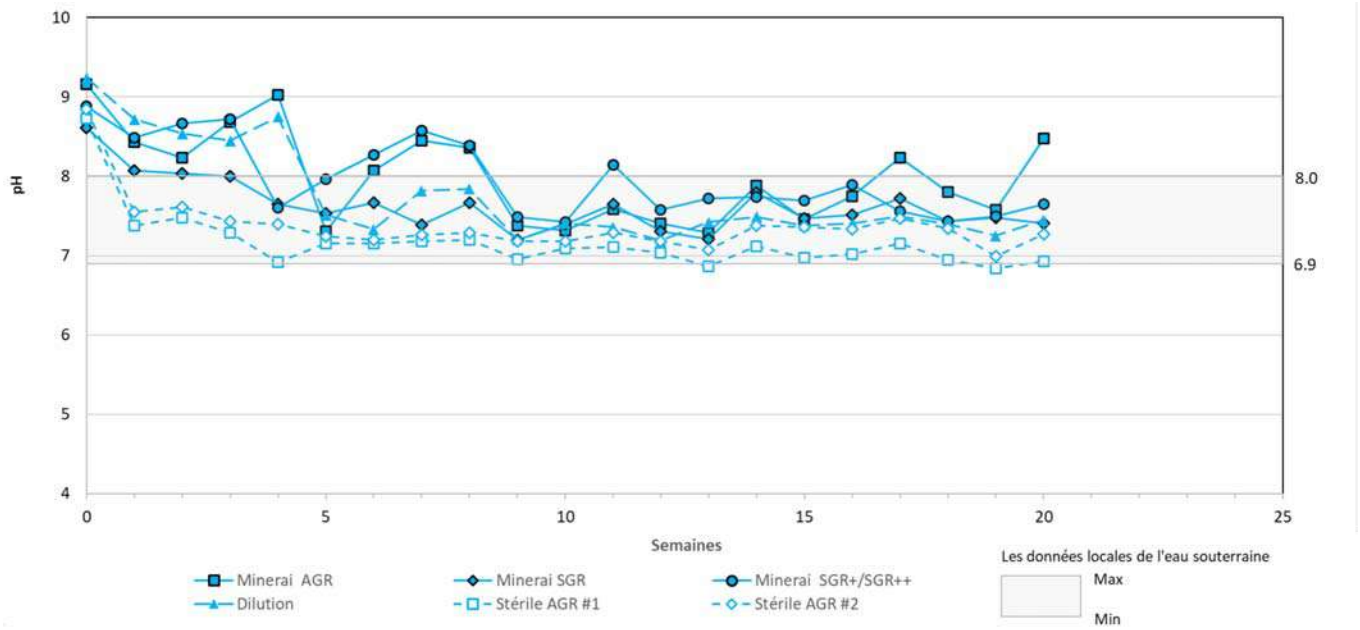



**Figure 19: Résultats intérimaires des essais cinétiques : pH**

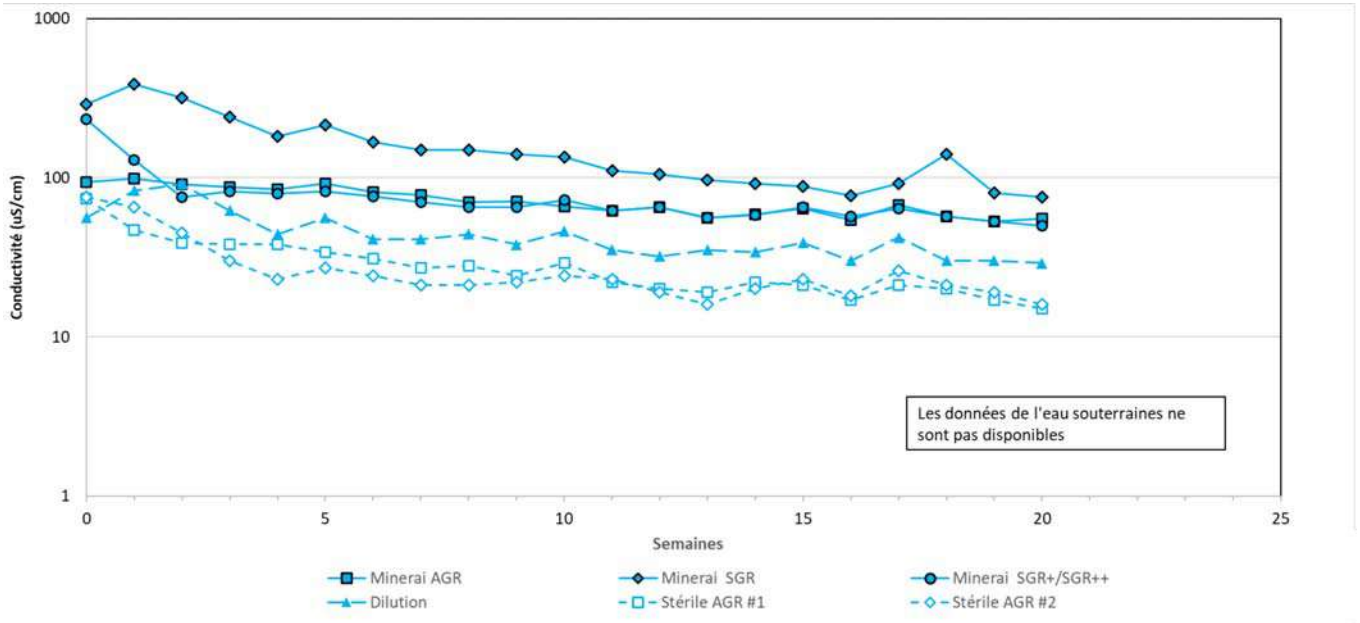



**Figure 20: Résultats intérimaires des essais cinétiques : conductivité électrique**

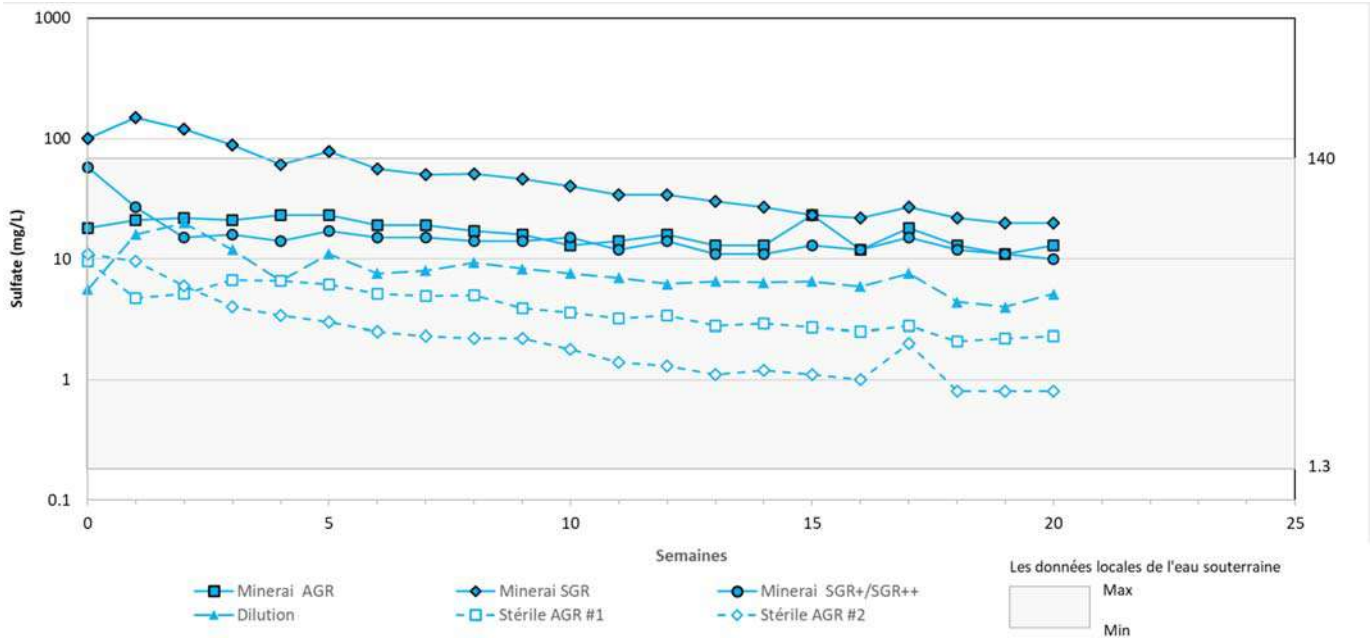



**Figure 21: Résultats intérimaires des essais cinétiques : sulfate**

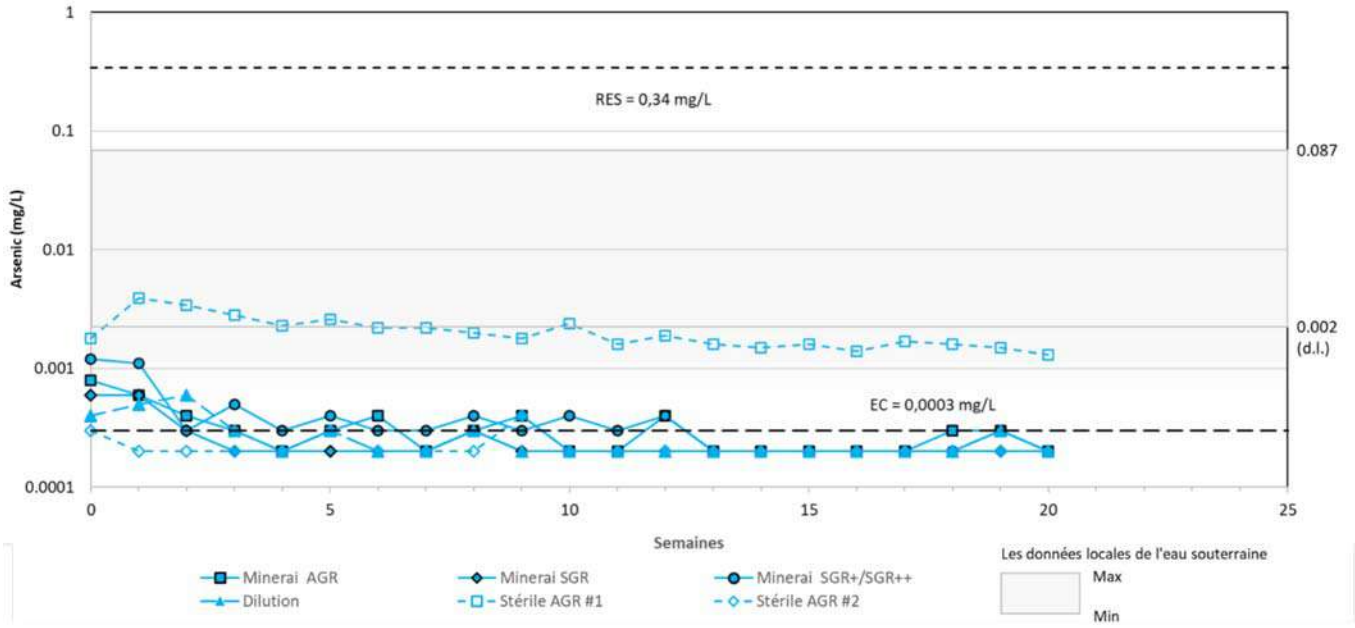



**Figure 22 : Résultats intérimaires des essais cinétiques : arsenic**

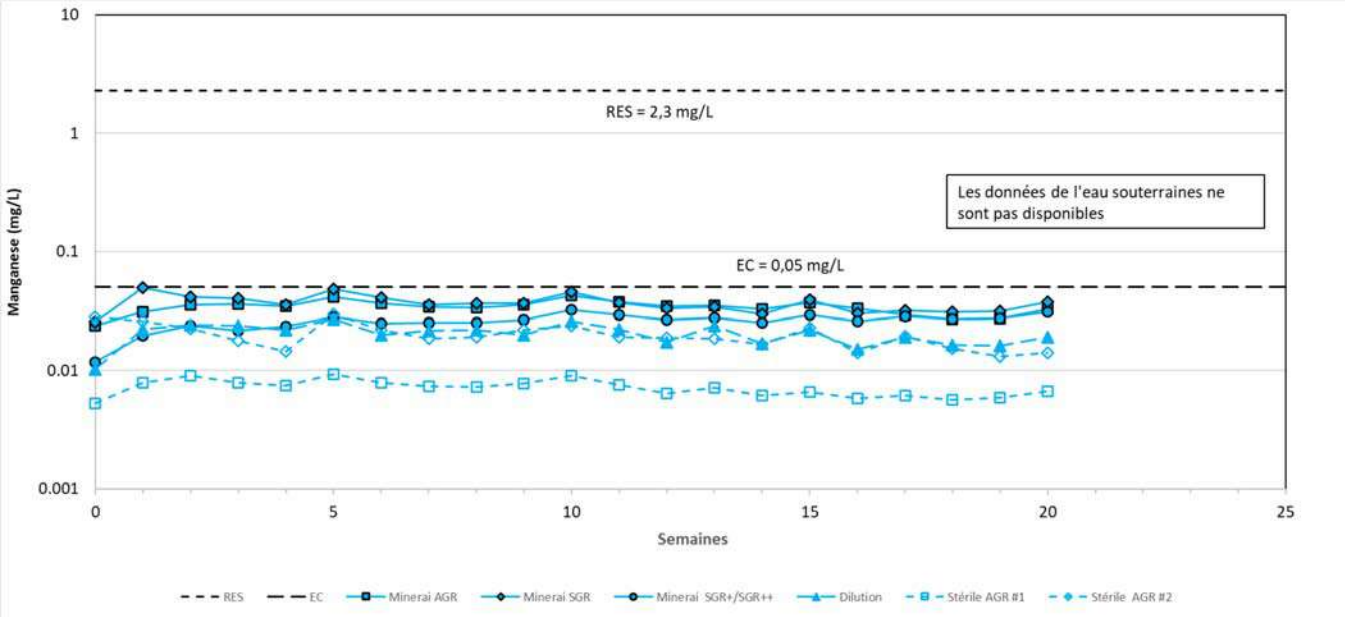



**Figure 23 : Résultats intérimaires des essais cinétiques : manganèse**

Tous les types de roches sédimentaires (minerai, dilution et stériles), d'après les essais cinétiques, sont validés de manière temporaire au 2 février 2021 comme étant PGA et lixiviables majoritairement pour le minerai SGR+, SGR++ et les stériles AGR, avec un dépassement en arsenic, comme présenté dans le tableau 12.

**Tableau 12 : Sommaire des essais cinétiques (tests à cellule humide) dans le Secteur East Gouldie**

| Type | Lithologie | Potentiel acidogène selon les essais statiques (East Gouldie) | Potentiel de lixiviation de métaux[1] | | pH (cycle 20) | Délai de consommation du sulfure (Années) | Délai de consommation du PN-$CO_3$ (Années) | Validation intérimaire du PGA au 2 février |
|---|---|---|---|---|---|---|---|---|
| | | | Cycle 1 | Cycle 20 (dernier cycle avec résultats) | | | | |
| **Minerai** | AGR | PGA | As | | 8,5 | 79 | 20 | PGA |
| | SGR | PGA | As | Hg | 7,4 | 84 | 24 | PGA |
| | SGR+/ SGR++ | PGA | As | | 7,7 | 169 | 37 | PGA |
| **Dilution** | AGR/SGR | PGA | As | | 7,5 | 69 | 19 | PGA |
| **Stériles** | AGR | PGA | As | As | 6,9 | 57 | 6 | PGA |
| | | PGA | | | 7,3 | 135 | 24 | PGA |

Notes :

[1] Selon les critères du Guide 2020.

## 5.0 DISCUSSION

Selon les résultats statiques, tous les types de roches sédimentaires (minerai, dilution, stériles et puits d'accès) sont classifiés comme étant PGA, et ceux de type minerai SGR, SGR+ et SGR++ sont faiblement lixiviables, avec un dépassement en argent et en arsenic pour les trois types de minerai et un dépassement en manganèse pour le minerai SGR.

Les résultats préliminaires d'essais cinétiques en cours et le calcul de consommation minéralogique réalisé au cycle 20 du test cinétique corroborent la classification acidogène des matériaux testés, mais indiquent également un délai avant l'acidification, si le PGA se manifeste à long terme. En effet, le lixiviat de chacun des 6 tests cinétiques en cours demeure neutre et montre un faible taux d'oxydation (peu de sulfate) après 20 cycles de rinçage. Le relâchement d'éléments chimiques est également moindre qu'en tests de lixiviation statique après 20 cycles de tests cinétiques; seuls l'arsenic et le mercure sont relâchés en concentrations supérieures au critère d'eau souterraine pour l'eau de consommation. Il faut rappeler que les échantillons sélectionnés pour les tests cinétiques ont une composition chimique qui représente le quartile supérieur ou médian de concentration en soufre et de lixiviation de tous les échantillons analysés du Secteur East Gouldie.

La poursuite des tests cinétiques permettra de vérifier le potentiel acidogène et de lixiviation à long terme des matériaux testés. Les résultats des tests cinétiques effectués seront présentés dans une prochaine version de ce rapport.

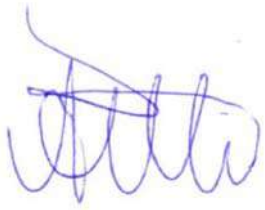
## 6.0 RECOMMANDATIONS

Il est important de continuer les tests cinétiques en cours jusqu'à ce que les objectifs de tests soient atteints : l'acidification et/ou un taux de lixiviation stable.

Un suivi opérationnel de la géochimie des matériaux est recommandé afin de vérifier la portée des conclusions de cette étude ainsi que la présence de différences chimiques localisées.

## 7.0 CLÔTURE

Nous espérons que ce rapport répond à vos attentes. Si vous avez des questions, n'hésitez pas à en contacter les signataires.



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*Associée, géochimiste senior*

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**ANNEXE A**

# Programme d’échantillonnage

# East Gouldie

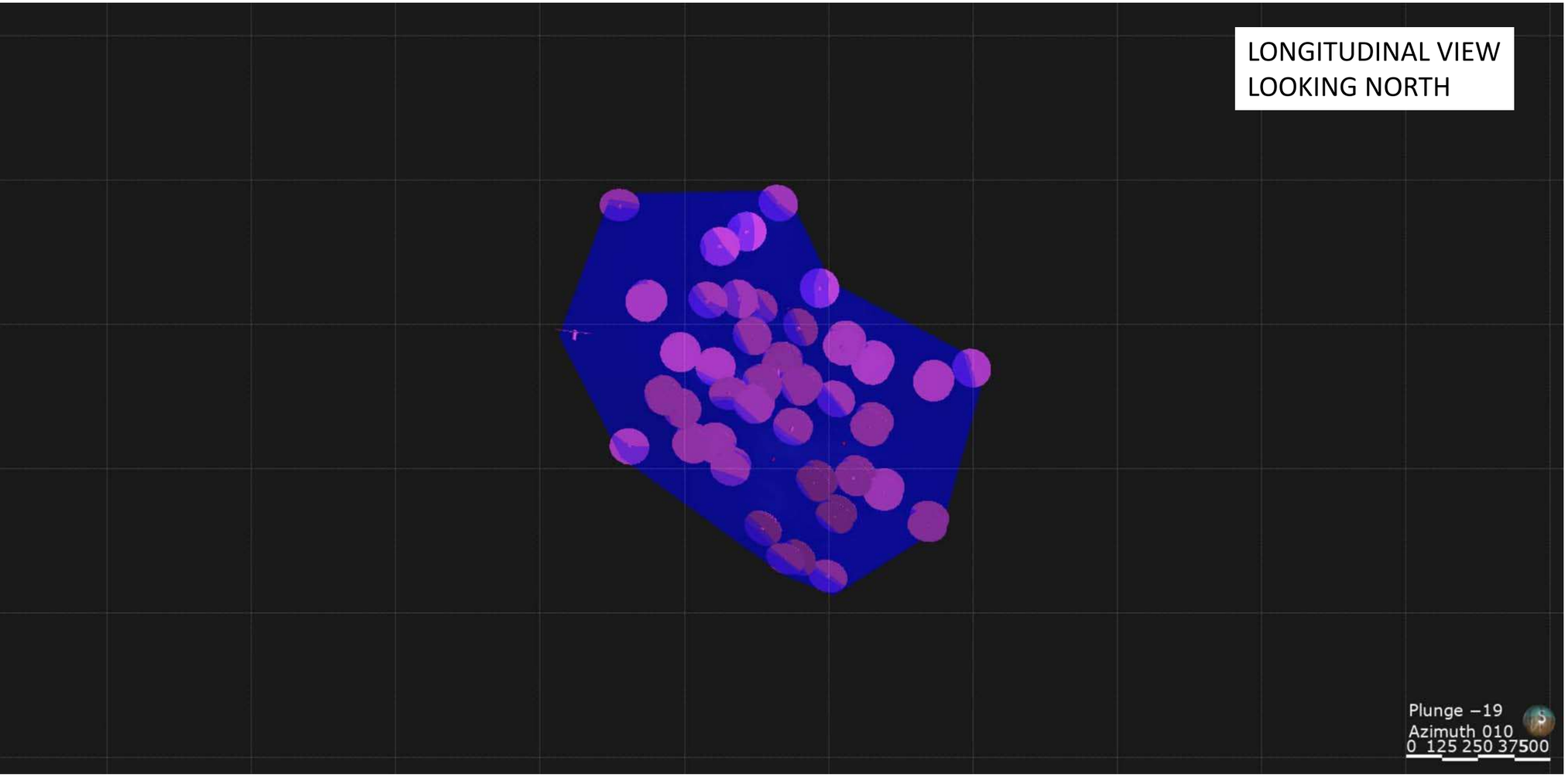
# Programme d'échantillonnage
# Caractérisation géochimique
# East Gouldie

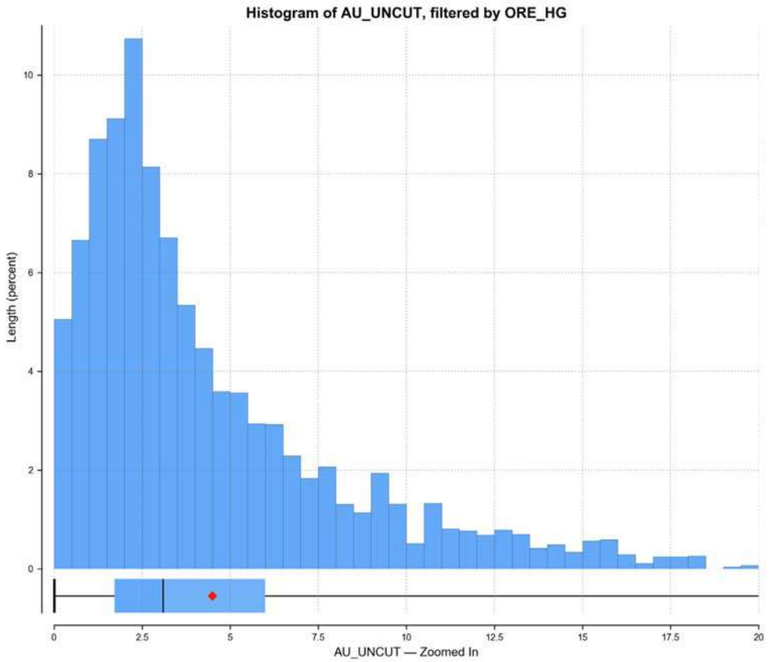
## Phase 1

# NATURE ET OBJECTIF DU PROGRAMME D'ÉCHANTILLONNAGE

- Le gisment East Gouldie est principalement constitué de roches sédimentaires plus ou moins minéralisées (pyrite) et altérées (silicifiées).
- Étant donné le peu de caractéristiques géologiques distinctives pouvant être modélisées, un programme général d'analyse géochimique est proposé.
- Le but de programme est de fournir une base de données à partir de laquelle il sera possible de distinguer des domaines lithogéochimiques distincts.
- Ultimement, la détermination des domaines lithogéochimiques permettra d'optimiser les prochaines phases de caractérisation en géochimie environnementale et en métallurgie.
- La sélection d'échantillon est représentative de la variabilité des teneurs en or et est répartie spatialement pour chaque source de roche à être extraite (minerais HG et LG, dilution, zone de développement et shaft).
- Les analyses suivantes sont demandées pour chaque échantillon:
  - Multi-éléments (MA200)
  - Roche totale (Borate fusion)
  - C/S (Leco)

# ORE HG – SAMPLE SELECTION



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| Q3 | 6.0 |
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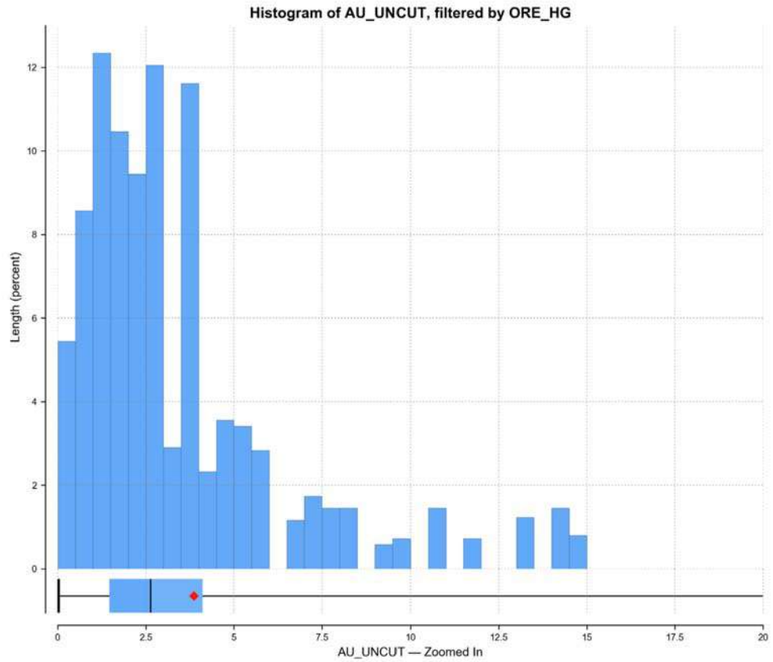


SAMPLE SELECTION

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| CV | 1.1 |
| Variance | 16.6 |
| Minimum | 0.0 |
| Q1 | 1.5 |
| Q2 | 2.6 |
| Q3 | 4.1 |
| Maximum | 22.0 |

| Name | Length | % |
|---|---|---|
| AGR | 260.2 | 19.60% |
| APO | 6.4 | 0.50% |
| CGR | 13.6 | 1.00% |
| IM | 10.7 | 0.80% |
| SGR | 673.6 | 50.80% |
| SGR+ | 322.7 | 24.30% |
| SGR++ | 32 | 2.40% |
| SPO | 4.3 | 0.30% |
| SPO+ | 0.3 | 0.00% |
| SPO++ | 2.7 | 0.20% |

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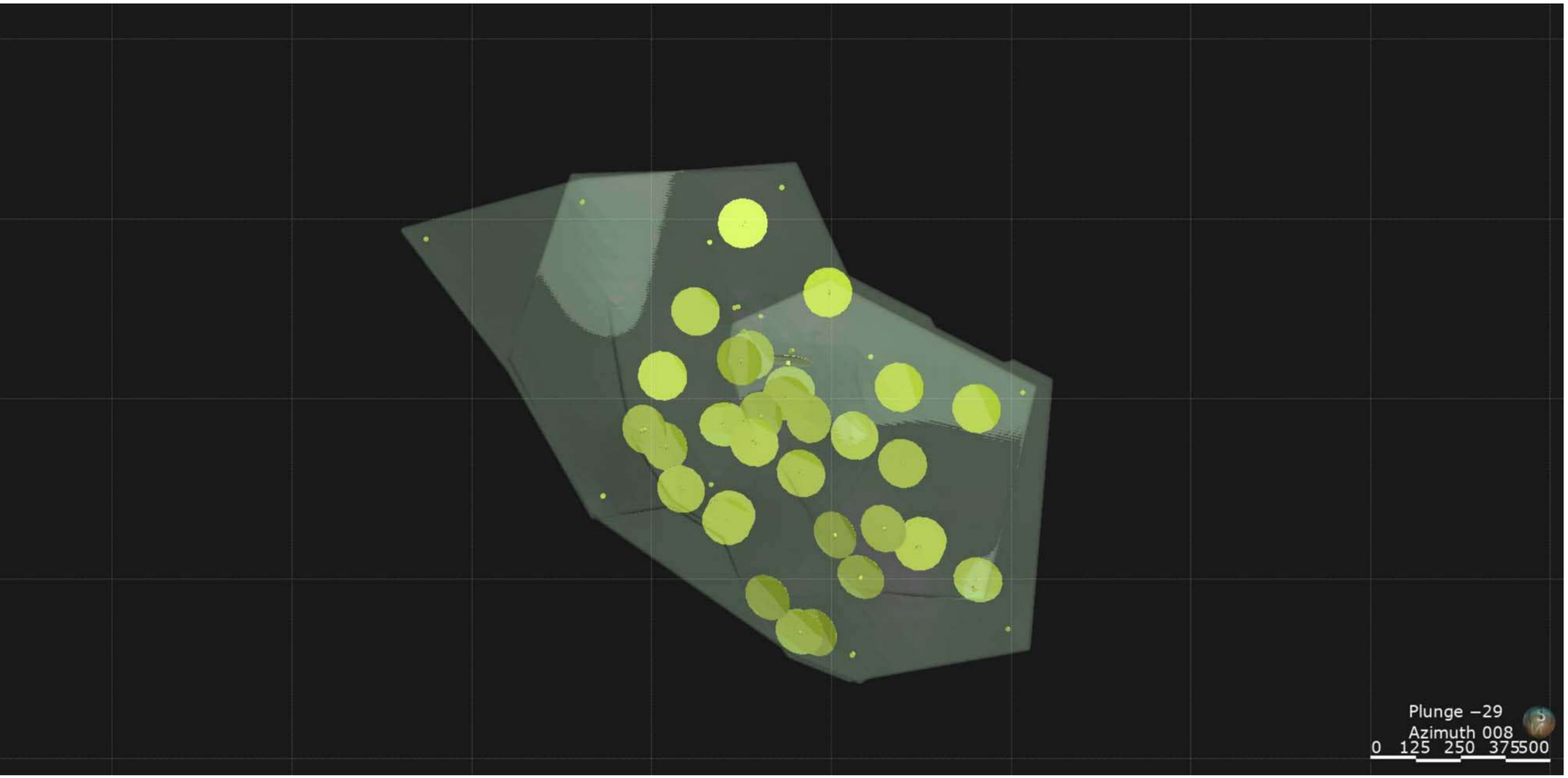
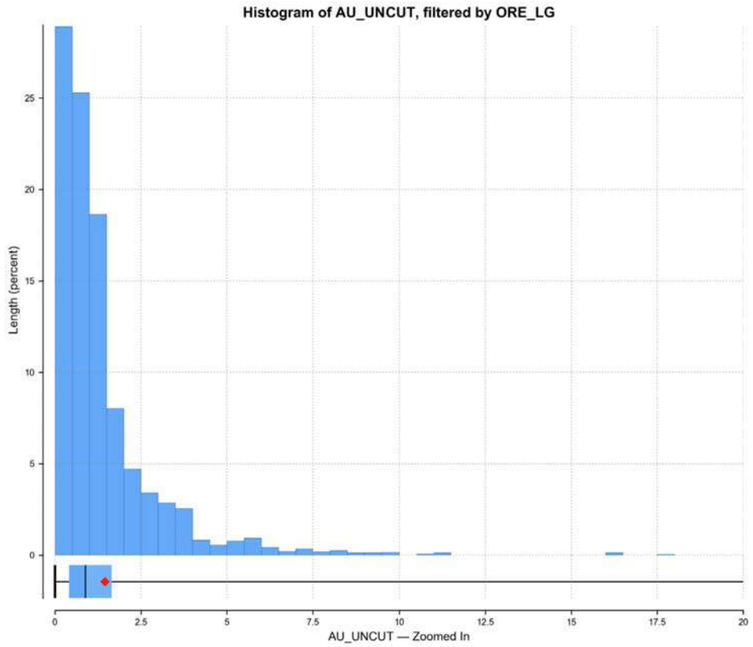
(North and South)

# ORE LG – SAMPLE SELECTION



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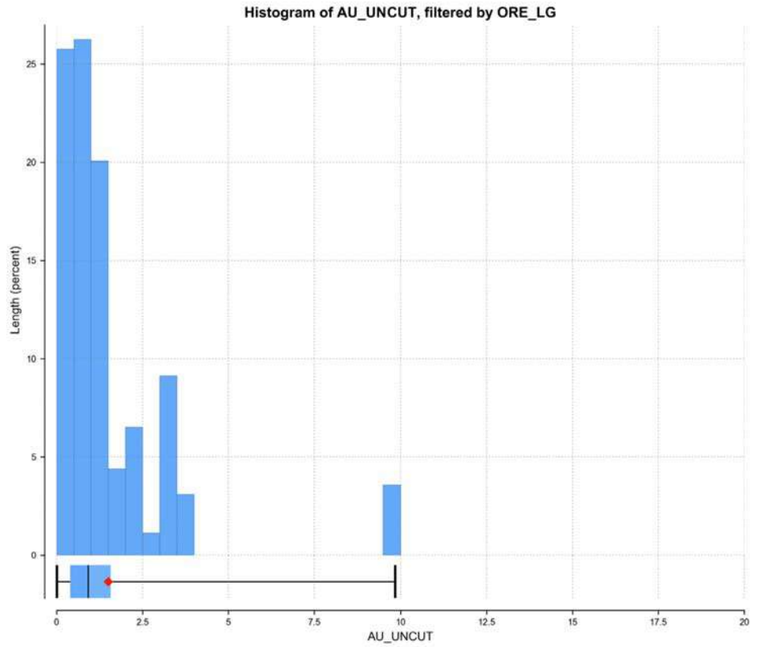
DATABASE




SAMPLE SELECTION

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| Mean | 1.5 |
| SD | 1.9 |
| CV | 1.3 |
| Variance | 3.7 |
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| Q1 | 0.4 |
| Q2 | 0.9 |
| Q3 | 1.6 |
| Maximum | 9.8 |

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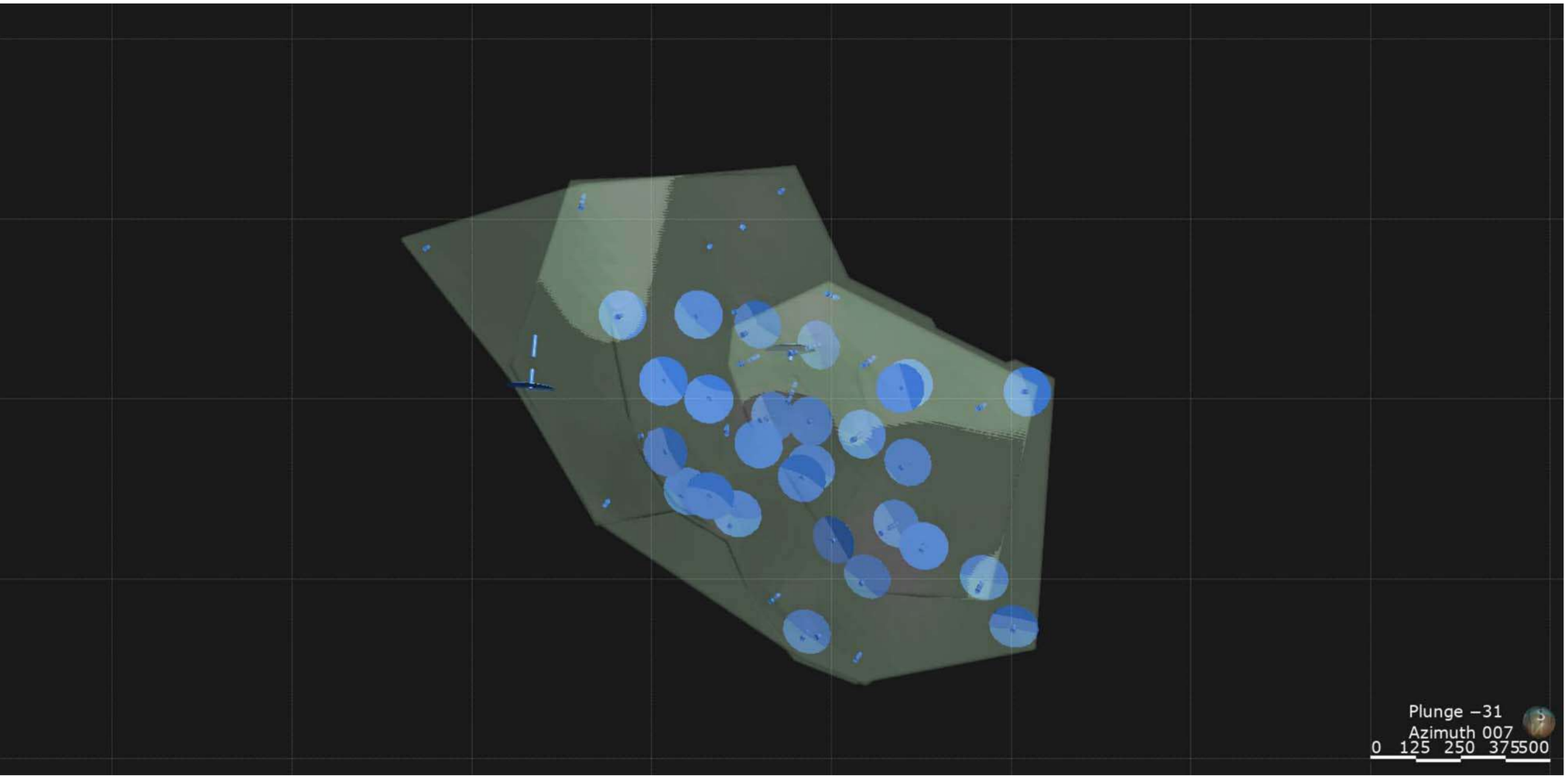

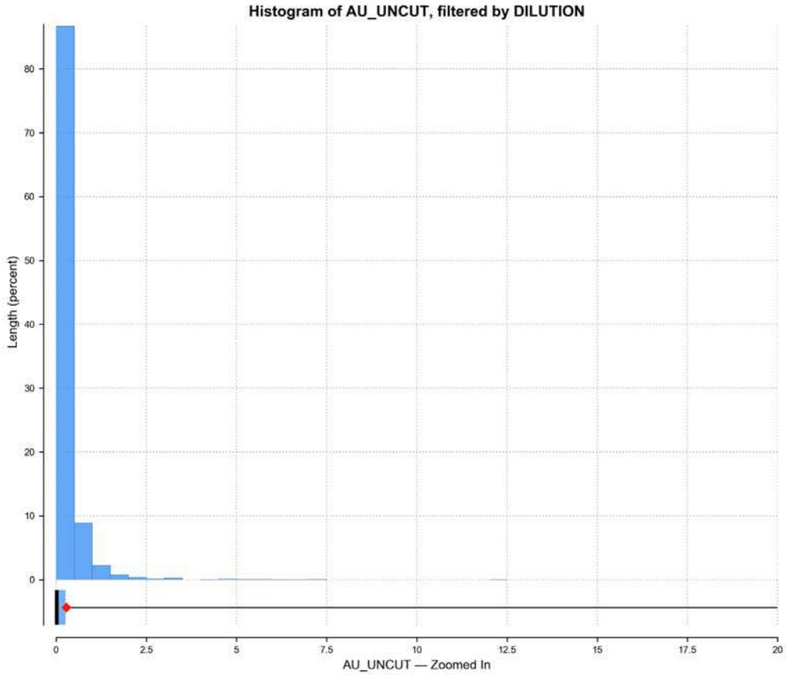


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| Q3 | 0.3 |
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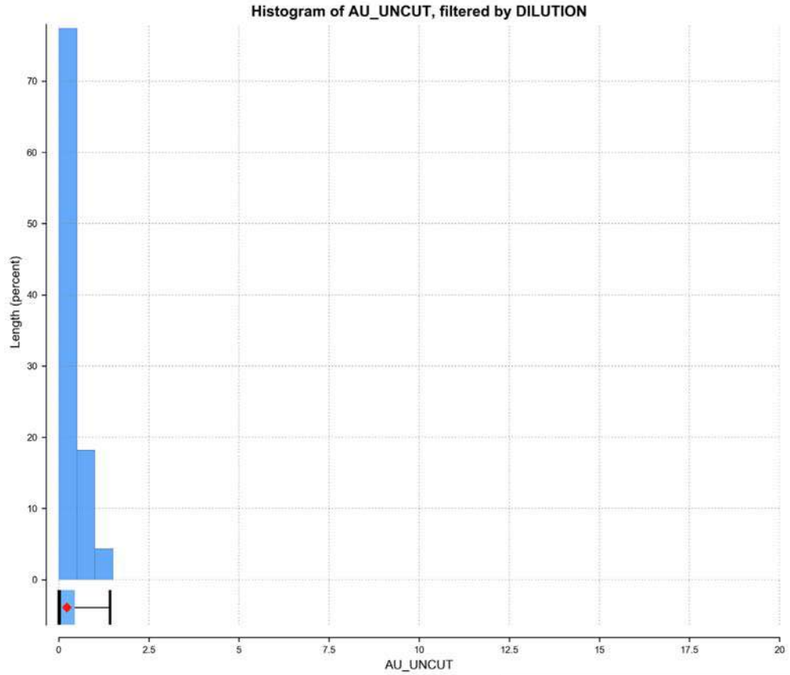


SAMPLE SELECTION

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| CV | 1.5 |
| Variance | 0.1 |
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| Q3 | 0.4 |
| Maximum | 1.4 |

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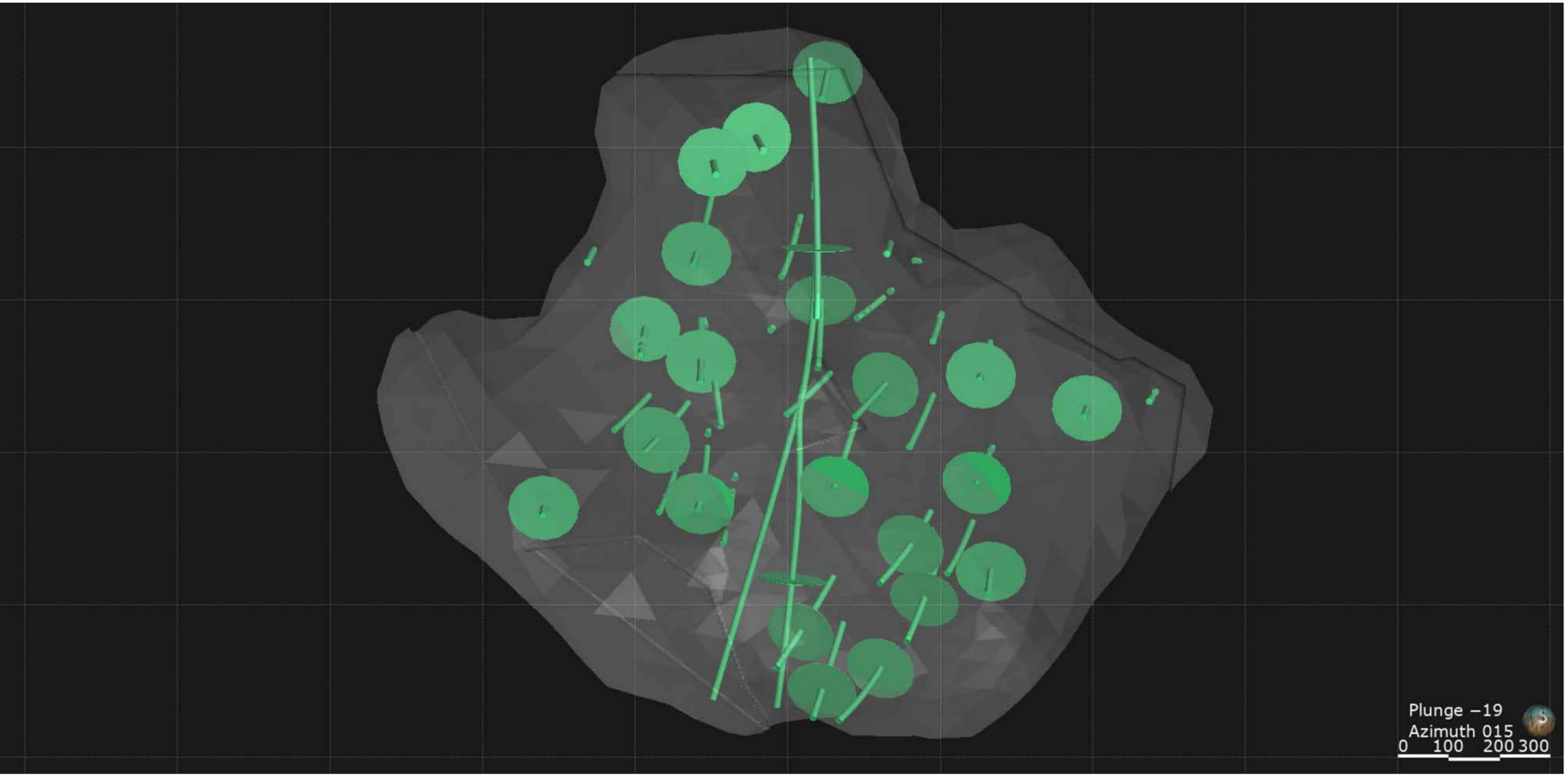

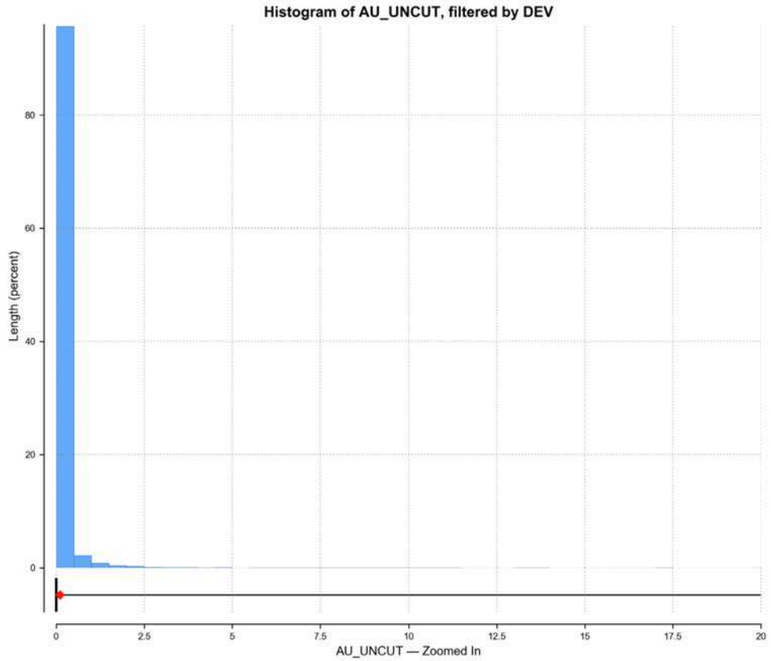


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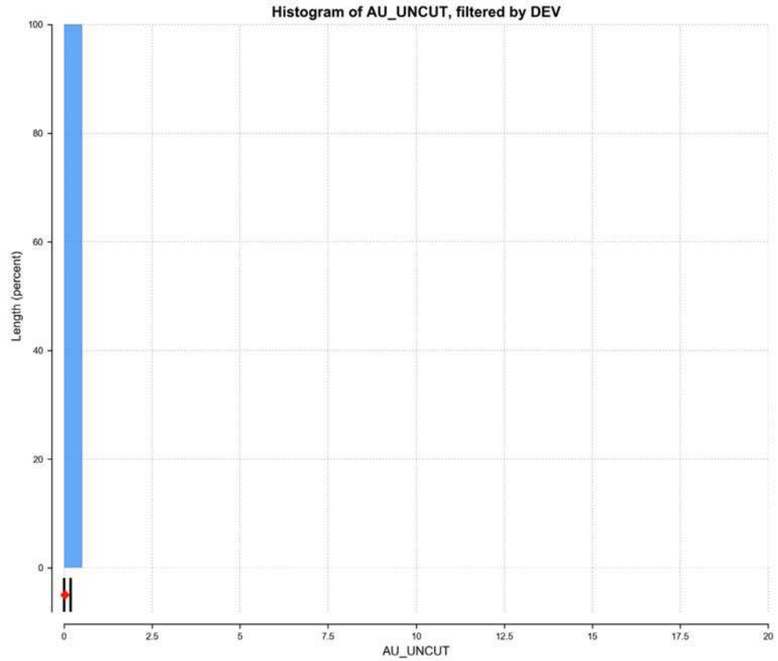
DATABASE




SAMPLE SELECTION

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| Mean | 0.024 |
| SD | 0.040 |
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| Variance | 0.002 |
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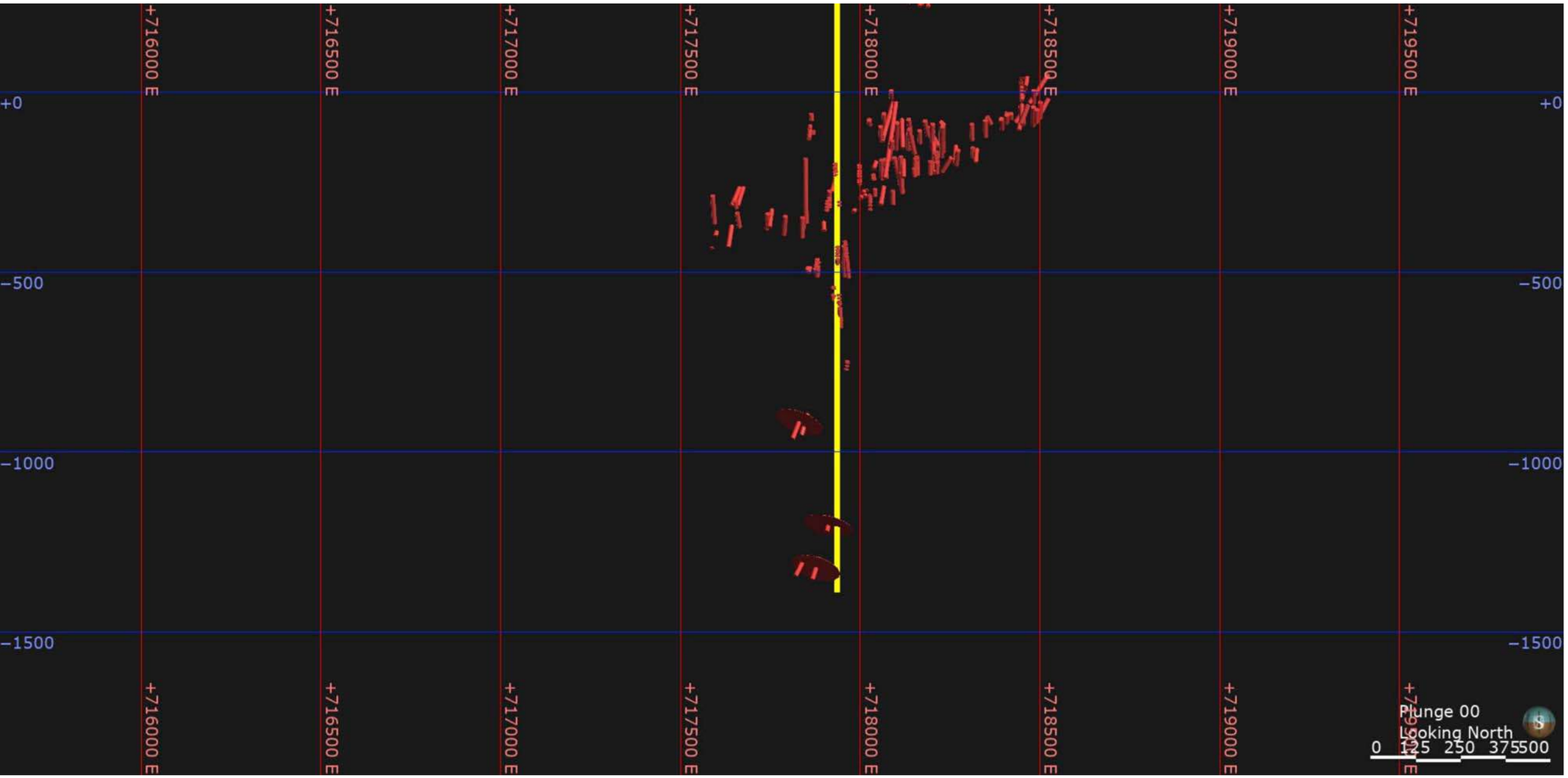
# SHAFT – SAMPLE SELECTION – PHASE 1



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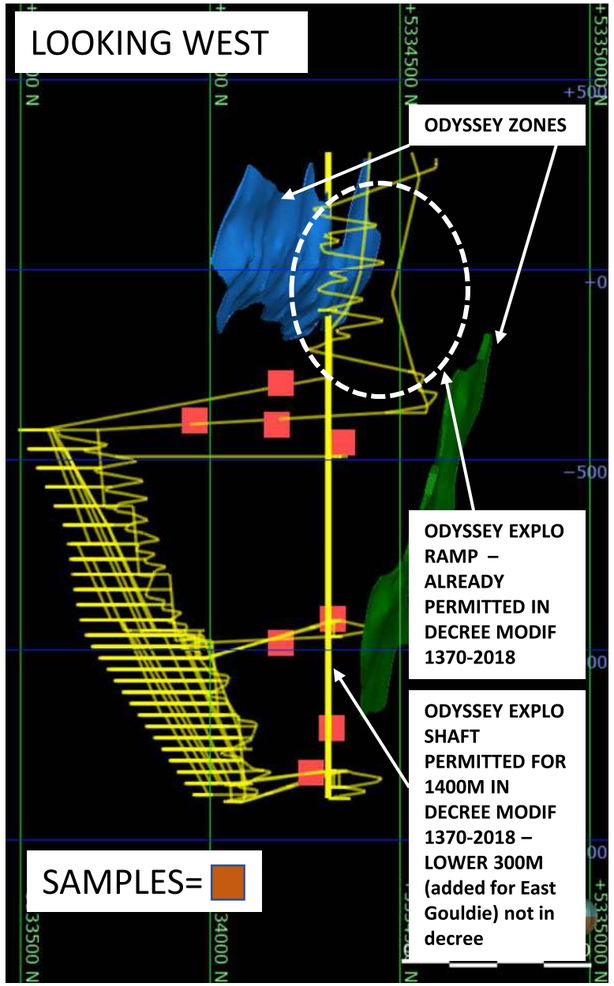
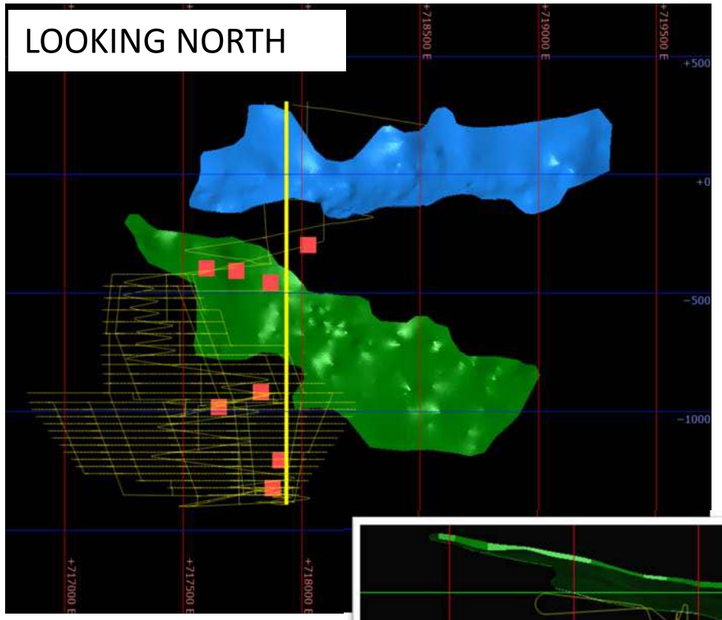
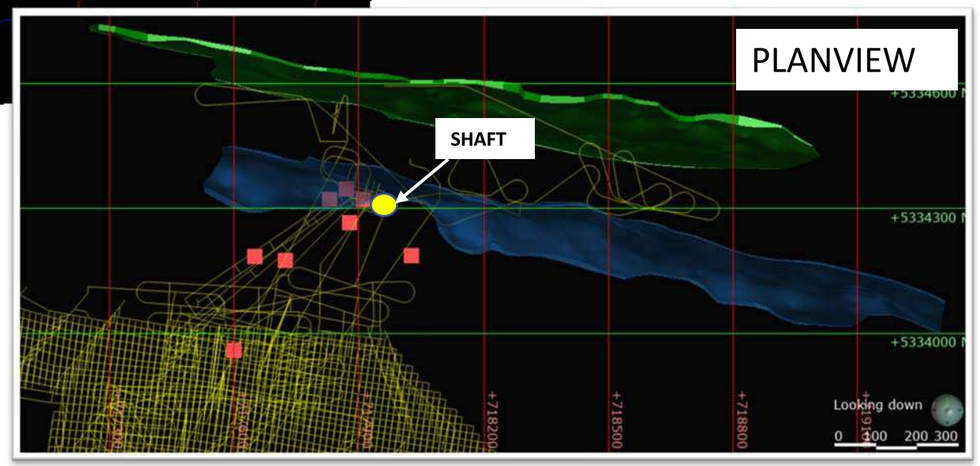
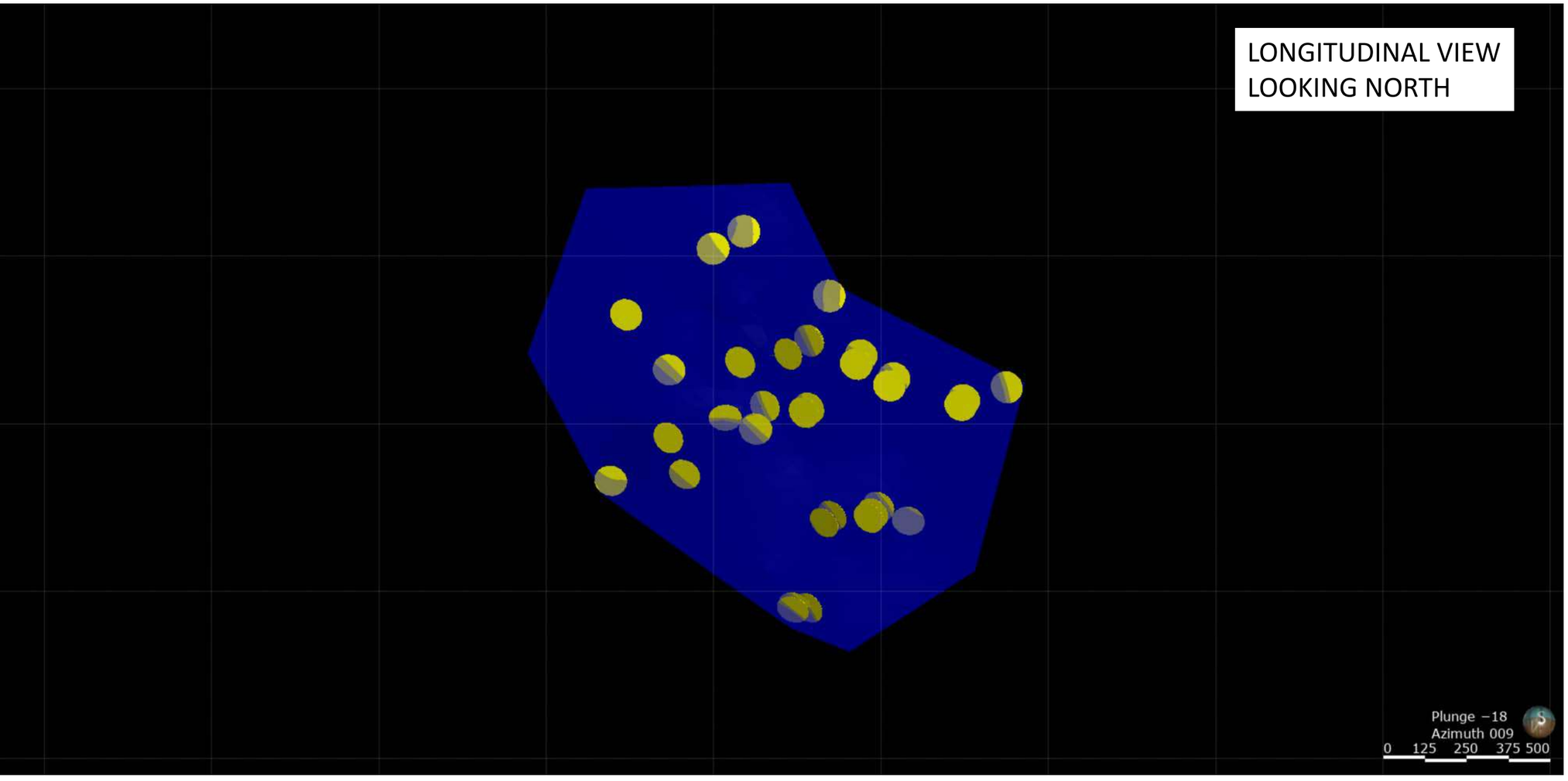


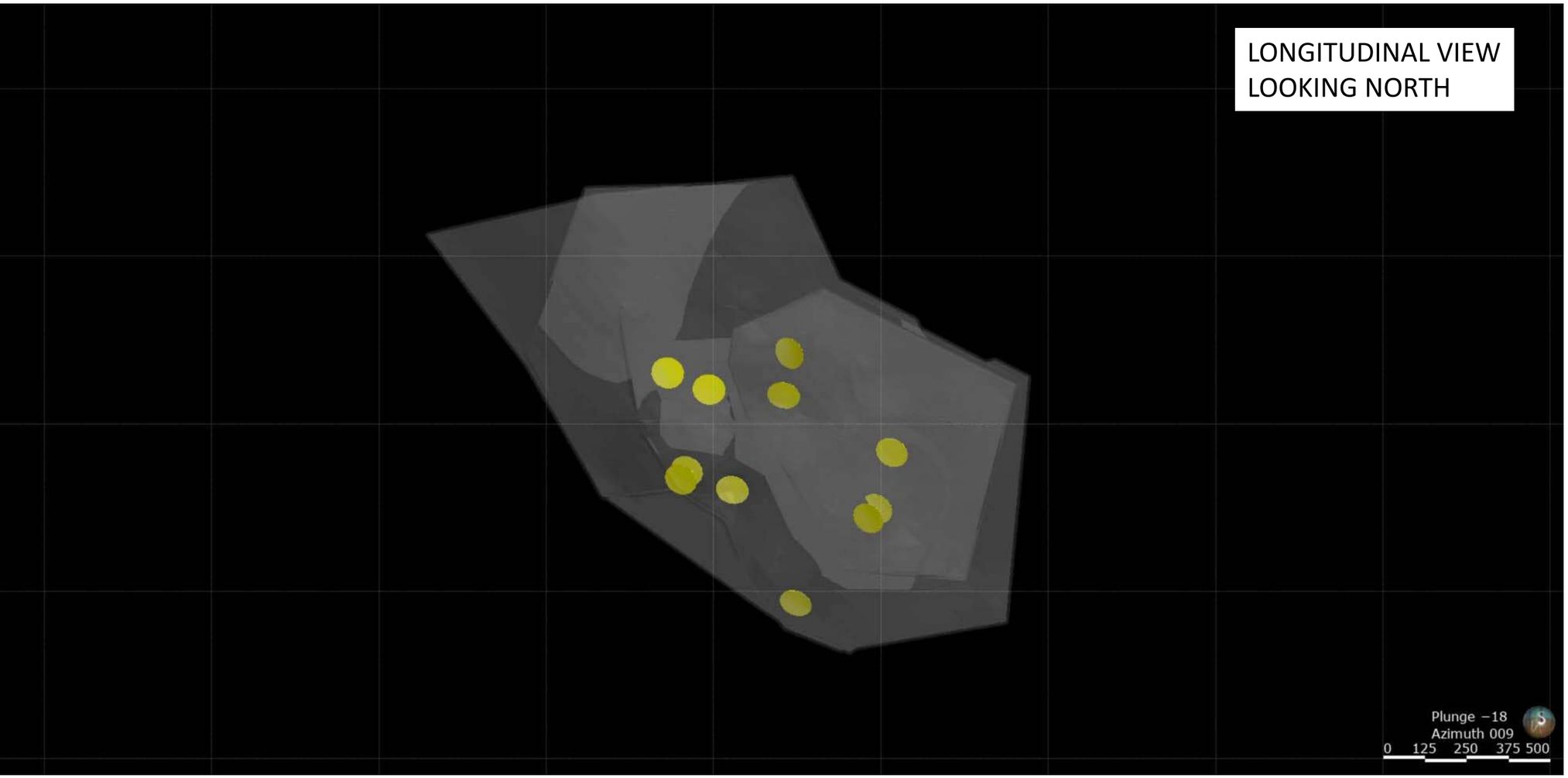



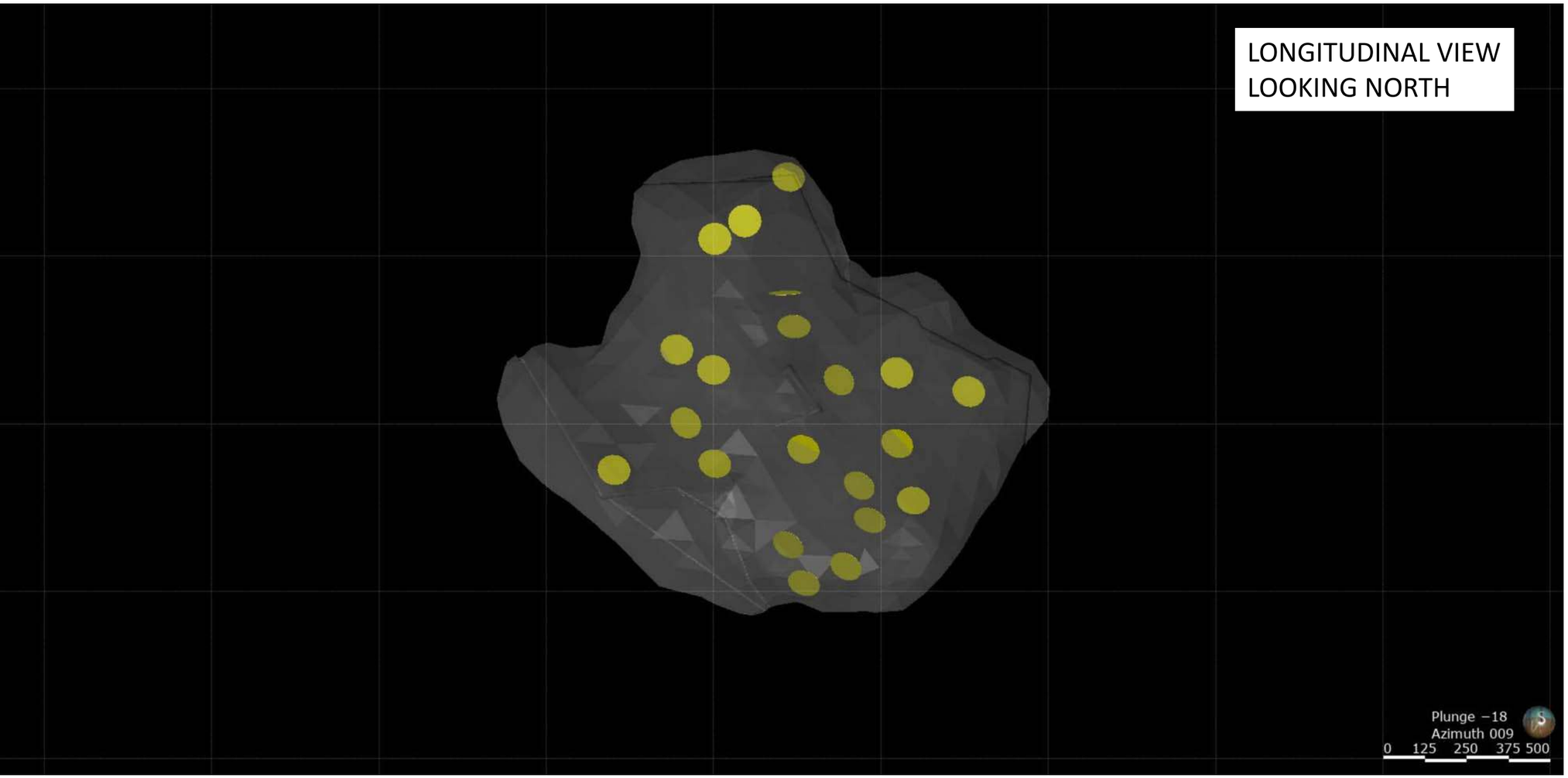
# ORE – SAMPLE SELECTION – PHASE 2



# DILUTION – SAMPLE SELECTION – PHASE 2

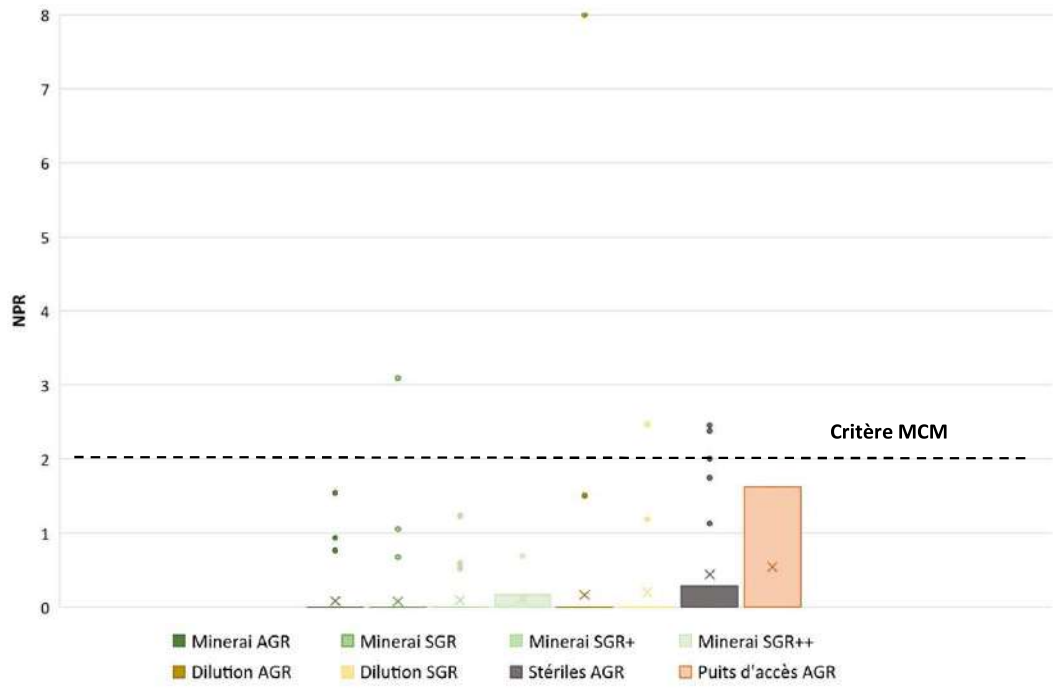


# DEVELOPMENT – SAMPLE SELECTION – PHASE 2



**ANNEXE B**

# Histogramme sur la distribution des échantillons




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

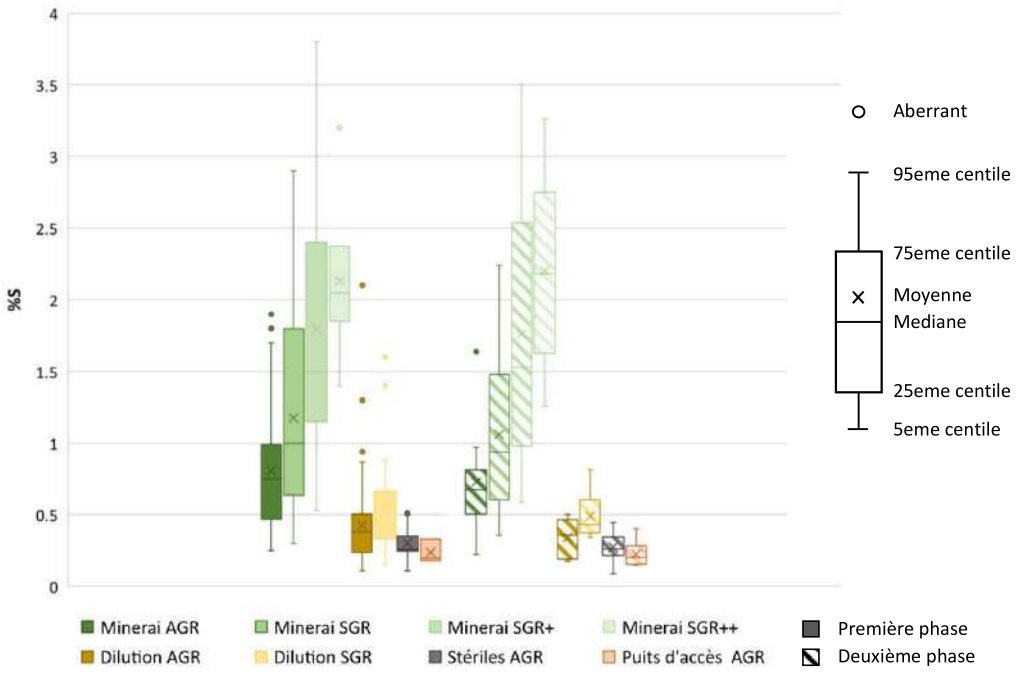
**Ratio du Potentiel de Neutralisation (RPN)**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Bilan Acide-Base**
**Zone East Gouldie**

Mine Canadian Malartic (MCM) — GOLDER

**ANNEXE B, FIGURE 1**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

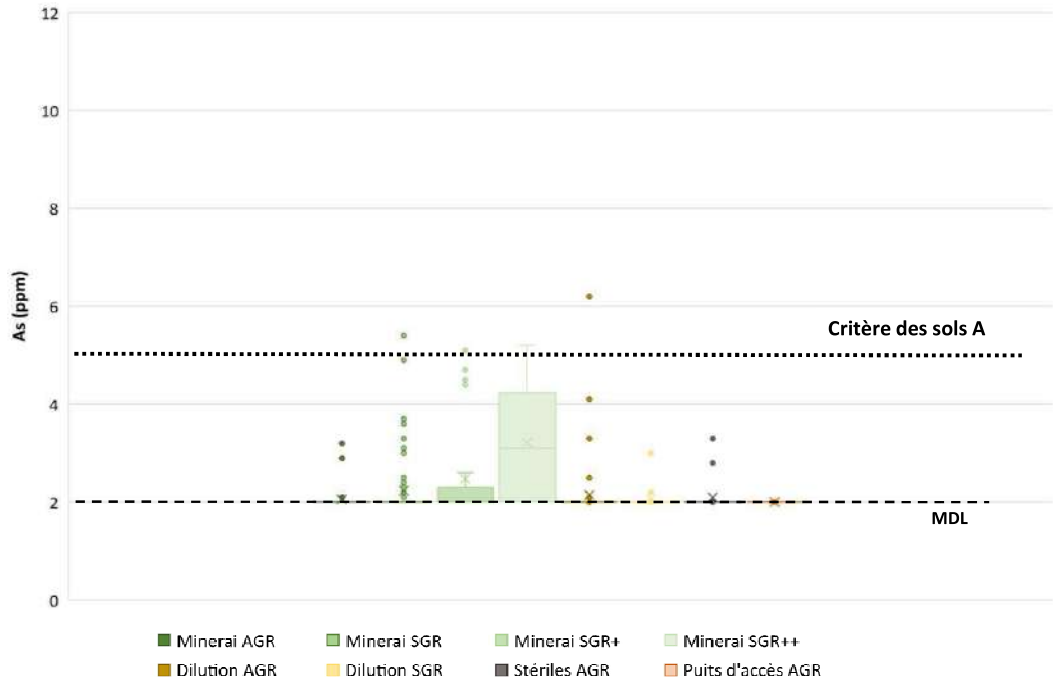
**Soufre total**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Bilan acide-base**
**Zone East Gouldie**

Mine Canadian Malartic (MCM) — GOLDER

**ANNEXE B, FIGURE 2**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

**Arsenic**

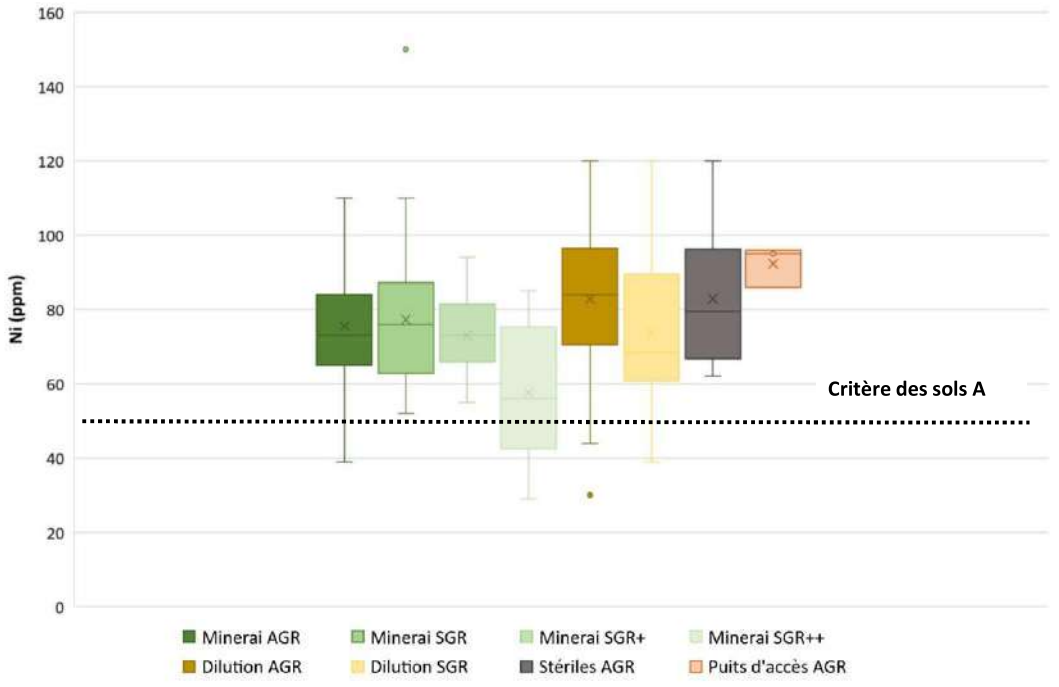
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Composition chimique phase solide Zone East Gouldie**

**Mine Canadian Malartic (MCM)**

GOLDER

**ANNEXE B, FIGURE 3**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

**Nickel**

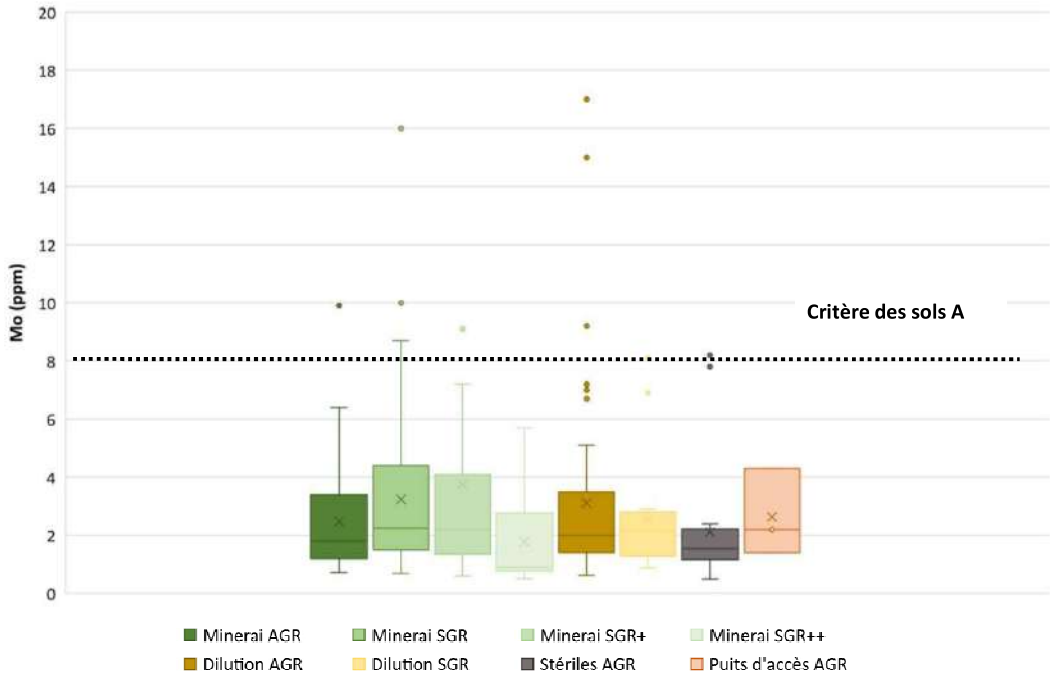
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Composition chimique phase solide Zone East Gouldie**

**Mine Canadian Malartic (MCM)**

GOLDER

**ANNEXE B, FIGURE 4**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

**Molybdène**

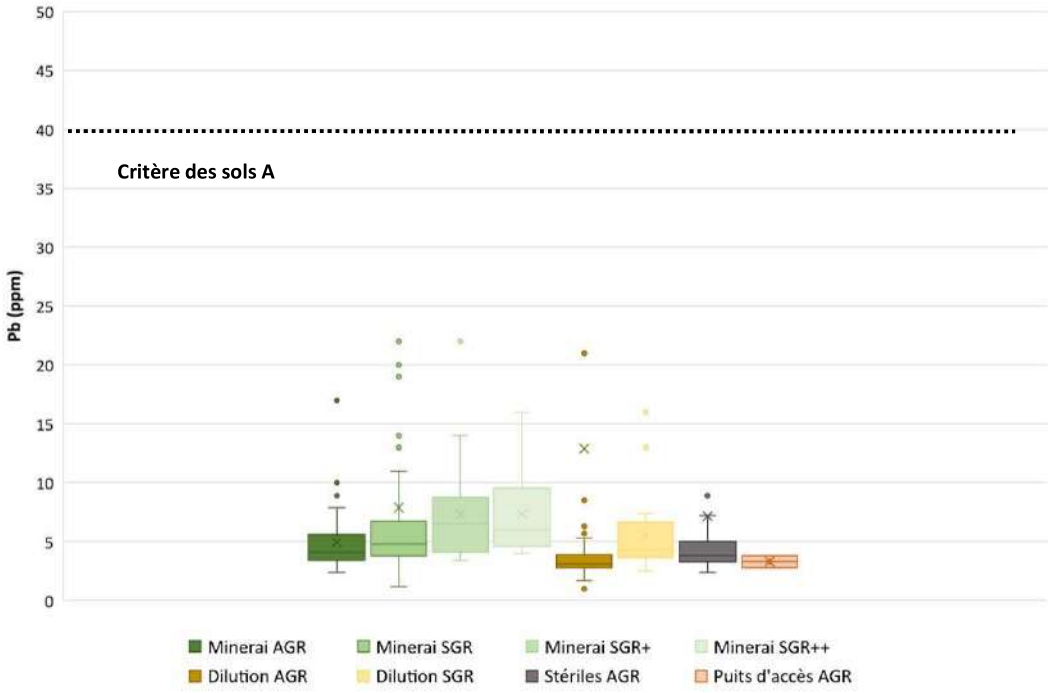
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

**Mine Canadian Malartic (MCM)**

GOLDER

**ANNEXE B, FIGURE 5**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

**Plomb**

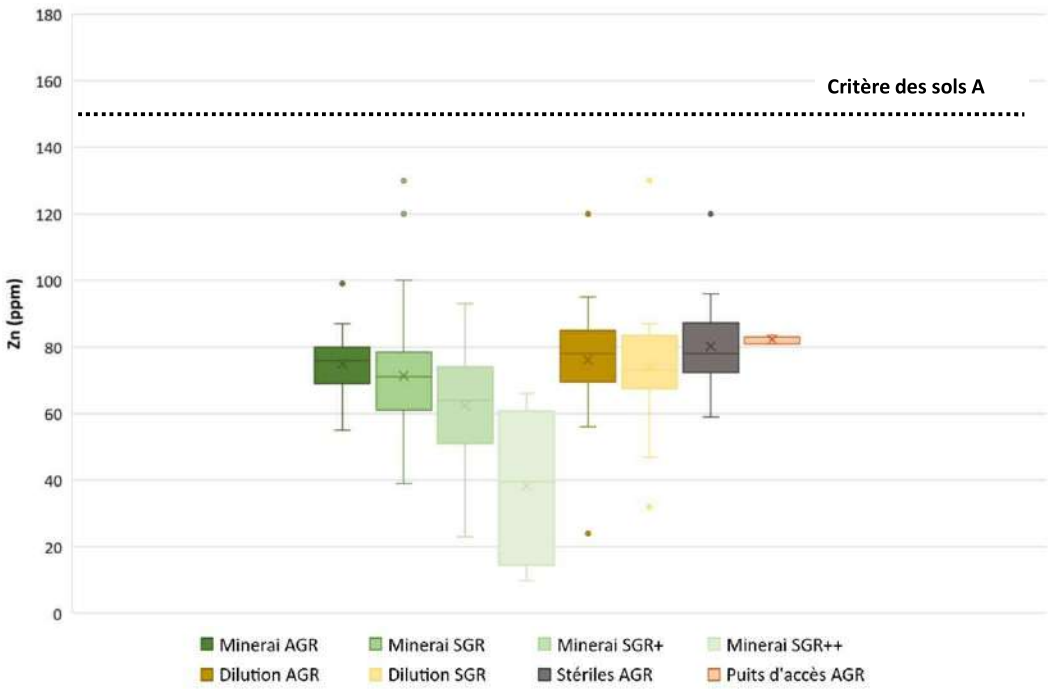
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

**Mine Canadian Malartic (MCM)**

GOLDER

**ANNEXE B, FIGURE 6**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

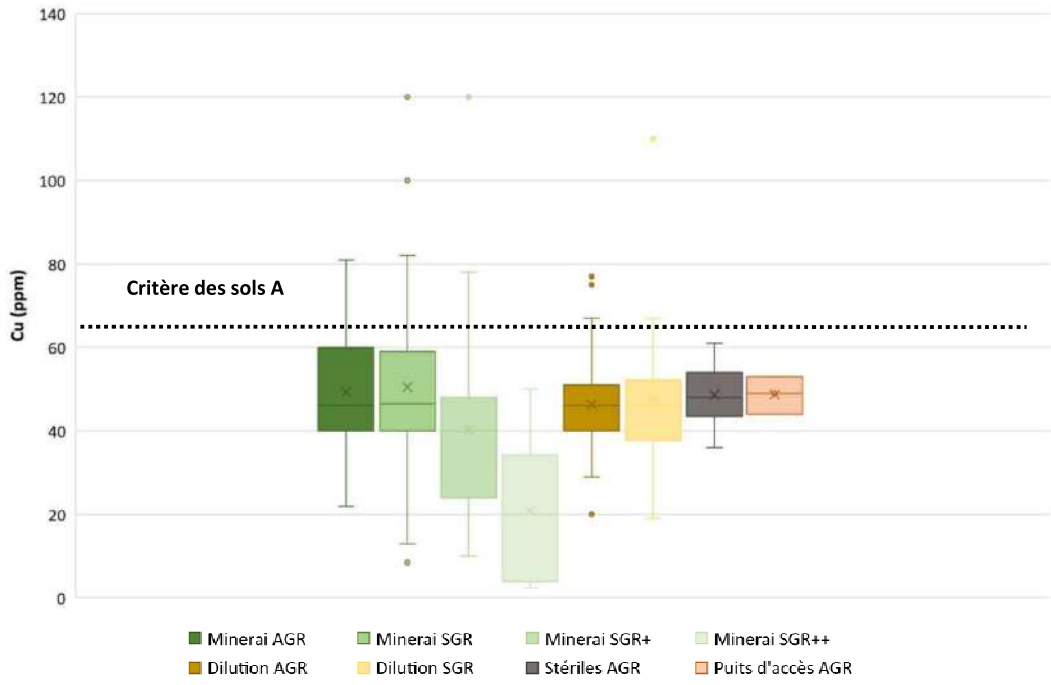
**Zinc**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

**Mine Canadian Malartic (MCM)** GOLDER

**ANNEXE B, FIGURE 7**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

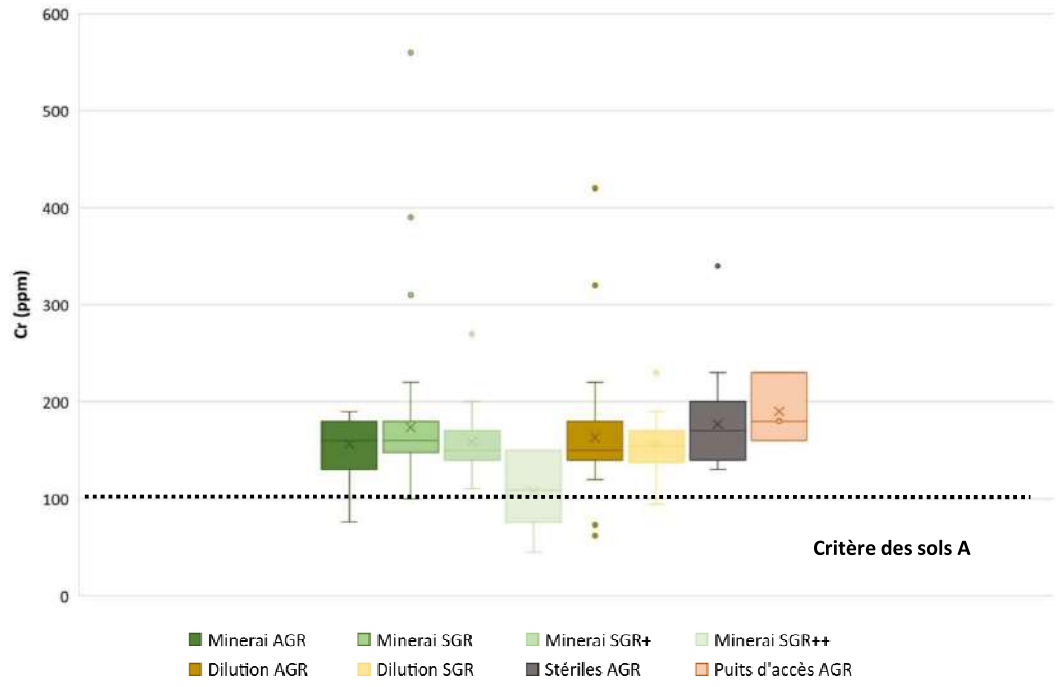
**Cuivre**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

**Mine Canadian Malartic (MCM)** GOLDER

**ANNEXE B, FIGURE 8**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

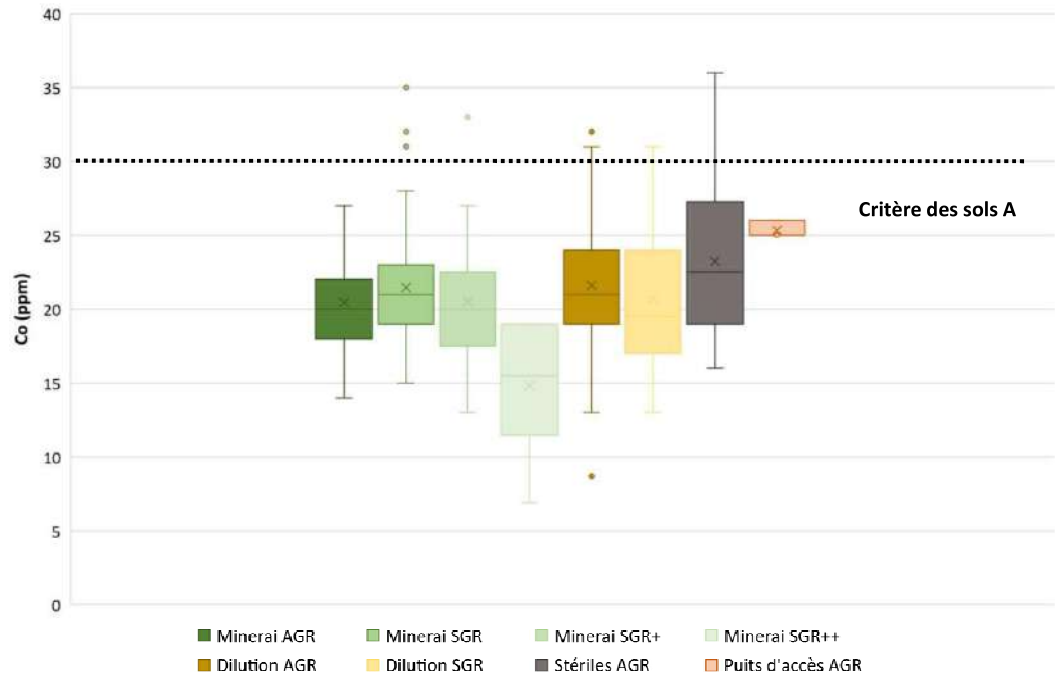
**Chrome**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

Mine Canadian Malartic (MCM) — GOLDER

**ANNEXE B, FIGURE 9**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

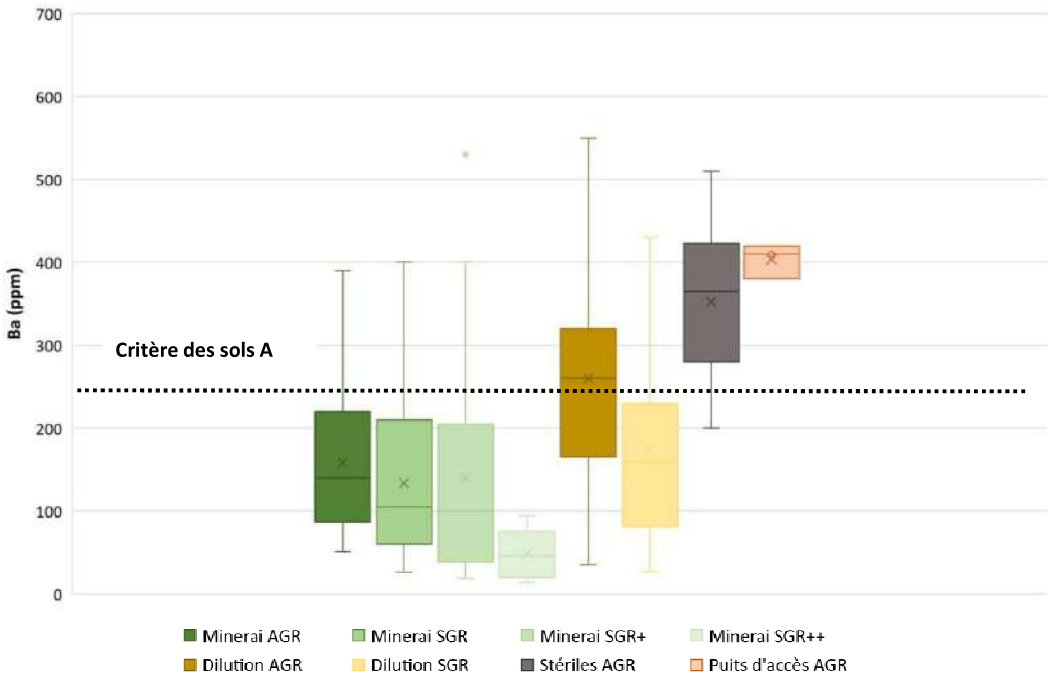
**Cobalt**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

Mine Canadian Malartic (MCM) — GOLDER

**ANNEXE B, FIGURE 10**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

**Baryum**

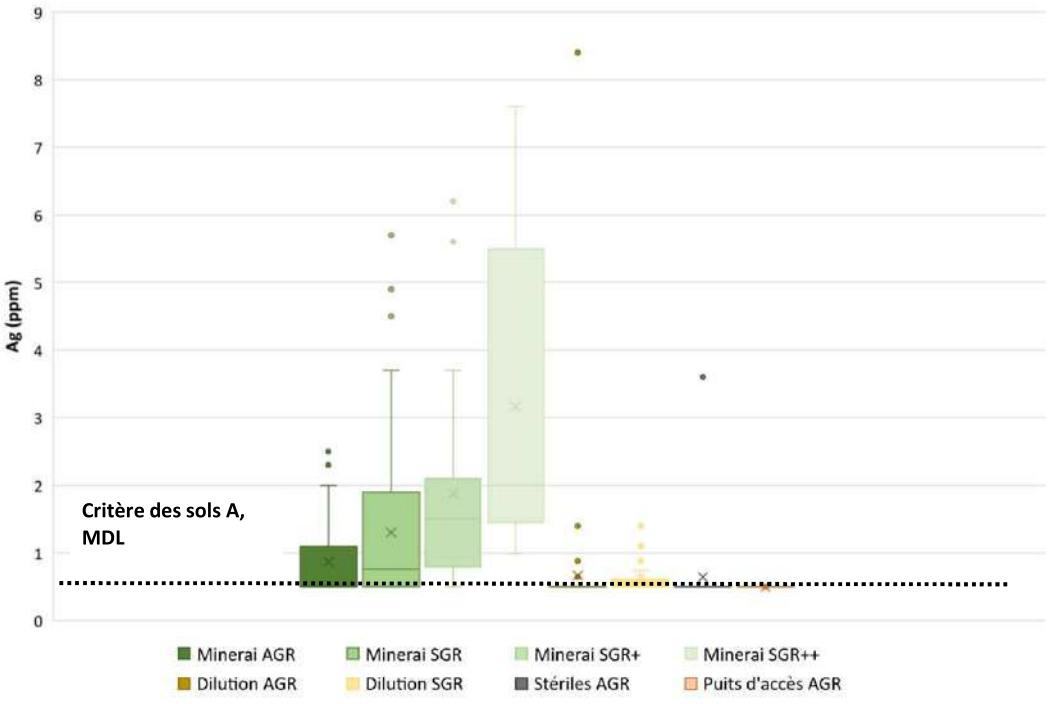
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

**Mine Canadian Malartic (MCM)**

GOLDER

**ANNEXE B, FIGURE 11**




Notes :

Les valeurs < LDM sont considérées égales à celle-ci

Analyse de métaux extractible sur la phase solide selon la méthode MA-200

**Argent**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | Dec-20 |
| CHECKED | VJB | JOB NO | 19115345 |
| REVIEWED | VJB | PHASE/TASK | 61118 |

**Essais statiques : Zone East Gouldie**

**Mine Canadian Malartic (MCM)**

GOLDER

**ANNEXE B, FIGURE 12**

**ANNEXE C**

# Programme de sélection des échantillons des tests cinétiques

# Annexe C
# Sélection des échantillons pour les essais en phase 2: Tests statiques additionnels et tests cinétiques Zone East Gouldie

**Le nombre d'échantillons sélectionné pour les essais statiques et cinétiques est basé sur les conditions suivantes:**

- 20 échantillons BAB et 10 échantillons DRX comme dans le programme de travail original.
- 6 échantillons pour essai cinétique.
- 5 échantillons de minerais pour les essais de désulfuration (limité par le montant de matériel disponible – un mandat séparé)

- La distribution des échantillons pour l'analyse de bilan acide-base (BAB) et minéralogie (DRX) a été choisie en proportion au nombre d'échantillons sélectionnés durant la phase 2
- La distribution des échantillons pour les essais cinétiques a été choisi afin d'évaluer le comportement de chaque type d'échantillon.
- La distribution des échantillons pour les essais de désulfuration ont été choisis en fonction de la teneur en minerai et de la disponibilité des échantillons.

# Sélection des échantillons pour les essais statiques additionnels en phase 2

## La procedure de sélection des échantillons pour les tests BAB:

- Compilation des résultats des essais statiques de la phase 2 et sélection des échantillons de la phase 2.
- Pour les lithologies avec 1 échantillon BAB: une concentration du quartile supérieur pour les teneurs en S et C
- Pour les lithologies avec 2 échantillons BAB : une concentration médiane et du quartile supérieur pour les teneurs en S et C
- Pour les lithologies avec 3 échantillons BAB : une concentration du quartile inférieur et/ou médiane et deux concentrations du quartile supérieur pour les teneurs en S et C.
- Pour les lithologies avec plus de 3 échantillons BAB : une concentration du quartile inférieur juqu'au quartile supérieur pour les teneurs en S et C.

Objectif: Evaluer  le potentiel de neutralisation du carbonate et de generation de sulphur pour des échantillons avec des teneurs en carbone et soufre élevés.

**La procédure de selection pour des échantillons pour les tests DRX:**

- Compilation des résultats des essais statiques de la phase 2 et selection des échantillons de la phase 2.
- Pour les lithologies avec 1 échantillon DRX: une concentration du quartile supérieur pour les teneurs en S et C
- Pour les lithologies avec 2 échantillons DRX : une concentration médiane et du quartile supérieur pour les teneurs en S et C

Objectif: Évaluer la minéralogie du sulphur et du carbonate sur les échantillons ayant la plus haute teneur de S et C. Sélectionner tous les échantillons soumis à l'essai cinétique.

# Sélection des échantillons pour les essais cinétiques phase 2

**Procédure de selection des échantillons pour les essais cinétiques:**

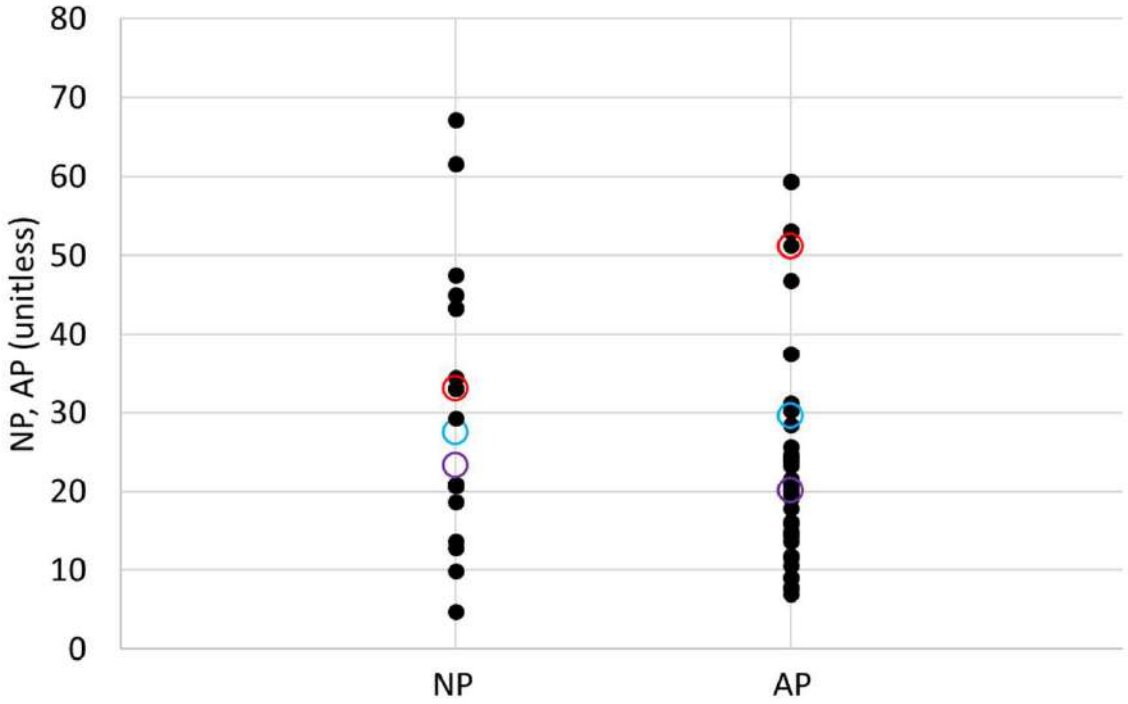
- Compilation des résultats des essais statiques de la phase 2 et sélection des échantillons compositionnellement et spatialement représentatif de la phase 2.
- Pour chaque type d'échantillon : un échantillon ayant une forte teneur en S (PA), faible teneur en C (PN) et faible RPN afin d'une évaluation conservatrice du délais au DMA.
- Dans la mesure du possible, selection d'échantillons ayant une concentration relativement élevée d'éléments d'intérêt dans le lixiviat d'essai statique (TCLP, SPLP, CTEU9)
- Objectif: Tester la réactivité des échantillons potentiellement acidogènes et évaluer le taux de libération des composé chimiques dans le lixiviat.

# Légende des graphiques

## Exemple

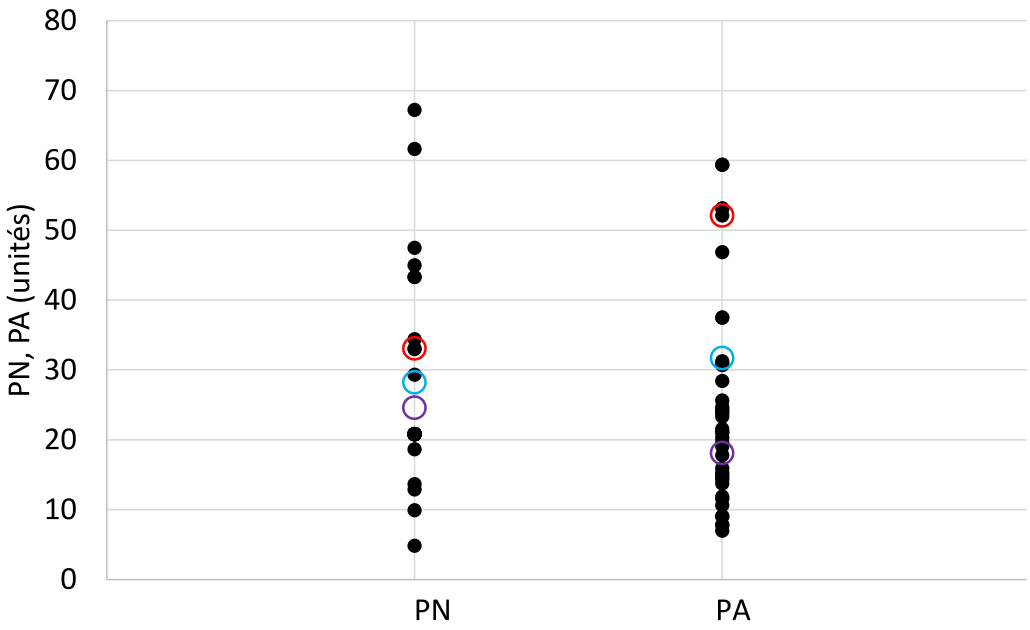
**Échantillons sélectionnés**

- Sélectionné pour test cinétique
- Composite de composition quartile supérieur
- Composite de composition médianne






[1]MA200 : ppm, TCLP-SPLP-CTEU9 : ppb




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : PN, PA**

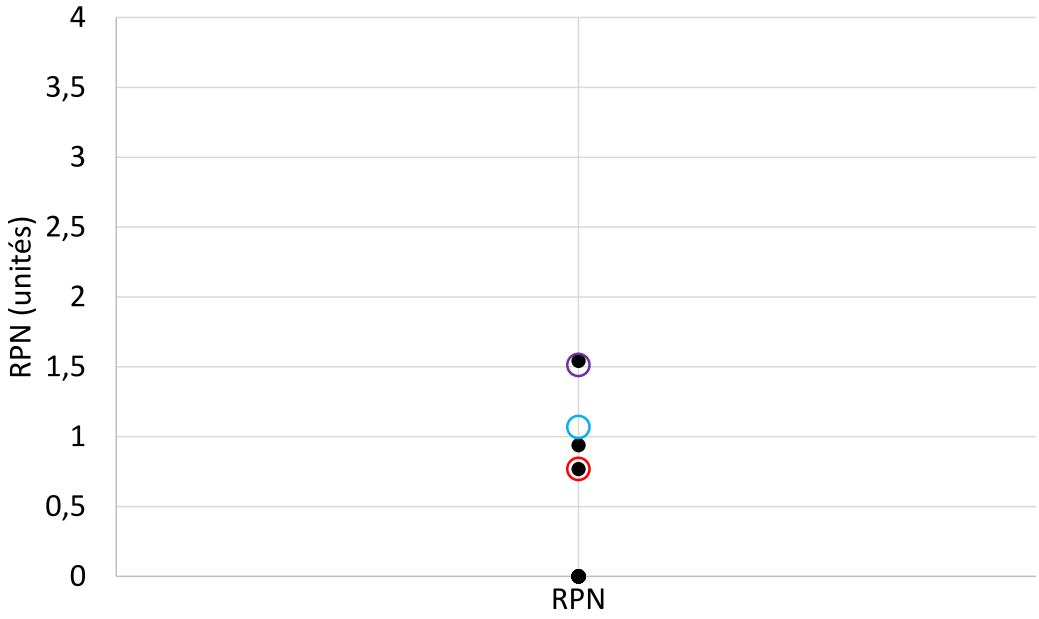
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 1**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : RPN**

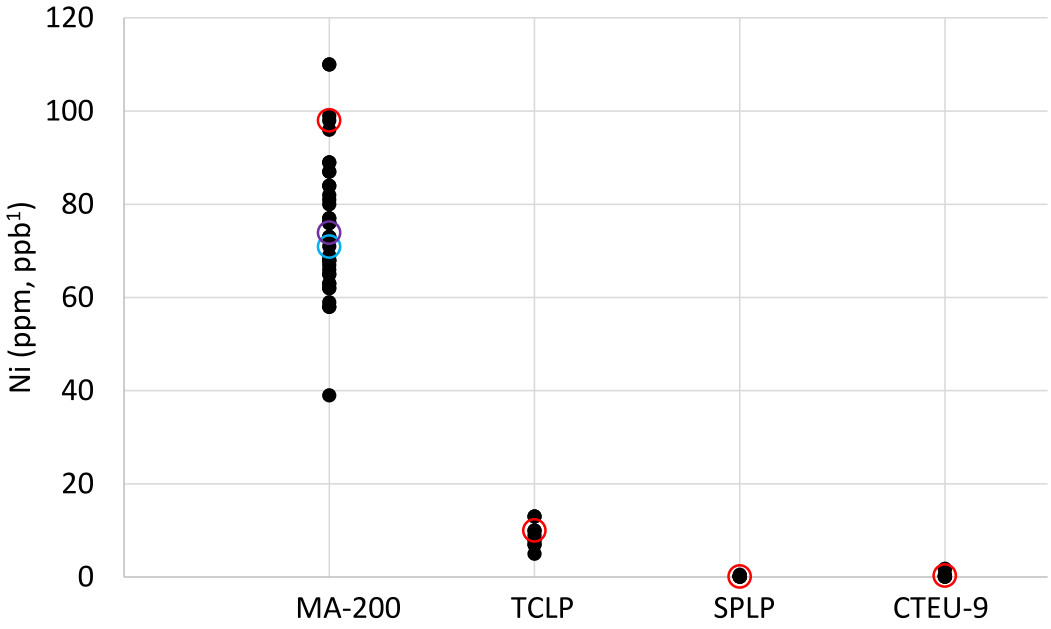
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 2**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

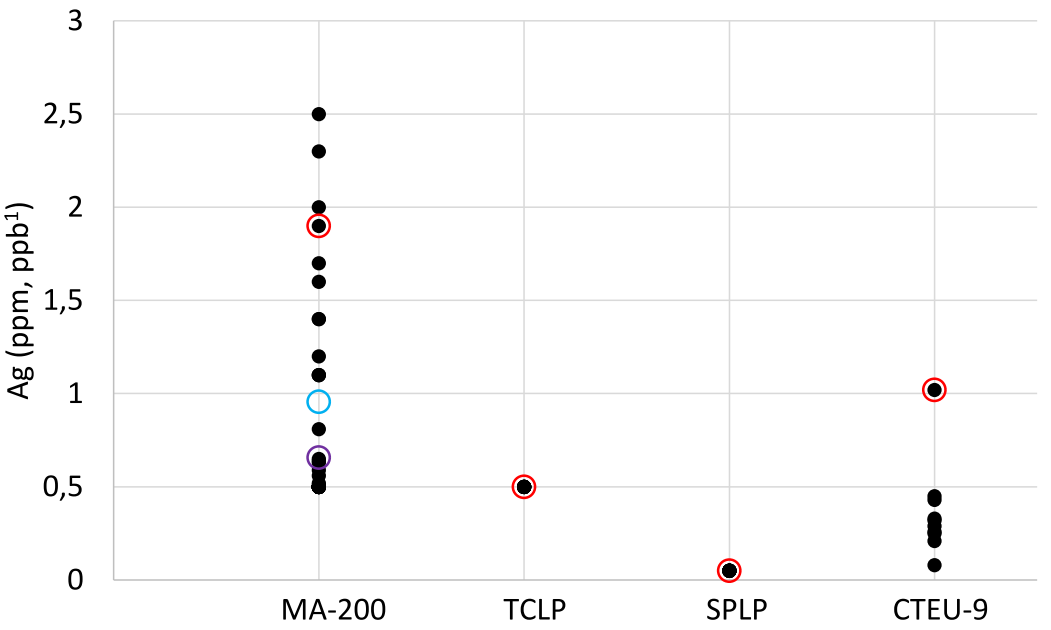
**Lixiviats : Ni**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP | GOLDER

**ANNEXE C, FIGURE 3**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

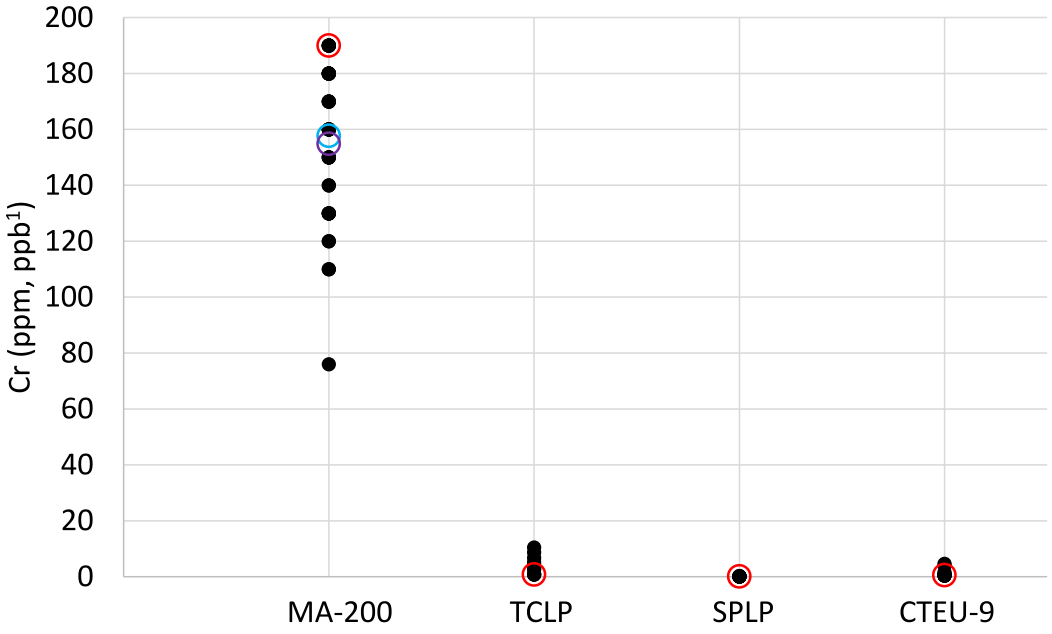
**Lixiviats : Ag**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP | GOLDER

**ANNEXE C, FIGURE 4**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Cr**

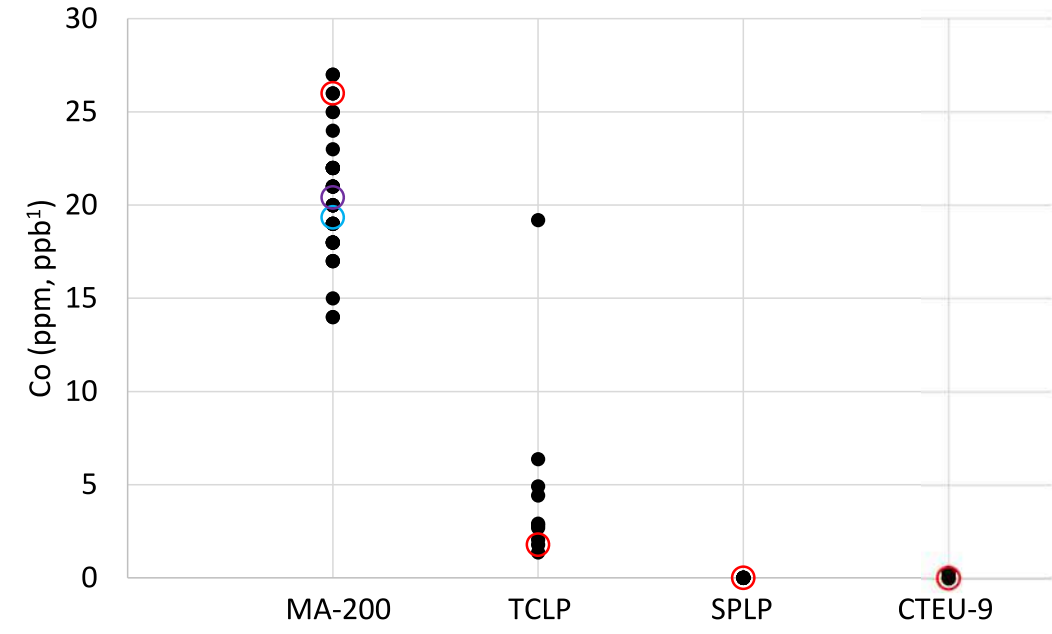
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 5**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Co**

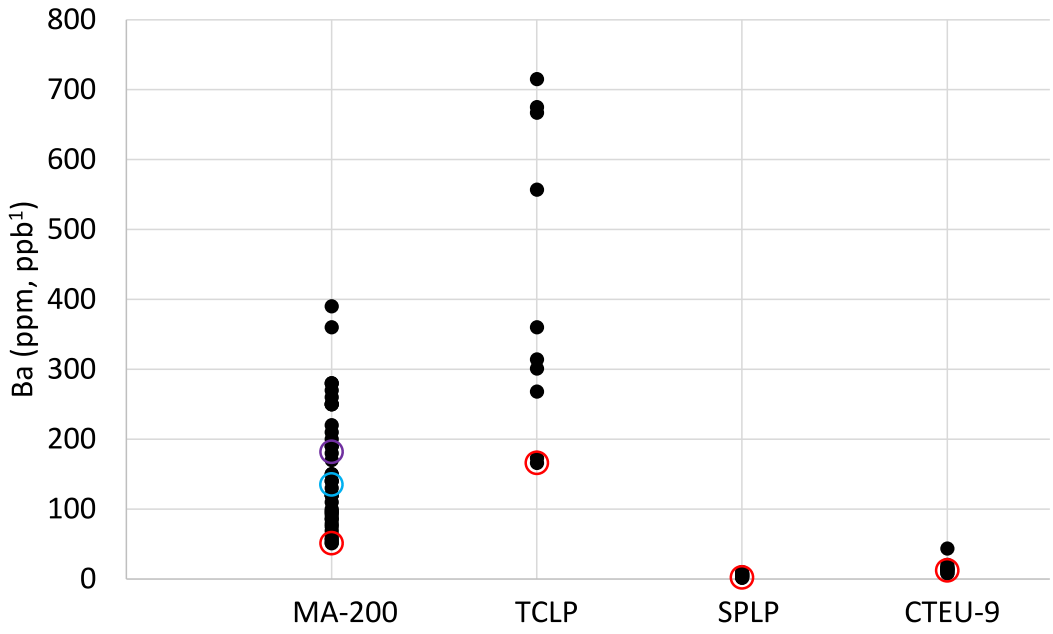
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 6**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ba**

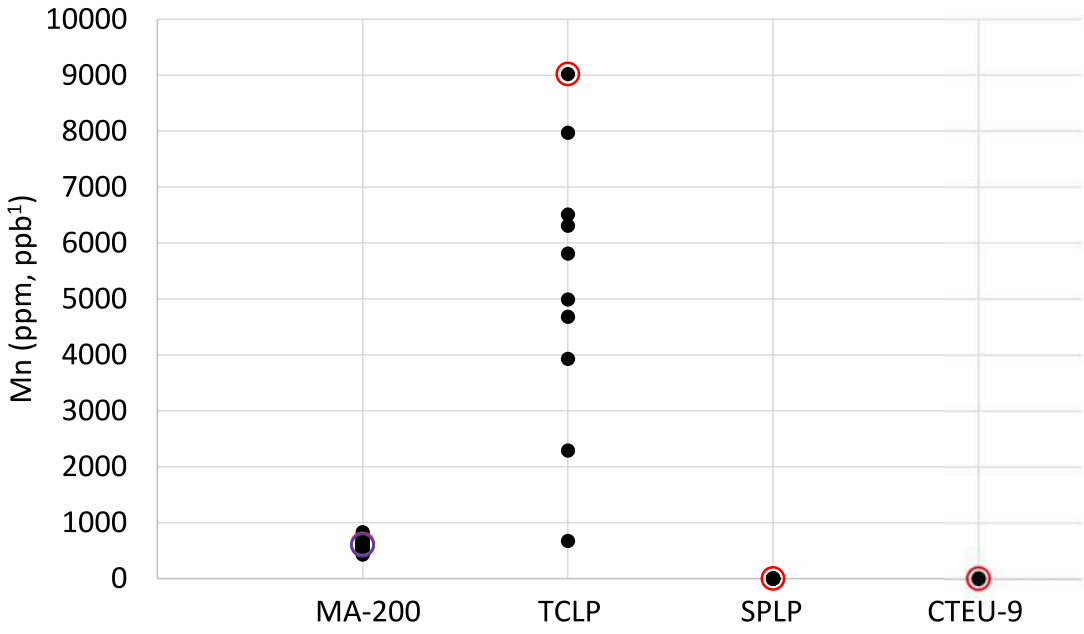
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 7**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Mn**

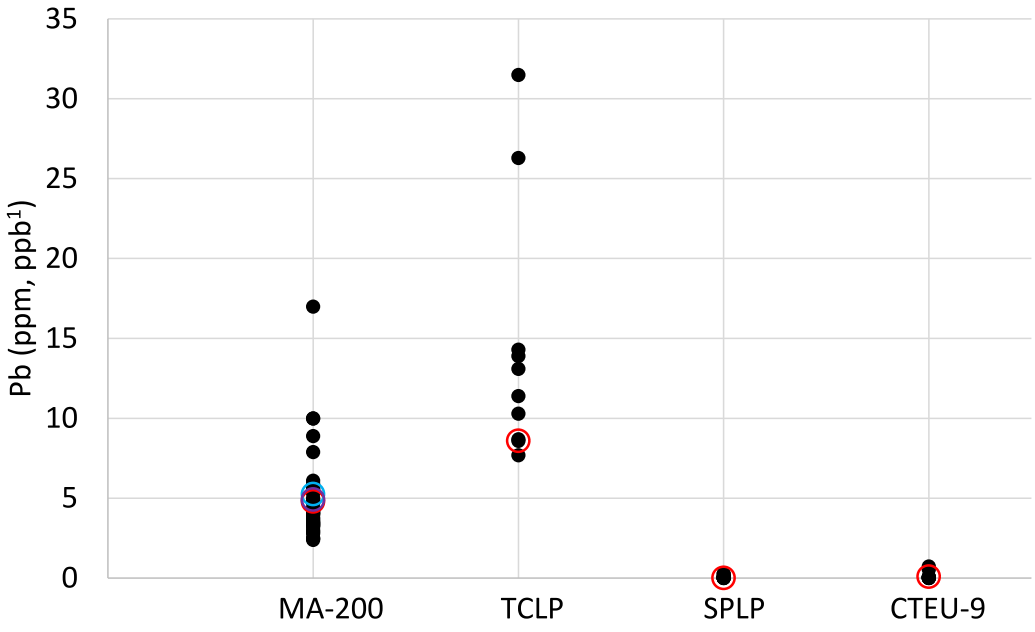
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 8**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

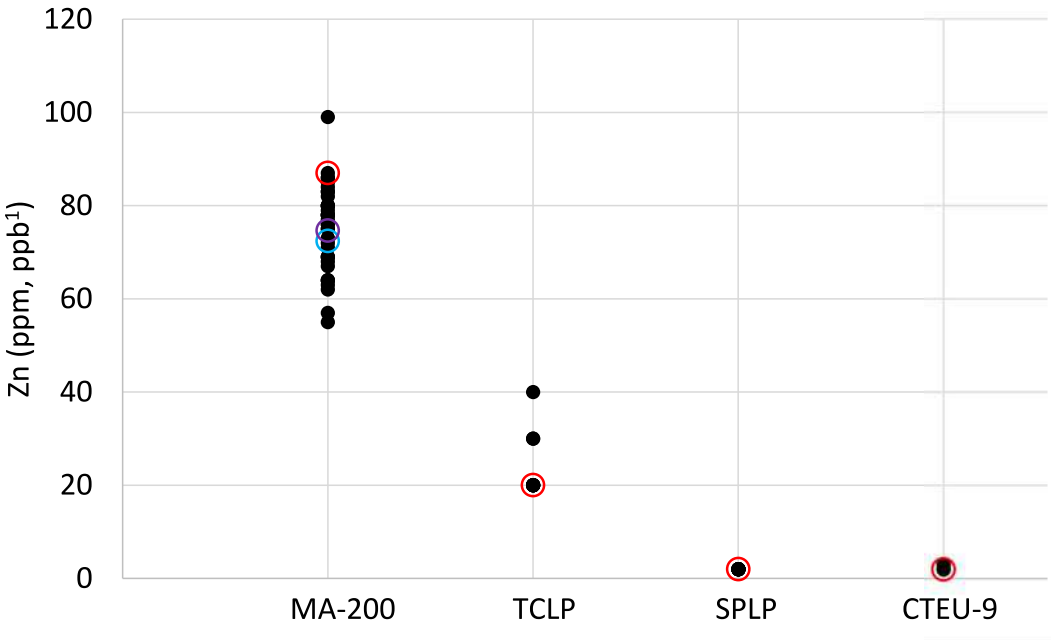
**Lixiviats : Pb**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

**CMGP** | GOLDER

**ANNEXE C, FIGURE 9**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Zn**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai AGR de la zone East Gouldie**

**CMGP** | GOLDER

**ANNEXE C, FIGURE 10**

# Minerai : AGR

## Échantillons sélectionnés

**Essai BAB (au laboratoire SGS) :**

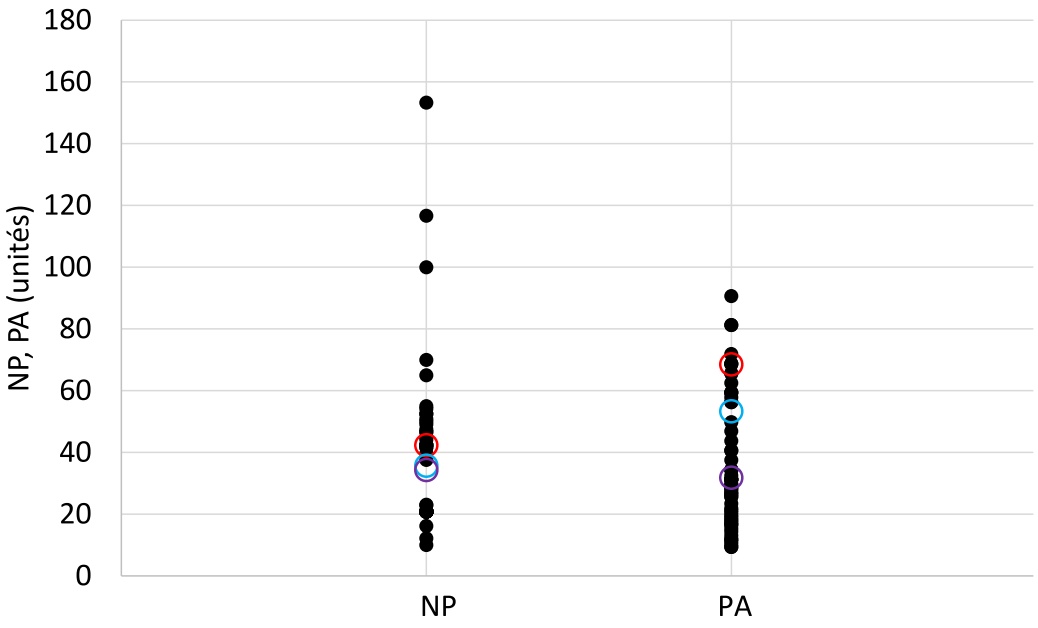
- X19148W-2073.00-1036
- X19152W-1715.00-0597
- X19152-1648.00-1481

**Essai DRX (au laboratoire SGS) :**

- X19148W-2073.00-1036

**Essai cinétique (1kg, au laboratoire SGS) :**

- X19148W-2073.00-1036




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : PN, PA**

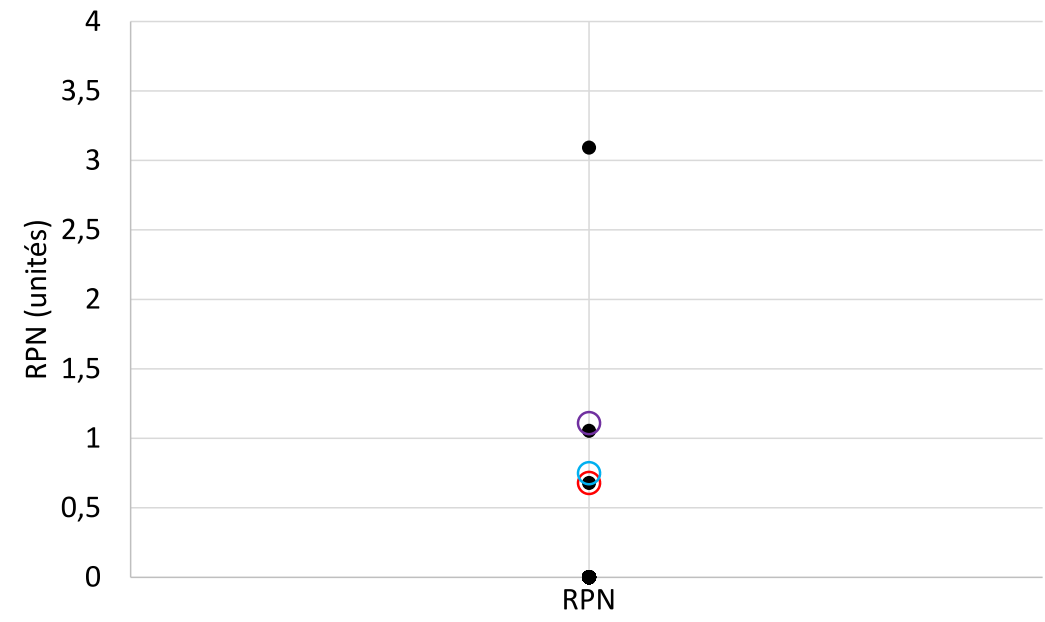
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 1**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : RPN**

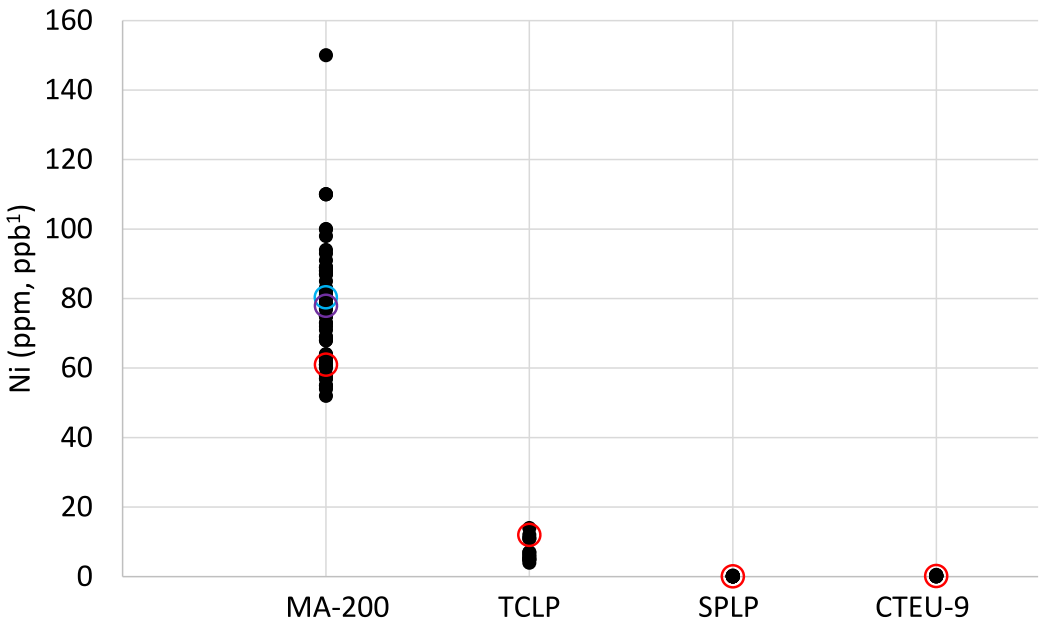
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR de la zone East Gouldie**

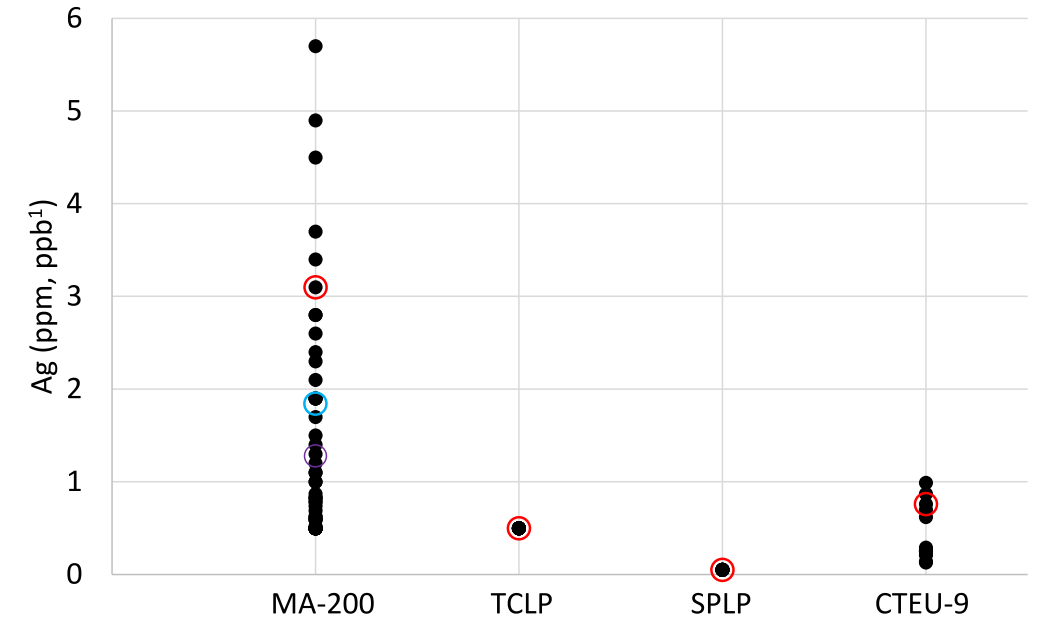
**CMGP**

GOLDER

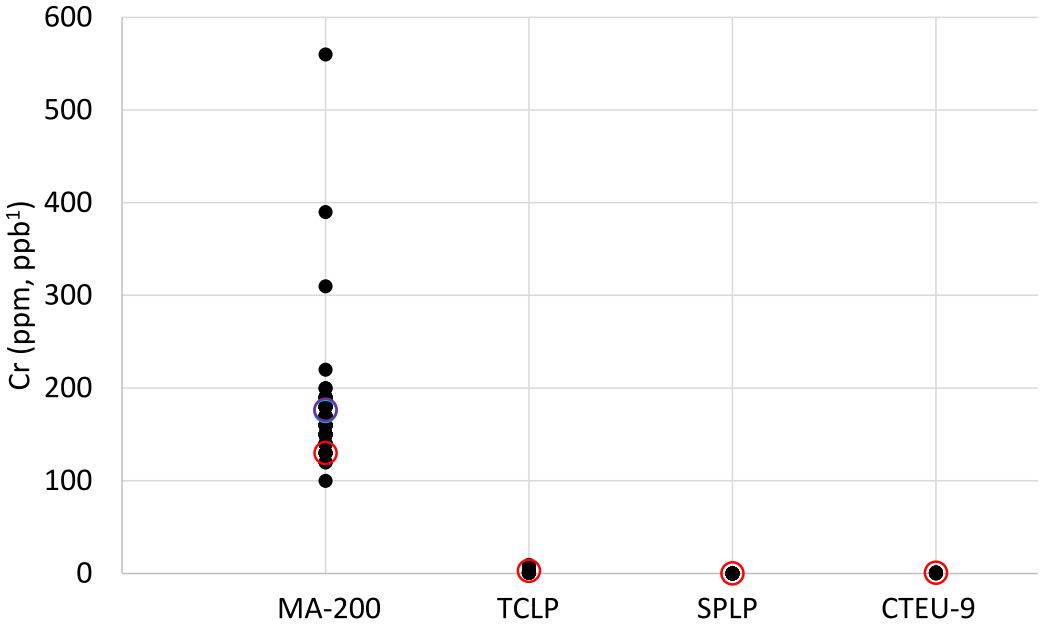
**ANNEXE C, FIGURE 2**




| | | | |
|---|---|---|---|
| Notes :<br>Les valeurs < LDM sont considérées égales à celle-ci<br><br>[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb | **Lixiviats : Ni** | | **Essai cinétique : minerai SGR de la zone East Gouldie** |
| | PREPARED AT | DATE déc-20 | **CMGP** GOLDER |
| | CHECKED VB | JOB NO 19115345 | |
| | REVIEWED VB | PHASE/TASK 61118 | **ANNEXE C, FIGURE 3** |




| | | | |
|---|---|---|---|
| Notes :<br>Les valeurs < LDM sont considérées égales à celle-ci<br><br>[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb | **Lixiviats : Ag** | | **Essai cinétique : minerai SGR de la zone East Gouldie** |
| | PREPARED AT | DATE déc-20 | **CMGP** GOLDER |
| | CHECKED VB | JOB NO 19115345 | |
| | REVIEWED VB | PHASE/TASK 61118 | **ANNEXE C, FIGURE 4** |




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Cr**

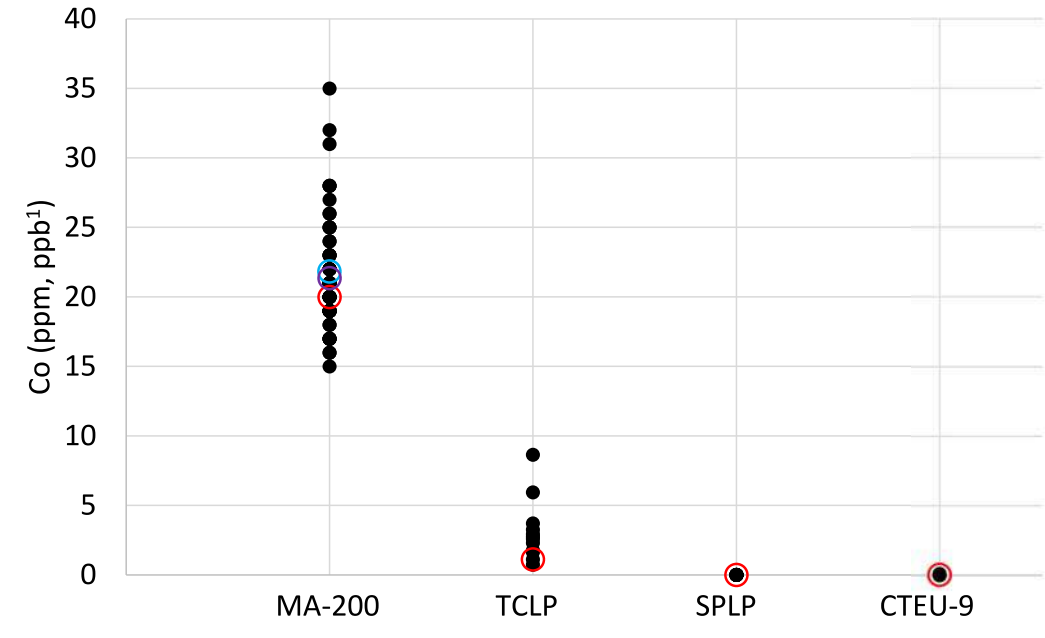
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 5**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Co**

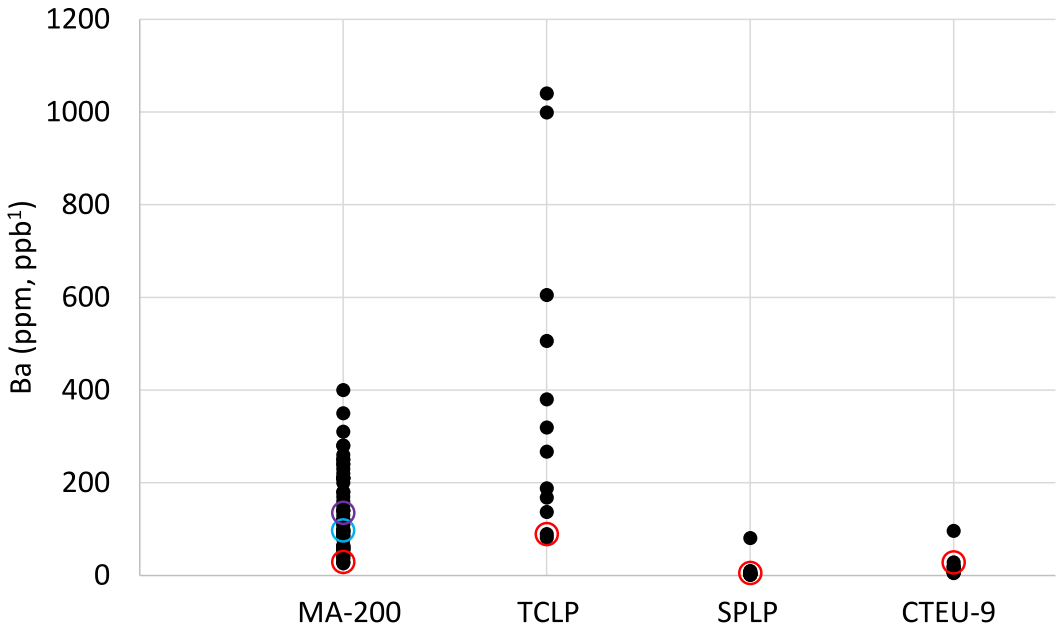
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR de la zone East Gouldie**

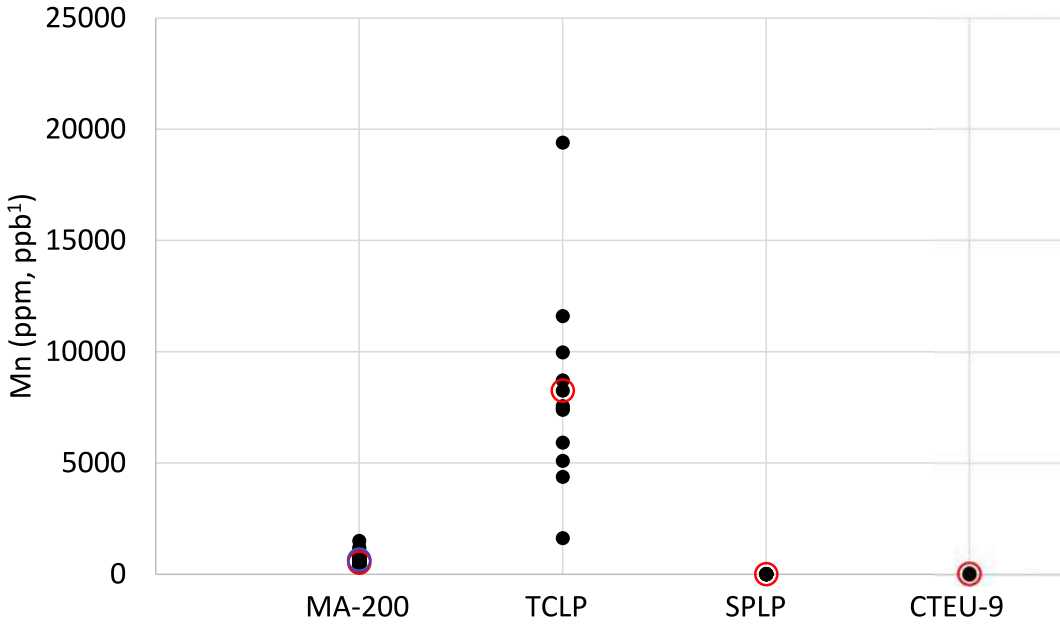
**CMGP**

GOLDER

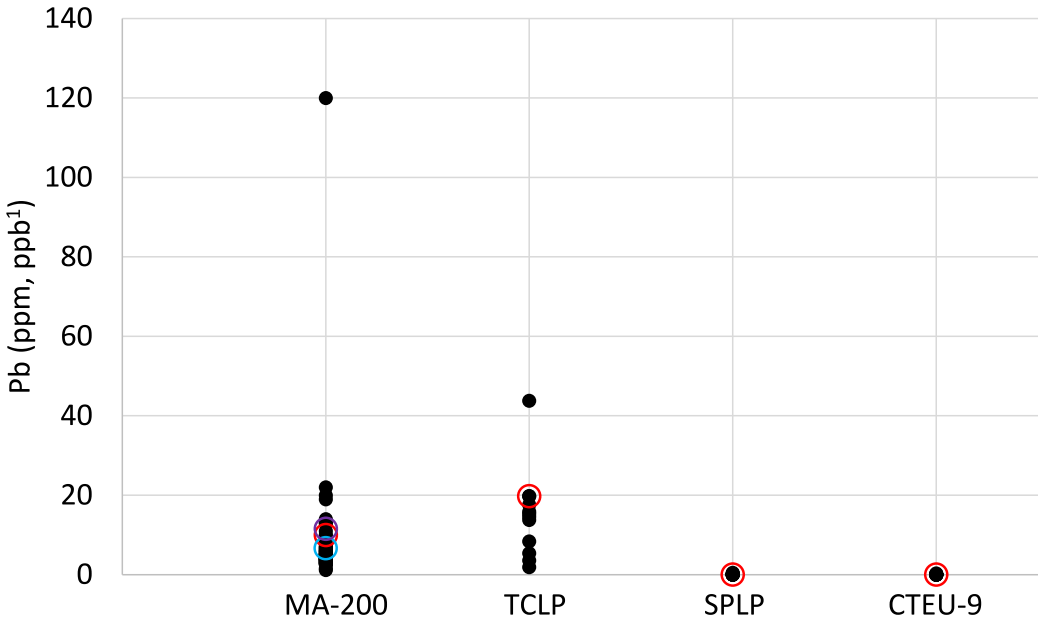
**ANNEXE C, FIGURE 6**



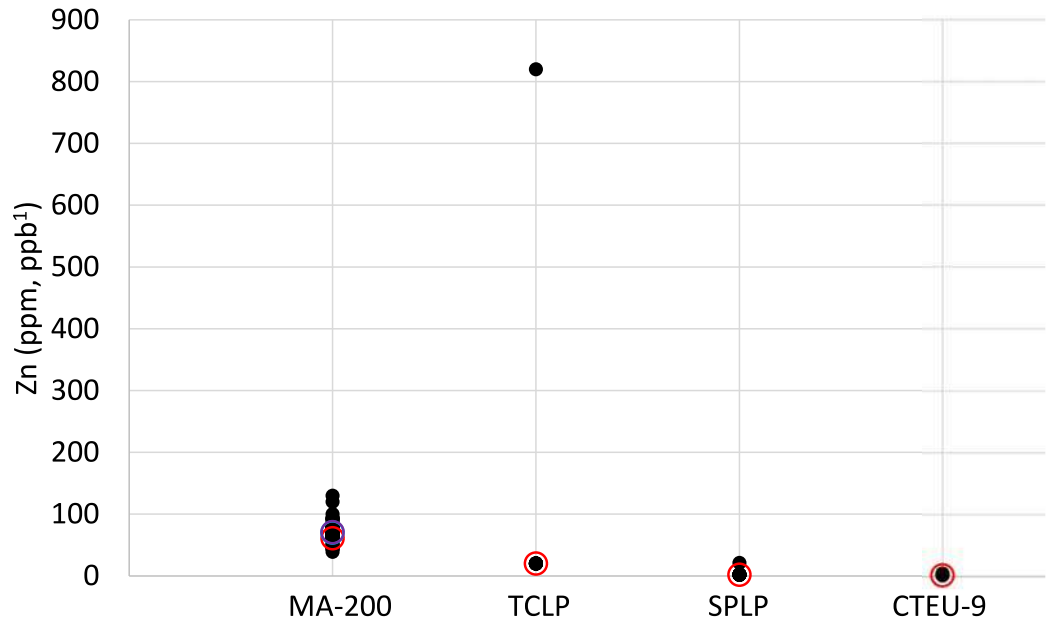

| | | | | |
|---|---|---|---|---|
| Notes :<br>Les valeurs < LDM sont considérées égales à celle-ci<br>[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb | **Lixiviats : Ba** | | | **Essai cinétique : minerai SGR de la zone East Gouldie** |
| | PREPARED AT | DATE déc-20 | | **CMGP** GOLDER |
| | CHECKED VB | JOB NO 19115345 | | |
| | REVIEWED VB | PHASE/TASK 61118 | | **ANNEXE C, FIGURE 7** |




| | | | | |
|---|---|---|---|---|
| Notes :<br>Les valeurs < LDM sont considérées égales à celle-ci<br>[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb | **Lixiviats : Mn** | | | **Essai cinétique : minerai SGR de la zone East Gouldie** |
| | PREPARED AT | DATE déc-20 | | **CMGP** GOLDER |
| | CHECKED VB | JOB NO 19115345 | | |
| | REVIEWED VB | PHASE/TASK 61118 | | **ANNEXE C, FIGURE 8** |




| | | | | |
|---|---|---|---|---|
| Notes :<br>Les valeurs < LDM sont considérées égales à celle-ci<br>[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb | **Lixiviats : Pb** | | | **Essai cinétique : minerai SGR de la zone East Gouldie** |
| | PREPARED AT | DATE déc-20 | | **CMGP** GOLDER |
| | CHECKED VB | JOB NO 19115345 | | |
| | REVIEWED VB | PHASE/TASK 61118 | | **ANNEXE C, FIGURE 9** |




| | | | | |
|---|---|---|---|---|
| Notes :<br>Les valeurs < LDM sont considérées égales à celle-ci<br>[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb | **Lixiviats : Zn** | | | **Essai cinétique : minerai SGR de la zone East Gouldie** |
| | PREPARED AT | DATE déc-20 | | **CMGP** GOLDER |
| | CHECKED VB | JOB NO 19115345 | | |
| | REVIEWED VB | PHASE/TASK 61118 | | **ANNEXE C, FIGURE 10** |

# Minerai : SGR

## Échantillons sélectionnés

**Essai BAB (laboratoire SGS) :**

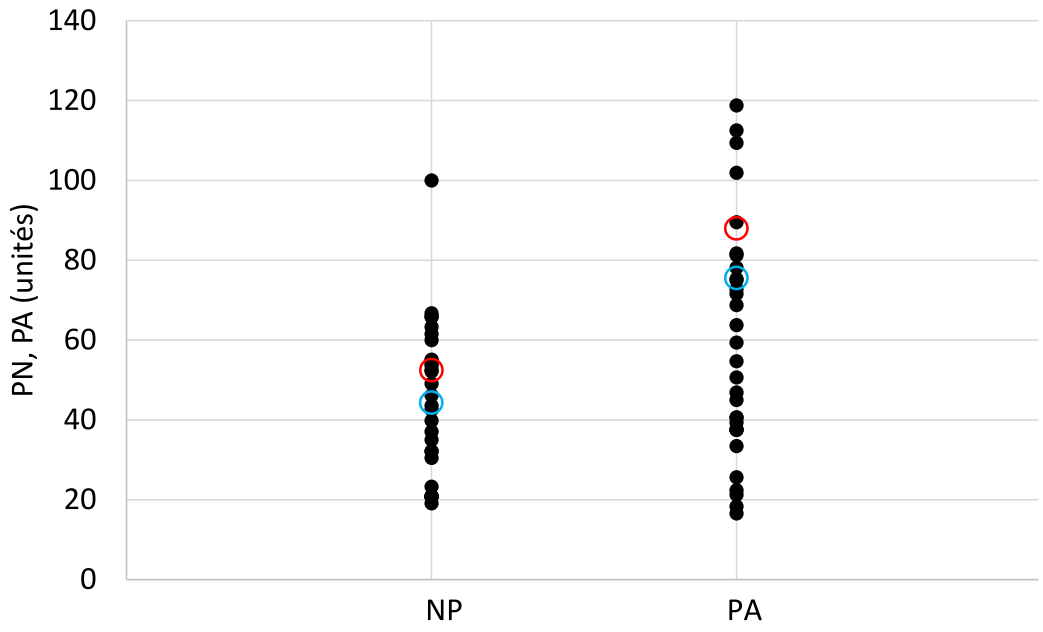
- X19149A-2009.70-2213
- Y155016EXT-1882.50-I001
- X19156-1768.60-1296

**Essai DRX (laboratoire SGS) :**

- X19149A-2009.70-2213
- X19156-1768.60-1296

**Essai cinétique (1kg, au laboratoire SGS) :**

- X19149A-2009.70-2213




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : PN, PA**

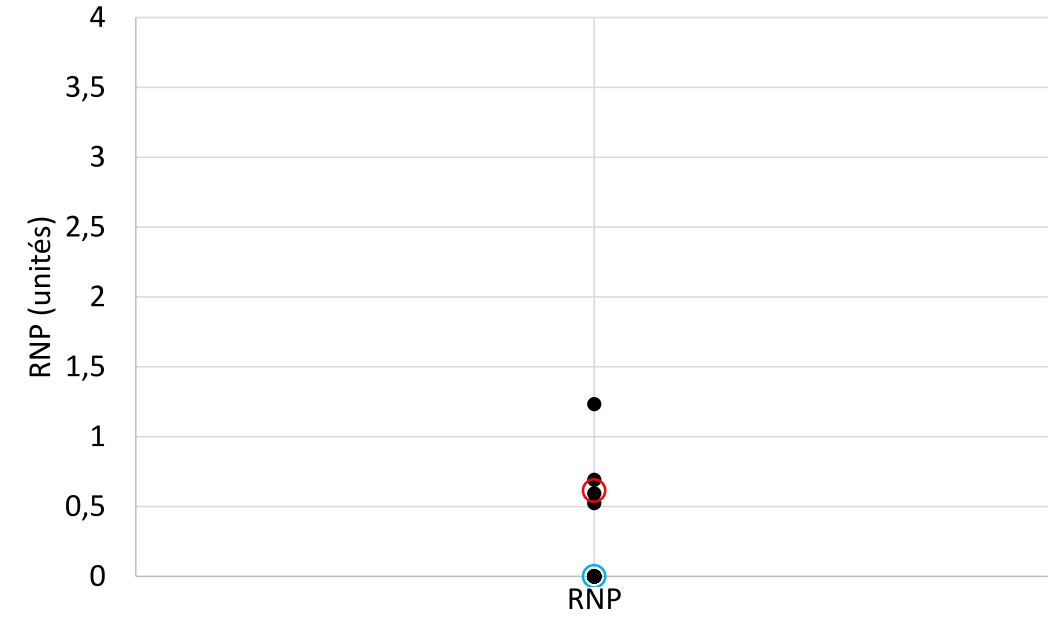
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 2**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**ABA : RNP**

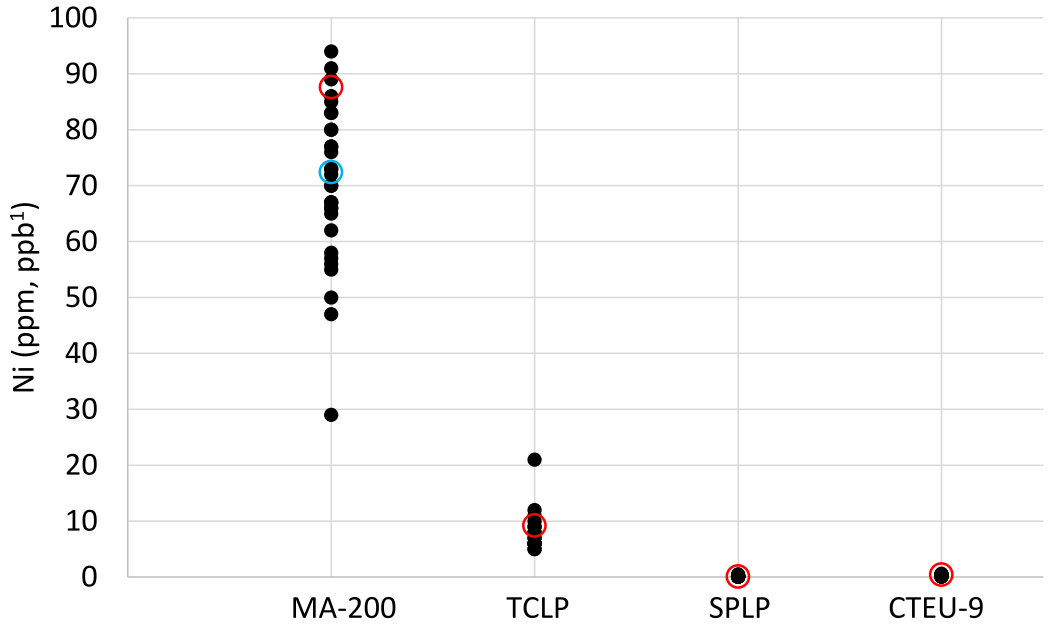
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 2**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ni**

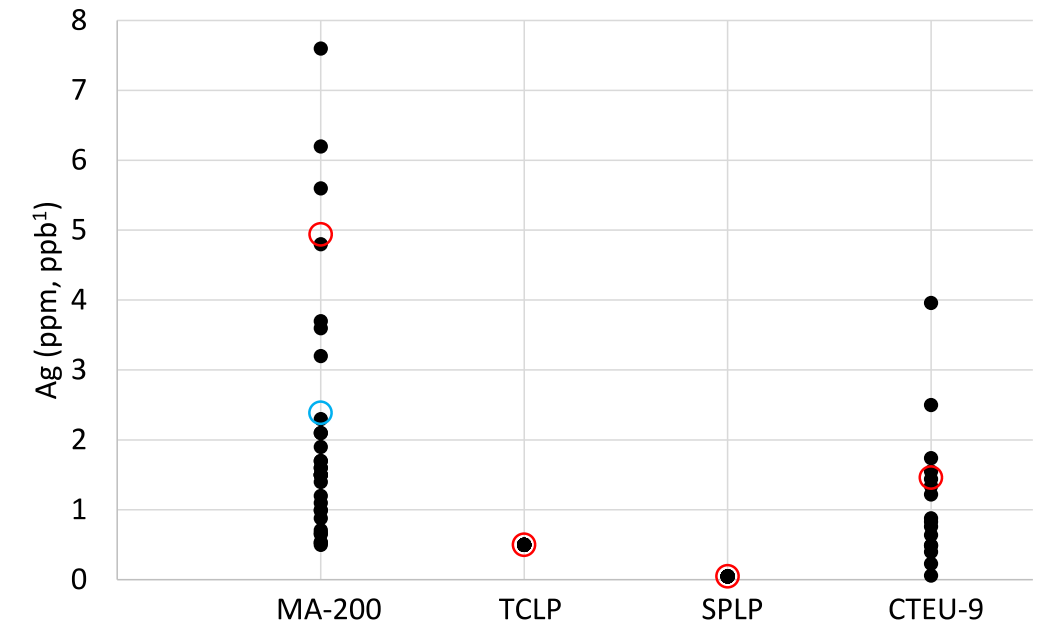
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 3**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ag**

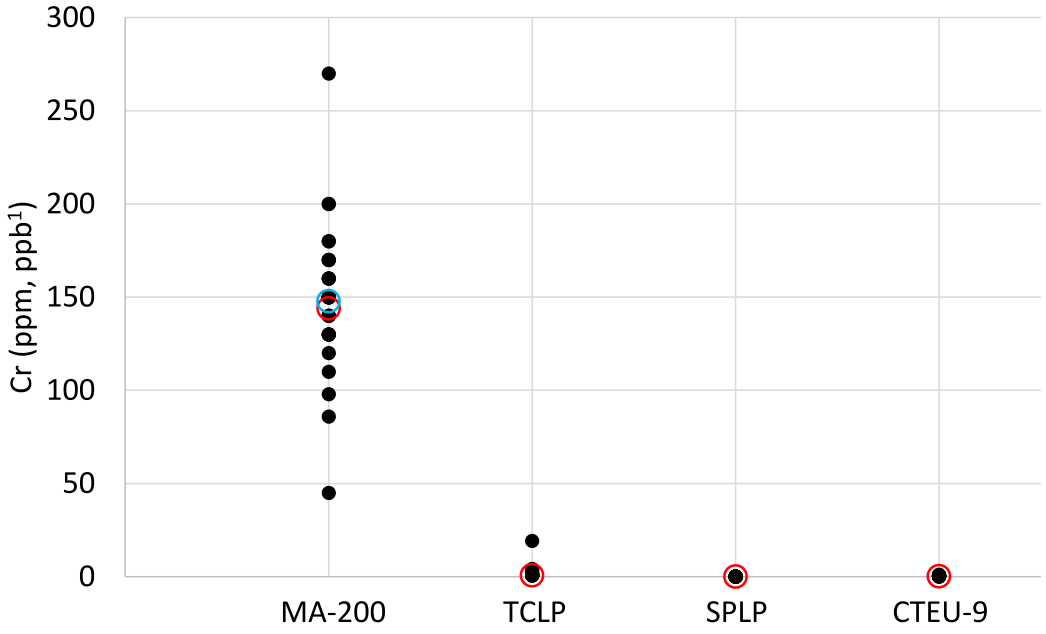
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 4**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Cr**

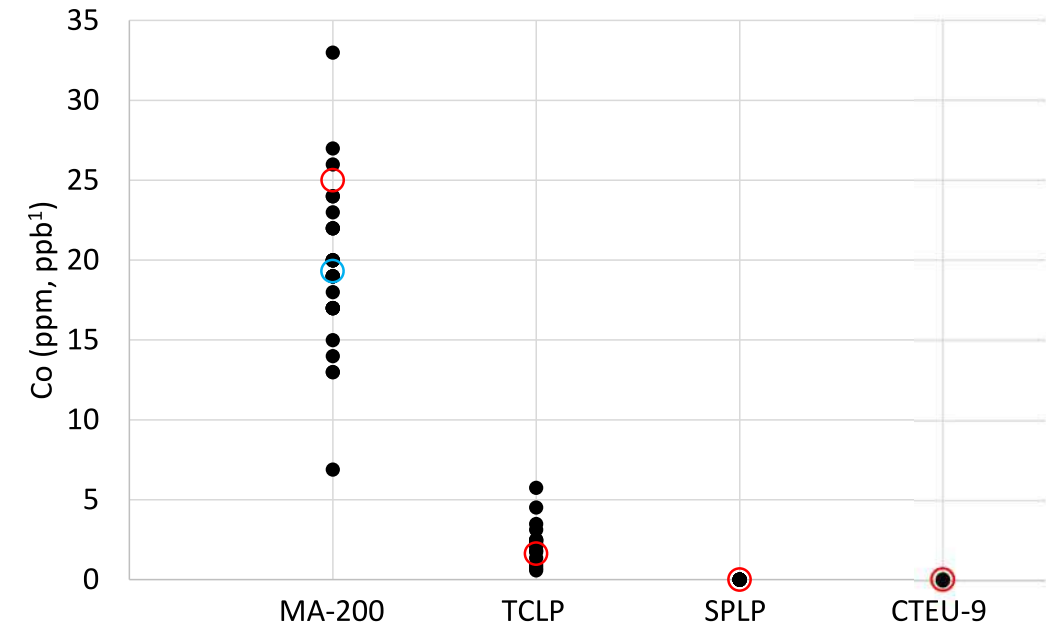
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 5**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Co**

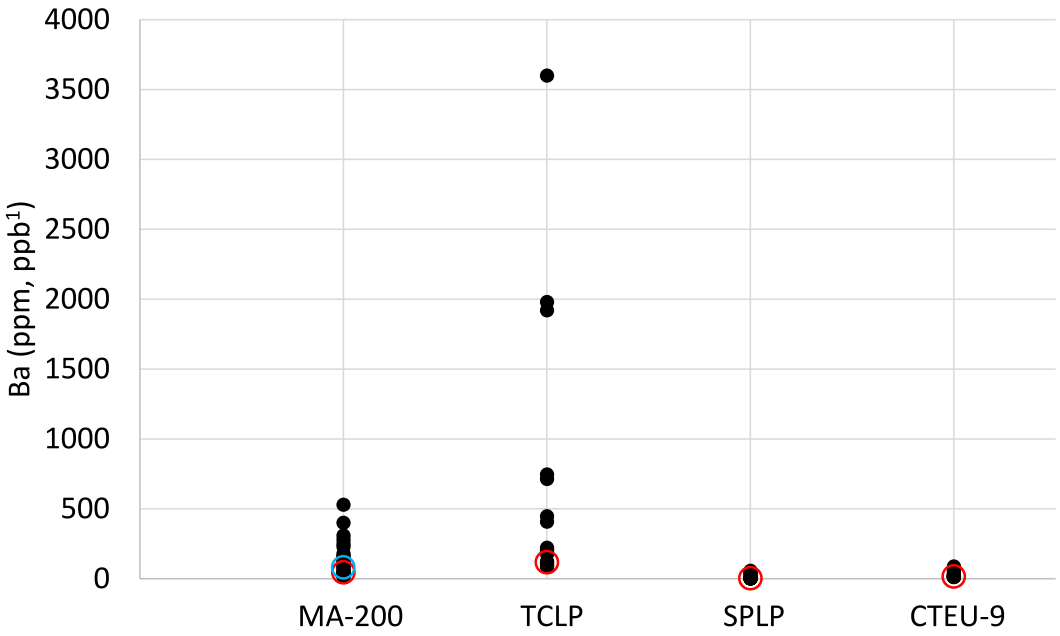
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 6**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ba**

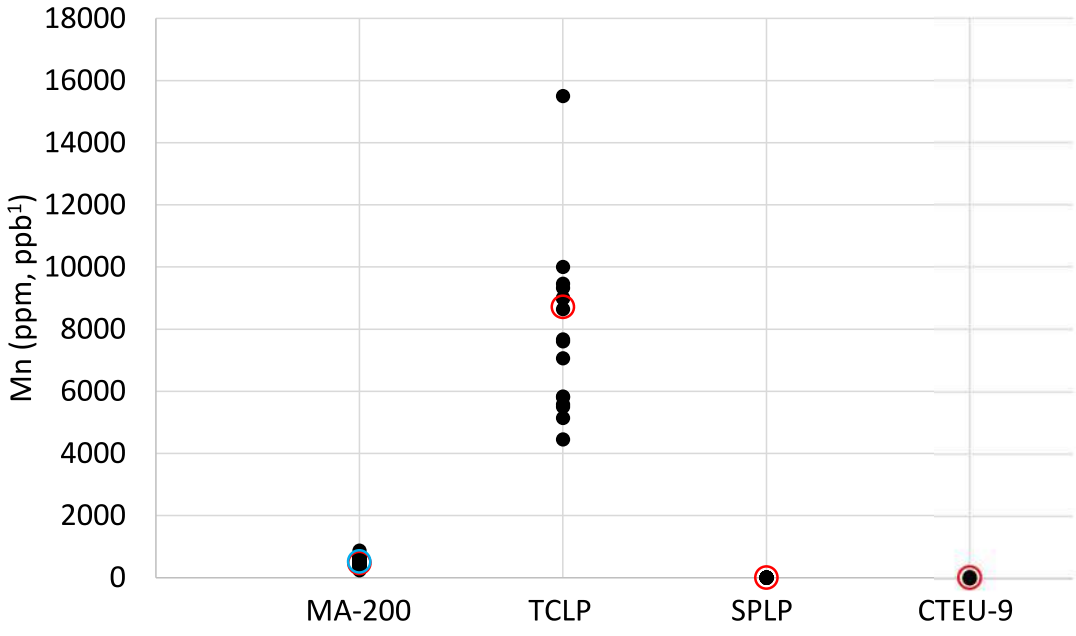
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 7**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Mn**

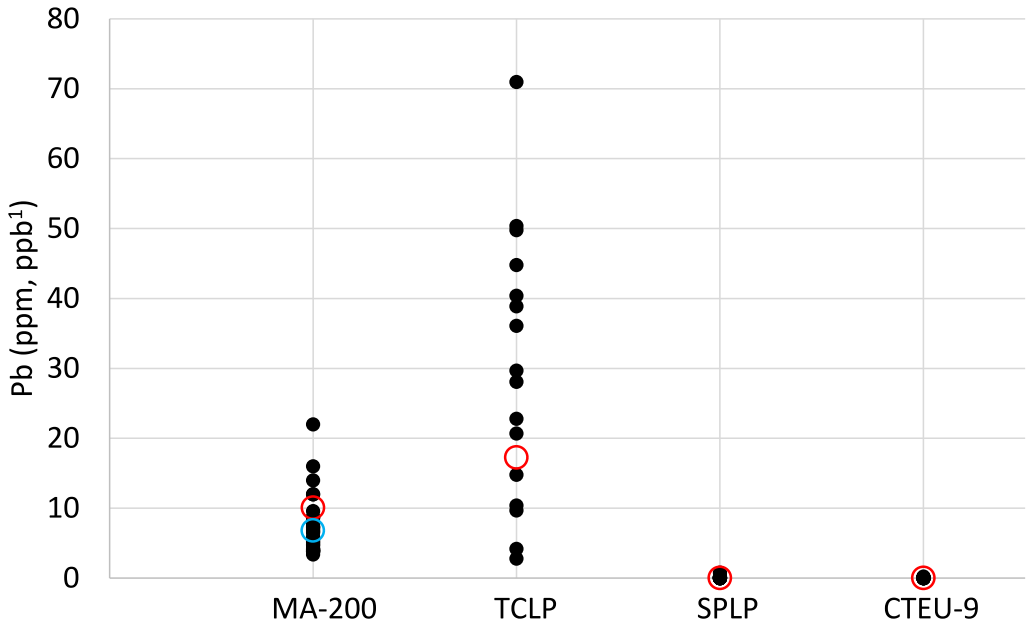
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 8**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Pb**

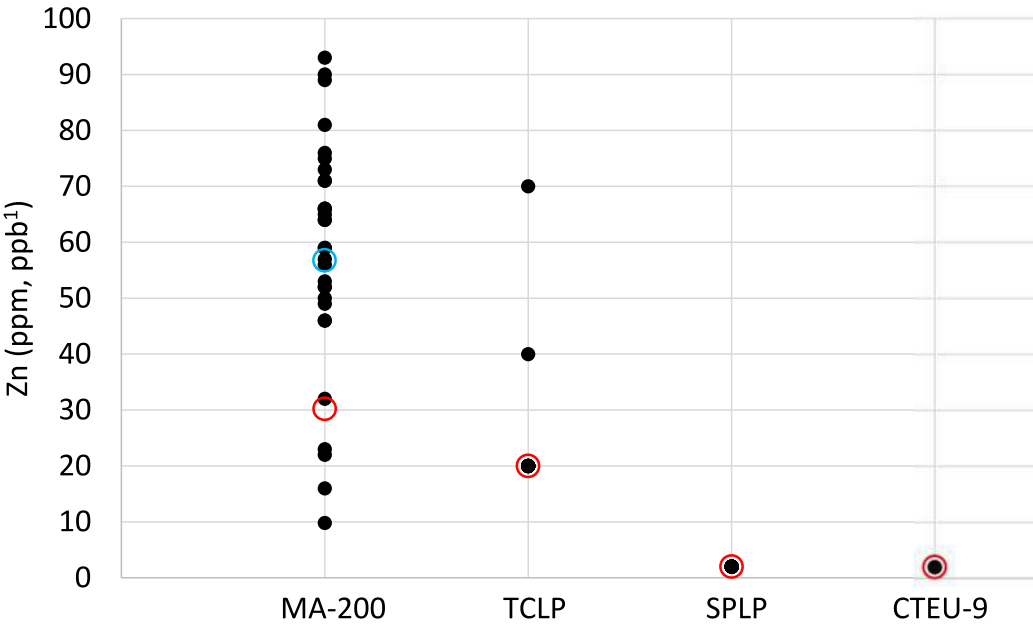
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 9**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Zn**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : minerai SGR+/SGR++ de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 10**

# Minerai : SGR+

## Échantillons sélectionnés

**Essai BAB (laboratoire SGS) :**

- X19150A-1450.65-1470
- X19143-1454.00-1452
- X19145WA-1901.00-0836

**Essai DRX (laboratoire SGS) :**

- X19150A-1450.65-1470

**Essai cinétique (800g pour l'essai cinétique composite SGR+/SGR++, au laboratoire SGS) :**

- X19150A-1450.65-1470

# Minerai : SGR++

## Échantillons sélectionnés

**Essai BAB (laboratoire SGS) :**

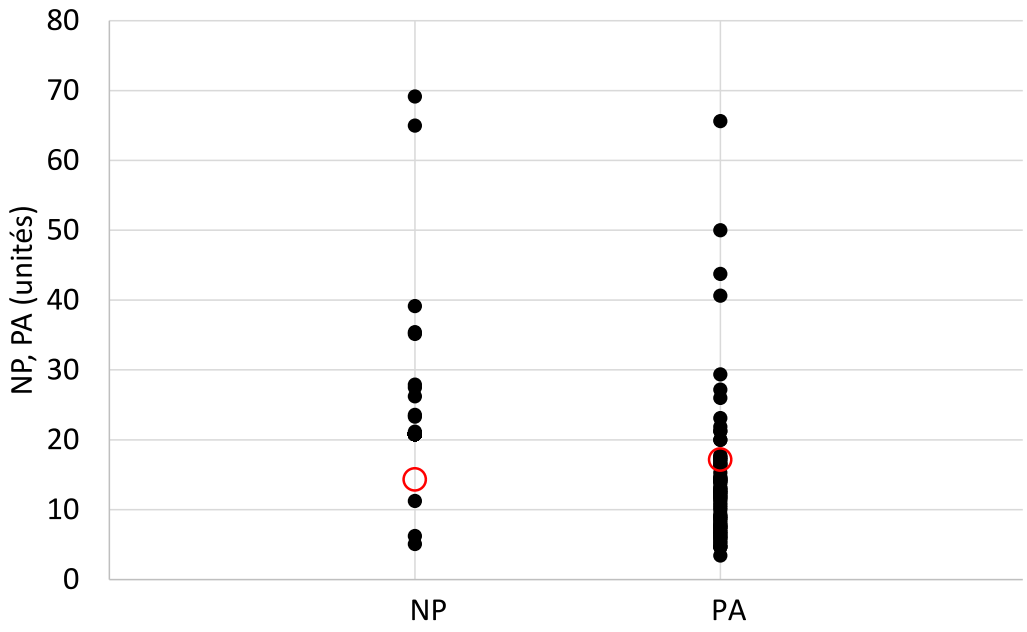
- Y155013EXT-1663.00-0736

**Essai DRX (laboratoire SGS) :**

- Y155013EXT-1663.00-0736

**Essai cinétique (200g pour l'essai cinétique composite SGR+/SGR++, au laboratoire SGS) :**

- Y155013EXT-1663.00-0736




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : PN, PA**

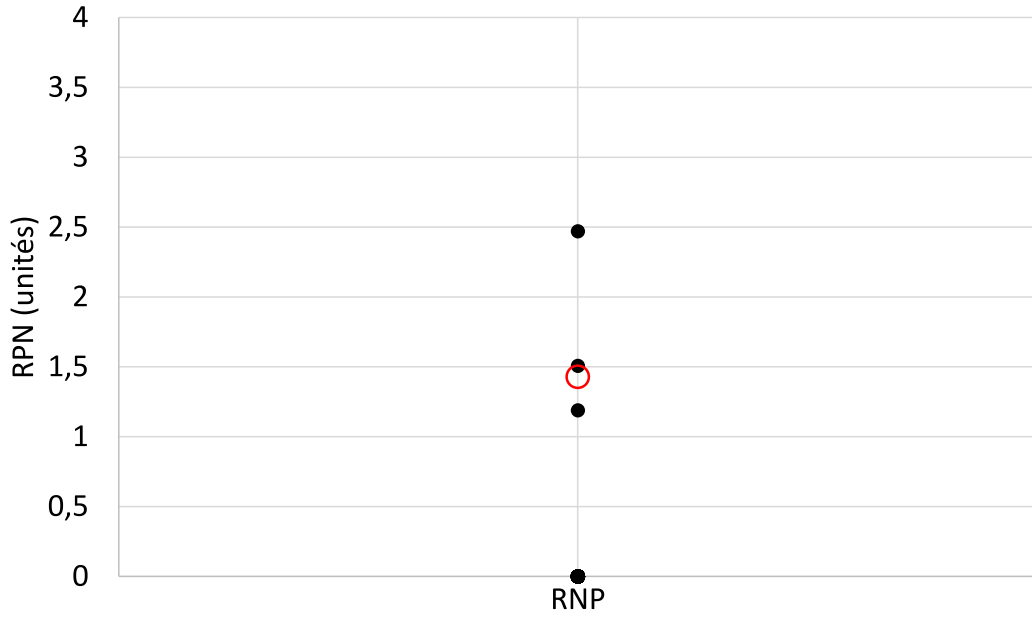
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 1**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : RPN**

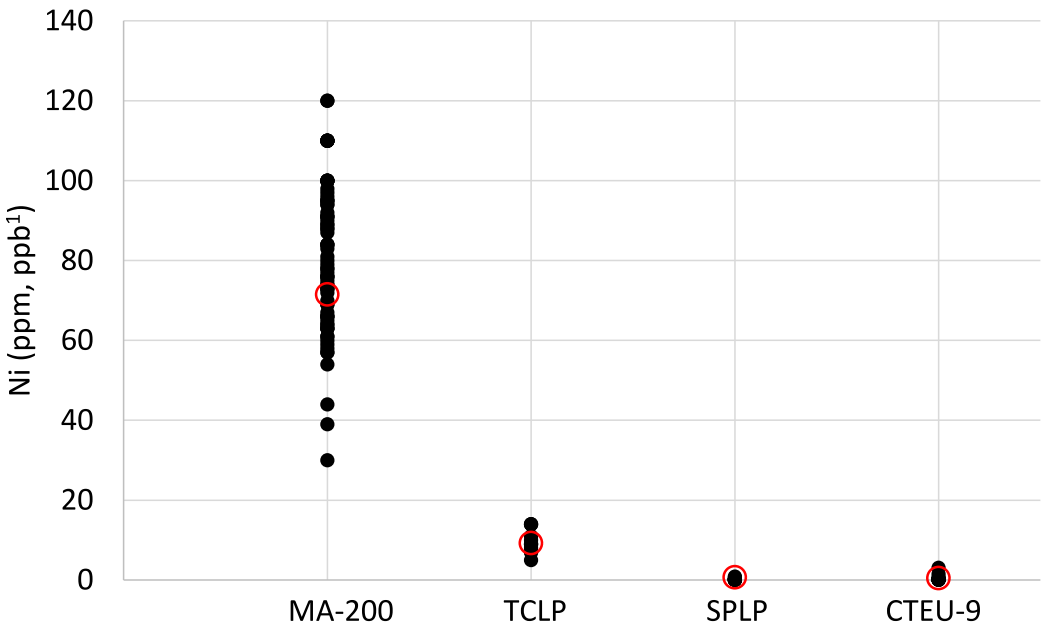
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 2**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ni**

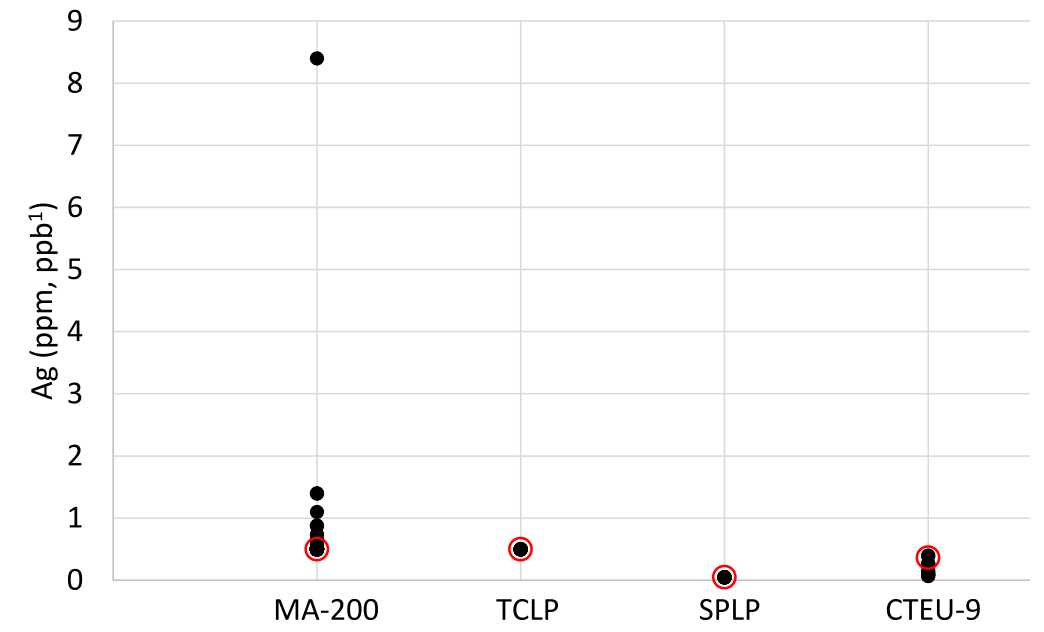
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 3**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ag**

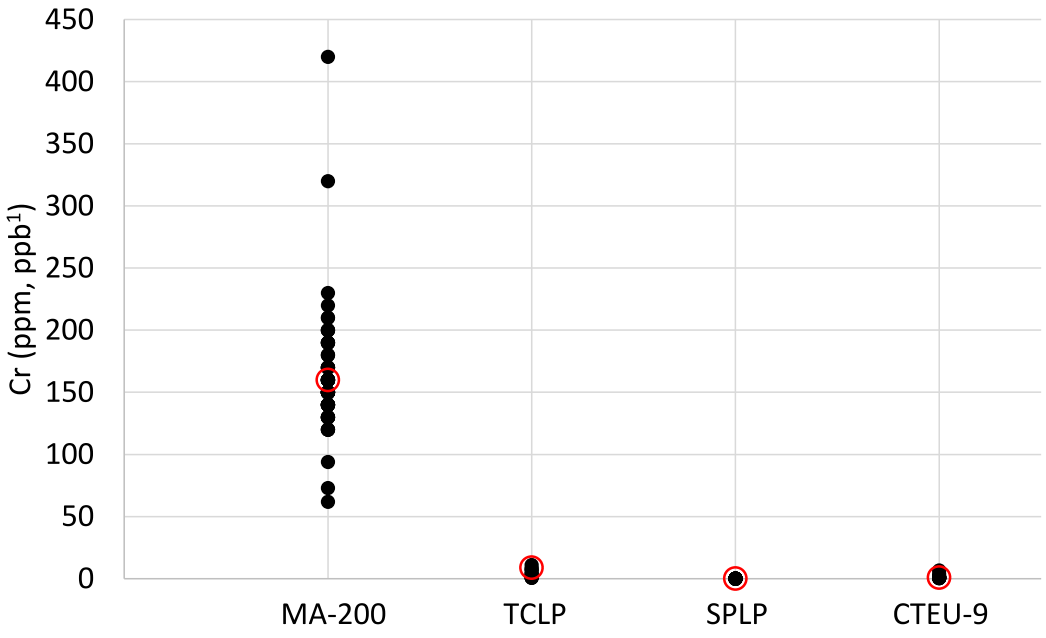
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 4**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Cr**

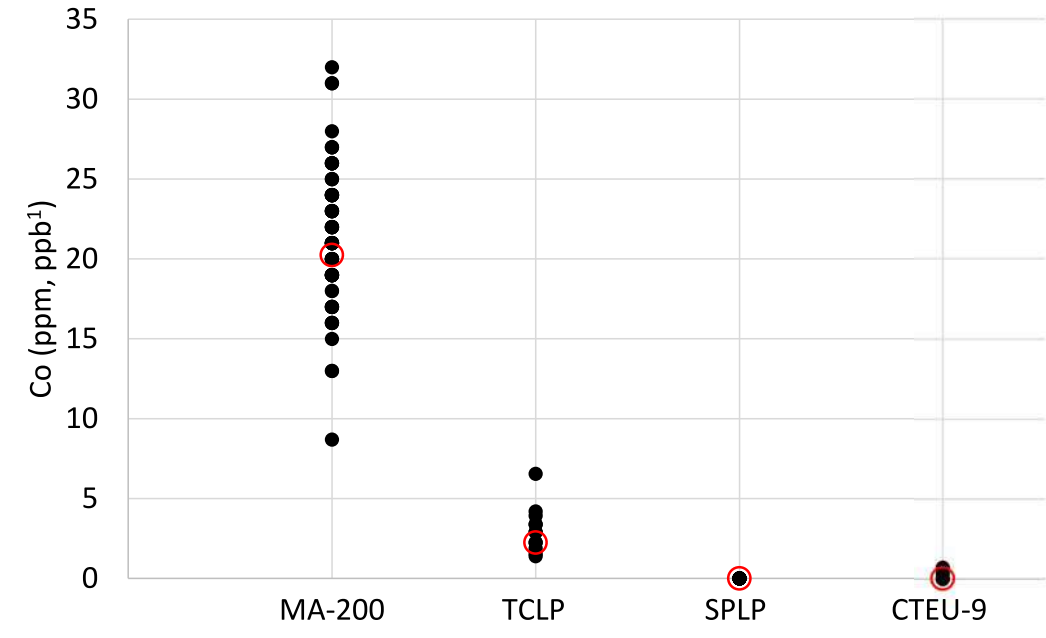
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 5**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Co**

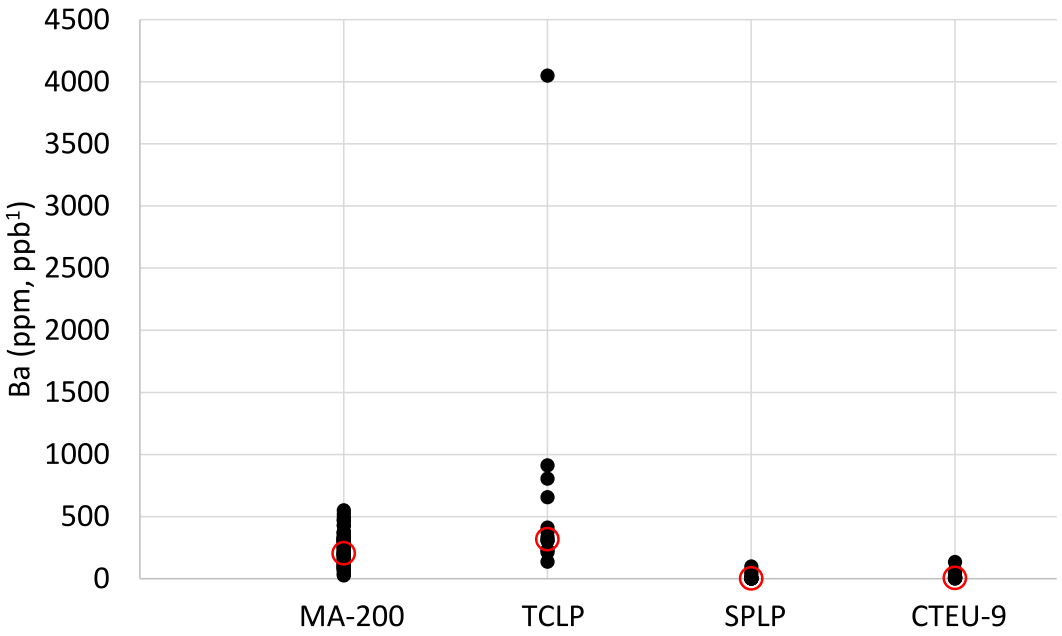
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 6**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ba**

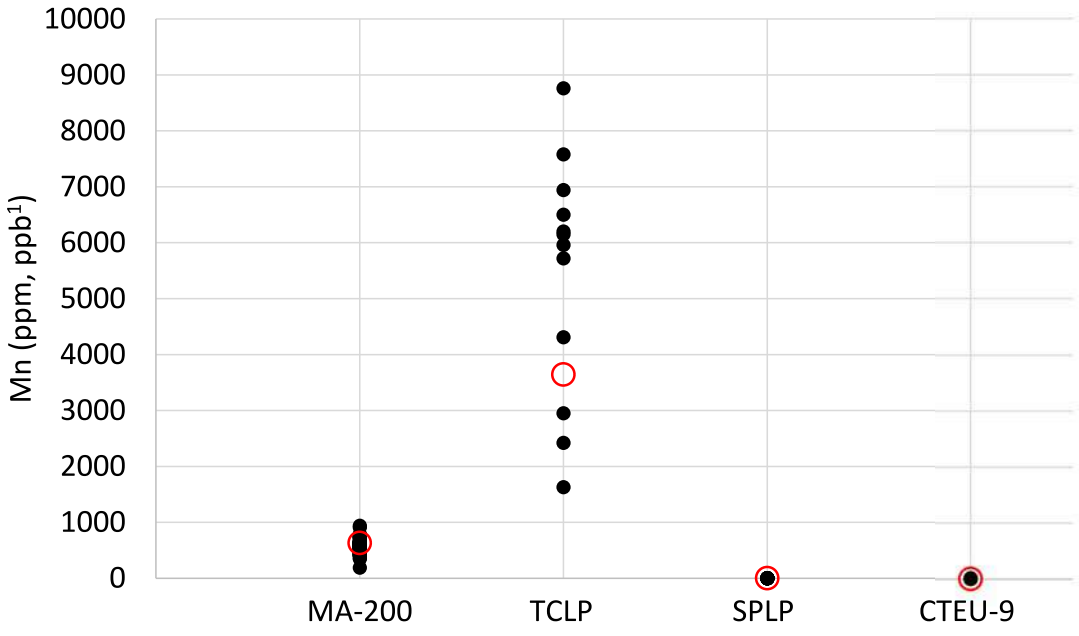
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 7**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Mn**

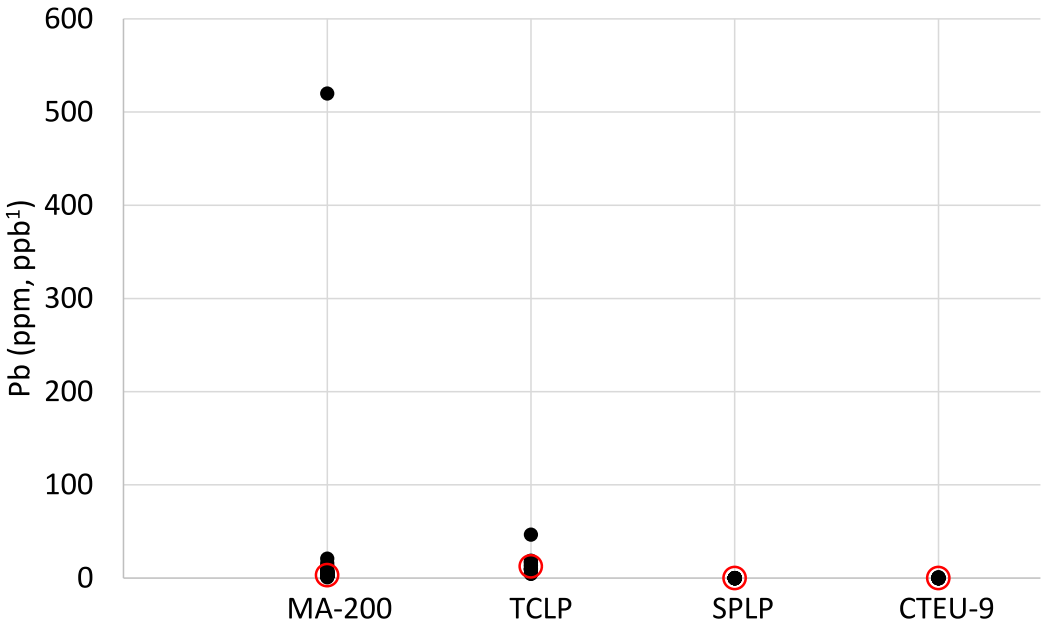
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 8**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Pb**

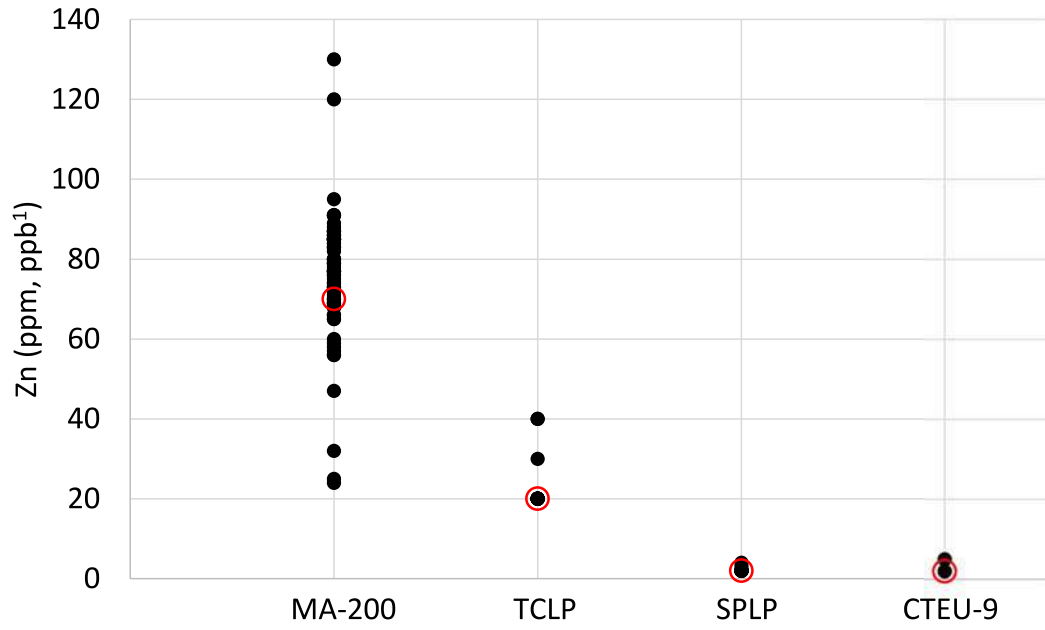
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 9**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Zn**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : dilution AGR/SGR de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 10**

# Dilution : AGR

## Échantillons sélectionnés

**Essai BAB (laboratoire SGS) :**

- X19153-1721.00-1226
- X19152W-1708.00-0590

**Essai DRX (laboratoire SGS) :**

- X19153-1721.00-1226

**Essai cinétique (750g pour l'essai cinétique composite AGR/SGR, au laboratoire SGS) :**

- X19153-1721.00-1226

# Dilution : AGR

## Échantillons sélectionnés

**Essai BAB (laboratoire SGS) :**

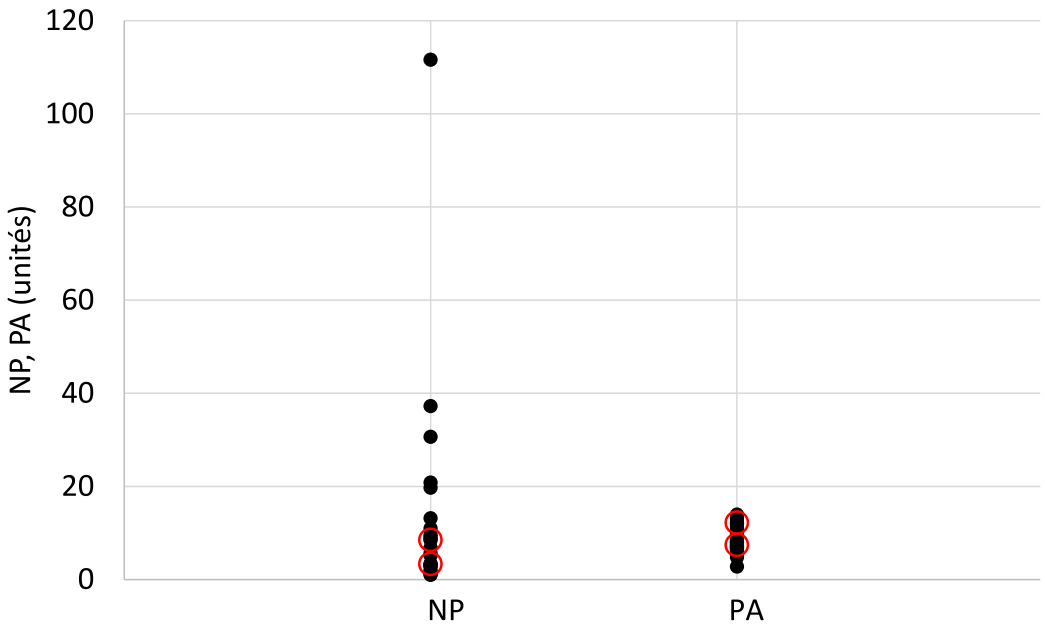
- X19149A-1999.00-2201
- X19156-1803.00-1343

**Essai DRX (laboratoire SGS) :**

- X19156-1803.00-1343

**Essai cinétique (250g pour l'essai cinétique composite AGR/SGR, au laboratoire SGS):**

- X19156-1803.00-1343




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : PN, PA**

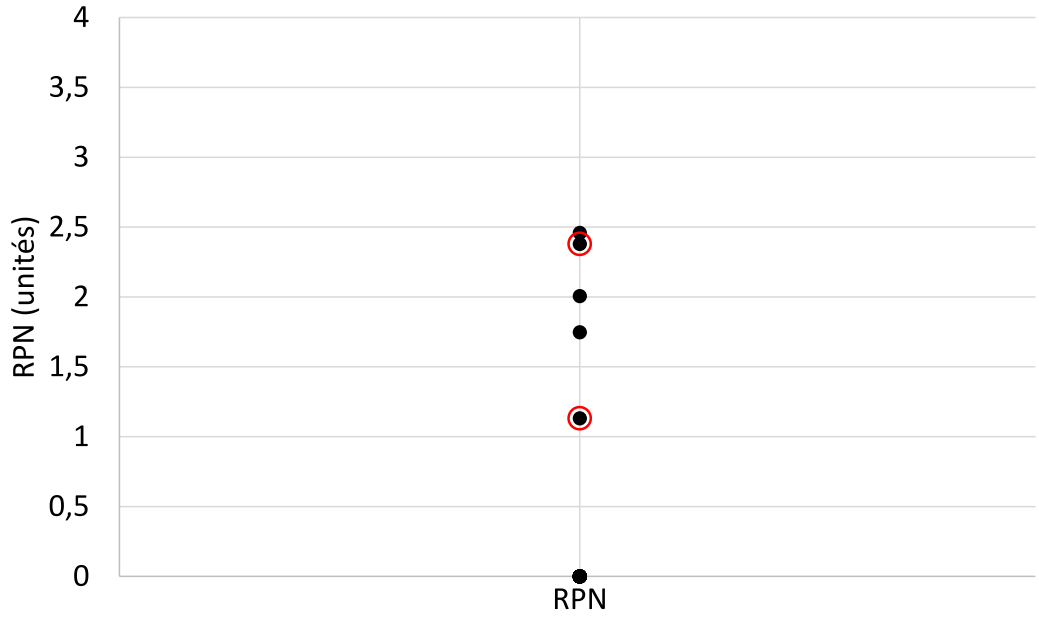
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 1**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

**BAB : RPN**

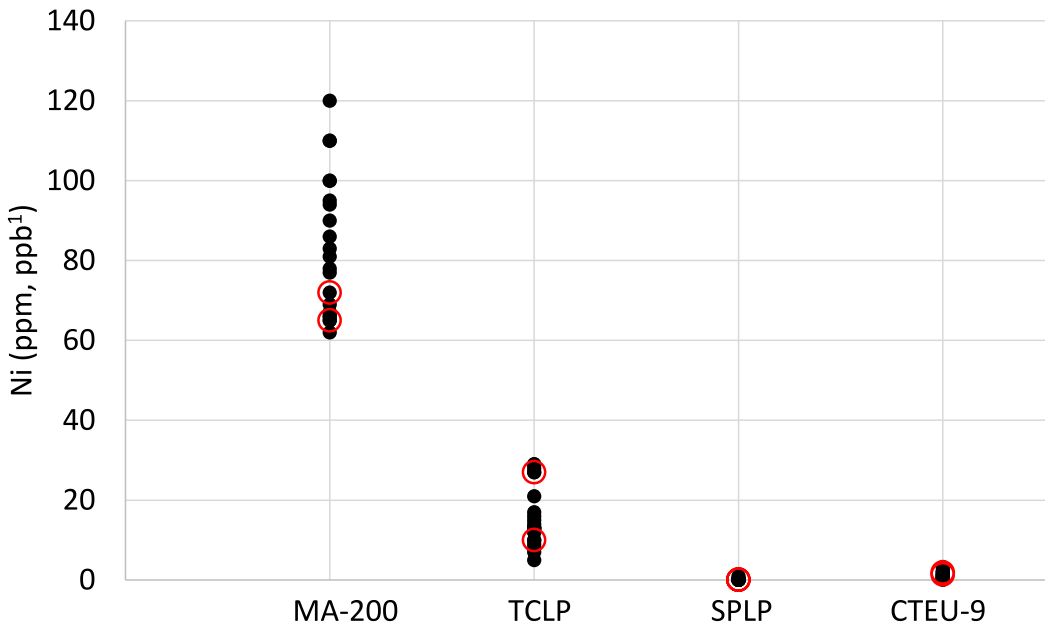
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 2**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ni**

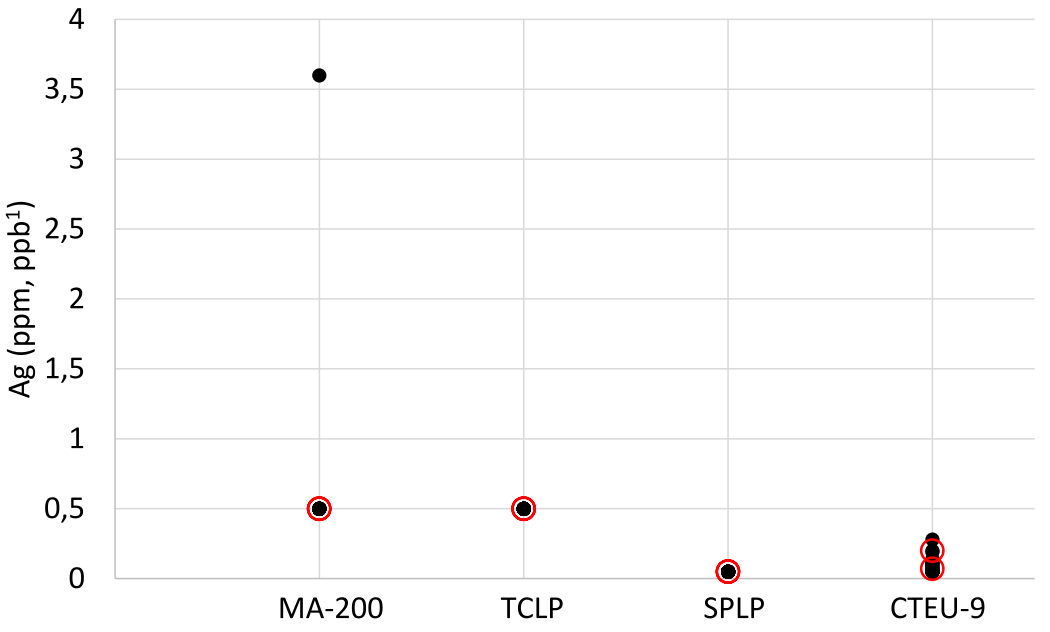
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 3**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ag**

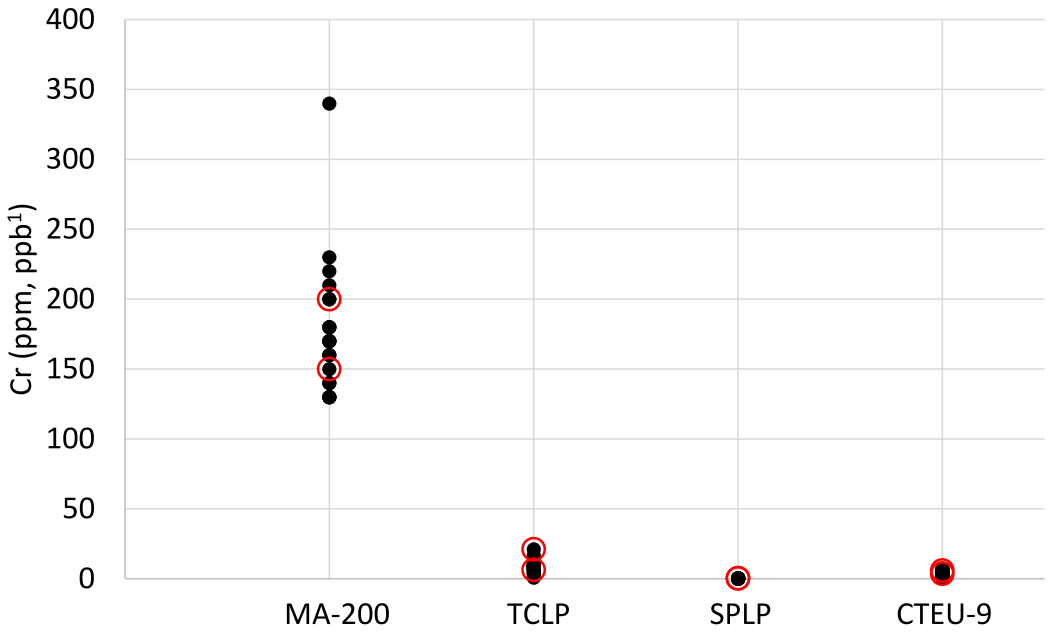
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

CMGP

GOLDER

**ANNEXE C, FIGURE 4**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Cr**

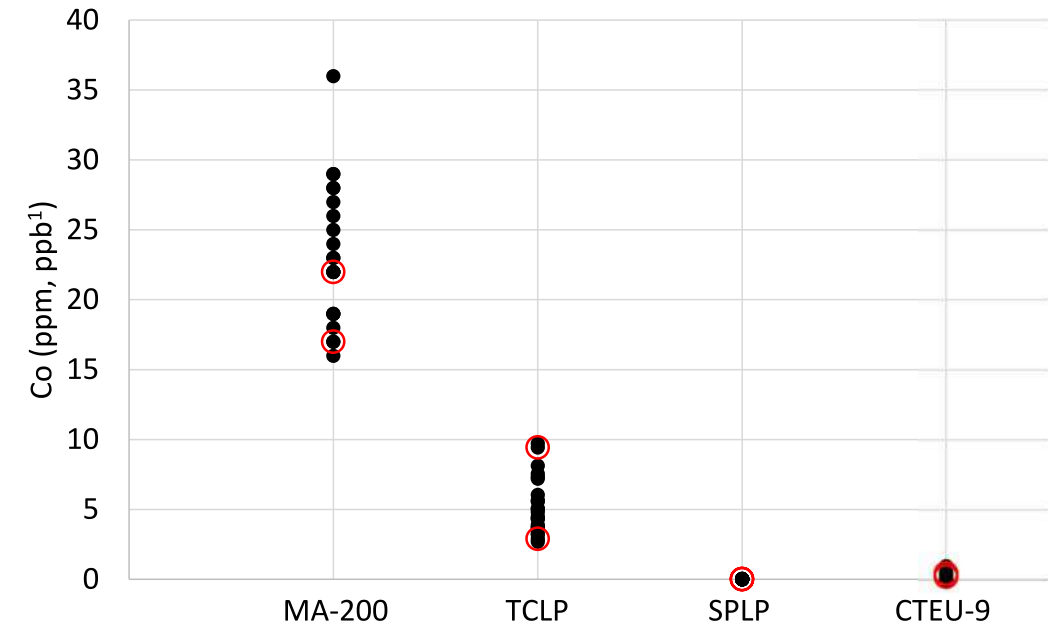
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 5**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Co**

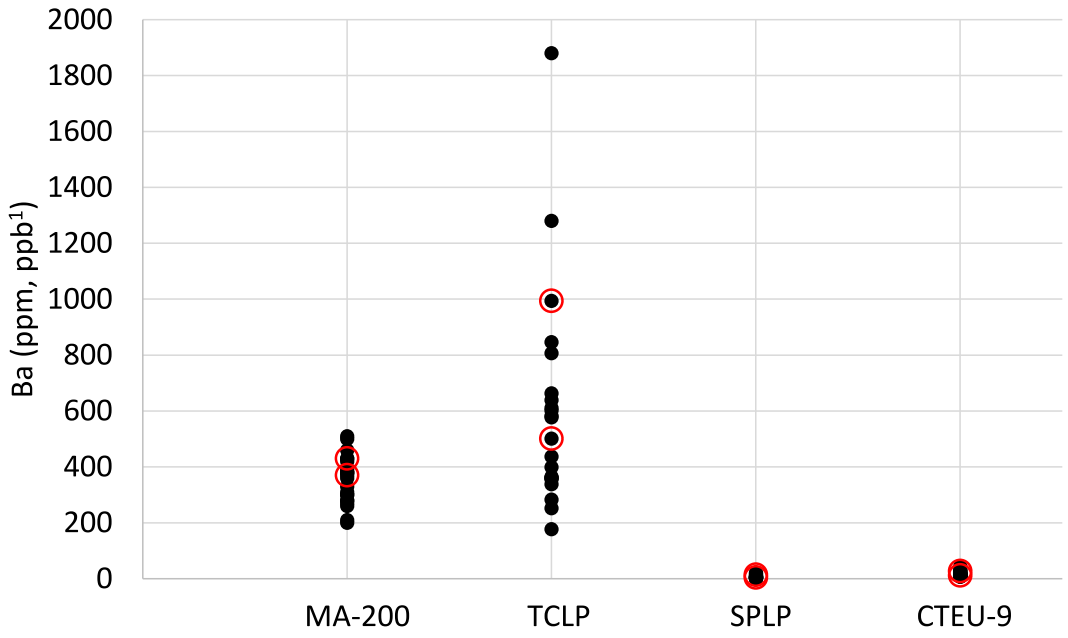
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 6**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Ba**

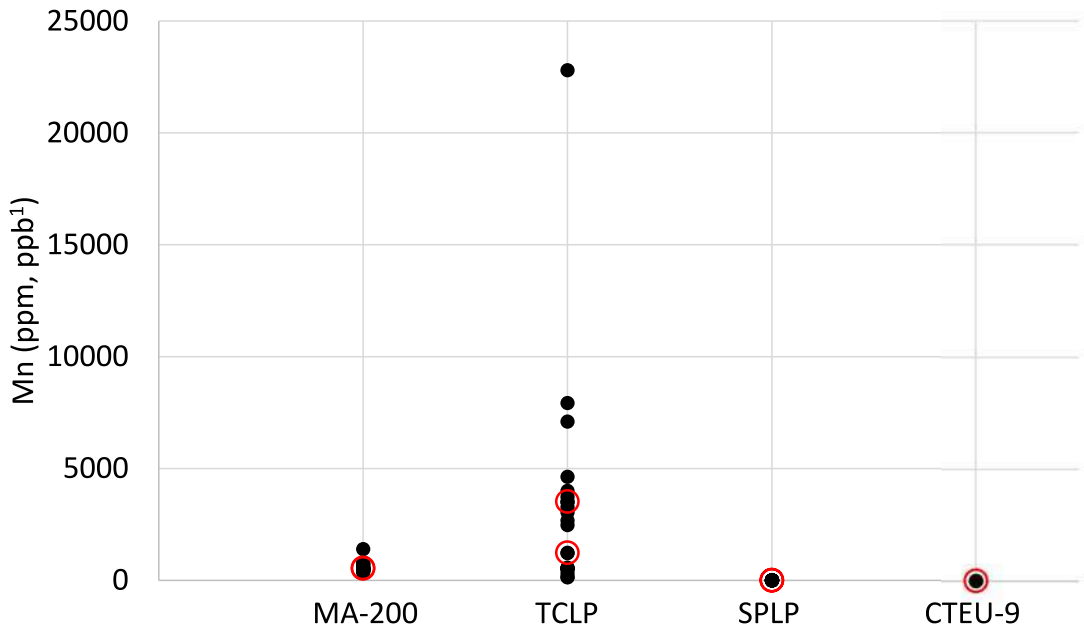
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 7**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Mn**

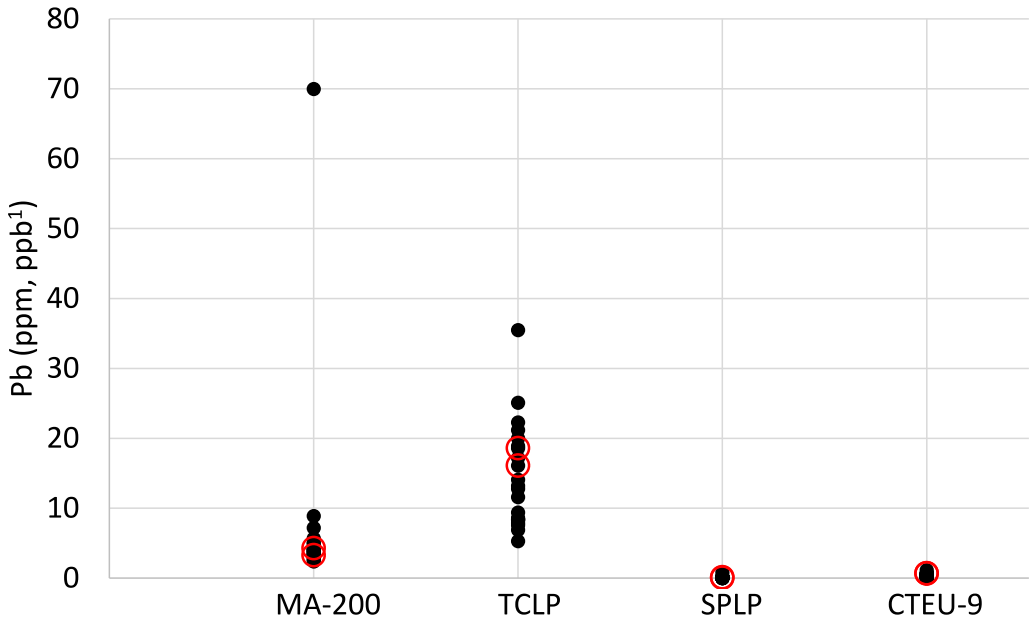
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 8**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Pb**

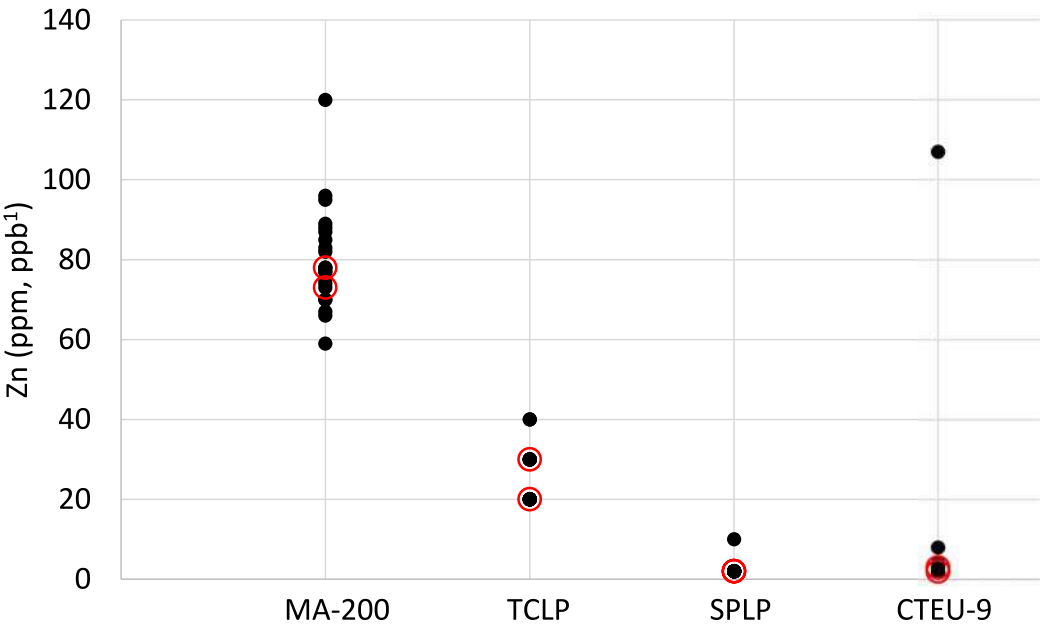
| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 9**




Notes :
Les valeurs < LDM sont considérées égales à celle-ci

[1]Les résultats MA-200 sont considérés égaux à ceux de ppm, TCLP, SPLP, et les résultats CTEU-9 sont considérés égaux à ceux de ppb

**Lixiviats : Zn**

| | | | |
|---|---|---|---|
| PREPARED | AT | DATE | déc-20 |
| CHECKED | VB | JOB NO | 19115345 |
| REVIEWED | VB | PHASE/TASK | 61118 |

**Essai cinétique : stériles de la zone East Gouldie**

**CMGP**

GOLDER

**ANNEXE C, FIGURE 10**

# Stériles : AGR

## Échantillons sélectionnés

**Essai BAB (laboratoire SGS) :**

- X19136W-1478.00-0915
- Y165037EXT-1663.00-0009
- Y155021EXTA-1724.00-0795
- X19149AWB-1844.00-0656
- X18121-1231.00-1009

**Essai DRX (laboratoire SGS) :**

- X19136W-1478.00-0915
- Y165037EXT-1663.00-0009

**Essai cinétique (1kg, au laboratoire SGS) :**

- Y165037EXT-1663.00-0009
- X19136W-1478.00-0915

**ANNEXE D**

# Tableaux des résultats statiques

Tableau D-1: Liste des échantillons et analyses

Zone East Gouldie
Mine Canadian Malartic

| | Méthode Analytique | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Échantillon** | **MA-200** | **TCLP** | **SPLP** | **CTEU-9** | **C, S (SGS)** | **BAB** | **DRX** | **XRD** |
| **Minerai AGR** | | | | | | | | |
| X19135-1850.00-1850 | X | | | | | | | |
| X19135W-1857.00-0916 | X | | | | | | | |
| X19135W-1860.00-0919 | X | | | | | | | |
| X19135W-1863.00-0923 | X | | | | | | | |
| X19135W-1901.20-0970 | X | | | | | | | |
| X19135W-1903.00-0972 | X | | | | | | | |
| X19135W-1906.00-0975 | X | | | | | | | |
| X19135W-1909.00-0978 | X | | | | | | | |
| X19135W-1914.00-0986 | X | X | X | X | X | | | |
| Y155016WB-1889.00-0464 | X | | | | | | | |
| X19139-1769.15-1918 | X | | | | | | | |
| X19142-1510.00-1471 | X | | | | | | | |
| X19145-1887.00-2165 | X | | | | | | | |
| X19147A-1582.00-1569 | X | | | | | | | |
| X19147A-1592.80-1582 | X | | | | | | | |
| X19148W-2073.00-1036 | X | X | X | X | X | X | X | X |
| X19148W-2077.90-1042 | X | | | | | | | |
| X19152-1572.00-1382 | X | X | X | X | X | | | |
| X19152-1643.00-1475 | X | X | X | X | X | | | |
| X19152-1648.00-1481 | X | X | X | X | X | X | | |
| X19154-1562.00-0866 | X | X | X | X | X | | | |
| X19152W-1627.00-0363 | X | | | | | | | |
| Y165037EXT-1687.00-0038 | X | | | | | | | |
| X19155-1665.00-0726 | X | X | X | X | X | | | |
| X19145-1930.00-2216 | X | | | | | | | |
| X19146WB-1875.40-0951 | X | | | | | | | |
| X19135-1832.70-1829 | X | X | X | X | X | | | |
| X19135-1889.65-1896 | X | | | | | | | |
| X19135W-1835.00-0891 | X | | | | | | | |
| X19135W-1837.00-0893 | X | | | | | | | |
| X19135W-1839.00-0895 | X | X | X | X | X | | | |
| X19135W-1872.00-0933 | X | | | | | | | |
| X19135W-1878.00-0941 | X | | | | | | | |
| X19135W-1893.00-0959 | X | | | | | | | |
| X19135W-1896.00-0963 | X | | | | | | | |
| X19140-1641.00-1741 | X | | | | | | | |
| X19145WA-1880.15-0811 | X | | | | | | | |
| X19152W-1715.00-0597 | X | X | X | X | X | X | | |
| X19152W-1717.20-0601 | X | | | | | | | |

Tableau D-1: Liste des échantillons et analyses

Zone East Gouldie
Mine Canadian Malartic

| | Méthode Analytique | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Échantillon** | **MA-200** | **TCLP** | **SPLP** | **CTEU-9** | **C, S (SGS)** | **BAB** | **DRX** | **XRD** |
| **Minerai SGR** | | | | | | | | |
| Y155016EXT-1882.50-I001 | X | X | X | X | X | X | | |
| X18127A-1379.00-0598 | X | | | | | | | |
| Y165106EXT-1640.00-0489 | X | X | X | X | X | | | |
| X19135W-1898.00-0966 | X | | | | | | | |
| Y155016WB-1860.50-0427 | X | | | | | | | |
| Y155021EXTA-1800.00-0881 | X | X | X | X | X | | | |
| X19136-1676.00-1690 | X | | | | | | | |
| X19139-1789.00-1941 | X | | | | | | | |
| X19140-1560.15-1641 | X | X | X | X | X | | | |
| X19140-1631.00-1727 | X | X | X | X | X | | | |
| X19136W-1664.60-1144 | X | | | | | | | |
| X19136W-1672.55-1155 | X | | | | | | | |
| X19141AW-1664.40-0787 | X | | | | | | | |
| X19139WA-1747.20-0648 | X | | | | | | | |
| X19147A-1591.10-1579 | X | | | | | | | |
| X19147A-1601.00-1591 | X | | | | | | | |
| X19145WA-1854.00-0778 | X | X | X | X | X | | | |
| X19146WB-1928.00-1013 | X | | | | | | | |
| X19151-1768.00-1745 | X | | | | | | | |
| X19149AWB-1992.00-0826 | X | | | | | | | |
| X19149AWB-2003.00-0839 | X | | | | | | | |
| X19152-1638.35-1468 | X | | | | | | | |
| X19152W-1604.00-0336 | X | | | | | | | |
| X19152W-1605.00-0337 | X | | | | | | | |
| X19152W-1617.80-0352 | X | | | | | | | |
| X19152W-1621.00-0356 | X | | | | | | | |
| X19152W-1624.00-0359 | X | | | | | | | |
| X19155-1684.00-0749 | X | | | | | | | |
| X19156-1751.00-1272 | X | | | | | | | |
| X19156-1754.00-1275 | X | | | | | | | |
| X19156-1756.50-1278 | X | | | | | | | |
| X19156-1761.00-1287 | X | | | | | | | |
| X19156-1774.00-1306 | X | | | | | | | |
| X19156-1777.00-1309 | X | | | | | | | |
| X19156-1780.00-1312 | X | | | | | | | |
| X19156-1782.00-1315 | X | | | | | | | |
| X19156-1784.00-1318 | X | | | | | | | |
| X19156-1786.50-1322 | X | | | | | | | |
| X19156-1789.35-1326 | X | | | | | | | |
| X19156-1792.00-1329 | X | | | | | | | |
| X19156-1795.10-1333 | X | | | | | | | |
| X19156-1796.00-1334 | X | | | | | | | |
| X19157-1628.00-0434 | X | | | | | | | |
| X19147AWA-1634.00-0376 | X | X | X | X | X | | | |
| Y155016EXT-1862.00-0921 | X | | | | | | | |
| X19153-1812.00-1341 | X | | | | | | | |
| X19149AWB-1996.00-0830 | X | | | | | | | |
| X19155-1676.00-0741 | X | | | | | | | |
| Y155016EXT-1871.00-0933 | X | | | | | | | |
| X19135W-1880.00-0944 | X | | | | | | | |
| X19135W-1883.00-0947 | X | X | X | X | X | | | |
| X19135W-1888.00-0954 | X | | | | | | | |
| X19135W-1891.00-0957 | X | | | | | | | |
| X19136W-1730.50-1236 | X | X | X | X | X | | | |
| X19141AW-1670.85-0796 | X | X | X | X | X | | | |
| X19149A-2009.70-2213 | X | X | X | X | X | X | X | X |
| X19153-1814.00-1344 | X | | | | | | | |
| X19156-1763.00-1290 | X | | | | | | | |
| X19156-1766.00-1293 | X | | | | | | | |
| X19156-1768.60-1296 | X | X | X | X | X | X | X | X |
| X19156-1769.50-1298 | X | | | | | | | |
| X19147AWA-1624.00-0365 | X | | | | | | | |

Tableau D-1: Liste des échantillons et analyses

Zone East Gouldie
Mine Canadian Malartic

| | Méthode Analytique | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Échantillon** | **MA-200** | **TCLP** | **SPLP** | **CTEU-9** | **C, S (SGS)** | **BAB** | **DRX** | **XRD** |
| **Minerai SGR+** | | | | | | | | |
| X18110A-1296.05-0650 | X | | | | | | | |
| X18127W-1258.00-0827 | X | | | | | | | |
| X18131-0915.00-0737 | X | | | | | | | |
| X19133-0875.05-0584 | X | | | | | | | |
| X19135-1902.50-1912 | X | | | | | | | |
| X19136W-1716.90-1217 | X | | | | | | | |
| X19142-1559.00-1528 | X | X | X | X | X | | | |
| X19141AW-1622.15-0730 | X | X | X | X | X | | | |
| X19143-1454.00-1452 | X | X | X | X | X | X | | |
| X19148-2077.00-1657 | X | | | | | | | |
| X19150A-1450.65-1470 | X | X | X | X | X | X | X | X |
| X19145WA-1901.00-0836 | X | X | X | X | X | X | | |
| X19152W-1596.10-0327 | X | X | X | X | X | | | |
| X19152W-1599.00-0331 | X | | | | | | | |
| X19152W-1601.30-0332 | X | X | X | X | X | | | |
| Y165037EXT-1739.00-0105 | X | | | | | | | |
| Y165037EXT-1752.00-0121 | X | | | | | | | |
| X19156-1758.40-1282 | X | | | | | | | |
| X19139WA-1752.20-0656 | X | | | | | | | |
| X19149A-2030.30-2239 | X | X | X | X | X | | | |
| X19153-1770.00-1290 | X | | | | | | | |
| X19136W-1692.40-1182 | X | X | X | X | X | | | |
| X19139WA-1778.85-0693 | X | X | X | X | X | | | |
| X19135W-1884.70-0949 | X | | | | | | | |
| X19153-1754.20-1269 | X | | | | | | | |
| **Minerai SGR++** | | | | | | | | |
| Y155013EXT-1663.00-0736 | X | X | X | X | X | X | X | X |
| X19152W-1592.75-0322 | X | X | X | X | X | | | |
| X19155-1653.20-0711 | X | X | X | X | X | | | |
| X18108AC-1277.00-0058 | X | X | X | X | X | | | |
| X19157-1723.60-0551 | X | X | X | X | X | | | |
| X19143-1451.25-1448 | X | X | X | X | X | | | |

Tableau D-1: Liste des échantillons et analyses

Zone East Gouldie
Mine Canadian Malartic

| | Méthode Analytique | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Échantillon** | **MA-200** | **TCLP** | **SPLP** | **CTEU-9** | **C, S (SGS)** | **BAB** | **DRX** | **XRD** |
| **Dilution AGR** | | | | | | | | |
| X18110AA-1374.20-0039 | X | | | | | | | |
| X18108AW-1237.00-0050 | X | | | | | | | |
| X18121-1298.00-1087 | X | | | | | | | |
| Y155016EXT-1886.00-0952 | X | | | | | | | |
| X18127W-1283.20-0858 | X | | | | | | | |
| X19135-1872.00-1876 | X | | | | | | | |
| Y165106EXT-1651.00-0502 | X | | | | | | | |
| X19135W-1826.00-0881 | X | | | | | | | |
| X19135W-1832.00-0888 | X | | | | | | | |
| X19135W-1848.00-0906 | X | | | | | | | |
| X19135W-1854.00-0912 | X | X | X | X | X | | | |
| X19135W-1864.00-0924 | X | | | | | | | |
| X19135W-1869.00-0930 | X | | | | | | | |
| X19135W-1917.00-0989 | X | X | X | X | X | | | |
| X19135W-1923.00-0995 | X | | | | | | | |
| X19136-1663.00-1673 | X | | | | | | | |
| X19139-1748.00-1894 | X | | | | | | | |
| X19140-1547.00-1625 | X | | | | | | | |
| X19142-1509.00-1470 | X | | | | | | | |
| X19145-1895.00-2173 | X | | | | | | | |
| X19146-1948.00-2112 | X | | | | | | | |
| X19145WA-1907.00-0844 | X | | | | | | | |
| X19146WB-1849.25-0919 | X | | | | | | | |
| X19151-1772.00-1749 | X | | | | | | | |
| X19153-1721.00-1226 | X | X | X | X | X | X | X | X |
| X19154-1593.00-0902 | X | | | | | | | |
| X19152W-1585.00-0313 | X | | | | | | | |
| X19152W-1591.00-0319 | X | | | | | | | |
| X19152W-1608.00-0341 | X | | | | | | | |
| X19152W-1611.00-0344 | X | | | | | | | |
| X19152W-1614.00-0347 | X | | | | | | | |
| X19152W-1616.00-0350 | X | | | | | | | |
| X19152W-1630.00-0366 | X | | | | | | | |
| X19152W-1636.00-0372 | X | | | | | | | |
| X19152W-1702.00-0583 | X | | | | | | | |
| X19152W-1708.00-0590 | X | X | X | X | X | X | | |
| X19152W-1718.00-0602 | X | | | | | | | |
| X19152W-1724.00-0609 | X | | | | | | | |
| X19156-1738.00-1258 | X | | | | | | | |
| X19156-1741.00-1262 | X | | | | | | | |
| X19156-1745.00-1266 | X | X | X | X | X | | | |
| X19156-1805.35-1346 | X | | | | | | | |
| X19139WA-1730.30-0618 | X | | | | | | | |
| Y155013EXT-1771.00-0865 | X | | | | | | | |
| X19135W-1841.00-0897 | X | | | | | | | |
| X19135W-1875.00-0937 | X | | | | | | | |
| X19136-1708.55-1732 | X | | | | | | | |
| X19149A-2020.00-2225 | X | | | | | | | |
| X19146WB-1866.00-0939 | X | | | | | | | |
| X19149AWB-2010.00-0848 | X | | | | | | | |
| X19154-1579.00-0887 | X | | | | | | | |
| X19152W-1709.00-0591 | X | | | | | | | |
| X19152W-1712.00-0594 | X | | | | | | | |
| X19145-1901.00-2179 | X | | | | | | | |
| X19133-0877.75-0589 | X | | | | | | | |
| X19135W-1854.50-0913 | X | | | | | | | |
| X19154-1588.00-0896 | X | X | X | X | X | | | |

Tableau D-1: Liste des échantillons et analyses

Zone East Gouldie
Mine Canadian Malartic

| | Méthode Analytique | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Échantillon** | **MA-200** | **TCLP** | **SPLP** | **CTEU-9** | **C, S (SGS)** | **BAB** | **DRX** | **XRD** |
| **Dilution SGR** | | | | | | | | |
| X19139-1842.00-2011 | X | | | | | | | |
| X19136W-1734.40-1241 | X | | | | | | | |
| X19147A-1603.00-1593 | X | X | X | X | X | | | |
| X19149A-1999.00-2201 | X | X | X | X | X | X | | |
| Y165037EXT-1704.30-0059 | X | | | | | | | |
| X19156-1748.10-1269 | X | | | | | | | |
| X19156-1797.00-1336 | X | X | X | X | X | | | |
| X19156-1803.00-1343 | X | X | X | X | X | X | X | X |
| X18127A-1366.00-0584 | X | | | | | | | |
| X18127A-1428.00-0654 | X | X | X | X | X | | | |
| Y155016WB-1867.65-0436 | X | | | | | | | |
| X19139-1817.70-1976 | X | | | | | | | |
| X19139-1821.35-1983 | X | | | | | | | |
| X19139WA-1789.00-0708 | X | | | | | | | |
| X19148W-2070.20-1032 | X | | | | | | | |
| Y165037EXT-1717.00-0076 | X | X | X | X | X | | | |
| Y165037EXT-1732.85-0096 | X | | | | | | | |
| X19156-1772.00-1302 | X | | | | | | | |
| **Stérile AGR** | | | | | | | | |
| X18108AWC-1087.20-0196 | X | X | X | X | X | | | |
| X18121-1231.00-1009 | X | X | X | X | X | X | | |
| Y155016EXT-1758.00-0804 | X | X | X | X | X | | | |
| X18127A-1122.00-0299 | X | X | X | X | X | | | |
| X18131-0777.00-0578 | X | X | X | X | X | | | |
| X19135-1719.00-1698 | X | X | X | X | X | | | |
| Y155021EXTA-1724.00-0795 | X | X | X | X | X | X | | |
| X19139-1738.00-1882 | X | X | X | X | X | | | |
| X19140-1518.00-1591 | X | X | X | X | X | | | |
| X19136W-1478.00-0915 | X | X | X | X | X | X | X | X |
| X19141AW-1557.75-0646 | X | X | X | X | X | | | |
| X19143-1265.10-1226 | X | X | X | X | X | | | |
| X19145-1736.00-1992 | X | X | X | X | X | | | |
| X19147A-1466.00-1437 | X | X | X | X | X | | | |
| X19149A-1906.00-2084 | X | X | X | X | X | | | |
| X19150A-1326.00-1330 | X | X | X | X | X | | | |
| X19145WA-1677.00-0575 | X | X | X | X | X | | | |
| X19148W-1824.00-0744 | X | X | X | X | X | | | |
| X19151-1671.00-1628 | X | X | X | X | X | | | |
| X19149AWB-1844.00-0656 | X | X | X | X | X | X | | |
| X19154-1403.00-0731 | X | | | | | | | |
| Y165037EXT-1663.00-0009 | X | X | X | X | X | X | X | X |
| X18121-1189.00-0961 | X | X | X | X | X | | | |
| **Puits d'accès** | | | | | | | | |
| X19140-0708.00-0706 | X | X | X | X | X | | | |
| X19139-0887.00-0918 | X | X | X | X | X | | | |
| X19157-0933.00-0984 | X | X | X | X | X | | | |
| X18127W-0773.00-0369 | X | X | X | X | X | | | |
| X19159-1392.00-1329 | X | X | X | X | X | | | |
| X19148W-1752.00-0664 | X | X | X | X | X | | | |
| X19148-1583.00-1092 | X | X | X | X | X | | | |
| X19148-1717.15-1564 | X | | | | | | | |
| X19149AWB-1297.00-0122 | X | X | X | X | X | X | X | X |

Tableau D-2: Analyses chimiques roche totale (XRF)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Type | Code lithologique | $SiO_2$ | $Al_2O_3$ | $Fe_2O_3$ | MgO | CaO | $Na_2O$ | $K_2O$ | $TiO_2$ | $P_2O_5$ | MnO | $Cr_2O_3$ | $V_2O_5$ | LOI | Somme |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| **Minerai AGR** | | | | | | | | | | | | | | | | |
| X19148W-2073.00-1036 | Minerai | AGR | 60 | 15 | 5.6 | 2.9 | 2.6 | 4.0 | 4.6 | 0.59 | 0.14 | 0.07 | 0.02 | 0.03 | 3.2 | 99 |
| **Minerai SGR** | | | | | | | | | | | | | | | | |
| X19149A-2009.70-2213 | Minerai | SGR | 66 | 12 | 4.3 | 2.1 | 3.1 | 3.9 | 3.4 | 0.43 | 0.06 | 0.07 | 0.02 | 0.01 | 3.4 | 99 |
| X19156-1768.60-1296 | Minerai | SGR | 44 | 12 | 8.7 | 8.2 | 9.4 | 1.8 | 5.0 | 0.7 | 0.17 | 0.18 | 0.08 | 0.05 | 7.0 | 97 |
| | | COMPTE | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| | | MOYENNE | 55 | 12 | 6.5 | 5.1 | 6.2 | 2.9 | 4.2 | 0.57 | 0.12 | 0.13 | 0.05 | 0.03 | 5.2 | 98 |
| **Minerai SGR+** | | | | | | | | | | | | | | | | |
| X19150A-1450.65-1470 | Minerai | SGR+ | 62 | 14 | 4.7 | 1.7 | 3.2 | 5.3 | 3.8 | 0.49 | 0.12 | 0.06 | 0.02 | < 0.01 | 3.2 | 98 |
| **Minerai SGR++** | | | | | | | | | | | | | | | | |
| Y155013EXT-1663.00-0736 | Minerai | SGR++ | 63 | 13 | 4.9 | 2.3 | 3.2 | 5.5 | 2.2 | 0.47 | 0.08 | 0.06 | 0.02 | 0.01 | 3.7 | 99 |
| **Dilution AGR** | | | | | | | | | | | | | | | | |
| X19153-1721.00-1226 | DILUTION | AGR | 66 | 14 | 5.3 | 2.2 | 2.6 | 3.9 | 2.5 | 0.51 | 0.14 | 0.08 | 0.03 | 0.01 | 1.5 | 100 |
| **Dilution SGR** | | | | | | | | | | | | | | | | |
| X19156-1803.00-1343 | DILUTION | SGR | 61 | 15 | 6.0 | 2.8 | 3.3 | 3.7 | 3.7 | 0.61 | 0.12 | 0.09 | 0.03 | 0.02 | 2.6 | 100 |
| **Stérile AGR** | | | | | | | | | | | | | | | | |
| X19136W-1478.00-0915 | DEVELOPMENT | AGR | 65 | 15 | 5.5 | 2.6 | 3.1 | 3.4 | 2.5 | 0.58 | 0.19 | 0.1 | 0.03 | 0.02 | 0.95 | 99 |
| Y165037EXT-1663.00-0009 | DEVELOPMENT | AGR | 67 | 14 | 5.5 | 2.8 | 2.3 | 4.1 | 2.0 | 0.53 | 0.14 | 0.08 | 0.04 | 0.02 | 1.1 | 100 |
| | | COMPTE | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| | | MOYENNE | 66 | 15 | 5.5 | 2.7 | 2.7 | 3.7 | 2.3 | 0.56 | 0.17 | 0.09 | 0.035 | 0.02 | 1.0 | 99 |
| **Puits d'accès et ses galleries** | | | | | | | | | | | | | | | | |
| X19149AWB-1297.00-0122 | Rampe du puits d'accès | AGR | 65 | 15 | 5.5 | 3.4 | 2.4 | 4.0 | 2.2 | 0.55 | 0.14 | 0.07 | 0.03 | 0.01 | 1.6 | 100 |

Tableau D-3: Analyses minéralogiques par DRX

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Type | Code lithologique | Quartz $SiO_2$ | Microcline $KAlSi_3O_8$ | Chlorite $(Fe,(Mg,Mn)_5Al)(Si_3Al)O_{10}(OH)_8$ | Biotite $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | Muscovite $KAl_2(AlSi_3O_{10})(OH)_2$ | Calcite $CaCO_3$ | Pyrite $FeS_2$ | Magnetite $Fe_3O_4$ | Albite $NaAlSi_3O_8$ | Total - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | % | % | % | % | % | % | % | % | % | % |
| **Minerai AGR** | | | | | | | | | | | | |
| X19148W-2073.00-1036 | Minerai | AGR | 19 | 14 | 2.0 | 13 | 4.8 | 4.0 | 1.5 | 0.54 | 41 | 100 |
| **Minerai SGR** | | | | | | | | | | | | |
| X19149A-2009.70-2213 | Minerai | SGR | 27 | 13 | 1.9 | 8.1 | 3.8 | 5.2 | 1.7 | - | 39 | 100 |
| X19156-1768.60-1296 | Minerai | SGR | 11 | 5.2 | 3.8 | 32 | 3.9 | 17 | 1.9 | 0.59 | 25 | 100 |
| **Minerai SGR+** | | | | | | | | | | | | |
| X19150A-1450.65-1470 | Minerai | SGR+ | 14 | 17 | 1.6 | 5.6 | 2.6 | 4.4 | 2.5 | 0.54 | 51 | 100 |
| **Minerai SGR++** | | | | | | | | | | | | |
| Y155013EXT-1663.00-0736 | Minerai | SGR++ | 20 | 3.6 | 2.0 | 7.7 | 4.3 | 4.8 | 2.0 | 0.57 | 55 | 100 |
| **Dilution AGR** | | | | | | | | | | | | |
| X19153-1721.00-1226 | DILUTION | AGR | 30 | 2.0 | 2.5 | 11 | 5.4 | 1.6 | 0.43 | 0.075 | 47 | 100 |
| **Dilution SGR** | | | | | | | | | | | | |
| X19156-1803.00-1343 | DILUTION | SGR | 20 | 8.1 | 2.9 | 13 | 6.9 | 2.3 | 0.91 | 0.16 | 46 | 100 |
| **Stérile AGR** | | | | | | | | | | | | |
| X19136W-1478.00-0915 | DEVELOPMENT | AGR | 30 | 1.4 | 2.4 | 12 | 6.4 | 1.6 | 0.3 | 0.32 | 46 | 100 |
| Y165037EXT-1663.00-0009 | DEVELOPMENT | AGR | 28 | 3.1 | 1.5 | 14 | 0.76 | 0.65 | 0.33 | 0.31 | 51 | 100 |
| **Puits d'accès et ses galleries** | | | | | | | | | | | | |
| X19149AWB-1297.00-0122 | Rampe du puits d'accès | AGR | 28 | 4.9 | 3.0 | 13 | 4.1 | 0.4 | 0.27 | 0.52 | 46 | 100 |

Tableau D-4: Bilan acide-base (Phase 2)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Soufre (total, BV) | Soufre (total, SGS) | Acide lixiviable $SO_4^{-2}$ | Sulfure | Carbone (total, BV) | Carbone (total, SGS) | Carbone (graphite) | Carbonates | PN (Acisol) | PA | PN-$CO_3$ | $CO_3$ PNN (PN $CO_3$-PA) | PNN Acisol (PN Acisol-PA) | $CO_3$-RPN ($CO_3$ PN/PA) | RPN (PN Acisol/PA) | Potentiel de génération d'acide-critères MCM/MLCC | Potentiel de génération d'acide-MLCC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | $SO_4$ % | $S^{2-}$ % | % | % | % | $CO_3$ % | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | | |
| **Directive 019 [1]** | **0.04** | **0.04** | | | | | | | | | | **20** | **20** | **2.0** | **2.0** | | |
| **Minerai AGR** | | | | | | | | | | | | | | | | | |
| X19135W-1914.00-0986 | **0.76** | **0.63** | --- | --- | <0,50 | 0.4 | < 0,05 | --- | --- | 20 | 33 | **13** | --- | **1.7** | --- | PGA | --- |
| X19148W-2073.00-1036 | **1.8** | **1.6** | 0.25 | 1.4 | <0,50 | 0.4 | < 0,05 | 1.3 | 40 | 52 | 21 | **-31** | **-12** | **0.41** | **0.77** | PGA | PGA |
| X19152-1572.00-1382 | **0.65** | **0.68** | --- | --- | <0,50 | 0.16 | < 0,05 | --- | --- | 21 | 13 | **-8.2** | --- | **0.61** | --- | PGA | --- |
| X19152-1643.00-1475 | **0.47** | **0.46** | --- | --- | <0,50 | 0.41 | < 0,05 | --- | --- | 14 | 34 | 20 | --- | 2.4 | --- | Non-PGA | --- |
| X19152-1648.00-1481 | **0.93** | **0.97** | 0.04 | 0.94 | <0,50 | 0.22 | < 0,05 | 0.78 | 29 | 31 | 13 | **-18** | **-1.9** | **0.43** | **0.94** | PGA | PGA |
| X19154-1562.00-0866 | **0.8** | **0.75** | --- | --- | 0.83 | 0.81 | 0.07 | --- | --- | 23 | 67 | 44 | --- | 2.9 | --- | Non-PGA | --- |
| X19155-1665.00-0726 | **0.75** | **0.67** | --- | --- | <0,50 | 0.12 | < 0,05 | --- | --- | 21 | 9.9 | **-11** | --- | **0.47** | --- | PGA | --- |
| X19135-1832.70-1829 | **0.26** | **0.22** | --- | --- | <0,50 | 0.058 | < 0,05 | --- | --- | 7.0 | 4.8 | **-2.2** | --- | **0.69** | --- | PGA | --- |
| X19135W-1839.00-0895 | **0.77** | **0.76** | --- | --- | <0,50 | 0.35 | < 0,05 | --- | --- | 24 | 29 | **5.5** | --- | **1.2** | --- | PGA | --- |
| X19152W-1715.00-0597 | **0.54** | **0.52** | 0.07 | 0.42 | <0,50 | 0.16 | < 0,05 | 0.54 | 24 | 15 | 9.0 | **-6.3** | **8.3** | **0.59** | **1.5** | PGA | PGA |
| COMPTE | 10 | 10 | 3.0 | 3.0 | 9.0 | 10 | 10 | 3.0 | 3.0 | 10 | 10 | 10 | 3.0 | 10 | 3.0 | | |
| MINIMUM | 0.26 | 0.22 | 0.04 | 0.42 | < 0,5 | 0.058 | < 0,05 | 0.54 | 24 | 7.0 | 4.8 | -31 | -12 | 0.41 | 0.77 | | |
| MAXIMUM | 1.8 | 1.6 | 0.25 | 1.4 | 0.5 | 0.81 | 0.07 | 1.3 | 40 | 52 | 67 | 44 | 8.3 | 2.9 | 1.5 | | |
| MEDIANE | 0.76 | 0.68 | 0.07 | 0.94 | 0.5 | 0.29 | 0.05 | 0.78 | 29 | 21 | 17 | -4.2 | -1.9 | 0.65 | 0.94 | | |
| MOYENNE | 0.77 | 0.73 | 0.12 | 0.93 | 0.5 | 0.31 | 0.052 | 0.86 | 31 | 23 | 23 | 0.65 | -1.9 | 1.1 | 1.1 | | |
| ÉCART TYPE | 0.41 | 0.38 | 0.11 | 0.5 | 0 | 0.22 | 0.0063 | 0.37 | 8.4 | 12 | 19 | 21 | 10 | 0.9 | 0.41 | | |
| 25eme CENTILE | 0.57 | 0.55 | 0.055 | 0.68 | 0.5 | 0.16 | 0.05 | 0.66 | 26 | 16 | 11 | -10 | -7.0 | 0.5 | 0.85 | | |
| 75eme CENTILE | 0.79 | 0.76 | 0.16 | 1.2 | 0.5 | 0.4 | 0.05 | 1.0 | 34 | 24 | 32 | 11 | 3.2 | 1.6 | 1.2 | | |
| CUMULATIF | | | | | | | | | | 228 | 235 | 29 | -235 | 1.0 | 1.1 | PGA | PGA |
| **Minerai SGR** | | | | | | | | | | | | | | | | | |
| Y155016EXT-1882.50-I001 | **0.97** | **0.92** | 0.09 | 0.86 | <0,50 | 0.28 | < 0,05 | 0.95 | 31 | 30 | 16 | **-14** | **1.6** | **0.53** | **1.1** | PGA | PGA |
| Y165106EXT-1640.00-0489 | **1.0** | **1.0** | --- | --- | <0,50 | 0.28 | < 0,05 | --- | --- | 33 | 23 | **-9.6** | --- | **0.71** | --- | PGA | --- |
| Y155021EXTA-1800.00-0881 | **1.1** | **0.95** | --- | --- | <0,50 | 0.12 | < 0,05 | --- | --- | 30 | 10 | **-20** | --- | **0.34** | --- | PGA | --- |
| X19140-1560.15-1641 | **2.1** | **1.9** | --- | --- | <0,50 | 0.15 | < 0,05 | --- | --- | 58 | 12 | **-46** | --- | **0.21** | --- | PGA | --- |
| X19140-1631.00-1727 | **0.51** | **0.36** | --- | --- | 0.52 | 0.48 | < 0,05 | --- | --- | 11 | 40 | 29 | --- | 3.6 | --- | Non-PGA | --- |
| X19145WA-1854.00-0778 | **0.64** | **0.59** | --- | --- | <0,50 | 0.45 | 0.06 | --- | --- | 18 | 38 | **19** | --- | 2.0 | --- | PGA | --- |
| X19147AWA-1634.00-0376 | **1.3** | **1.3** | --- | --- | 0.55 | 0.51 | < 0,05 | --- | --- | 41 | 42 | **1.7** | --- | **1.0** | --- | PGA | --- |
| X19135W-1883.00-0947 | **0.87** | **0.89** | --- | --- | <0,50 | 0.19 | < 0,05 | --- | --- | 28 | 16 | **-12** | --- | **0.58** | --- | PGA | --- |
| X19136W-1730.50-1236 | **0.41** | **0.38** | --- | --- | 0.66 | 0.61 | < 0,05 | --- | --- | 12 | 51 | 39 | --- | 4.3 | --- | Non-PGA | --- |
| X19141AW-1670.85-0796 | **0.75** | **0.66** | --- | --- | 0.53 | 0.5 | < 0,05 | --- | --- | 21 | 42 | 21 | --- | 2.0 | --- | Non-PGA | --- |
| X19149A-2009.70-2213 | **2.5** | **2.2** | 0.06 | 2.1 | 0.54 | 0.51 | < 0,05 | 1.7 | 47 | 69 | 28 | **-41** | **-22** | **0.4** | **0.68** | PGA | PGA |
| X19156-1768.60-1296 | **1.5** | **1.5** | 0.33 | 1.3 | 2.1 | 1.8 | 0.14 | 8.0 | 154 | 50 | 133 | 83 | 104 | 2.7 | 3.1 | Non-PGA | Non-PGA |
| COMPTE | 12 | 12 | 3.0 | 3.0 | 6.0 | 12 | 12 | 3.0 | 3.0 | 12 | 12 | 12 | 3.0 | 12 | 3.0 | | |
| MINIMUM | 0.41 | 0.36 | 0.06 | 0.86 | < 0,5 | 0.12 | < 0,05 | 0.95 | 31 | 11 | 10 | -46 | -22 | 0.21 | 0.68 | | |
| MAXIMUM | 2.5 | 2.2 | 0.33 | 2.1 | 0.5 | 1.8 | 0.14 | 8.0 | 154 | 69 | 133 | 83 | 104 | 4.3 | 3.1 | | |
| MEDIANE | 0.99 | 0.94 | 0.09 | 1.3 | 0.5 | 0.46 | 0.05 | 1.7 | 47 | 30 | 33 | -3.9 | 1.6 | 0.87 | 1.1 | | |
| MOYENNE | 1.1 | 1.1 | 0.16 | 1.4 | 0.5 | 0.49 | 0.058 | 3.5 | 77 | 33 | 37 | 4.2 | 28 | 1.5 | 1.6 | | |
| ÉCART TYPE | 0.63 | 0.58 | 0.15 | 0.65 | 0 | 0.45 | 0.026 | 3.9 | 67 | 18 | 33 | 36 | 67 | 1.4 | 1.3 | | |
| 25eme CENTILE | 0.72 | 0.64 | 0.075 | 1.1 | 0.5 | 0.25 | 0.05 | 1.3 | 39 | 20 | 16 | -15 | -10 | 0.5 | 0.87 | | |
| 75eme CENTILE | 1.4 | 1.4 | 0.21 | 1.7 | 0.5 | 0.51 | 0.05 | 4.8 | 100 | 43 | 42 | 23 | 53 | 2.2 | 2.1 | | |
| CUMULATIF | | | | | | | | | | 399 | 450 | 93 | -450 | 1.1 | 1.2 | PGA | PGA |
| **Minerai SGR+** | | | | | | | | | | | | | | | | | |
| X19142-1559.00-1528 | **2.2** | **3.5** | --- | --- | <0,50 | 0.66 | < 0,05 | --- | --- | 109 | 55 | **-54** | --- | **0.5** | --- | PGA | --- |
| X19141AW-1622.15-0730 | **1.5** | **1.4** | --- | --- | <0,50 | 0.28 | < 0,05 | --- | --- | 45 | 23 | **-22** | --- | **0.52** | --- | PGA | --- |
| X19143-1454.00-1452 | **1.3** | **1.2** | 0.16 | 1.1 | 0.51 | 0.48 | < 0,05 | 1.7 | 47 | 38 | 28 | **-10** | **8.8** | **0.73** | **1.2** | PGA | PGA |
| X19150A-1450.65-1470 | **3.2** | **2.9** | < 0.04 | 2.9 | 0.68 | 0.63 | 0.06 | 2.0 | 53 | 90 | 33 | **-56** | **-36** | **0.37** | **0.59** | PGA | PGA |
| X19145WA-1901.00-0836 | **2.3** | **2.2** | 0.23 | 2.1 | <0,50 | 0.39 | < 0,05 | 1.2 | 38 | 72 | 20 | **-52** | **-34** | **0.27** | **0.52** | PGA | PGA |
| X19152W-1596.10-0327 | **1.9** | **1.6** | --- | --- | <0,50 | 0.37 | < 0,05 | --- | --- | 51 | 31 | **-20** | --- | **0.6** | --- | PGA | --- |
| X19152W-1601.30-0332 | **0.71** | **0.59** | --- | --- | <0,50 | 0.45 | < 0,05 | --- | --- | 18 | 37 | **19** | --- | 2.0 | --- | PGA | --- |
| X19149A-2030.30-2239 | **2.4** | **2.4** | --- | --- | 0.78 | 0.74 | < 0,05 | --- | --- | 75 | 62 | **-14** | --- | **0.82** | --- | PGA | --- |
| X19136W-1692.40-1182 | **1.1** | **1.1** | --- | --- | <0,50 | 0.42 | < 0,05 | --- | --- | 33 | 35 | **1.6** | --- | **1.0** | --- | PGA | --- |
| X19139WA-1778.85-0693 | **0.72** | **0.72** | --- | --- | 0.56 | 0.52 | < 0,05 | --- | --- | 22 | 44 | 21 | --- | **1.9** | --- | PGA | --- |
| COMPTE | 10 | 10 | 3.0 | 3.0 | 6.0 | 10 | 10 | 3.0 | 3.0 | 10 | 10 | 10 | 3.0 | 10 | 3.0 | | |
| MINIMUM | 0.71 | 0.59 | < 0.04 | 1.1 | < 0,5 | 0.28 | < 0,05 | 1.2 | 38 | 18 | 20 | -56 | -36 | 0.27 | 0.52 | | |
| MAXIMUM | 3.2 | 3.5 | 0.23 | 2.9 | 0.5 | 0.74 | 0.06 | 2.0 | 53 | 109 | 62 | 21 | 8.8 | 2.0 | 1.2 | | |
| MEDIANE | 1.7 | 1.5 | 0.16 | 2.1 | 0.5 | 0.46 | 0.05 | 1.7 | 47 | 48 | 34 | -17 | -34 | 0.67 | 0.59 | | |
| MOYENNE | 1.7 | 1.8 | 0.14 | 2.0 | 0.5 | 0.49 | 0.051 | 1.6 | 46 | 55 | 37 | -19 | -21 | 0.88 | 0.78 | | |
| ECART TYPE | 0.81 | 0.97 | 0.096 | 0.91 | 0 | 0.14 | 0.0032 | 0.41 | 7.9 | 30 | 13 | 28 | 25 | 0.62 | 0.39 | | |
| 25eme CENTILE | 1.2 | 1.1 | 0.1 | 1.6 | 0.5 | 0.39 | 0.05 | 1.4 | 42 | 35 | 28 | -45 | -35 | 0.51 | 0.56 | | |
| 75eme CENTILE | 2.3 | 2.4 | 0.2 | 2.5 | 0.5 | 0.6 | 0.05 | 1.8 | 50 | 74 | 42 | -1.4 | -13 | 0.99 | 0.91 | | |
| CUMULATIF | | | | | | | | | | 553 | 366 | -143 | -366 | 0.66 | 0.74 | PGA | PGA |
| **Minerai SGR++** | | | | | | | | | | | | | | | | | |
| Y155013EXT-1663.00-0736 | **2.1** | **2.6** | 0.14 | 2.5 | 0.7 | 0.64 | 0.06 | 2.3 | 57 | 82 | 38 | **-44** | **-25** | **0.47** | **0.69** | PGA | PGA |
| X19152W-1592.75-0322 | **2.0** | **1.8** | --- | --- | <0,50 | 0.23 | < 0,05 | --- | --- | 55 | 19 | **-36** | --- | **0.35** | --- | PGA | --- |
| X19155-1653.20-0711 | **1.4** | **1.3** | --- | --- | <0,50 | 0.39 | < 0,05 | --- | --- | 39 | 32 | **-7.2** | --- | **0.82** | --- | PGA | --- |
| X18108AC-1277.00-0058 | **2.0** | **2.3** | --- | --- | 0.62 | 0.59 | < 0,05 | --- | --- | 73 | 49 | **-24** | --- | **0.67** | --- | PGA | --- |
| X19157-1723.60-0551 | **2.1** | **2.0** | --- | --- | 0.58 | 0.55 | 0.05 | --- | --- | 64 | 46 | **-18** | --- | **0.72** | --- | PGA | --- |
| X19143-1451.25-1448 | **3.2** | **3.3** | --- | --- | 0.84 | 0.8 | 0.06 | --- | --- | 102 | 67 | **-35** | --- | **0.66** | --- | PGA | --- |
| COMPTE | 6.0 | 6.0 | 1.0 | 1.0 | 2.0 | 6.0 | 6.0 | 1.0 | 1.0 | 6.0 | 6.0 | 6.0 | 1.0 | 6.0 | 1.0 | | |
| MINIMUM | 1.4 | 1.3 | NC | NC | < 0,5 | 0.23 | < 0,05 | NC | NC | 39 | 19 | -44 | NC | 0.35 | NC | | |
| MAXIMUM | 3.2 | 3.3 | NC | NC | 0.5 | 0.8 | 0.06 | NC | NC | 102 | 67 | -7.2 | NC | 0.82 | NC | | |
| MEDIANE | 2.1 | 2.2 | NC | NC | 0.5 | 0.57 | 0.05 | NC | NC | 68 | 42 | -29 | NC | 0.66 | NC | | |
| MOYENNE | 2.1 | 2.2 | NC | NC | 0.5 | 0.53 | 0.053 | NC | NC | 69 | 42 | -27 | NC | 0.61 | NC | | |
| ÉCART TYPE | 0.59 | 0.69 | NC | NC | NC | 0.2 | 0.0052 | NC | NC | 22 | 16 | 13 | NC | 0.17 | NC | | |
| 25eme CENTILE | 2.0 | 1.8 | NC | NC | NC | 0.43 | 0.05 | NC | NC | 57 | 34 | -35 | NC | 0.51 | NC | | |
| 75eme CENTILE | 2.1 | 2.5 | NC | NC | NC | 0.63 | 0.058 | NC | NC | 79 | 48 | -19 | NC | 0.71 | NC | | |
| CUMULATIF | | | | | | | | | | 414 | 251 | -147 | -251 | 0.61 | 0.64 | PGA | PGA |

Tableau D-4: Bilan acide-base (Phase 2)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Soufre (total, BV) | Soufre (total, SGS) | Acide lixiviable $SO_4^{2-}$ | Sulfure | Carbone (total, BV) | Carbone (total, SGS) | Carbone (graphite) | Carbonates | PN (Acisol) | PA | PN-$CO_3$ | $CO_3$ PNN (PN $CO_3$-PA) | PNN Acisol (PN Acisol-PA) | $CO_3$-RPN ($CO_3$ PN/PA) | RPN (PN Acisol/PA) | Potentiel de génération d'acide-critères MCM/MLCC | Potentiel de génération d'acide-MLCC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | % | % | $SO_4$ % | $S^{2-}$ % | % | % | % | $CO_3$ % | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | kg $CaCO_3$/t | | |
| **Directive 019 [1]** | **0.04** | **0.04** | | | | | | | | | | **20** | **20** | **2.0** | **2.0** | | |
| **Dilution AGR** | | | | | | | | | | | | | | | | | |
| X19135W-1854.00-0912 | **0.35** | **0.35** | --- | --- | <0,50 | 0.32 | < 0,05 | --- | --- | 11 | 26 | **15** | --- | 2.4 | --- | PGA | --- |
| X19135W-1917.00-0989 | **0.41** | **0.37** | --- | --- | <0,50 | 0.25 | < 0,05 | --- | --- | 11 | 21 | **9.7** | --- | **1.9** | --- | PGA | --- |
| X19153-1721.00-1226 | **0.47** | **0.46** | 0.1 | 0.36 | <0,50 | 0.14 | < 0,05 | 0.49 | 21 | 14 | 8.1 | **-6.1** | **7.2** | **0.57** | **1.5** | PGA | PGA |
| X19152W-1708.00-0590 | **0.55** | **0.5** | 0.12 | 0.41 | <0,50 | 0.33 | < 0,05 | 1.2 | 132 | 17 | 20 | **3.7** | 116 | **1.2** | 8.0 | PGA | Non-PGA |
| X19156-1745.00-1266 | **0.24** | **0.18** | --- | --- | <0,50 | 0.075 | < 0,05 | --- | --- | 5.5 | 6.3 | **0.72** | --- | **1.1** | --- | PGA | --- |
| X19154-1588.00-0896 | **0.25** | **0.2** | --- | --- | <0,50 | 0.061 | < 0,05 | --- | --- | 6.1 | 5.1 | **-1.0** | --- | **0.83** | --- | PGA | --- |
| COMPTE | 6.0 | 6.0 | 2.0 | 2.0 | 6.0 | 6.0 | 6.0 | 2.0 | 2.0 | 6.0 | 6.0 | 6.0 | 2.0 | 6.0 | 2.0 | | |
| MINIMUM | 0.24 | 0.18 | 0.1 | 0.36 | < 0,5 | 0.061 | < 0,05 | 0.49 | 21 | 5.5 | 5.1 | -6.1 | 7.2 | 0.57 | 1.5 | | |
| MAXIMUM | 0.55 | 0.5 | 0.12 | 0.41 | 0.5 | 0.33 | 0.05 | 1.2 | 132 | 17 | 26 | 15 | 116 | 2.4 | 8.0 | | |
| MEDIANE | 0.38 | 0.36 | 0.11 | 0.39 | 0.5 | 0.19 | 0.05 | 0.85 | 77 | 11 | 14 | 2.2 | 61 | 1.2 | 4.8 | | |
| MOYENNE | 0.38 | 0.34 | 0.11 | 0.39 | 0.5 | 0.2 | 0.05 | 0.85 | 77 | 11 | 15 | 3.7 | 61 | 1.3 | 4.8 | | |
| ÉCART TYPE | 0.12 | 0.13 | NC | NC | 0 | 0.12 | 7.6E-18 | NC | NC | 4.3 | 9.1 | 7.7 | NC | 0.67 | NC | | |
| 25eme CENTILE | 0.28 | 0.24 | NC | NC | 0.5 | 0.09 | 0.05 | NC | NC | 7.3 | 6.7 | -0.6 | NC | 0.9 | NC | | |
| 75eme CENTILE | 0.46 | 0.43 | NC | NC | 0.5 | 0.3 | 0.05 | NC | NC | 14 | 21 | 8.2 | NC | 1.7 | NC | | |
| CUMULATIF | | | | | | | | | | 65 | 87 | 33 | -87 | 1.3 | 1.5 | PGA | PGA |
| **Dilution SGR** | | | | | | | | | | | | | | | | | |
| X19147A-1603.00-1593 | **0.39** | **0.34** | --- | --- | <0,50 | 0.28 | < 0,05 | --- | --- | 11 | 23 | **13** | --- | 2.2 | --- | PGA | --- |
| X19149A-1999.00-2201 | **0.62** | **0.54** | 0.1 | 0.44 | <0,50 | 0.43 | < 0,05 | 1.6 | 42 | 17 | 27 | **10** | 25 | **1.6** | 2.5 | PGA | Non-PGA |
| X19156-1797.00-1336 | **0.33** | **0.39** | --- | --- | <0,50 | 0.42 | 0.06 | --- | --- | 12 | 35 | 23 | --- | 2.9 | --- | Non-PGA | --- |
| X19156-1803.00-1343 | **0.88** | **0.82** | 0.06 | 0.77 | <0,50 | 0.28 | 0.05 | 0.97 | 31 | 26 | 16 | **-9.8** | **4.9** | **0.62** | **1.2** | PGA | PGA |
| X18127A-1428.00-0654 | **0.37** | **0.47** | --- | --- | 0.56 | 0.47 | < 0,05 | --- | --- | 15 | 39 | 25 | --- | 2.7 | --- | Non-PGA | --- |
| Y165037EXT-1717.00-0076 | **0.46** | **0.4** | --- | --- | <0,50 | 0.34 | < 0,05 | --- | --- | 12 | 28 | **16** | --- | 2.3 | --- | PGA | --- |
| COMPTE | 6.0 | 6.0 | 2.0 | 2.0 | 5.0 | 6.0 | 6.0 | 2.0 | 2.0 | 6.0 | 6.0 | 6.0 | 2.0 | 6.0 | 2.0 | | |
| MINIMUM | 0.33 | 0.34 | 0.06 | 0.44 | < 0,5 | 0.28 | < 0,05 | 0.97 | 31 | 11 | 16 | -9.8 | 4.9 | 0.62 | 1.2 | | |
| MAXIMUM | 0.88 | 0.82 | 0.1 | 0.77 | 0.5 | 0.47 | 0.06 | 1.6 | 42 | 26 | 39 | 25 | 25 | 2.9 | 2.5 | | |
| MEDIANE | 0.43 | 0.43 | 0.08 | 0.61 | 0.5 | 0.38 | 0.05 | 1.3 | 36 | 14 | 27 | 14 | 15 | 2.2 | 1.8 | | |
| MOYENNE | 0.51 | 0.49 | 0.08 | 0.61 | 0.5 | 0.37 | 0.052 | 1.3 | 36 | 15 | 28 | 13 | 15 | 2.0 | 1.8 | | |
| ÉCART TYPE | 0.21 | 0.17 | NC | NC | 0 | 0.081 | 0.0041 | NC | NC | 5.6 | 8.2 | 12 | NC | 0.83 | NC | | |
| 25eme CENTILE | 0.38 | 0.39 | NC | NC | 0.5 | 0.3 | 0.05 | NC | NC | 12 | 24 | 11 | NC | 1.8 | NC | | |
| 75eme CENTILE | 0.58 | 0.52 | NC | NC | 0.5 | 0.42 | 0.05 | NC | NC | 16 | 33 | 21 | NC | 2.6 | NC | | |
| CUMULATIF | | | | | | | | | | 93 | 169 | 92 | -169 | 1.8 | 2.0 | PGA | PGA |
| **Stérile AGR** | | | | | | | | | | | | | | | | | |
| X18108AWC-1087.20-0196 | **0.29** | **0.28** | --- | --- | <0,50 | 0.24 | < 0,05 | --- | --- | 8.8 | 20 | **11** | --- | 2.2 | --- | PGA | --- |
| X18121-1231.00-1009 | **0.35** | **0.33** | 0.15 | 0.16 | <0,50 | 0.16 | < 0,05 | 0.57 | 24 | 9.6 | 9.5 | **-0.053** | **14** | **0.99** | 2.5 | PGA | PGA |
| Y155016EXT-1758.00-0804 | **0.25** | **0.24** | --- | --- | <0,50 | 0.068 | < 0,05 | --- | --- | 7.4 | 5.7 | **-1.7** | --- | **0.77** | --- | PGA | --- |
| X18127A-1122.00-0299 | **0.3** | **0.33** | --- | --- | <0,50 | 0.02 | < 0,05 | --- | --- | 10 | 1.7 | **-8.5** | --- | **0.16** | --- | PGA | --- |
| X18131-0777.00-0578 | **0.24** | **0.26** | --- | --- | <0,50 | 0.11 | < 0,05 | --- | --- | 8.0 | 9.2 | **1.2** | --- | **1.1** | --- | PGA | --- |
| X19135-1719.00-1698 | **0.35** | **0.36** | --- | --- | <0,50 | 0.1 | < 0,05 | --- | --- | 11 | 8.7 | **-2.6** | --- | **0.77** | --- | PGA | --- |
| Y155021EXTA-1724.00-0795 | **0.25** | **0.21** | 0.1 | 0.12 | <0,50 | 0.04 | < 0,05 | 0.12 | 14 | 6.9 | 1.9 | **-5.0** | **6.9** | **0.28** | 2.0 | PGA | PGA |
| X19139-1738.00-1882 | **0.21** | **0.18** | --- | --- | <0,50 | 0.022 | < 0,05 | --- | --- | 5.5 | 1.8 | **-3.7** | --- | **0.33** | --- | PGA | --- |
| X19140-1518.00-1591 | **0.26** | **0.23** | --- | --- | <0,50 | 0.082 | < 0,05 | --- | --- | 7.2 | 6.8 | **-0.35** | --- | **0.95** | --- | PGA | --- |
| X19136W-1478.00-0915 | **0.28** | **0.27** | 0.08 | 0.16 | <0,50 | 0.1 | < 0,05 | 0.39 | 18 | 7.4 | 6.4 | **-1.0** | **10** | **0.86** | 2.4 | PGA | PGA |
| X19141AW-1557.75-0646 | **0.11** | **0.089** | --- | --- | 1.4 | 1.3 | 0.1 | --- | --- | 2.8 | 112 | 109 | --- | 40 | --- | Non-PGA | --- |
| X19143-1265.10-1226 | **0.25** | **0.22** | --- | --- | <0,50 | 0.45 | 0.06 | --- | --- | 6.8 | 37 | 30 | --- | 5.5 | --- | Non-PGA | --- |
| X19145-1736.00-1992 | **0.23** | **0.21** | --- | --- | <0,50 | 0.062 | < 0,05 | --- | --- | 6.4 | 5.2 | **-1.2** | --- | **0.81** | --- | PGA | --- |
| X19147A-1466.00-1437 | **0.52** | **0.27** | --- | --- | <0,50 | 0.012 | < 0,05 | --- | --- | 8.3 | 1.0 | **-7.3** | --- | **0.12** | --- | PGA | --- |
| X19149A-1906.00-2084 | **0.5** | **0.45** | --- | --- | <0,50 | 0.37 | < 0,05 | --- | --- | 14 | 31 | **17** | --- | 2.2 | --- | PGA | --- |
| X19150A-1326.00-1330 | **0.36** | **0.34** | --- | --- | <0,50 | 0.12 | < 0,05 | --- | --- | 11 | 9.6 | **-1.1** | --- | **0.9** | --- | PGA | --- |
| X19145WA-1677.00-0575 | **0.26** | **0.39** | --- | --- | <0,50 | 0.13 | < 0,05 | --- | --- | 12 | 11 | **-1.2** | --- | **0.9** | --- | PGA | --- |
| X19148W-1824.00-0744 | **0.51** | **0.42** | --- | --- | <0,50 | 0.036 | < 0,05 | --- | --- | 13 | 3.0 | **-10** | --- | **0.23** | --- | PGA | --- |
| X19151-1671.00-1628 | **0.2** | **0.15** | --- | --- | <0,50 | 0.014 | < 0,05 | --- | --- | 4.8 | 1.2 | **-3.6** | --- | **0.24** | --- | PGA | --- |
| X19149AWB-1844.00-0656 | **0.26** | **0.25** | 0.11 | 0.14 | <0,50 | 0.032 | < 0,05 | 0.07 | 14 | 7.8 | 1.2 | **-6.7** | **5.9** | **0.15** | **1.7** | PGA | PGA |
| Y165037EXT-1663.00-0009 | **0.4** | **0.37** | 0.2 | 0.19 | <0,50 | 0.04 | < 0,05 | 0.09 | 14 | 12 | 1.5 | **-11** | **1.6** | **0.12** | **1.1** | PGA | PGA |
| X18121-1189.00-0961 | **---** | **0.22** | --- | --- | --- | 0.037 | < 0,05 | --- | --- | 6.8 | 3.1 | **-3.8** | --- | **0.45** | --- | PGA | --- |
| COMPTE | 21 | 22 | 5.0 | 5.0 | 20 | 22 | 22 | 5.0 | 5.0 | 22 | 22 | 22 | 5.0 | 22 | 5.0 | | |
| MINIMUM | 0.11 | 0.089 | 0.08 | 0.12 | < 0,5 | 0.012 | < 0,05 | 0.07 | 14 | 2.8 | 1.0 | -11 | 1.6 | 0.12 | 1.1 | | |
| MAXIMUM | 0.52 | 0.45 | 0.2 | 0.19 | 0.5 | 1.3 | 0.1 | 0.57 | 24 | 14 | 112 | 109 | 14 | 40 | 2.5 | | |
| MEDIANE | 0.26 | 0.26 | 0.11 | 0.16 | 0.5 | 0.075 | 0.05 | 0.12 | 14 | 7.9 | 6.0 | -1.5 | 6.9 | 0.79 | 2.0 | | |
| MOYENNE | 0.3 | 0.27 | 0.13 | 0.15 | 0.5 | 0.16 | 0.053 | 0.25 | 17 | 8.6 | 13 | 4.5 | 7.7 | 0.96[2] | 1.9 | | |
| ECART TYPE | 0.11 | 0.089 | 0.048 | 0.026 | 0 | 0.29 | 0.011 | 0.22 | 4.3 | 2.8 | 24 | 25 | 4.7 | 8.4 | 0.54 | | |
| 25eme CENTILE | 0.25 | 0.22 | 0.1 | 0.14 | 0.5 | 0.036 | 0.05 | 0.09 | 14 | 6.9 | 1.9 | -4.7 | 5.9 | 0.25 | 1.7 | | |
| 75eme CENTILE | 0.35 | 0.34 | 0.15 | 0.16 | 0.5 | 0.13 | 0.05 | 0.39 | 18 | 11 | 9.6 | -0.13 | 10 | 0.98 | 2.4 | | |
| CUMULATIF | | | | | | | | | | 185[2] | 176[2] | 113 | -176 | 0.95 | 1.6 | PGA | PGA |
| **Puits d'accès** | | | | | | | | | | | | | | | | | |
| X19140-0708.00-0706 | **---** | **0.4** | --- | --- | --- | 0.013 | < 0,05 | --- | --- | 13 | 1.1 | **-11** | --- | **0.086** | --- | PGA | --- |
| X19139-0887.00-0918 | **---** | **0.23** | --- | --- | --- | 0.047 | < 0,05 | --- | --- | 7.0 | 3.9 | **-3.1** | --- | **0.56** | --- | PGA | --- |
| X19157-0933.00-0984 | **---** | **0.23** | --- | --- | --- | 0.013 | < 0,05 | --- | --- | 7.3 | 1.1 | **-6.2** | --- | **0.15** | --- | PGA | --- |
| X18127W-0773.00-0369 | **---** | **0.18** | --- | --- | --- | 0.092 | < 0,05 | --- | --- | 5.7 | 7.7 | **1.9** | --- | **1.3** | --- | PGA | --- |
| X19159-1392.00-1329 | **---** | **0.17** | --- | --- | --- | 0.006 | < 0,05 | --- | --- | 5.4 | 0.5 | **-4.9** | --- | **0.093** | --- | PGA | --- |
| X19148W-1752.00-0664 | **---** | **0.15** | --- | --- | --- | 0.02 | < 0,05 | --- | --- | 4.6 | 1.7 | **-3.0** | --- | **0.36** | --- | PGA | --- |
| X19148-1583.00-1092 | **0.2** | **0.15** | --- | --- | <0,50 | 0.017 | < 0,05 | --- | --- | 4.6 | 1.4 | **-3.2** | --- | **0.31** | --- | PGA | --- |
| X19149AWB-1297.00-0122 | **0.33** | **0.3** | 0.1 | 0.2 | <0,50 | 0.039 | < 0,05 | 0.1 | 15 | 9.3 | 1.7 | **-7.6** | **5.8** | **0.18** | **1.6** | PGA | PGA |
| COMPTE | 2.0 | 8.0 | 1.0 | 1.0 | 2.0 | 8.0 | 8.0 | 1.0 | 1.0 | 8.0 | 8.0 | 8.0 | 1.0 | 8.0 | 1.0 | | |
| MINIMUM | 0.2 | 0.15 | NC | NC | < 0,5 | 0.006 | < 0,05 | NC | NC | 4.6 | 0.5 | -11 | NC | 0.086 | NC | | |
| MAXIMUM | 2.0 | 8.0 | NC | NC | 2.0 | 8.0 | 8.0 | NC | NC | 8.0 | 8.0 | 8.0 | NC | 8.0 | NC | | |
| MEDIANE | 0.27 | 0.2 | NC | NC | 0.5 | 0.019 | 0.05 | NC | NC | 6.4 | 1.5 | -4.0 | NC | 0.24 | NC | | |
| MOYENNE | 0.27 | 0.23 | NC | NC | 0.5 | 0.031 | 0.05 | NC | NC | 7.1 | 2.4 | -4.7 | NC | 0.38 | NC | | |
| ECART TYPE | NC | 0.088 | NC | NC | NC | 0.028 | 0.0 | NC | NC | 2.7 | 2.4 | 3.9 | NC | 0.42 | NC | | |
| 25eme CENTILE | NC | 0.17 | NC | NC | NC | 0.013 | 0.05 | NC | NC | 5.2 | 1.1 | -6.6 | NC | 0.13 | NC | | |
| 75eme CENTILE | NC | 0.25 | NC | NC | NC | 0.041 | 0.05 | NC | NC | 7.8 | 2.2 | -3.1 | NC | 0.41 | NC | | |
| CUMULATIF | | | | | | | | | | 18 | 4.8 | -12 | -4.8 | 0.26 | 0.34 | PGA | PGA |

Note
NC - Statistique non calculée

[1]Critères proviennent de la directive 019

[2] échantillons X19141AW-1557.75-0646 sont exlus des calculs des statistiques.

Tableau D-5: Métaux extractibles (MA 200)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | F | Br | Hg | Ag | Al | As | Ba | B | Be | Bi | Cd | Ca | Cr | Co | Cu | Fe | Li | K | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Te | Th | Ti | Tl | U | V | W | Y | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | % | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| **Critère de sols PPSRTC-A (Province du Supérieur) du MELCC 2019** | | | **0.3** | **0.5** | | **5.0** | **240** | | | | **0.9** | | **100** | **30** | **65** | | | | | **1000** | **8.0** | | **50** | | **40** | | **3.0** | | **5.0** | | | | | | | | | | **150** |
| **Critère de sols B du MELCC 2019** | 400 | 50 | 2.0 | 20 | | 30 | 500 | | | | 5.0 | | 250 | 50 | 100 | | | | | 1000 | 10 | | 100 | | 500 | | 3.0 | | 50 | | | | | | | | | | 500 |
| **Critère de sols C du MELCC 2019** | 2000 | 300 | 10 | 40 | | 50 | 2000 | | | | 20 | | 800 | 300 | 500 | | | | | 2200 | 40 | | 500 | | 1000 | | 10 | | 300 | | | | | | | | | | 1500 |
| **Minerai AGR** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19135-1850.00-1850 | --- | --- | <0,010 | **2.0** | 25000 | <2,0 | 87 | <2,0 | 0.18 | <2,0 | <0,10 | 3000 | **190** | 26 | 60 | 46000 | 30 | 22000 | 19000 | 630 | 5.0 | 340 | **96** | --- | 3.2 | <0,10 | 1.2 | 2400 | <1,0 | 10 | --- | 5.8 | 3000 | 0.69 | <2,0 | 130 | 3.1 | --- | 86 |
| X19135W-1857.00-0916 | --- | --- | <0,010 | <0,50 | 24000 | <2,0 | 220 | 2.0 | 0.34 | <2,0 | <0,10 | 12000 | **160** | 21 | 43 | 43000 | 25 | 19000 | 20000 | 570 | 2.2 | 490 | **76** | --- | 4.8 | <0,10 | <0,50 | 2700 | <1,0 | 33 | --- | 7.8 | 2700 | 0.5 | <2,0 | 110 | 3.0 | --- | 82 |
| X19135W-1860.00-0919 | --- | --- | <0,010 | <0,50 | 18000 | <2,0 | 190 | <2,0 | 0.44 | <2,0 | <0,10 | 17000 | **150** | 19 | 46 | 38000 | 22 | 15000 | 16000 | 670 | 4.8 | 550 | **63** | --- | 5.0 | <0,10 | <0,50 | 2400 | <1,0 | 68 | --- | 8.7 | 2400 | 0.37 | 2.6 | 91 | 6.0 | --- | 71 |
| X19135W-1863.00-0923 | --- | --- | <0,010 | **0.51** | 16000 | <2,0 | 140 | <2,0 | 0.92 | <2,0 | <0,10 | 16000 | **130** | 20 | **78** | 36000 | 17 | 8200 | 16000 | 540 | 1.8 | 490 | **71** | --- | 3.4 | <0,10 | <0,50 | 1900 | <1,0 | 59 | --- | 6.9 | 1700 | 0.18 | <2,0 | 76 | 9.1 | --- | 69 |
| X19135W-1901.20-0970 | --- | --- | <0,010 | **1.1** | 20000 | <2,0 | 58 | <2,0 | 1.3 | <2,0 | <0,10 | 18000 | **130** | 14 | 43 | 31000 | 18 | 19000 | 26000 | 580 | 3.4 | 310 | **62** | --- | 5.6 | <0,10 | <0,50 | 1700 | <1,0 | 89 | --- | 8.0 | 1900 | 0.46 | <2,0 | 71 | 7.1 | --- | 64 |
| X19135W-1903.00-0972 | --- | --- | <0,010 | **2.3** | 15000 | <2,0 | 52 | <2,0 | 0.66 | <2,0 | <0,10 | 12000 | **150** | 15 | 56 | 33000 | 14 | 14000 | 19000 | 510 | 3.1 | 390 | **63** | --- | 6.1 | <0,10 | <0,50 | 1500 | <1,0 | 55 | --- | 5.8 | 1700 | 0.35 | <2,0 | 82 | 17 | --- | 64 |
| X19135W-1906.00-0975 | --- | --- | <0,010 | **1.4** | 20000 | <2,0 | 92 | <2,0 | 0.49 | <2,0 | <0,10 | 8200 | **170** | 20 | 55 | 41000 | 20 | 19000 | 22000 | 590 | 1.8 | 540 | **87** | --- | 4.8 | <0,10 | <0,50 | 2000 | <1,0 | 32 | --- | 6.3 | 2300 | 0.51 | <2,0 | 150 | 9.4 | --- | 85 |
| X19135W-1909.00-0978 | --- | --- | <0,010 | **1.4** | 15000 | <2,0 | 110 | <2,0 | 0.49 | <2,0 | <0,10 | 16000 | **180** | 18 | 47 | 39000 | 14 | 14000 | 17000 | 670 | 3.1 | 520 | **69** | --- | 8.9 | <0,10 | <0,50 | 2000 | <1,0 | 82 | --- | 7.9 | 1900 | 0.33 | 2.2 | 76 | 19 | --- | 63 |
| X19135W-1914.00-0986 | < 1 | < 1,5 | <0,010 | **0.59** | 21000 | <2,0 | **270** | <2,0 | 0.64 | <2,0 | <0,10 | 14000 | **180** | 17 | 38 | 40000 | 20 | 19000 | 21000 | 730 | 0.72 | 650 | **73** | --- | 4.7 | <0,10 | <0,50 | 2500 | <1,0 | 48 | --- | 5.9 | 2400 | 0.36 | <2,0 | 97 | 14 | --- | 80 |
| Y155016WB-1889.00-0464 | --- | --- | <0,010 | **0.64** | 17000 | <2,0 | 95 | <2,0 | 0.45 | <2,0 | <0,10 | 10000 | **180** | 22 | 22 | 40000 | 24 | 15000 | 20000 | 600 | 1.3 | 450 | **87** | --- | 3.8 | <0,10 | <0,50 | 1900 | <1,0 | 32 | --- | 6.3 | 2200 | 0.41 | <2,0 | 86 | 5.2 | --- | 67 |
| X19139-1769.15-1918 | --- | --- | <0,010 | **1.7** | 21000 | <2,0 | **360** | <2,0 | 0.53 | <2,0 | <0,10 | 9200 | **180** | 24 | **81** | 40000 | 19 | 16000 | 18000 | 500 | 2.2 | 500 | **73** | --- | 10 | <0,10 | <0,50 | 2600 | <1,0 | 40 | --- | 5.0 | 1900 | 0.37 | <2,0 | 170 | 17 | --- | 78 |
| X19142-1510.00-1471 | --- | --- | <0,010 | <0,50 | 21000 | <2,0 | 200 | <2,0 | 0.25 | <2,0 | <0,10 | 2000 | **110** | 17 | 40 | 36000 | 19 | 15000 | 20000 | 430 | 1.4 | 330 | **76** | --- | 3.3 | <0,10 | <0,50 | 3300 | <1,0 | 8.4 | --- | 6.0 | 1500 | 0.43 | <2,0 | 75 | <1,0 | --- | 73 |
| X19145-1887.00-2165 | --- | --- | <0,010 | **0.65** | 25000 | <2,0 | 120 | <2,0 | 0.17 | <2,0 | <0,10 | 6500 | **110** | 18 | 46 | 33000 | 36 | 21000 | 21000 | 530 | 2.0 | 520 | **58** | --- | 5.3 | <0,10 | <0,50 | 3100 | <1,0 | 30 | --- | 12 | 2300 | 0.6 | 2.3 | 67 | 3.3 | --- | 62 |
| X19147A-1582.00-1569 | --- | --- | <0,010 | **1.1** | 19000 | 3.2 | 140 | <2,0 | 0.44 | <2,0 | <0,10 | 18000 | **160** | 21 | 59 | 35000 | 22 | 15000 | 17000 | 620 | 1.0 | 480 | **65** | --- | 4.0 | <0,10 | <0,50 | 2800 | <1,0 | 46 | --- | 7.7 | 1900 | 0.39 | <2,0 | 73 | 7.5 | --- | 76 |
| X19147A-1592.80-1582 | --- | --- | <0,010 | <0,50 | 19000 | 2.1 | 69 | <2,0 | 0.62 | <2,0 | <0,10 | 9600 | **130** | 22 | 46 | 37000 | 23 | 14000 | 17000 | 460 | 1.2 | 420 | **68** | --- | 4.2 | <0,10 | <0,50 | 2700 | <1,0 | 34 | --- | 9.6 | 1900 | 0.48 | <2,0 | 91 | 7.4 | --- | 80 |
| X19148W-2073.00-1036 | < 1 | < 1,5 | <0,010 | **1.9** | 19000 | <2,0 | 51 | <2,0 | 0.68 | <2,0 | <0,10 | 17000 | **190** | 26 | 60 | 43000 | 28 | 18000 | 19000 | 620 | 1.2 | 350 | **98** | --- | 4.8 | <0,10 | <0,50 | 2000 | <1,0 | 66 | --- | 8.1 | 2300 | 0.56 | <2,0 | 150 | 14 | --- | 87 |
| X19148W-2077.90-1042 | --- | --- | <0,010 | **1.2** | 18000 | <2,0 | 79 | <2,0 | 0.84 | <2,0 | <0,10 | 25000 | **170** | 21 | **74** | 39000 | 26 | 17000 | 19000 | 680 | 1.7 | 480 | **68** | --- | 7.9 | <0,10 | 0.98 | 2000 | <1,0 | 140 | --- | 8.1 | 1900 | 0.48 | <2,0 | 97 | 18 | --- | 78 |
| X19152-1572.00-1382 | < 1 | < 1,5 | <0,010 | <0,50 | 18000 | <2,0 | 180 | <2,0 | 0.14 | <2,0 | <0,10 | 6400 | **140** | 17 | 38 | 34000 | 20 | 16000 | 15000 | 560 | 1.1 | 400 | **59** | --- | 2.8 | <0,10 | <0,50 | 2000 | <1,0 | 22 | --- | 5.6 | 2400 | 0.36 | <2,0 | 96 | 6.6 | --- | 64 |
| X19152-1643.00-1475 | < 1 | < 1,5 | <0,010 | <0,50 | 18000 | <2,0 | 210 | <2,0 | 0.35 | <2,0 | <0,10 | 14000 | **190** | 19 | 43 | 35000 | 28 | 15000 | 17000 | 600 | 1.4 | 380 | **67** | --- | 3.6 | <0,10 | <0,50 | 2100 | <1,0 | 69 | --- | 5.6 | 2100 | 0.4 | <2,0 | 84 | 4.4 | --- | 69 |
| X19152-1648.00-1481 | < 1 | < 1,5 | <0,010 | **0.63** | 15000 | <2,0 | 63 | <2,0 | 0.39 | <2,0 | <0,10 | 9400 | **120** | 19 | 61 | 33000 | 27 | 11000 | 14000 | 460 | 1.0 | 290 | **66** | --- | 2.5 | <0,10 | <0,50 | 1500 | <1,0 | 33 | --- | 5.5 | 1700 | 0.33 | <2,0 | 99 | 4.2 | --- | 68 |
| X19154-1562.00-0866 | < 1 | < 1,5 | <0,010 | <0,50 | 15000 | <2,0 | 150 | <2,0 | 0.71 | <2,0 | <0,10 | 22000 | **130** | 18 | 32 | 39000 | 13 | 13000 | 21000 | 750 | 1.5 | 430 | **58** | --- | 17 | <0,10 | <0,50 | 2600 | <1,0 | 220 | --- | <4.0 | 1800 | 0.25 | <2,0 | 46 | 12 | --- | 73 |
| X19152W-1627.00-0363 | --- | --- | 0.03 | <0,50 | 23000 | <2,0 | **260** | 4.5 | 0.21 | <2,0 | <0,10 | 4500 | **180** | 19 | 40 | 42000 | 38 | 19000 | 22000 | 610 | 3.0 | 400 | **73** | --- | 3.3 | <0,10 | <0,50 | 2500 | <1,0 | 18 | --- | 7.5 | 2600 | 0.53 | <2,0 | 93 | 2.9 | --- | 75 |
| Y165037EXT-1687.00-0038 | --- | --- | <0,010 | <0,50 | 27000 | <2,0 | **280** | <2,0 | 0.14 | <2,0 | <0,10 | 2100 | **120** | 22 | **69** | 45000 | 20 | 24000 | 25000 | 600 | 1.5 | 340 | **99** | --- | 4.1 | <0,10 | <0,50 | 3500 | <1,0 | 9.8 | --- | 8.2 | 2700 | 0.54 | <2,0 | 70 | <1,0 | --- | 83 |
| X19155-1665.00-0726 | < 1 | < 1,5 | <0,010 | <0,50 | 17000 | <2,0 | 170 | <2,0 | 0.42 | <2,0 | <0,10 | 5600 | **150** | 18 | 54 | 35000 | 13 | 16000 | 17000 | 500 | 1.1 | 420 | **68** | --- | 4.9 | <0,10 | <0,50 | 770 | <1,0 | 19 | --- | 7.3 | 1900 | <0,10 | <2,0 | 68 | 7.9 | --- | 75 |
| X19145-1930.00-2216 | --- | --- | <0,010 | **0.52** | 27000 | <2,0 | 85 | <2,0 | 0.4 | <2,0 | <0,10 | 2900 | **190** | 27 | 60 | 47000 | 26 | 22000 | 21000 | 670 | 4.0 | 430 | **110** | --- | 4.4 | <0,10 | 1.1 | 2300 | <1,0 | 21 | --- | 5.8 | 2800 | 0.58 | <2,0 | 120 | 4.9 | --- | 86 |
| X19146WB-1875.40-0951 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | 120 | <2,0 | 0.14 | <2,0 | <0,10 | 3100 | **180** | 22 | 43 | 40000 | 29 | 21000 | 17000 | 530 | 1.0 | 280 | **89** | --- | 2.9 | <0,10 | <0,50 | 1800 | <1,0 | 10 | --- | 6.3 | 2900 | 0.57 | <2,0 | 110 | 3.1 | --- | 79 |
| X19135-1832.70-1829 | < 1 | < 1,5 | <0,010 | <0,50 | 24000 | <2,0 | **250** | <2,0 | 0.27 | <2,0 | <0,10 | 3800 | **130** | 22 | 44 | 41000 | 25 | 17000 | 19000 | 510 | 2.4 | 330 | **84** | --- | 2.5 | <0,10 | <0,50 | 2200 | <1,0 | 26 | --- | 5.3 | 2100 | 0.39 | <2,0 | 89 | <1,0 | --- | 78 |
| X19135-1889.65-1896 | --- | --- | <0,010 | **1.6** | 22000 | <2,0 | 120 | <2,0 | 0.12 | <2,0 | <0,10 | 3200 | **180** | 22 | 55 | 42000 | 22 | 19000 | 16000 | 630 | 4.6 | 600 | **89** | --- | 3.0 | <0,10 | 1.2 | 2400 | <1,0 | 16 | --- | 5.9 | 2700 | 0.49 | <2,0 | 120 | 6.2 | --- | 80 |
| X19135W-1835.00-0891 | --- | --- | <0,010 | <0,50 | 15000 | <2,0 | 150 | <2,0 | 0.3 | <2,0 | <0,10 | 14000 | **140** | 20 | 30 | 33000 | 20 | 10000 | 13000 | 540 | **9.9** | 470 | **65** | --- | 3.5 | <0,10 | <0,50 | 1500 | <1,0 | 41 | --- | 5.0 | 1800 | 0.31 | <2,0 | 59 | 5.7 | --- | 57 |
| X19135W-1837.00-0893 | --- | --- | <0,010 | **1.1** | 14000 | <2,0 | **250** | <2,0 | 0.49 | <2,0 | <0,10 | 16000 | 76 | 14 | 24 | 31000 | 17 | 7300 | 13000 | 530 | 0.98 | 710 | 39 | --- | 10 | <0,10 | <0,50 | 1300 | <1,0 | 65 | --- | 5.2 | 1500 | 0.18 | <2,0 | 58 | 8.2 | --- | 55 |
| X19135W-1839.00-0895 | < 1 | < 1,5 | <0,010 | **0.81** | 16000 | <2,0 | 130 | <2,0 | 0.37 | <2,0 | <0,10 | 14000 | **150** | 19 | 40 | 37000 | 20 | 11000 | 14000 | 580 | 3.5 | 480 | **62** | --- | 3.4 | <0,10 | 1.5 | 1500 | <1,0 | 41 | --- | 6.4 | 1900 | 0.29 | <2,0 | 80 | 6.1 | --- | 69 |
| X19135W-1872.00-0933 | --- | --- | <0,010 | <0,50 | 21000 | <2,0 | 190 | <2,0 | 0.35 | <2,0 | <0,10 | 7700 | **190** | 25 | 64 | 44000 | 25 | 19000 | 16000 | 630 | 3.8 | 500 | **84** | --- | 4.0 | <0,10 | <0,50 | 2800 | <1,0 | 24 | --- | 7.8 | 2700 | 0.48 | <2,0 | 100 | 11 | --- | 83 |
| X19135W-1878.00-0941 | --- | --- | <0,010 | <0,50 | 19000 | <2,0 | 97 | <2,0 | 0.47 | <2,0 | <0,10 | 3600 | **160** | 21 | 49 | 40000 | 27 | 15000 | 16000 | 450 | 1.7 | 440 | **80** | --- | 2.4 | <0,10 | 1.2 | 1800 | <1,0 | 13 | --- | 5.6 | 2500 | 0.44 | <2,0 | 130 | 8.8 | --- | 84 |
| X19135W-1893.00-0959 | --- | --- | <0,010 | **0.56** | 17000 | 2.9 | 75 | <2,0 | 0.53 | <2,0 | <0,10 | 15000 | **160** | 20 | 48 | 39000 | 17 | 16000 | 21000 | 830 | 1.1 | 550 | **77** | --- | 5.9 | <0,10 | <0,50 | 2100 | <1,0 | 79 | --- | 6.8 | 2500 | 0.4 | <2,0 | 92 | 10 | --- | 80 |
| X19135W-1896.00-0963 | --- | --- | <0,010 | <0,50 | 27000 | <2,0 | 100 | <2,0 | 0.34 | <2,0 | <0,10 | 4400 | **170** | 23 | 44 | 47000 | 24 | 24000 | 26000 | 770 | 2.2 | 360 | **110** | --- | 3.5 | <0,10 | <0,50 | 2600 | <1,0 | 10 | --- | 6.8 | 3000 | 0.62 | <2,0 | 170 | 5.9 | --- | 99 |
| X1940-1641.00-1741 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | **280** | <2,0 | 0.35 | <2,0 | <0,10 | 17000 | **160** | 27 | 61 | 39000 | 25 | 16000 | 17000 | 600 | 6.4 | 450 | **82** | --- | 3.7 | <0,10 | <0,50 | 2700 | <1,0 | 130 | --- | 7.0 | 2000 | 0.46 | <2,0 | 110 | 8.0 | --- | 77 |
| X19145WA-1880.15-0811 | --- | --- | <0,010 | **2.5** | 19000 | <2,0 | 56 | <2,0 | 0.71 | <2,0 | <0,10 | 22000 | **170** | 25 | 47 | 41000 | 24 | 9800 | 18000 | 620 | 4.1 | 530 | **81** | --- | 5.8 | <0,10 | <0,50 | 2500 | <1,0 | 70 | --- | 7.2 | 1800 | 0.29 | <2,0 | 110 | 12 | --- | 78 |
| X19152W-1715.00-0597 | < 1 | < 1,5 | <0,010 | <0,50 | 20000 | 2.1 | **250** | <2,0 | 0.27 | <2,0 | <0,10 | 7200 | **160** | 20 | 45 | 40000 | 21 | 17000 | 20000 | 700 | 1.1 | 430 | **76** | --- | 4.1 | <0,10 | <0,50 | 2300 | <1,0 | 53 | --- | 7.0 | 2400 | 0.35 | <2,0 | 77 | 3.6 | --- | 72 |
| X19152W-1717.20-0601 | --- | --- | <0,010 | 0.5 | 22000 | <2,0 | **390** | <2,0 | 0.55 | <2,0 | <0,10 | 8800 | **190** | 18 | 38 | 43000 | 23 | 19000 | 23000 | 650 | 1.2 | 620 | **77** | --- | 5.6 | <0,10 | <0,50 | 2500 | <1,0 | 38 | --- | 5.1 | 2700 | 0.42 | <2,0 | 150 | 6.5 | --- | 76 |
| COMPTE | 10 | 10 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 0 | 39 | 39 | 39 | 39 | 39 | 39 | 0 | 39 | 39 | 39 | 39 | 39 | 0 | 39 |
| MINIMUM | < 1 | < 1,5 | < 0,01 | < 0,5 | 14000 | < 2 | 51 | < 2 | 0.12 | < 2 | < 0,1 | 2000 | 76 | 14 | 22 | 31000 | 13 | 7300 | 13000 | 430 | 0.72 | 280 | 39 | NC | 2.4 | < 0,1 | < 0,5 | 770 | < 1 | 8.4 | NC | < 4 | 1500 | < 0,1 | < 2 | 46 | < 1 | NC | 55 |
| MAXIMUM | <1 | <1,5 | 0.03 | 2.5 | 27000 | 3.2 | 390 | 4.5 | 1.3 | <2 | <0,1 | 25000 | 190 | 27 | 81 | 47000 | 38 | 24000 | 26000 | 830 | 9.9 | 710 | 110 | NC | 17 | <0,1 | 1.5 | 3500 | <1 | 220 | NC | 12 | 3000 | 0.69 | 2.6 | 170 | 19 | NC | 99 |
| MEDIANE | NC | NC | 0.01 | 0.51 | 19000 | 2.0 | 140 | 2.0 | 0.42 | NC | NC | 9600 | 160 | 20 | 46 | 39000 | 22 | 16000 | 19000 | 600 | 1.8 | 450 | 73 | NC | 4.1 | NC | 0.5 | 2300 | NC | 38 | NC | 6.4 | 2200 | 0.41 | 2.0 | 92 | 6.6 | NC | 76 |
| MOYENNE | NC | NC | 0.011 | 0.86 | 19795 | 2.1 | 159 | 2.1 | 0.45 | NC | NC | 10774 | 157 | 20 | 49 | 38897 | 23 | 16341 | 18667 | 596 | 2.5 | 453 | 76 | NC | 4.9 | NC | 0.61 | 2225 | NC | 49 | NC | 6.7 | 2215 | 0.42 | 2.0 | 98 | 7.7 | NC | 75 |
| ÉCART TYPE | NC | NC | NC | 0.57 | 3621 | 0.24 | 87 | 0.4 | 0.24 | NC | NC | 6270 | 28 | 3.3 | 13 | 4272 | 5.6 | 4015 | 3247 | 90 | 1.8 | 99 | 15 | NC | 2.7 | NC | 0.26 | 560 | NC | 42 | NC | 1.5 | 426 | 0.13 | 0.11 | 30 | 4.8 | NC | 9.1 |
| 25eme CENTILE | NC | NC | 0.01 | 0.5 | 17000 | 2.0 | 90 | 2.0 | 0.29 | NC | NC | 5050 | 135 | 18 | 42 | 35500 | 20 | 14500 | 16500 | 530 | 1.2 | 385 | 66 | NC | 3.4 | NC | 0.5 | 1900 | NC | 22 | NC | 5.7 | 1900 | 0.35 | 2.0 | 76 | 4.3 | NC | 69 |
| 75eme CENTILE | NC | NC | 0.01 | 1.1 | 22000 | 2.0 | 215 | 2.0 | 0.54 | NC | NC | 16000 | 180 | 22 | 60 | 41500 | 26 | 19000 | 21000 | 640 | 3.3 | 510 | 84 | NC | 5.5 | NC | 0.5 | 2600 | NC | 66 | NC | 7.8 | 2550 | 0.5 | 2.0 | 110 | 9.7 | NC | 80 |

Tableau D-5: Métaux extractibles (MA 200)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | F | Br | Hg | Ag | Al | As | Ba | B | Be | Bi | Cd | Ca | Cr | Co | Cu | Fe | Li | K | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Te | Th | Ti | Tl | U | V | W | Y | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | % | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| **Critère de sols PPSRTC-A (Province du Supérieur) du MELCC 2019** | | | **0.3** | **0.5** | | **5.0** | **240** | | | | **0.9** | | **100** | **30** | **65** | | | | | **1000** | **8.0** | | **50** | | **40** | | **3.0** | | **5.0** | | | | | | | | | | **150** |
| **Critère de sols B du MELCC 2019** | 400 | 50 | 2.0 | 20 | | 30 | 500 | | | | 5.0 | | 250 | 50 | 100 | | | | | 1000 | 10 | | 100 | | 500 | | 3.0 | | 50 | | | | | | | | | | 500 |
| **Critère de sols C du MELCC 2019** | 2000 | 300 | 10 | 40 | | 50 | 2000 | | | | 20 | | 800 | 300 | 500 | | | | | 2200 | 40 | | 500 | | 1000 | | 10 | | 300 | | | | | | | | | | 1500 |
| **Minerai SGR** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y155016EXT-1882.50-I001 | < 1 | < 1,5 | <0,010 | **1.1** | 21000 | 2.4 | 100 | <2,0 | 0.46 | <2,0 | <0,10 | 13000 | **180** | 25 | **120** | 41000 | 27 | 19000 | 18000 | 720 | 4.3 | 430 | **100** | --- | 3.8 | <0,10 | <0,50 | 2100 | <1,0 | 36 | --- | 6.3 | 2400 | 0.56 | <2,0 | 110 | 5.7 | --- | 78 |
| X18127A-1379.00-0598 | --- | --- | <0,010 | <0,50 | 19000 | <2,0 | 210 | <2,0 | 0.34 | <2,0 | <0,10 | 10000 | **140** | 18 | 40 | 34000 | 18 | 17000 | 15000 | 530 | 1.3 | 570 | **61** | --- | 3.1 | <0,10 | 1.2 | 310 | <1,0 | 32 | --- | 5.8 | 2300 | <0,10 | <2,0 | 78 | 3.9 | --- | 70 |
| Y165106EXT-1640.00-0489 | < 1 | < 1,5 | <0,010 | **0.83** | 22000 | 4.9 | 130 | <2,0 | 0.33 | <2,0 | 0.13 | 12000 | **180** | 24 | 43 | 40000 | 27 | 19000 | 18000 | 630 | 1.5 | 490 | **91** | --- | 3.7 | <0,10 | 1.8 | 2000 | <1,0 | 33 | --- | 7.0 | 2600 | 0.48 | <2,0 | 120 | 5.4 | --- | 76 |
| X19135W-1898.00-0966 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | 110 | <2,0 | 0.53 | <2,0 | <0,10 | 5100 | **150** | 22 | 52 | 43000 | 20 | 21000 | 23000 | 680 | 3.2 | 350 | **98** | --- | 4.0 | <0,10 | <0,50 | 2500 | <1,0 | 22 | --- | 6.6 | 2500 | 0.54 | <2,0 | 110 | 7.7 | --- | 91 |
| Y155016WB-1860.50-0427 | --- | --- | <0,010 | **0.79** | 19000 | <2,0 | 84 | <2,0 | 0.69 | <2,0 | <0,10 | 11000 | **160** | 21 | **100** | 39000 | 23 | 9800 | 25000 | 700 | 6.3 | 310 | **87** | --- | 1.6 | <0,10 | <0,50 | 1500 | <1,0 | 45 | --- | 5.9 | 1700 | 0.23 | <2,0 | 74 | 7.0 | --- | 69 |
| Y155021EXTA-1800.00-0881 | < 1 | < 1,5 | <0,010 | **0.69** | 20000 | <2,0 | 45 | <2,0 | 0.41 | <2,0 | <0,10 | 6100 | **190** | 19 | 61 | 42000 | 26 | 17000 | 24000 | 770 | 2.3 | 450 | **80** | --- | 1.2 | <0,10 | <0,50 | 2000 | <1,0 | 22 | --- | 5.0 | 2200 | 0.53 | <2,0 | 110 | 3.4 | --- | 82 |
| X19136-1676.00-1690 | --- | --- | <0,010 | <0,50 | 13000 | <2,0 | **400** | <2,0 | 0.36 | <2,0 | <0,10 | 16000 | **150** | 20 | 42 | 27000 | 7.8 | 9000 | 12000 | 330 | 2.2 | 560 | **63** | --- | 22 | <0,10 | 0.58 | 2100 | <1,0 | 51 | --- | 6.3 | 1200 | 0.19 | <2,0 | 83 | 32 | --- | 59 |
| X19139-1789.00-1941 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | 240 | <2,0 | 0.39 | <2,0 | <0,10 | 17000 | **160** | 22 | 43 | 38000 | 17 | 19000 | 18000 | 610 | 1.5 | 460 | **68** | --- | 6.8 | <0,10 | <0,50 | 3600 | <1,0 | 46 | --- | 9.1 | 2300 | 0.47 | 2.5 | 89 | 4.5 | --- | 71 |
| X19140-1560.15-1641 | < 1 | < 1,5 | <0,010 | **3.7** | 20000 | **5.4** | 87 | <2,0 | 0.21 | <2,0 | 0.17 | 7000 | **150** | 28 | 55 | 42000 | 20 | 17000 | 15000 | 540 | 1.9 | 400 | **110** | --- | 4.4 | <0,10 | <0,50 | 3000 | <1,0 | 22 | --- | 6.8 | 2000 | 0.54 | <2,0 | 120 | 9.4 | --- | 82 |
| X19140-1631.00-1727 | < 1 | < 1,5 | <0,010 | <0,50 | 21000 | <2,0 | 160 | <2,0 | 0.86 | <2,0 | <0,10 | 19000 | **150** | 25 | 57 | 38000 | 16 | 18000 | 17000 | 580 | 2.1 | 320 | **81** | --- | 5.0 | <0,10 | <0,50 | 3300 | <1,0 | 110 | --- | 6.2 | 2200 | 0.43 | <2,0 | 120 | 14 | --- | 86 |
| X19136W-1664.60-1144 | --- | --- | <0,010 | **1.0** | 14000 | 3.3 | 110 | <2,0 | 0.11 | <2,0 | 0.16 | 6900 | **180** | 20 | 18 | 32000 | 14 | 12000 | 12000 | 420 | 1.2 | 530 | **64** | --- | 5.1 | <0,10 | <0,50 | 2400 | <1,0 | 28 | --- | 7.6 | 1200 | 0.31 | <2,0 | 78 | 18 | --- | 44 |
| X19136W-1672.55-1155 | --- | --- | <0,010 | **0.59** | 27000 | <2,0 | **350** | <2,0 | 0.56 | <2,0 | 0.26 | 53000 | **310** | **32** | **100** | 59000 | 29 | 35000 | 34000 | **1200** | 4.7 | 240 | **73** | --- | 13 | <0,10 | <0,50 | 6300 | <1,0 | 200 | --- | 4.4 | 2900 | 0.61 | <2,0 | 170 | 18 | --- | 120 |
| X19141AW-1664.40-0787 | --- | --- | <0,010 | **0.83** | 18000 | <2,0 | 180 | <2,0 | 0.53 | <2,0 | <0,10 | 9700 | **190** | 19 | 46 | 39000 | 13 | 16000 | 20000 | 570 | 1.9 | 390 | **83** | --- | 5.1 | <0,10 | <0,50 | 2200 | <1,0 | 26 | --- | 4.8 | 2000 | 0.3 | <2,0 | 100 | 22 | --- | 72 |
| X19139WA-1747.20-0648 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | **280** | <2,0 | 0.31 | <2,0 | <0,10 | 14000 | **160** | 23 | 50 | 39000 | 17 | 20000 | 17000 | 640 | 2.0 | 810 | **78** | --- | 5.3 | <0,10 | <0,50 | 3900 | <1,0 | 37 | --- | 5.9 | 2400 | 0.42 | <2,0 | 120 | 17 | --- | 81 |
| X19147A-1591.10-1579 | --- | --- | <0,010 | **1.4** | 13000 | <2,0 | 150 | <2,0 | 0.74 | <2,0 | 0.15 | 32000 | **130** | 20 | 13 | 35000 | 12 | 10000 | 14000 | 580 | 0.76 | 590 | **54** | --- | 19 | <0,10 | <0,50 | 2500 | <1,0 | 140 | --- | 6.6 | 1200 | 0.16 | <2,0 | 47 | 16 | --- | 45 |
| X19147A-1601.00-1591 | --- | --- | <0,010 | <0,50 | 17000 | 2.3 | 57 | <2,0 | 0.64 | <2,0 | <0,10 | 21000 | **140** | 20 | 44 | 34000 | 22 | 12000 | 15000 | 520 | 1.5 | 340 | **57** | --- | 4.2 | <0,10 | 0.79 | 2500 | <1,0 | 68 | --- | 8.9 | 1600 | 0.39 | <2,0 | 77 | 8.6 | --- | 64 |
| X19145WA-1854.00-0778 | < 1 | < 1,5 | <0,010 | **0.52** | 16000 | <2,0 | 120 | <2,0 | 0.58 | <2,0 | <0,10 | 18000 | 100 | 17 | 34 | 28000 | 16 | 14000 | 15000 | 410 | 1.4 | 450 | **52** | --- | 6.7 | <0,10 | <0,50 | 2500 | <1,0 | 83 | --- | 6.6 | 1700 | 0.38 | <2,0 | 55 | 9.0 | --- | 64 |
| X19146WB-1928.00-1013 | --- | --- | <0,010 | **1.9** | 18000 | <2,0 | 56 | <2,0 | 0.44 | <2,0 | <0,10 | 9900 | **190** | 28 | 46 | 40000 | 29 | 14000 | 16000 | 520 | **10** | 400 | **93** | --- | 3.9 | <0,10 | 1.1 | 2300 | <1,0 | 26 | --- | 6.7 | 1700 | 0.47 | <2,0 | 120 | 14 | --- | 72 |
| X19151-1768.00-1745 | --- | --- | <0,010 | <0,50 | 17000 | <2,0 | 200 | <2,0 | 0.67 | <2,0 | <0,10 | 20000 | **140** | 19 | 45 | 36000 | 18 | 15000 | 15000 | 600 | 6.0 | 560 | **60** | --- | 9.8 | <0,10 | 0.65 | 2200 | <1,0 | 110 | --- | 8.1 | 1900 | 0.42 | <2,0 | 88 | 5.5 | --- | 68 |
| X19149AWB-1992.00-0826 | --- | --- | <0,010 | **1.9** | 19000 | <2,0 | 43 | <2,0 | 0.33 | <2,0 | <0,10 | 15000 | **190** | 26 | 65 | 42000 | 25 | 17000 | 18000 | 630 | 1.9 | 540 | **89** | --- | 5.9 | <0,10 | <0,50 | 2100 | <1,0 | 41 | --- | 8.6 | 1900 | 0.54 | <2,0 | 140 | 11 | --- | 94 |
| X19149AWB-2003.00-0839 | --- | --- | <0,010 | **3.4** | 14000 | 3.7 | 28 | <2,0 | 0.73 | <2,0 | <0,10 | 26000 | **130** | 19 | 65 | 43000 | 20 | 13000 | 16000 | 720 | 0.95 | 420 | **55** | --- | 4.3 | <0,10 | 1.2 | 1800 | <1,0 | 160 | --- | 4.0 | 1400 | 0.37 | <2,0 | 67 | 16 | --- | 51 |
| X19152-1638.35-1468 | --- | --- | <0,010 | **1.5** | 16000 | <2,0 | 140 | <2,0 | 0.15 | 2.0 | 0.1 | 17000 | **160** | 21 | 8.5 | 41000 | 25 | 14000 | 15000 | 750 | 2.4 | 540 | **72** | --- | 4.8 | <0,10 | 1.3 | 2100 | <1,0 | 77 | --- | 6.4 | 2000 | 0.29 | <2,0 | 52 | 15 | --- | 39 |
| X19152W-1604.00-0336 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | **310** | <2,0 | 0.4 | <2,0 | <0,10 | 10000 | **160** | 18 | 47 | 39000 | 19 | 18000 | 19000 | 640 | 1.1 | 360 | **68** | --- | 4.8 | <0,10 | <0,50 | 2200 | <1,0 | 38 | --- | 6.7 | 2400 | 0.41 | <2,0 | 83 | 14 | --- | 75 |
| X19152W-1605.00-0337 | --- | --- | <0,010 | <0,50 | 21000 | <2,0 | 240 | <2,0 | 0.24 | <2,0 | <0,10 | 10000 | **180** | 19 | 48 | 43000 | 20 | 20000 | 20000 | 700 | 1.6 | 410 | **73** | --- | 4.1 | <0,10 | <0,50 | 2800 | <1,0 | 78 | --- | 7.2 | 2700 | 0.48 | <2,0 | 110 | 6.7 | --- | 77 |
| X19152W-1617.80-0352 | --- | --- | <0,010 | **0.61** | 23000 | 3.1 | 140 | <2,0 | 0.21 | <2,0 | <0,10 | 5900 | **190** | 21 | 59 | 46000 | 26 | 20000 | 22000 | 710 | 3.7 | 410 | **85** | --- | 2.7 | <0,10 | <0,50 | 3100 | <1,0 | 30 | --- | 6.7 | 2800 | 0.62 | <2,0 | 130 | 3.2 | --- | 74 |
| X19152W-1621.00-0356 | --- | --- | <0,010 | <0,50 | 24000 | <2,0 | 180 | <2,0 | 0.14 | <2,0 | <0,10 | 6700 | **200** | 19 | 45 | 44000 | 35 | 22000 | 22000 | 730 | 1.8 | 380 | **82** | --- | 2.8 | <0,10 | <0,50 | 3000 | <1,0 | 24 | --- | 7.3 | 3000 | 0.65 | <2,0 | 130 | 3.6 | --- | 75 |
| X19152W-1624.00-0359 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | 170 | <2,0 | 0.29 | <2,0 | <0,10 | 14000 | **170** | 16 | 43 | 36000 | 24 | 19000 | 21000 | 720 | 2.5 | 350 | **58** | --- | 3.4 | <0,10 | <0,50 | 2700 | <1,0 | 58 | --- | 5.3 | 2400 | 0.52 | <2,0 | 77 | 2.7 | --- | 73 |
| X19155-1684.00-0749 | --- | --- | <0,010 | <0,50 | 19000 | <2,0 | **260** | <2,0 | 1.2 | <2,0 | <0,10 | 14000 | **180** | 25 | 38 | 41000 | 20 | 21000 | 17000 | 550 | 6.2 | 480 | **94** | --- | 6.9 | <0,10 | <0,50 | 2200 | 1.0 | 110 | --- | 6.3 | 2800 | 0.38 | <2,0 | 130 | 24 | --- | 91 |
| X19156-1751.00-1272 | --- | --- | <0,010 | **4.5** | 16000 | <2,0 | 95 | <2,0 | 0.45 | <2,0 | <0,10 | 9000 | **140** | 26 | 57 | 38000 | 18 | 12000 | 14000 | 470 | 5.1 | 440 | **89** | --- | 4.6 | <0,10 | <0,50 | 2100 | <1,0 | 31 | --- | 6.5 | 1600 | 0.38 | <2,0 | 94 | 6.4 | --- | 65 |
| X19156-1754.00-1275 | --- | --- | <0,010 | **2.3** | 15000 | <2,0 | 140 | <2,0 | 0.88 | <2,0 | <0,10 | 24000 | **190** | 22 | **74** | 36000 | 16 | 8300 | 18000 | 510 | 2.8 | 470 | **80** | --- | 3.5 | <0,10 | 0.9 | 2100 | <1,0 | 87 | --- | 6.3 | 1300 | 0.18 | <2,0 | 99 | 11 | --- | 59 |
| X19156-1756.50-1278 | --- | --- | <0,010 | **2.4** | 12000 | <2,0 | 45 | 3.3 | 0.86 | <2,0 | <0,10 | 18000 | **140** | 19 | 57 | 31000 | 14 | 12000 | 13000 | 420 | 1.4 | 490 | **57** | --- | 5.0 | <0,10 | <0,50 | 2200 | <1,0 | 80 | --- | 5.8 | 1600 | 0.34 | <2,0 | 110 | 22 | --- | 61 |
| X19156-1761.00-1287 | --- | --- | <0,010 | **2.8** | 14000 | 2.1 | 36 | <2,0 | 0.79 | <2,0 | <0,10 | 17000 | **160** | 23 | 27 | 40000 | 17 | 8200 | 16000 | 510 | 6.5 | 420 | **81** | --- | 5.5 | <0,10 | 1.1 | 1800 | <1,0 | 56 | --- | 5.6 | 1400 | 0.19 | <2,0 | 110 | 29 | --- | 55 |
| X19156-1774.00-1306 | --- | --- | <0,010 | **1.0** | 18000 | <2,0 | 61 | <2,0 | 0.56 | <2,0 | <0,10 | 12000 | **180** | 23 | 46 | 40000 | 26 | 14000 | 16000 | 540 | **8.7** | 570 | **88** | --- | 4.3 | <0,10 | 0.77 | 2100 | <1,0 | 43 | --- | 6.4 | 1900 | 0.39 | <2,0 | 120 | 9.5 | --- | 71 |
| X19156-1777.00-1309 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | 56 | <2,0 | 0.31 | <2,0 | <0,10 | 7600 | **160** | 20 | 44 | 36000 | 28 | 17000 | 15000 | 600 | 4.4 | 540 | **77** | --- | 2.6 | <0,10 | 0.95 | 2100 | <1,0 | 21 | --- | 5.8 | 2100 | 0.45 | <2,0 | 84 | 6.5 | --- | 68 |
| X19156-1780.00-1312 | --- | --- | <0,010 | **1.9** | 26000 | <2,0 | 62 | <2,0 | 0.68 | <2,0 | <0,10 | 11000 | **220** | 27 | 62 | 49000 | 40 | 24000 | 22000 | 670 | 6.3 | 500 | **110** | --- | 3.9 | <0,10 | 0.94 | 2700 | <1,0 | 43 | --- | 6.4 | 2700 | 0.74 | <2,0 | 180 | 4.6 | --- | 93 |
| X19156-1782.00-1315 | --- | --- | <0,010 | **5.7** | 19000 | <2,0 | 88 | <2,0 | 0.63 | 11 | 0.15 | 15000 | **180** | 20 | 57 | 38000 | 26 | 17000 | 18000 | 590 | **16** | 620 | **75** | --- | **120** | <0,10 | 1.3 | 2400 | <1,0 | 63 | --- | 5.7 | 2000 | 0.49 | <2,0 | 110 | 5.2 | --- | 68 |
| X19156-1784.00-1318 | --- | --- | <0,010 | **4.9** | 12000 | <2,0 | 38 | <2,0 | 0.46 | <2,0 | <0,10 | 16000 | **150** | 17 | 51 | 34000 | 17 | 9800 | 12000 | 520 | 4.4 | 550 | **61** | --- | 11 | <0,10 | <0,50 | 1700 | <1,0 | 110 | --- | 5.4 | 1200 | 0.28 | <2,0 | 62 | 10 | --- | 44 |
| X19156-1786.50-1322 | --- | --- | <0,010 | **2.1** | 12000 | <2,0 | 49 | <2,0 | 0.61 | <2,0 | <0,10 | 19000 | **160** | 19 | 31 | 36000 | 18 | 8100 | 12000 | 450 | 4.6 | 600 | **64** | --- | 13 | <0,10 | <0,50 | 1500 | <1,0 | 60 | --- | 5.0 | 1300 | 0.22 | <2,0 | 86 | 11 | --- | 48 |
| X19156-1789.35-1326 | --- | --- | <0,010 | **1.9** | 16000 | 3.6 | 45 | <2,0 | 0.81 | <2,0 | <0,10 | 15000 | **160** | 21 | **77** | 38000 | 24 | 15000 | 16000 | 560 | 2.5 | 450 | **75** | --- | 6.2 | <0,10 | 0.85 | 1900 | <1,0 | 76 | --- | 5.6 | 1700 | 0.41 | <2,0 | 100 | 9.7 | --- | 73 |
| X19156-1792.00-1329 | --- | --- | <0,010 | **1.7** | 12000 | 3.0 | 26 | <2,0 | 0.93 | <2,0 | <0,10 | 18000 | **150** | 17 | 31 | 36000 | 15 | 10000 | 13000 | 500 | 1.8 | 430 | **62** | --- | 5.8 | <0,10 | <0,50 | 1800 | <1,0 | 89 | --- | 5.2 | 1300 | 0.3 | <2,0 | 77 | 16 | --- | 47 |
| X19156-1795.10-1333 | --- | --- | <0,010 | **0.87** | 18000 | <2,0 | 65 | <2,0 | 0.72 | <2,0 | <0,10 | 13000 | **160** | 22 | 54 | 37000 | 23 | 16000 | 16000 | 540 | 0.69 | 430 | **88** | --- | 3.8 | <0,10 | <0,50 | 2300 | <1,0 | 44 | --- | 5.8 | 2000 | 0.47 | <2,0 | 100 | 11 | --- | 74 |
| X19156-1796.00-1334 | --- | --- | <0,010 | **0.74** | 15000 | <2,0 | 63 | <2,0 | 0.54 | <2,0 | <0,10 | 20000 | **150** | 20 | 56 | 33000 | 20 | 13000 | 14000 | 590 | 1.2 | 380 | **69** | --- | 4.2 | <0,10 | <0,50 | 2200 | <1,0 | 60 | --- | 7.3 | 1700 | 0.37 | <2,0 | 80 | 12 | --- | 66 |
| X19157-1628.00-0434 | --- | --- | 0.019 | <0,50 | 22000 | 2.2 | 230 | 3.5 | 0.58 | <2,0 | 0.16 | 18000 | **140** | 24 | 38 | 37000 | 27 | 17000 | 16000 | 570 | **10** | 880 | **87** | --- | 14 | <0,10 | <0,50 | 3000 | <1,0 | 53 | --- | 6.9 | 2200 | 0.39 | <2,0 | 94 | 6.2 | --- | 66 |
| X19147AWA-1634.00-0376 | < 1 | < 1,5 | <0,010 | **0.62** | 18000 | <2,0 | **250** | <2,0 | 0.73 | <2,0 | <0,10 | 19000 | **170** | 19 | 64 | 40000 | 15 | 16000 | 16000 | 550 | 1.6 | 600 | **62** | --- | 8.0 | <0,10 | 1.1 | 1700 | <1,0 | 140 | --- | 6.5 | 2400 | 0.24 | <2,0 | 51 | 18 | --- | 65 |
| Y155016EXT-1862.00-0921 | --- | --- | <0,010 | **1.2** | 21000 | <2,0 | 94 | <2,0 | 0.49 | <2,0 | <0,10 | 5100 | **170** | 28 | 57 | 47000 | 24 | 17000 | 18000 | 540 | 5.4 | 440 | **110** | --- | 3.6 | <0,10 | <0,50 | 1900 | <1,0 | 26 | --- | 6.3 | 2100 | 0.46 | <2,0 | 130 | 8.7 | --- | 75 |
| X19153-1812.00-1341 | --- | --- | <0,010 | **0.78** | 17000 | <2,0 | 120 | <2,0 | 0.54 | <2,0 | <0,10 | 17000 | **180** | 23 | **68** | 43000 | 21 | 11000 | 17000 | 650 | 1.6 | 430 | **83** | --- | 4.1 | <0,10 | <0,50 | 1600 | <1,0 | 61 | --- | 6.8 | 1900 | 0.25 | <2,0 | 110 | 8.6 | --- | 69 |
| X19149AWB-1996.00-0830 | --- | --- | <0,010 | **2.8** | 17000 | <2,0 | 45 | <2,0 | 0.69 | <2,0 | 0.73 | 24000 | **150** | 21 | 59 | 41000 | 23 | 16000 | 18000 | 720 | 2.6 | 560 | **71** | --- | 20 | <0,10 | <0,50 | 1900 | <1,0 | 87 | --- | 7.8 | 1900 | 0.42 | <2,0 | 110 | 19 | --- | 93 |
| X19155-1676.00-0741 | --- | --- | <0,010 | <0,50 | 18000 | <2,0 | **280** | <2,0 | 0.63 | <2,0 | <0,10 | 13000 | **140** | 21 | 30 | 37000 | 19 | 17000 | 15000 | 540 | 2.4 | 560 | **75** | --- | 6.1 | <0,10 | 1.2 | 2500 | <1,0 | 42 | --- | 7.6 | 2100 | 0.47 | <2,0 | 100 | 13 | --- | 84 |
| Y155016EXT-1871.00-0933 | --- | --- | <0,010 | **0.6** | 18000 | <2,0 | 120 | <2,0 | 0.48 | <2,0 | <0,10 | 14000 | **170** | 21 | 61 | 38000 | 22 | 16000 | 16000 | 530 | 4.1 | 400 | **77** | --- | 4.4 | <0,10 | <0,50 | 1800 | <1,0 | 68 | --- | 5.6 | 2000 | 0.35 | <2,0 | 91 | 7.8 | --- | 64 |
| X19135W-1880.00-0944 | --- | --- | <0,010 | **0.82** | 12000 | <2,0 | 81 | <2,0 | 0.32 | <2,0 | <0,10 | 12000 | **120** | 17 | 35 | 28000 | 16 | 9100 | 11000 | 460 | 1.3 | 570 | **58** | --- | 3.1 | <0,10 | <0,50 | 1600 | <1,0 | 37 | --- | 4.9 | 1500 | 0.25 | <2,0 | 63 | 15 | --- | 50 |
| X19135W-1883.00-0947 | < 1 | < 1,5 | 0.028 | **0.59** | 23000 | <2,0 | 98 | 4.9 | 0.36 | <2,0 | <0,10 | 7800 | **170** | 19 | 44 | 43000 | 19 | 20000 | 22000 | 740 | 2.1 | 430 | **82** | --- | 3.4 | <0,10 | <0,50 | 2300 | <1,0 | 28 | --- | 6.7 | 2700 | 0.53 | <2,0 | 110 | 7.8 | --- | 80 |
| X19135W-1888.00-0954 | --- | --- | <0,010 | **1.3** | 15000 | 2.5 | 55 | <2,0 | 0.65 | <2,0 | <0,10 | 17000 | **150** | 19 | 48 | 38000 | 15 | 14000 | 17000 | 720 | 2.1 | 530 | **75** | --- | 5.0 | <0,10 | <0,50 | 1700 | <1,0 | 99 | --- | 7.5 | 1700 | 0.37 | <2,0 | 70 | 13 | --- | 61 |
| X19135W-1891.00-0957 | --- | --- | <0,010 | **0.63** | 14000 | <2,0 | 62 | <2,0 | 0.57 | <2,0 | <0,10 | 16000 | **120** | 15 | 40 | 32000 | 14 | 13000 | 16000 | 660 | 1.3 | 480 | **55** | --- | 4.6 | <0,10 | <0,50 | 1600 | <1,0 | 80 | --- | 6.1 | 1800 | 0.37 | <2,0 | 56 | 11 | --- | 60 |
| X19136W-1730.50-1236 | < 1 | < 1,5 | 0.022 | <0,50 | 17000 | <2,0 | 210 | 4.2 | 0.46 | <2,0 | <0,10 | 19000 | **130** | 16 | 33 | 32000 | 12 | 15000 | 17000 | 770 | 1.5 | 310 | **63** | --- | 5.7 | <0,10 | <0,50 | 2400 | <1,0 | 76 | --- | 7.3 | 1900 | 0.38 | <2,0 | 71 | 5.4 | --- | 71 |
| X19141AW-1670.85-0796 | < 1 | < 1,5 | <0,010 | <0,50 | 16000 | <2,0 | 210 | <2,0 | 0.59 | <2,0 | <0,10 | 17000 | **140** | 17 | 27 | 36000 | 12 | 12000 | 17000 | 620 | 1.4 | 360 | **61** | --- | 9.1 | <0,10 | <0,50 | 2000 | <1,0 | 46 | --- | 4.6 | 1600 | 0.2 | <2,0 | 70 | 7.2 | --- | 59 |
| X19149A-2009.70-2213 | < 1 | < 1,5 | <0,010 | **3.1** | 12000 | <2,0 | 29 | <2,0 | 0.36 | <2,0 | 0.17 | 20000 | **130** | 20 | 33 | 31000 | 17 | 11000 | 13000 | 520 | 1.2 | 410 | **61** | --- | 10 | <0,10 | 1.1 | 1900 | <1,0 | 59 | --- | 7.9 | 1200 | 0.27 | <2,0 | 65 | 18 | --- | 61 |
| X19153-1814.00-1344 | --- | --- | <0,010 | <0,50 | 17000 | <2,0 | 78 | <2,0 | 0.36 | <2,0 | <0,10 | 9800 | **190** | 19 | 45 | 41000 | 24 | 13000 | 15000 | 660 | 2.3 | 350 | **69** | --- | 2.9 | <0,10 | <0,50 | 1700 | <1,0 | 26 | --- | 7.5 | 1900 | 0.37 | <2,0 | 110 | 9.6 | --- | 68 |
| X19156-1763.00-1290 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | 93 | <2,0 | 0.35 | <2,0 | <0,10 | 11000 | **180** | 21 | 46 | 38000 | 25 | 17000 | 16000 | 530 | 3.4 | 460 | **78** | --- | 3.2 | <0,10 | <0,50 | 2000 | <1,0 | 38 | --- | 5.7 | 2300 | 0.51 | <2,0 | 110 | 3.7 | --- | 72 |
| X19156-1766.00-1293 | --- | --- | <0,010 | <0,50 | 22000 | <2,0 | 97 | <2,0 | 0.33 | <2,0 | <0,10 | 7400 | **200** | 22 | 46 | 42000 | 28 | 20000 | 18000 | 510 | 3.5 | 550 | **89** | --- | 2.9 | <0,10 | <0,50 | 2400 | <1,0 | 24 | --- | 5.8 | 2600 | 0.61 | <2,0 | 130 | 5.4 | --- | 78 |
| X19156-1768.60-1296 | 1.0 | < 1,5 | <0,010 | **2.6** | 41000 | <2,0 | 220 | <2,0 | 2.2 | <2,0 | 0.25 | 69000 | **560** | **35** | 65 | 57000 | 47 | 39000 | 47000 | **1500** | 0.68 | 200 | **150** | --- | 7.3 | <0,10 | 1.2 | 3000 | <1,0 | 450 | --- | <4.0 | 2600 | 0.95 | <2,0 | 220 | 5.7 | --- | 130 |
| X19156-1769.50-1298 | --- | --- | <0,010 | **1.1** | 37000 | <2,0 | **250** | <2,0 | 1.4 | <2,0 | 0.16 | 42000 | **390** | **31** | **82** | 56000 | 42 | 32000 | 36000 | **1100** | 3.1 | 320 | **100** | --- | 5.1 | <0,10 | 1.4 | 3500 | <1,0 | 190 | --- | <4.0 | 3000 | 0.85 | <2,0 | 210 | 5.9 | --- | 100 |
| X19147AWA-1624.00-0365 | --- | --- | <0,010 | <0,50 | 18000 | <2,0 | 210 | <2,0 | 0.64 | <2,0 | <0,10 | 16000 | **160** | 21 | 57 | 42000 | 17 | 17000 | 15000 | 650 | 4.6 | 590 | **79** | --- | 6.3 | <0,10 | <0,50 | 1800 | <1,0 | 92 | --- | 4.9 | 2500 | 0.36 | <2,0 | 110 | 22 | --- | 83 |
| COMPTE | 12 | 12 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 0 | 62 | 62 | 62 | 62 | 62 | 62 | 0 | 62 | 62 | 62 | 62 | 62 | 62 | 0 | 62 |
| MINIMUM | < 1 | < 1,5 | < 0,01 | < 0,5 | 12000 | < 2 | 26 | < 2 | 0.11 | < 2 | < 0,1 | 5100 | 100 | 15 | 8.5 | 27000 | 7.8 | 8100 | 11000 | 330 | 0.68 | 200 | 52 | NC | 1.2 | < 0,1 | < 0,5 | 310 | < 1 | 21 | NC | < 4 | 1200 | < 0,1 | < 2 | 47 | 2.7 | NC | 39 |
| MAXIMUM | 1.0 | <1,5 | 0.028 | 5.7 | 41000 | 5.4 | 400 | 4.9 | 2.2 | 11 | 0.73 | 69000 | 560 | 35 | 120 | 59000 | 47 | 39000 | 47000 | 1500 | 16 | 880 | 150 | NC | 120 | <0,1 | 1.8 | 6300 | 1.0 | 450 | NC | 9.1 | 3000 | 0.95 | 2.5 | 220 | 32 | NC | 130 |
| MEDIANE | 1.0 | NC | 0.01 | 0.76 | 18000 | 2.0 | 105 | 2.0 | 0.54 | 2.0 | 0.1 | 15000 | 160 | 21 | 47 | 38500 | 20 | 16000 | 16000 | 590 | 2.3 | 450 | 76 | NC | 4.8 | NC | 0.5 | 2150 | 1.0 | 55 | NC | 6.3 | 2000 | 0.39 | 2.0 | 100 | 9.6 | NC | 71 |
| MOYENNE | 1.0 | NC | 0.011 | 1.3 | 18710 | 2.2 | 134 | 2.1 | 0.56 | 2.1 | 0.12 | 16258 | 174 | 21 | 50 | 39065 | 21 | 16198 | 17806 | 624 | 3.2 | 465 | 77 | NC | 7.9 | NC | 0.68 | 2297 | 1.0 | 70 | NC | 6.3 | 2018 | 0.41 | 2.0 | 101 | 11 | NC | 71 |
| ECART TYPE | NC | NC | 0.0029 | 1.2 | 5218 | 0.66 | 89 | 0.52 | 0.32 | 1.1 | 0.085 | 10563 | 65 | 4.0 | 19 | 6103 | 7.2 | 5791 | 5822 | 180 | 2.7 | 117 | 17 | NC | 15 | NC | 0.31 | 778 | NC | 63 | NC | 1.1 | 500 | 0.16 | NC | 34 | 6.5 | NC | 17 |
| 25eme CENTILE | 1.0 | NC | 0.01 | 0.5 | 16000 | 2.0 | 61 | 2.0 | 0.36 | 2.0 | 0.1 | 10000 | 150 | 19 | 41 | 36000 | 17 | 12250 | 15000 | 530 | 1.5 | 400 | 63 | NC | 3.8 | NC | 0.5 | 1900 | 1.0 | 34 | NC | 5.6 | 1700 | 0.3 | 2.0 | 77 | 6.0 | NC | 62 |
| 75eme CENTILE | 1.0 | NC | 0.01 | 1.9 | 21000 | 2.0 | 208 | 2.0 | 0.68 | 2.0 | 0.1 | 18000 | 180 | 23 | 59 | 42000 | 25 | 18750 | 18000 | 695 | 4.4 | 548 | 87 | NC | 6.6 | NC | 0.84 | 2500 | 1.0 | 82 | NC | 6.9 | 2400 | 0.49 | 2.0 | 118 | 15 | NC | 78 |

Tableau D-5: Métaux extractibles (MA 200)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | F | Br | Hg | Ag | Al | As | Ba | B | Be | Bi | Cd | Ca | Cr | Co | Cu | Fe | Li | K | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Te | Th | Ti | Tl | U | V | W | Y | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | % | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| **Critère de sols PPSRTC-A (Province du Supérieur) du MELCC 2019** | | | **0.3** | **0.5** | | **5.0** | **240** | | | | **0.9** | | **100** | **30** | **65** | | | | | **1000** | **8.0** | | **50** | | **40** | | **3.0** | | **5.0** | | | | | | | | | | **150** |
| **Critère de sols B du MELCC 2019** | 400 | 50 | 2.0 | 20 | | 30 | 500 | | | | 5.0 | | 250 | 50 | 100 | | | | | 1000 | 10 | | 100 | | 500 | | 3.0 | | 50 | | | | | | | | | | 500 |
| **Critère de sols C du MELCC 2019** | 2000 | 300 | 10 | 40 | | 50 | 2000 | | | | 20 | | 800 | 300 | 500 | | | | | 2200 | 40 | | 500 | | 1000 | | 10 | | 300 | | | | | | | | | | 1500 |
| **Minerai SGR+** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X18110A-1296.05-0650 | --- | --- | 0.041 | **6.2** | 9400 | <2,0 | 27 | 3.2 | 0.66 | <2,0 | <0,10 | 25000 | **130** | 24 | 22 | 43000 | 15 | 6200 | 12000 | 380 | 7.2 | 440 | **86** | --- | 3.4 | <0,10 | 1.5 | 820 | <1,0 | 97 | --- | 5.9 | 680 | 0.2 | <2,0 | 50 | <1,0 | --- | 32 |
| X18127W-1258.00-0827 | --- | --- | <0,010 | **1.5** | 17000 | 4.7 | 46 | <2,0 | 0.91 | <2,0 | 0.11 | 20000 | **160** | 22 | 15 | 41000 | 24 | 15000 | 16000 | 580 | **26** | 360 | **80** | --- | 8.8 | <0,10 | 1.0 | 320 | <1,0 | 120 | --- | 5.4 | 2000 | 0.13 | <2,0 | 89 | 6.1 | --- | 66 |
| X18131-0915.00-0737 | --- | --- | <0,010 | **3.7** | 12000 | 2.6 | 33 | 3.0 | 0.75 | <2,0 | 0.19 | 20000 | **130** | 20 | 40 | 37000 | 15 | 9800 | 13000 | 510 | 0.91 | 460 | **73** | --- | 7.2 | <0,10 | 1.1 | 1400 | <1,0 | 87 | --- | 5.1 | 1100 | 0.25 | <2,0 | 51 | 18 | --- | 53 |
| X19133-0875.05-0584 | --- | --- | <0,010 | **3.2** | 14000 | 4.4 | 120 | <2,0 | 0.35 | <2,0 | 0.17 | 15000 | **140** | 20 | 56 | 38000 | 22 | 12000 | 14000 | 540 | 0.59 | 530 | **80** | --- | 5.5 | <0,10 | <0,50 | 1300 | <1,0 | 42 | --- | 5.5 | 1200 | 0.28 | <2,0 | 64 | 7.8 | --- | 71 |
| X19135-1902.50-1912 | --- | --- | <0,010 | **1.4** | 22000 | <2,0 | 120 | <2,0 | 0.22 | <2,0 | <0,10 | 7900 | **180** | 22 | 49 | 43000 | 24 | 19000 | 18000 | 670 | 3.9 | 800 | **83** | --- | 3.8 | <0,10 | <0,50 | 2300 | <1,0 | 28 | --- | 5.9 | 2300 | 0.44 | <2,0 | 120 | 13 | --- | 73 |
| X19136W-1716.90-1217 | --- | --- | <0,010 | **1.0** | 20000 | <2,0 | **400** | <2,0 | 0.76 | <2,0 | 0.13 | 47000 | **270** | **33** | **120** | 44000 | 12 | 17000 | 22000 | 870 | **9.1** | 490 | **77** | --- | 22 | <0,10 | <0,50 | 3500 | <1,0 | 560 | --- | 5.2 | 2100 | 0.28 | <2,0 | 120 | 17 | --- | 76 |
| X19142-1559.00-1528 | < 1 | < 1,5 | <0,010 | **1.9** | 9400 | <2,0 | 90 | <2,0 | 0.49 | <2,0 | 0.11 | 13000 | **110** | 13 | 40 | 29000 | 11 | 8400 | 13000 | 540 | 2.3 | 480 | **55** | --- | 6.5 | <0,10 | <0,50 | 1400 | <1,0 | 59 | --- | 5.2 | 930 | 0.22 | <2,0 | 51 | 10 | --- | 46 |
| X19141AW-1622.15-0730 | < 1 | < 1,5 | <0,010 | **1.5** | 15000 | **5.1** | 180 | <2,0 | 0.37 | <2,0 | 0.11 | 11000 | **180** | 19 | 29 | 41000 | 15 | 13000 | 19000 | 670 | 1.4 | 390 | **67** | --- | 4.1 | <0,10 | <0,50 | 1900 | <1,0 | 45 | --- | 6.0 | 1800 | 0.34 | <2,0 | 78 | 7.3 | --- | 66 |
| X19143-1454.00-1452 | 1.0 | < 1,5 | 0.026 | **1.5** | 23000 | 2.5 | 96 | 2.8 | 1.1 | <2,0 | <0,10 | 21000 | **200** | 26 | 54 | 43000 | 28 | 20000 | 21000 | 550 | 4.3 | 360 | **89** | --- | 3.9 | <0,10 | <0,50 | 3000 | <1,0 | 59 | --- | 7.3 | 2200 | 0.65 | <2,0 | 100 | 1.9 | --- | 90 |
| X19148-2077.00-1657 | --- | --- | <0,010 | **1.6** | 13000 | <2,0 | 19 | <2,0 | 0.68 | <2,0 | 0.12 | 28000 | **170** | 23 | 13 | 40000 | 16 | 11000 | 15000 | 580 | 1.3 | 350 | **76** | --- | 8.7 | <0,10 | 0.64 | 1900 | <1,0 | 130 | --- | 7.1 | 1200 | 0.31 | <2,0 | 58 | 36 | --- | 49 |
| X19150A-1450.65-1470 | < 1 | < 1,5 | <0,010 | **5.6** | 11000 | 4.5 | 40 | <2,0 | 0.72 | 2.2 | 0.18 | 27000 | **150** | 27 | 10 | 37000 | 12 | 9600 | 11000 | 480 | 2.5 | 520 | **94** | --- | 8.6 | <0,10 | 1.3 | 1500 | <1,0 | 100 | --- | 5.2 | 920 | 0.22 | <2,0 | 50 | 37 | --- | 23 |
| X19145WA-1901.00-0836 | < 1 | < 1,5 | <0,010 | **1.5** | 15000 | <2,0 | 40 | <2,0 | 1.4 | <2,0 | <0,10 | 13000 | **150** | 20 | 44 | 37000 | 17 | 14000 | 16000 | 420 | 1.7 | 420 | **77** | --- | 3.8 | <0,10 | 0.88 | 540 | <1,0 | 86 | --- | 4.5 | 1600 | 0.16 | <2,0 | 130 | 15 | --- | 81 |
| X19152W-1596.10-0327 | < 1 | < 1,5 | <0,010 | **1.7** | 11000 | <2,0 | **250** | <2,0 | 0.46 | <2,0 | <0,10 | 14000 | **170** | 19 | 47 | 35000 | 9.1 | 9000 | 14000 | 380 | 5.2 | 590 | **65** | --- | 14 | <0,10 | <0,50 | 2500 | <1,0 | 130 | --- | 5.7 | 1200 | 0.14 | <2,0 | 64 | 20 | --- | 50 |
| X19152W-1599.00-0331 | --- | --- | 0.021 | **1.1** | 16000 | 2.1 | **310** | 4.1 | 0.71 | <2,0 | <0,10 | 13000 | **150** | 15 | 34 | 35000 | 12 | 14000 | 18000 | 570 | 0.77 | 450 | **58** | --- | 7.8 | <0,10 | <0,50 | 2300 | <1,0 | 56 | --- | 4.8 | 1900 | 0.26 | <2,0 | 88 | 15 | --- | 64 |
| X19152W-1601.30-0332 | < 1 | < 1,5 | <0,010 | **0.71** | 19000 | <2,0 | **530** | <2,0 | 1.4 | <2,0 | 0.11 | 16000 | **200** | 17 | **78** | 40000 | 17 | 17000 | 24000 | 610 | 1.0 | 530 | **67** | --- | 12 | <0,10 | <0,50 | 3100 | <1,0 | 150 | --- | 4.7 | 2300 | 0.25 | <2,0 | 140 | 28 | --- | 93 |
| Y165037EXT-1739.00-0105 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | 160 | <2,0 | 0.86 | <2,0 | <0,10 | 12000 | **140** | 20 | 40 | 42000 | 12 | 19000 | 22000 | 610 | 2.6 | 290 | **91** | --- | 9.6 | <0,10 | <0,50 | 1100 | <1,0 | 72 | --- | 5.8 | 2300 | 0.14 | <2,0 | 70 | 9.4 | --- | 89 |
| Y165037EXT-1752.00-0121 | --- | --- | <0,010 | **1.2** | 11000 | <2,0 | 32 | <2,0 | 0.68 | <2,0 | <0,10 | 17000 | **160** | 17 | 13 | 37000 | 6.5 | 11000 | 17000 | 550 | 1.0 | 330 | **66** | --- | 5.2 | <0,10 | <0,50 | 760 | <1,0 | 110 | --- | 4.6 | 1500 | 0.13 | <2,0 | 63 | 30 | --- | 52 |
| X19156-1758.40-1282 | --- | --- | <0,010 | **3.6** | 12000 | <2,0 | 37 | 2.9 | 0.58 | <2,0 | <0,10 | 16000 | **150** | 24 | 23 | 41000 | 14 | 7400 | 13000 | 450 | 3.9 | 580 | **83** | --- | 5.9 | <0,10 | 1.2 | 1800 | <1,0 | 46 | --- | 5.4 | 1300 | 0.23 | <2,0 | 75 | 19 | --- | 56 |
| X19139WA-1752.20-0656 | --- | --- | <0,010 | **0.65** | 14000 | <2,0 | 230 | <2,0 | 0.59 | <2,0 | <0,10 | 22000 | **150** | 18 | 25 | 35000 | 10 | 11000 | 13000 | 570 | 2.0 | 720 | **56** | --- | 7.3 | <0,10 | <0,50 | 1800 | <1,0 | 140 | --- | 4.9 | 1600 | 0.17 | <2,0 | 48 | 16 | --- | 52 |
| X19149A-2030.30-2239 | < 1 | < 1,5 | <0,010 | **0.67** | 13000 | <2,0 | 23 | <2,0 | 0.97 | <2,0 | 0.14 | 25000 | **160** | 19 | 31 | 36000 | 20 | 12000 | 16000 | 580 | 2.2 | 500 | **73** | --- | 3.8 | <0,10 | <0,50 | 1400 | <1,0 | 160 | --- | <4.0 | 1300 | 0.28 | <2,0 | 49 | 22 | --- | 46 |
| X19153-1770.00-1290 | --- | --- | <0,010 | **2.1** | 18000 | <2,0 | 100 | <2,0 | 0.77 | <2,0 | <0,10 | 18000 | **150** | 20 | 62 | 38000 | 17 | 15000 | 17000 | 520 | 6.3 | 510 | **70** | --- | 4.7 | <0,10 | 1.0 | 1800 | <1,0 | 88 | --- | 6.5 | 1900 | 0.34 | <2,0 | 86 | 10 | --- | 75 |
| X19136W-1692.40-1182 | < 1 | < 1,5 | <0,010 | **0.88** | 17000 | <2,0 | **280** | <2,0 | 0.69 | <2,0 | <0,10 | 16000 | **170** | 19 | 29 | 36000 | 12 | 15000 | 15000 | 540 | 1.8 | 500 | **66** | --- | 12 | <0,10 | <0,50 | 1800 | <1,0 | 88 | --- | 5.5 | 2300 | 0.26 | <2,0 | 64 | 21 | --- | 65 |
| X19139WA-1778.85-0693 | < 1 | < 1,5 | <0,010 | **0.53** | 17000 | <2,0 | 140 | <2,0 | 0.58 | <2,0 | <0,10 | 18000 | **130** | 22 | 44 | 37000 | 17 | 13000 | 15000 | 650 | 3.0 | 520 | **70** | --- | 6.7 | <0,10 | <0,50 | 1900 | <1,0 | 100 | --- | 5.6 | 1800 | 0.3 | <2,0 | 62 | 9.1 | --- | 71 |
| X19135W-1884.70-0949 | --- | --- | <0,010 | **2.1** | 14000 | <2,0 | 43 | <2,0 | 0.74 | <2,0 | <0,10 | 17000 | **140** | 17 | 45 | 37000 | 15 | 13000 | 19000 | 670 | 1.4 | 510 | **67** | --- | 4.1 | <0,10 | <0,50 | 1600 | <1,0 | 130 | --- | 5.9 | 1500 | 0.33 | <2,0 | 85 | 16 | --- | 64 |
| X19153-1754.20-1269 | --- | --- | <0,010 | **0.54** | 15000 | <2,0 | 160 | <2,0 | 0.29 | <2,0 | <0,10 | 10000 | **130** | 17 | 43 | 31000 | 17 | 13000 | 14000 | 440 | 1.4 | 540 | **57** | --- | 4.3 | <0,10 | <0,50 | 1700 | <1,0 | 32 | --- | 4.7 | 1800 | 0.27 | <2,0 | 87 | 11 | --- | 59 |
| COMPTE | 10 | 10 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 0 | 25 | 25 | 25 | 25 | 25 | 25 | 0 | 25 | 25 | 25 | 25 | 25 | 25 | 0 | 25 |
| MINIMUM | < 1 | < 1,5 | < 0,01 | < 0,5 | 9400 | < 2 | 19 | < 2 | 0.22 | < 2 | < 0,1 | 7900 | 110 | 13 | 10 | 29000 | 6.5 | 6200 | 11000 | 380 | 0.59 | 290 | 55 | NC | 3.4 | < 0,1 | < 0,5 | 320 | < 1 | 28 | NC | < 4 | 680 | 0.13 | < 2 | 48 | < 1 | NC | 23 |
| MAXIMUM | 1.0 | <1,5 | 0.041 | 6.2 | 23000 | 5.1 | 530 | 4.1 | 1.4 | 2.2 | 0.19 | 47000 | 270 | 33 | 120 | 44000 | 28 | 20000 | 24000 | 870 | 26 | 800 | 94 | NC | 22 | <0,1 | 1.5 | 3500 | <1 | 560 | NC | 7.3 | 2300 | 0.65 | <2 | 140 | 37 | NC | 93 |
| MEDIANE | 1.0 | NC | 0.01 | 1.5 | 15000 | 2.0 | 100 | 2.0 | 0.69 | 2.0 | 0.1 | 17000 | 150 | 20 | 40 | 37000 | 15 | 13000 | 16000 | 550 | 2.2 | 500 | 73 | NC | 6.5 | NC | 0.5 | 1800 | NC | 88 | NC | 5.4 | 1600 | 0.26 | NC | 70 | 15 | NC | 64 |
| MOYENNE | 1.0 | NC | 0.012 | 1.9 | 15112 | 2.5 | 140 | 2.2 | 0.71 | 2.0 | 0.11 | 18476 | 159 | 21 | 40 | 38120 | 16 | 12976 | 16280 | 557 | 3.8 | 487 | 73 | NC | 7.3 | NC | 0.68 | 1738 | NC | 109 | NC | 5.5 | 1629 | 0.26 | NC | 78 | 16 | NC | 62 |
| ÉCART TYPE | NC | NC | 0.0071 | 1.5 | 3766 | 1.0 | 131 | 0.53 | 0.29 | NC | 0.027 | 7938 | 32 | 4.2 | 23 | 3723 | 5.0 | 3637 | 3410 | 106 | 5.1 | 114 | 11 | NC | 4.2 | NC | 0.31 | 767 | NC | 101 | NC | 0.77 | 487 | 0.11 | NC | 27 | 9.4 | NC | 17 |
| 25eme CENTILE | 1.0 | NC | 0.01 | 0.88 | 12000 | 2.0 | 40 | 2.0 | 0.58 | 2.0 | 0.1 | 13000 | 140 | 18 | 25 | 36000 | 12 | 11000 | 14000 | 510 | 1.4 | 420 | 66 | NC | 4.1 | NC | 0.5 | 1400 | NC | 59 | NC | 4.9 | 1200 | 0.2 | NC | 58 | 9.4 | NC | 52 |
| 75eme CENTILE | 1.0 | NC | 0.01 | 2.1 | 17000 | 2.1 | 180 | 2.0 | 0.77 | 2.0 | 0.11 | 21000 | 170 | 22 | 47 | 41000 | 17 | 15000 | 18000 | 610 | 3.9 | 530 | 80 | NC | 8.7 | NC | 0.88 | 1900 | NC | 130 | NC | 5.9 | 2000 | 0.3 | NC | 88 | 20 | NC | 73 |
| **Minerai SGR++** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Y155013EXT-1663.00-0736 | < 1 | < 1,5 | <0,010 | **2.3** | 12000 | **5.2** | 65 | 2.6 | 0.61 | <2,0 | 0.12 | 21000 | **120** | 17 | 29 | 31000 | 16 | 10000 | 12000 | 440 | 0.85 | 540 | **62** | --- | 16 | <0,10 | 1.0 | 540 | <1,0 | 65 | --- | 5.3 | 1100 | <0,10 | <2,0 | 49 | 15 | --- | 59 |
| X19152W-1592.75-0322 | < 1 | < 1,5 | <0,010 | **1.6** | 17000 | 3.9 | 94 | <2,0 | 0.36 | <2,0 | <0,10 | 8400 | **150** | 19 | 50 | 38000 | 16 | 15000 | 19000 | 640 | 0.9 | 320 | **85** | --- | 4.8 | <0,10 | <0,50 | 2100 | <1,0 | 24 | --- | 7.5 | 1800 | 0.41 | <2,0 | 76 | 8.7 | --- | 66 |
| X19155-1653.20-0711 | < 1 | < 1,5 | <0,010 | **7.6** | 3100 | <2,0 | 22 | <2,0 | 0.16 | <2,0 | <0,10 | 12000 | 45 | 6.9 | 4.4 | 17000 | <5.0 | 2500 | 4900 | 240 | 0.51 | 340 | 29 | --- | 7.4 | <0,10 | <0,50 | 690 | <1,0 | 48 | --- | <4.0 | 240 | <0,10 | <2,0 | 9.3 | 15 | --- | 9.8 |
| X18108AC-1277.00-0058 | < 1 | < 1,5 | <0,010 | **1.7** | 6000 | 3.3 | 27 | <2,0 | 0.27 | <2,0 | 0.14 | 20000 | 86 | 14 | 12 | 26000 | 7.8 | 4200 | 6900 | 330 | 5.7 | 480 | 50 | --- | 4.0 | <0,10 | <0,50 | 790 | <1,0 | 51 | --- | <4.0 | 400 | 0.11 | <2,0 | 22 | 20 | --- | 22 |
| X19157-1723.60-0551 | < 1 | < 1,5 | <0,010 | **0.99** | 9300 | <2,0 | 69 | <2,0 | 0.19 | 2.5 | 0.16 | 20000 | 98 | 13 | 2.4 | 31000 | 11 | 7600 | 10000 | 510 | 0.9 | 510 | 47 | --- | 6.9 | <0,10 | 1.4 | 1100 | <1,0 | 300 | --- | <4.0 | 820 | 0.16 | <2,0 | 13 | 7.5 | --- | 16 |
| X19143-1451.25-1448 | < 1 | < 1,5 | <0,010 | **4.8** | 7500 | 2.9 | 14 | <2,0 | 0.62 | <2,0 | 0.2 | 27000 | **150** | 19 | 28 | 38000 | 13 | 6200 | 12000 | 590 | 1.8 | 530 | **72** | --- | 5.1 | <0,10 | <0,50 | 1200 | <1,0 | 120 | --- | <4.0 | 530 | 0.15 | <2,0 | 43 | 20 | --- | 57 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 0 | 6.0 |
| MINIMUM | < 1 | < 1,5 | < 0,01 | 0.99 | 3100 | < 2 | 14 | < 2 | 0.16 | < 2 | < 0,1 | 8400 | 45 | 6.9 | 2.4 | 17000 | < 5 | 2500 | 4900 | 240 | 0.51 | 320 | 29 | NC | 4.0 | < 0,1 | < 0,5 | 540 | < 1 | 24 | NC | < 4 | 240 | < 0,1 | < 2 | 9.3 | 7.5 | NC | 9.8 |
| MAXIMUM | <1 | <1,5 | <0,01 | 7.6 | 17000 | 5.2 | 94 | 2.6 | 0.62 | 2.5 | 0.2 | 27000 | 150 | 19 | 50 | 38000 | 16 | 15000 | 19000 | 640 | 5.7 | 540 | 85 | NC | 16 | <0,1 | 1.4 | 2100 | <1 | 300 | NC | 7.5 | 1800 | 0.41 | <2 | 76 | 20 | NC | 66 |
| MEDIANE | NC | NC | NC | 2.0 | 8400 | 3.1 | 46 | 2.0 | 0.32 | 2.0 | 0.13 | 20000 | 109 | 16 | 20 | 31000 | 12 | 6900 | 11000 | 475 | 0.9 | 495 | 56 | NC | 6.0 | NC | 0.5 | 945 | NC | 58 | NC | 4.0 | 675 | 0.13 | NC | 33 | 15 | NC | 40 |
| MOYENNE | NC | NC | NC | 3.2 | 9150 | 3.2 | 49 | 2.1 | 0.37 | 2.1 | 0.14 | 18067 | 108 | 15 | 21 | 30167 | 11 | 7583 | 10800 | 458 | 1.8 | 453 | 58 | NC | 7.4 | NC | 0.73 | 1070 | NC | 101 | NC | 4.8 | 815 | 0.17 | NC | 35 | 14 | NC | 38 |
| ÉCART TYPE | NC | NC | NC | 2.5 | 4879 | 1.2 | 32 | NC | 0.2 | NC | 0.039 | 6725 | 41 | 4.6 | 18 | 7935 | 4.4 | 4473 | 4915 | 153 | 2.0 | 98 | 20 | NC | 4.4 | NC | 0.38 | 563 | NC | 102 | NC | 1.4 | 572 | 0.12 | NC | 26 | 5.4 | NC | 25 |
| 25eme CENTILE | NC | NC | NC | 1.6 | 6375 | 2.2 | 23 | 2.0 | 0.21 | 2.0 | 0.11 | 14000 | 89 | 13 | 6.3 | 27250 | 8.6 | 4700 | 7675 | 358 | 0.86 | 375 | 48 | NC | 4.9 | NC | 0.5 | 715 | NC | 49 | NC | 4.0 | 433 | 0.1 | NC | 15 | 10 | NC | 18 |
| 75eme CENTILE | NC | NC | NC | 4.2 | 11325 | 3.8 | 68 | 2.0 | 0.55 | 2.0 | 0.16 | 20750 | 143 | 19 | 29 | 36250 | 15 | 9400 | 12000 | 570 | 1.6 | 525 | 70 | NC | 7.3 | NC | 0.88 | 1175 | NC | 106 | NC | 5.0 | 1030 | 0.16 | NC | 48 | 19 | NC | 59 |

Tableau D-5: Métaux extractibles (MA 200)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | F | Br | Hg | Ag | Al | As | Ba | B | Be | Bi | Cd | Ca | Cr | Co | Cu | Fe | Li | K | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Te | Th | Ti | Tl | U | V | W | Y | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | % | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| **Critère de sols PPSRTC-A (Province du Supérieur) du MELCC 2019** | | | **0.3** | **0.5** | | **5.0** | **240** | | | | **0.9** | | **100** | **30** | **65** | | | | | **1000** | **8.0** | | **50** | | **40** | | **3.0** | | **5.0** | | | | | | | | | | **150** |
| **Critère de sols B du MELCC 2019** | 400 | 50 | 2.0 | 20 | | 30 | 500 | | | | 5.0 | | 250 | 50 | 100 | | | | | 1000 | 10 | | 100 | | 500 | | 3.0 | | 50 | | | | | | | | | | 500 |
| **Critère de sols C du MELCC 2019** | 2000 | 300 | 10 | 40 | | 50 | 2000 | | | | 20 | | 800 | 300 | 500 | | | | | 2200 | 40 | | 500 | | 1000 | | 10 | | 300 | | | | | | | | | | 1500 |
| **Dilution AGR** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X18110AA-1374.20-0039 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | 86 | <2,0 | 0.55 | <2,0 | <0,10 | 7500 | **140** | 21 | 60 | 35000 | 34 | 12000 | 17000 | 440 | 1.4 | 380 | **84** | --- | 1.7 | <0,10 | <0,50 | 1600 | <1,0 | 22 | --- | 6.3 | 1900 | 0.32 | <2,0 | 100 | 3.3 | --- | 70 |
| X18108AW-1237.00-0050 | --- | --- | <0,010 | <0,50 | 29000 | <2,0 | 160 | <2,0 | 0.17 | <2,0 | <0,10 | 2000 | **120** | 24 | 53 | 42000 | 36 | 17000 | 19000 | 430 | 2.5 | 360 | **110** | --- | 2.6 | <0,10 | <0,50 | 2600 | <1,0 | 9.4 | --- | 6.8 | 1700 | 0.48 | <2,0 | 80 | 2.1 | --- | 80 |
| X18121-1298.00-1087 | --- | --- | <0,010 | **0.88** | 19000 | 4.1 | 110 | <2,0 | 0.44 | <2,0 | 0.16 | 13000 | **130** | 19 | 41 | 34000 | 24 | 15000 | 15000 | 510 | 0.62 | 420 | **73** | --- | 5.7 | <0,10 | 0.73 | 1800 | <1,0 | 40 | --- | 6.0 | 1900 | 0.52 | <2,0 | 77 | 3.6 | --- | 68 |
| Y155016EXT-1886.00-0952 | --- | --- | <0,010 | <0,50 | 7600 | <2,0 | 35 | <2,0 | 0.18 | <2,0 | <0,10 | 6000 | 62 | 8.7 | 20 | 16000 | 7.9 | 3700 | 6900 | 190 | 1.2 | 190 | 30 | --- | <1,0 | <0,10 | <0,50 | 890 | <1,0 | 16 | --- | <4.0 | 700 | 0.11 | <2,0 | 30 | 1.8 | --- | 24 |
| X18127W-1283.20-0858 | --- | --- | <0,010 | <0,50 | 25000 | <2,0 | **340** | <2,0 | 0.13 | <2,0 | <0,10 | 2800 | **160** | 22 | 47 | 40000 | 27 | 19000 | 17000 | 530 | 2.0 | 460 | **84** | --- | 2.4 | <0,10 | 1.2 | 590 | <1,0 | 9.0 | --- | 4.6 | 2000 | <0,10 | <2,0 | 95 | 1.0 | --- | 78 |
| X19135-1872.00-1876 | --- | --- | <0,010 | <0,50 | 26000 | <2,0 | **330** | <2,0 | 0.13 | <2,0 | <0,10 | 2300 | **140** | 22 | 52 | 39000 | 25 | 19000 | 18000 | 410 | 1.1 | 350 | **80** | --- | 2.8 | <0,10 | <0,50 | 2900 | <1,0 | 8.2 | --- | 4.9 | 2100 | 0.45 | <2,0 | 89 | <1,0 | --- | 77 |
| Y165106EXT-1651.00-0502 | --- | --- | <0,010 | <0,50 | 27000 | <2,0 | **290** | <2,0 | 0.2 | <2,0 | <0,10 | 2500 | **150** | 26 | 46 | 44000 | 35 | 20000 | 20000 | 500 | 1.4 | 640 | **110** | --- | 2.1 | <0,10 | <0,50 | 3200 | <1,0 | 9.9 | --- | <4.0 | 2200 | 0.46 | <2,0 | 120 | 2.2 | --- | 88 |
| X19135W-1826.00-0881 | --- | --- | <0,010 | <0,50 | 25000 | <2,0 | **310** | <2,0 | 0.12 | <2,0 | <0,10 | 5000 | **160** | 20 | 42 | 42000 | 23 | 19000 | 17000 | 600 | 1.2 | 620 | **73** | --- | 2.7 | <0,10 | <0,50 | 2300 | <1,0 | 16 | --- | 6.1 | 2400 | 0.4 | <2,0 | 91 | 1.2 | --- | 79 |
| X19135W-1832.00-0888 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | 200 | <2,0 | 0.18 | <2,0 | <0,10 | 7400 | **160** | 21 | 44 | 38000 | 23 | 14000 | 15000 | 580 | 4.1 | 400 | **74** | --- | 2.7 | <0,10 | <0,50 | 1800 | <1,0 | 19 | --- | 5.7 | 2200 | 0.34 | <2,0 | 81 | 1.9 | --- | 73 |
| X19135W-1848.00-0906 | --- | --- | <0,010 | <0,50 | 31000 | <2,0 | 200 | <2,0 | 0.25 | <2,0 | <0,10 | 2900 | **140** | **32** | **77** | 50000 | 34 | 17000 | 21000 | 600 | 2.6 | 300 | **120** | --- | 4.0 | <0,10 | 1.0 | 3100 | <1,0 | 14 | --- | 6.4 | 2200 | 0.41 | <2,0 | 100 | <1,0 | --- | 91 |
| X19135W-1854.00-0912 | < 1 | < 1,5 | <0,010 | <0,50 | 25000 | <2,0 | 230 | <2,0 | 0.22 | <2,0 | <0,10 | 13000 | **170** | 24 | 45 | 42000 | 27 | 22000 | 19000 | 640 | 2.3 | 440 | **89** | --- | 3.9 | <0,10 | <0,50 | 2700 | <1,0 | 25 | --- | 6.8 | 2900 | 0.5 | <2,0 | 110 | 3.8 | --- | 85 |
| X19135W-1864.00-0924 | --- | --- | <0,010 | <0,50 | 22000 | <2,0 | 210 | <2,0 | 0.58 | <2,0 | <0,10 | 4400 | **170** | 22 | 38 | 44000 | 29 | 13000 | 20000 | 580 | 4.2 | 500 | **94** | --- | 3.0 | <0,10 | <0,50 | 2400 | <1,0 | 20 | --- | 6.4 | 2300 | 0.34 | <2,0 | 110 | 6.2 | --- | 86 |
| X19135W-1869.00-0930 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | 150 | <2,0 | 0.28 | <2,0 | <0,10 | 6700 | **180** | 20 | 45 | 38000 | 22 | 15000 | 16000 | 550 | 2.5 | 570 | **74** | --- | 3.9 | <0,10 | <0,50 | 2600 | <1,0 | 28 | --- | 5.6 | 2300 | 0.39 | <2,0 | 84 | 4.4 | --- | 76 |
| X19135W-1917.00-0989 | < 1 | < 1,5 | <0,010 | <0,50 | 24000 | <2,0 | 130 | <2,0 | 0.33 | <2,0 | <0,10 | 10000 | **190** | 21 | 56 | 41000 | 22 | 21000 | 23000 | 940 | 5.1 | 450 | **100** | --- | 3.0 | <0,10 | <0,50 | 2500 | <1,0 | 25 | --- | 6.2 | 2600 | 0.54 | <2,0 | 140 | 11 | --- | 87 |
| X19135W-1923.00-0995 | --- | --- | <0,010 | <0,50 | 25000 | <2,0 | 160 | <2,0 | 0.26 | <2,0 | <0,10 | 5800 | **160** | 19 | 35 | 41000 | 23 | 22000 | 24000 | 790 | 0.93 | 600 | **91** | --- | 3.3 | <0,10 | <0,50 | 2500 | <1,0 | 23 | --- | 8.5 | 2700 | 0.6 | <2,0 | 150 | 3.2 | --- | 85 |
| X19136-1663.00-1673 | --- | --- | <0,010 | <0,50 | 21000 | <2,0 | 240 | 3.1 | 0.12 | <2,0 | 0.19 | 3600 | **120** | 21 | 40 | 32000 | 18 | 17000 | 14000 | 430 | 1.4 | 460 | **76** | --- | 3.0 | <0,10 | <0,50 | 3000 | <1,0 | 15 | --- | 6.7 | 1900 | 0.73 | <2,0 | 62 | 1.2 | --- | 66 |
| X19139-1748.00-1894 | --- | --- | <0,010 | <0,50 | 31000 | <2,0 | **380** | <2,0 | 0.11 | <2,0 | <0,10 | 3900 | **150** | 27 | 51 | 42000 | 21 | 23000 | 19000 | 560 | 1.2 | 610 | **98** | --- | 3.5 | <0,10 | <0,50 | 5300 | <1,0 | 19 | --- | 7.9 | 2400 | 0.58 | <2,0 | 96 | <1,0 | --- | 87 |
| X19140-1547.00-1625 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | **320** | <2,0 | 0.14 | <2,0 | 0.64 | 4000 | **130** | 22 | 48 | 37000 | 24 | 16000 | 15000 | 410 | 1.5 | 450 | **76** | --- | 21 | <0,10 | <0,50 | 3100 | <1,0 | 15 | --- | 6.3 | 1700 | 0.44 | <2,0 | 81 | <1,0 | --- | 120 |
| X19142-1509.00-1470 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | **300** | <2,0 | 0.15 | <2,0 | <0,10 | 2600 | **140** | 17 | 38 | 36000 | 22 | 18000 | 21000 | 520 | 1.7 | 350 | **66** | --- | 2.8 | <0,10 | <0,50 | 2700 | <1,0 | 11 | --- | 6.3 | 1800 | 0.44 | <2,0 | 83 | <1,0 | --- | 75 |
| X19145-1895.00-2173 | --- | --- | <0,010 | <0,50 | 27000 | <2,0 | **550** | <2,0 | 0.13 | <2,0 | <0,10 | 3100 | **420** | 24 | 46 | 33000 | 31 | 23000 | 28000 | 350 | 2.8 | 490 | **110** | --- | 2.6 | <0,10 | 0.81 | 3300 | <1,0 | 17 | --- | 5.6 | 2300 | 0.5 | <2,0 | 95 | <1,0 | --- | 57 |
| X19146-1948.00-2112 | --- | --- | <0,010 | <0,50 | 25000 | <2,0 | **320** | <2,0 | 0.18 | <2,0 | <0,10 | 8300 | **140** | 26 | 32 | 37000 | 31 | 21000 | 17000 | 480 | 1.5 | 380 | **100** | --- | 3.1 | <0,10 | 0.88 | 3800 | <1,0 | 21 | --- | 7.0 | 2300 | 0.53 | <2,0 | 82 | 2.0 | --- | 84 |
| X19145WA-1907.00-0844 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | 130 | <2,0 | 0.18 | <2,0 | <0,10 | 13000 | **160** | 21 | 40 | 35000 | 24 | 20000 | 16000 | 500 | 1.0 | 490 | **66** | --- | 5.2 | <0,10 | 1.2 | 3400 | <1,0 | 29 | --- | 9.9 | 2200 | 0.54 | 2.3 | 77 | 3.4 | --- | 72 |
| X19146WB-1849.25-0919 | --- | --- | <0,010 | <0,50 | 25000 | <2,0 | 220 | <2,0 | 0.3 | <2,0 | <0,10 | 6800 | **210** | **31** | 50 | 44000 | 38 | 8900 | 21000 | 660 | **9.2** | 450 | **110** | --- | 3.0 | <0,10 | <0,50 | 2000 | <1,0 | 32 | --- | 8.5 | 1800 | 0.2 | <2,0 | 110 | 1.4 | --- | 87 |
| X19151-1772.00-1749 | --- | --- | <0,010 | **8.4** | 18000 | <2,0 | 220 | <2,0 | 0.21 | 23 | 0.23 | 29000 | **140** | 21 | 32 | 31000 | 17 | 13000 | 14000 | 740 | **17** | 480 | **78** | --- | **520** | <0,10 | 1.7 | 2700 | <1,0 | 88 | --- | 5.5 | 1400 | 0.33 | <2,0 | 75 | 3.7 | --- | 60 |
| X19153-1721.00-1226 | < 1 | < 1,5 | <0,010 | <0,50 | 18000 | <2,0 | **250** | <2,0 | 0.15 | <2,0 | <0,10 | 6100 | **150** | 19 | 59 | 37000 | 20 | 15000 | 13000 | 590 | 1.2 | 570 | **64** | --- | 3.0 | <0,10 | <0,50 | 2400 | <1,0 | 25 | --- | 6.1 | 2500 | 0.36 | <2,0 | 79 | 1.8 | --- | 68 |
| X19154-1593.00-0902 | --- | --- | <0,010 | <0,50 | 21000 | <2,0 | **300** | <2,0 | 0.23 | <2,0 | <0,10 | 14000 | **190** | 19 | 49 | 38000 | 29 | 17000 | 23000 | 600 | 4.7 | 470 | **64** | --- | 3.5 | <0,10 | <0,50 | 2400 | <1,0 | 39 | --- | 7.0 | 2200 | 0.44 | <2,0 | 82 | 1.4 | --- | 71 |
| X19152W-1585.00-0313 | --- | --- | <0,010 | <0,50 | 26000 | <2,0 | 170 | <2,0 | 0.24 | <2,0 | <0,10 | 4300 | **120** | 24 | 48 | 46000 | 18 | 22000 | 24000 | 610 | 2.9 | 280 | **110** | --- | 2.9 | <0,10 | <0,50 | 2900 | <1,0 | 10 | --- | 7.3 | 2500 | 0.55 | <2,0 | 68 | <1,0 | --- | 89 |
| X19152W-1591.00-0319 | --- | --- | <0,010 | <0,50 | 27000 | <2,0 | **250** | <2,0 | 0.21 | <2,0 | <0,10 | 3000 | **130** | 23 | 45 | 46000 | 20 | 22000 | 24000 | 620 | 1.8 | 260 | **100** | --- | 4.2 | <0,10 | <0,50 | 2900 | <1,0 | 8.8 | --- | 8.5 | 2700 | 0.49 | <2,0 | 71 | <1,0 | --- | 86 |
| X19152W-1608.00-0341 | --- | --- | <0,010 | <0,50 | 21000 | <2,0 | **330** | <2,0 | 0.1 | <2,0 | <0,10 | 4600 | **150** | 17 | 37 | 38000 | 20 | 18000 | 19000 | 640 | 1.4 | 360 | **63** | --- | 3.4 | <0,10 | <0,50 | 2600 | <1,0 | 12 | --- | 6.6 | 2400 | 0.37 | <2,0 | 65 | 2.2 | --- | 70 |
| X19152W-1611.00-0344 | --- | --- | <0,010 | <0,50 | 23000 | <2,0 | **470** | <2,0 | 0.12 | <2,0 | <0,10 | 4200 | **200** | 20 | 41 | 44000 | 19 | 19000 | 24000 | 650 | 1.4 | 520 | **75** | --- | 3.2 | <0,10 | <0,50 | 2500 | <1,0 | 49 | --- | 7.6 | 2500 | 0.36 | <2,0 | 110 | 1.5 | --- | 80 |
| X19152W-1614.00-0347 | --- | --- | <0,010 | <0,50 | 26000 | <2,0 | **520** | <2,0 | 0.32 | <2,0 | <0,10 | 2400 | **190** | 22 | 50 | 47000 | 21 | 21000 | 24000 | 580 | 3.7 | 400 | **91** | --- | 3.5 | <0,10 | <0,50 | 2700 | <1,0 | 11 | --- | 5.5 | 2600 | 0.48 | <2,0 | 130 | <1,0 | --- | 77 |
| X19152W-1616.00-0350 | --- | --- | <0,010 | <0,50 | 24000 | 3.3 | 220 | <2,0 | 0.12 | <2,0 | <0,10 | 2600 | **140** | 22 | 50 | 45000 | 23 | 22000 | 23000 | 630 | 7.2 | 310 | **91** | --- | 3.1 | <0,10 | <0,50 | 2900 | <1,0 | 8.6 | --- | 6.2 | 2700 | 0.53 | <2,0 | 73 | <1,0 | --- | 79 |
| X19152W-1630.00-0366 | --- | --- | 0.012 | <0,50 | 24000 | <2,0 | **300** | <2,0 | 0.19 | <2,0 | 0.13 | 3200 | **140** | 19 | 39 | 41000 | 22 | 18000 | 21000 | 540 | 1.5 | 370 | **78** | --- | 5.0 | <0,10 | <0,50 | 3000 | <1,0 | 12 | --- | 6.5 | 2200 | 0.4 | <2,0 | 72 | <1,0 | --- | 77 |
| X19152W-1636.00-0372 | --- | --- | <0,010 | <0,50 | 23000 | 2.5 | **320** | <2,0 | 0.29 | <2,0 | <0,10 | 5200 | **180** | 17 | 37 | 41000 | 45 | 15000 | 21000 | 730 | 1.3 | 340 | **63** | --- | 6.3 | <0,10 | <0,50 | 2600 | <1,0 | 19 | --- | 7.5 | 2100 | 0.28 | <2,0 | 75 | <1,0 | --- | 68 |
| X19152W-1702.00-0583 | --- | --- | <0,010 | <0,50 | 25000 | <2,0 | **300** | <2,0 | 0.18 | <2,0 | <0,10 | 2900 | **130** | 20 | 42 | 41000 | 23 | 19000 | 22000 | 480 | 7.0 | 320 | **88** | --- | 2.5 | <0,10 | <0,50 | 2900 | <1,0 | 15 | --- | 6.0 | 2000 | 0.41 | <2,0 | 77 | <1,0 | --- | 73 |
| X19152W-1708.00-0590 | < 1 | < 1,5 | <0,010 | <0,50 | 20000 | <2,0 | **370** | <2,0 | 0.23 | <2,0 | <0,10 | 9900 | **190** | 18 | 29 | 39000 | 24 | 17000 | 22000 | 720 | 1.5 | 370 | **69** | --- | 3.5 | <0,10 | <0,50 | 2300 | <1,0 | 53 | --- | 6.5 | 2200 | 0.31 | <2,0 | 77 | 4.4 | --- | 73 |
| X19152W-1718.00-0602 | --- | --- | <0,010 | <0,50 | 17000 | <2,0 | **310** | <2,0 | 0.36 | <2,0 | <0,10 | 11000 | **150** | 16 | 38 | 37000 | 17 | 15000 | 20000 | 630 | 2.1 | 550 | **57** | --- | 3.9 | <0,10 | <0,50 | 2200 | <1,0 | 63 | --- | 6.7 | 2100 | 0.34 | <2,0 | 74 | 2100 | --- | 69 |
| X19152W-1724.00-0609 | --- | --- | <0,010 | <0,50 | 18000 | <2,0 | **370** | <2,0 | 0.45 | <2,0 | <0,10 | 13000 | **140** | 15 | 39 | 35000 | 17 | 16000 | 18000 | 640 | 2.7 | 610 | **61** | --- | 5.3 | <0,10 | <0,50 | 2500 | <1,0 | 55 | --- | 6.2 | 2300 | 0.37 | <2,0 | 87 | 5.6 | --- | 58 |
| X19156-1738.00-1258 | --- | --- | <0,010 | <0,50 | 26000 | <2,0 | **430** | <2,0 | 0.17 | <2,0 | <0,10 | 3700 | **160** | 26 | 48 | 46000 | 29 | 21000 | 19000 | 630 | 1.6 | 500 | **92** | --- | 2.8 | <0,10 | <0,50 | 3700 | <1,0 | 20 | --- | 7.1 | 2500 | 0.57 | <2,0 | 110 | <1,0 | --- | 86 |
| X19156-1741.00-1262 | --- | --- | <0,010 | <0,50 | 28000 | <2,0 | **490** | <2,0 | 0.13 | <2,0 | <0,10 | 2600 | **150** | 28 | 53 | 48000 | 30 | 23000 | 20000 | 620 | 1.5 | 390 | **96** | --- | 3.5 | <0,10 | 1.3 | 3700 | <1,0 | 15 | --- | 7.0 | 2500 | 0.63 | <2,0 | 120 | <1,0 | --- | 91 |
| X19156-1745.00-1266 | < 1 | < 1,5 | <0,010 | <0,50 | 22000 | <2,0 | **270** | <2,0 | 0.15 | <2,0 | <0,10 | 4100 | **130** | 23 | 48 | 41000 | 22 | 19000 | 15000 | 550 | 1.1 | 510 | **72** | --- | 3.8 | <0,10 | 0.73 | 3300 | <1,0 | 25 | --- | 6.6 | 2300 | 0.47 | <2,0 | 77 | <1,0 | --- | 80 |
| X19156-1805.35-1346 | --- | --- | <0,010 | <0,50 | 19000 | <2,0 | 79 | <2,0 | 0.27 | <2,0 | <0,10 | 5300 | **160** | 19 | 44 | 36000 | 27 | 14000 | 15000 | 570 | **15** | 360 | **69** | --- | 2.7 | <0,10 | <0,50 | 2100 | <1,0 | 26 | --- | 6.1 | 2000 | 0.36 | <2,0 | 81 | 4.0 | --- | 65 |
| X19139WA-1730.30-0618 | --- | --- | <0,010 | <0,50 | 23000 | **6.2** | 97 | <2,0 | 0.22 | <2,0 | 0.1 | 15000 | **200** | 23 | 59 | 41000 | 20 | 19000 | 16000 | 620 | 3.1 | 700 | **77** | --- | 6.5 | <0,10 | 1.1 | 2400 | <1,0 | 39 | --- | 8.5 | 2600 | 0.58 | 2.0 | 81 | 3.3 | --- | 83 |
| Y155013EXT-1771.00-0865 | --- | --- | <0,010 | <0,50 | 22000 | <2,0 | **260** | <2,0 | 0.14 | <2,0 | <0,10 | 2600 | **150** | 21 | 47 | 40000 | 28 | 17000 | 16000 | 540 | 1.4 | 410 | **79** | --- | 3.0 | <0,10 | <0,50 | 2000 | <1,0 | 13 | --- | 5.5 | 2400 | 0.4 | <2,0 | 89 | 3.8 | --- | 74 |
| X19135W-1841.00-0897 | --- | --- | <0,010 | <0,50 | 24000 | <2,0 | **250** | <2,0 | 0.16 | <2,0 | <0,10 | 6200 | **160** | 24 | 47 | 41000 | 24 | 20000 | 17000 | 600 | 1.9 | 430 | **89** | --- | 2.6 | <0,10 | 0.97 | 2100 | <1,0 | 15 | --- | 6.0 | 2800 | 0.44 | <2,0 | 98 | 2.9 | --- | 77 |
| X19135W-1875.00-0937 | --- | --- | <0,010 | <0,50 | 25000 | <2,0 | 130 | <2,0 | 0.33 | <2,0 | <0,10 | 3500 | **150** | 25 | 55 | 45000 | 25 | 22000 | 18000 | 550 | 2.9 | 350 | **97** | --- | 2.8 | <0,10 | 1.5 | 2500 | <1,0 | 15 | --- | 6.1 | 3000 | 0.62 | <2,0 | 110 | 4.5 | --- | 91 |
| X19136-1708.55-1732 | --- | --- | <0,010 | **0.64** | 14000 | <2,0 | **270** | <2,0 | 0.46 | <2,0 | <0,10 | 15000 | **150** | 20 | **75** | 32000 | 7.2 | 11000 | 12000 | 450 | 1.3 | 660 | **59** | --- | 8.5 | <0,10 | <0,50 | 2000 | <1,0 | 65 | --- | 5.9 | 1300 | 0.21 | <2,0 | 90 | 19 | --- | 56 |
| X19149A-2020.00-2225 | --- | --- | <0,010 | **1.4** | 24000 | <2,0 | 90 | <2,0 | 0.31 | <2,0 | <0,10 | 15000 | **200** | 25 | 51 | 45000 | 35 | 21000 | 20000 | 600 | 3.3 | 550 | **83** | --- | 8.6 | <0,10 | <0,50 | 2700 | <1,0 | 40 | --- | 10 | 2400 | 0.63 | <2,0 | 150 | 11 | --- | 85 |
| X19146WB-1866.00-0939 | --- | --- | <0,010 | **0.66** | 24000 | <2,0 | 190 | <2,0 | 0.2 | <2,0 | <0,10 | 11000 | **210** | 27 | 53 | 44000 | 30 | 18000 | 20000 | 540 | 4.8 | 480 | **87** | --- | 4.6 | <0,10 | <0,50 | 2500 | <1,0 | 25 | --- | 8.1 | 2400 | 0.61 | 2.0 | 110 | 2.2 | --- | 79 |
| X19149AWB-2010.00-0848 | --- | --- | <0,010 | <0,50 | 24000 | <2,0 | 110 | <2,0 | 0.26 | <2,0 | <0,10 | 4800 | **200** | 25 | 45 | 43000 | 31 | 21000 | 20000 | 640 | 6.7 | 420 | **100** | --- | 2.7 | <0,10 | 0.79 | 2400 | <1,0 | 19 | --- | 6.7 | 2800 | 0.63 | <2,0 | 130 | 6.2 | --- | 85 |
| X19154-1579.00-0887 | --- | --- | <0,010 | <0,50 | 24000 | <2,0 | **270** | <2,0 | 0.37 | <2,0 | <0,10 | 9100 | **220** | 21 | 44 | 43000 | 33 | 21000 | 23000 | 600 | 6.8 | 500 | **90** | --- | 3.2 | <0,10 | <0,50 | 2700 | <1,0 | 25 | --- | 6.8 | 2800 | 0.59 | <2,0 | 150 | 2.3 | --- | 95 |
| X19152W-1709.00-0591 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | **320** | <2,0 | 0.17 | <2,0 | <0,10 | 6700 | **160** | 16 | 34 | 37000 | 22 | 17000 | 18000 | 650 | 1.2 | 510 | **58** | --- | 2.9 | <0,10 | <0,50 | 2500 | <1,0 | 27 | --- | 7.3 | 2300 | 0.32 | <2,0 | 72 | 6.6 | --- | 65 |
| X19152W-1712.00-0594 | --- | --- | <0,010 | <0,50 | 22000 | 2.1 | 190 | <2,0 | 0.19 | <2,0 | <0,10 | 4100 | **150** | 20 | 41 | 42000 | 21 | 19000 | 22000 | 640 | 3.3 | 420 | **84** | --- | 2.6 | <0,10 | <0,50 | 3100 | <1,0 | 37 | --- | 6.8 | 2500 | 0.44 | <2,0 | 71 | 17 | --- | 82 |
| X19145-1901.00-2179 | --- | --- | <0,010 | <0,50 | 27000 | <2,0 | **470** | <2,0 | 0.19 | <2,0 | <0,10 | 8800 | **320** | 23 | **67** | 36000 | 27 | 20000 | 26000 | 490 | 2.8 | 560 | **95** | --- | 3.5 | <0,10 | 1.2 | 1800 | <1,0 | 35 | --- | 4.7 | 2300 | 0.4 | <2,0 | 110 | 4.7 | --- | 56 |
| X19133-0877.75-0589 | --- | --- | <0,010 | <0,50 | 27000 | <2,0 | **370** | <2,0 | 0.14 | <2,0 | <0,10 | 2200 | **150** | 27 | 57 | 44000 | 32 | 22000 | 19000 | 480 | 1.4 | 410 | **110** | --- | 2.9 | <0,10 | <0,50 | 2300 | <1,0 | 8.4 | --- | 6.7 | 2500 | 0.47 | <2,0 | 96 | <1,0 | --- | 85 |
| X19135W-1854.50-0913 | --- | --- | <0,010 | <0,50 | 12000 | <2,0 | 120 | <2,0 | 0.15 | <2,0 | 0.14 | 25000 | 73 | 13 | 40 | 28000 | 12 | 9600 | 11000 | 740 | 4.1 | 450 | 44 | --- | 3.0 | <0,10 | <0,50 | 1800 | <1,0 | 100 | --- | <4.0 | 1000 | 0.24 | <2,0 | 49 | 3.3 | --- | 25 |
| X19154-1588.00-0896 | < 1 | < 1,5 | <0,010 | <0,50 | 25000 | <2,0 | **300** | <2,0 | 0.2 | <2,0 | <0,10 | 3000 | **160** | 23 | 49 | 45000 | 34 | 21000 | 24000 | 700 | 2.2 | 540 | **100** | --- | 2.8 | <0,10 | <0,50 | 2500 | <1,0 | 10 | --- | 7.3 | 2800 | 0.51 | <2,0 | 110 | <1,0 | --- | 84 |
| COMPTE | 6.0 | 6.0 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 0 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 57 | 0 | 57 |
| MINIMUM | < 1 | < 1,5 | < 0,01 | < 0,5 | 7600 | < 2 | 35 | < 2 | 0.1 | < 2 | < 0,1 | 2000 | 62 | 8.7 | 20 | 16000 | 7.2 | 3700 | 6900 | 190 | 0.62 | 190 | 30 | NC | < 1 | < 0,1 | < 0,5 | 590 | < 1 | 8.2 | NC | < 4 | 700 | < 0,1 | < 2 | 30 | < 1 | NC | 24 |
| MAXIMUM | <1 | <1,5 | 0.012 | 8.4 | 31000 | 6.2 | 550 | 3.1 | 0.58 | 23 | 0.64 | 29000 | 420 | 32 | 77 | 50000 | 45 | 23000 | 28000 | 940 | 17 | 700 | 120 | NC | 520 | <0,1 | 1.7 | 5300 | <1 | 100 | NC | 10 | 3000 | 0.73 | 2.3 | 150 | 2100 | NC | 120 |
| MEDIANE | NC | NC | 0.01 | 0.5 | 24000 | 2.0 | 260 | 2.0 | 0.19 | 2.0 | 0.1 | 5000 | 150 | 21 | 46 | 41000 | 24 | 19000 | 19000 | 590 | 2.0 | 450 | 84 | NC | 3.1 | NC | 0.5 | 2500 | NC | 20 | NC | 6.5 | 2300 | 0.44 | 2.0 | 87 | 2.1 | NC | 78 |
| MOYENNE | NC | NC | 0.01 | 0.67 | 22923 | 2.1 | 260 | 2.0 | 0.23 | 2.4 | 0.12 | 7012 | 163 | 22 | 46 | 39737 | 25 | 17898 | 18981 | 576 | 3.1 | 447 | 83 | NC | 13 | NC | 0.64 | 2591 | NC | 26 | NC | 6.6 | 2247 | 0.44 | 2.0 | 92 | 40 | NC | 76 |
| ÉCART TYPE | NC | NC | NC | 1.1 | 4208 | 0.64 | 117 | NC | 0.11 | NC | 0.074 | 5462 | 51 | 4.1 | 10 | 5605 | 7.1 | 3935 | 3972 | 115 | 3.1 | 107 | 18 | NC | 68 | NC | 0.29 | 701 | NC | 19 | NC | 1.2 | 443 | 0.13 | 0.04 | 24 | 278 | NC | 15 |
| 25eme CENTILE | NC | NC | 0.01 | 0.5 | 21000 | 2.0 | 170 | 2.0 | 0.15 | 2.0 | 0.1 | 3100 | 140 | 19 | 40 | 37000 | 21 | 16000 | 16000 | 510 | 1.4 | 370 | 72 | NC | 2.8 | NC | 0.5 | 2300 | NC | 14 | NC | 6.0 | 2100 | 0.36 | 2.0 | 77 | 1.0 | NC | 70 |
| 75eme CENTILE | NC | NC | 0.01 | 0.5 | 25000 | 2.0 | 320 | 2.0 | 0.27 | 2.0 | 0.1 | 9100 | 180 | 24 | 51 | 44000 | 30 | 21000 | 22000 | 640 | 3.3 | 510 | 96 | NC | 3.9 | NC | 0.5 | 2900 | NC | 29 | NC | 7.0 | 2500 | 0.53 | 2.0 | 110 | 3.8 | NC | 85 |
| **Dilution SGR** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19139-1842.00-2011 | --- | --- | <0,010 | <0,50 | 28000 | <2,0 | **340** | <2,0 | 0.18 | <2,0 | <0,10 | 12000 | **230** | **31** | 56 | 46000 | 30 | 24000 | 20000 | 770 | 2.3 | 450 | **120** | --- | 7.4 | <0,10 | <0,50 | 3500 | <1,0 | 26 | --- | 8.9 | 2900 | 0.58 | <2,0 | 130 | 5.2 | --- | 87 |
| X19136W-1734.40-1241 | --- | --- | <0,010 | <0,50 | 18000 | <2,0 | 180 | <2,0 | 0.37 | <2,0 | <0,10 | 10000 | **130** | 16 | 34 | 34000 | 14 | 17000 | 19000 | 660 | 1.2 | 270 | **57** | --- | 3.1 | <0,10 | <0,50 | 2900 | <1,0 | 41 | --- | 6.7 | 2000 | 0.45 | <2,0 | 60 | 3.5 | --- | 68 |
| X19147A-1603.00-1593 | < 1 | < 1,5 | <0,010 | <0,50 | 17000 | <2,0 | 110 | <2,0 | 0.47 | <2,0 | <0,10 | 12000 | **120** | 17 | 38 | 31000 | 23 | 11000 | 15000 | 420 | 2.3 | 430 | **54** | --- | 3.7 | <0,10 | 1.1 | 2600 | <1,0 | 88 | --- | 7.7 | 1600 | 0.35 | <2,0 | 76 | 5.8 | --- | 66 |
| X19149A-1999.00-2201 | 1.0 | < 1,5 | <0,010 | **0.56** | 24000 | <2,0 | 200 | <2,0 | 0.36 | <2,0 | <0,10 | 19000 | **180** | 23 | 47 | 41000 | 29 | 20000 | 18000 | 580 | 2.8 | 570 | **76** | --- | 6.6 | <0,10 | <0,50 | 3200 | <1,0 | 42 | --- | 11 | 2200 | 0.47 | 2.5 | 91 | 4.7 | --- | 83 |
| Y165037EXT-1704.30-0059 | --- | --- | <0,010 | **0.88** | 7900 | <2,0 | 92 | <2,0 | 0.2 | <2,0 | <0,10 | 10000 | 94 | 13 | 58 | 22000 | <5.0 | 2600 | 10000 | 360 | 1.3 | 480 | 39 | --- | 13 | <0,10 | <0,50 | 1400 | <1,0 | 50 | --- | 5.5 | 350 | <0,10 | <2,0 | 35 | 2.5 | --- | 32 |
| X19156-1748.10-1269 | --- | --- | <0,010 | <0,50 | 19000 | <2,0 | 190 | <2,0 | 0.22 | <2,0 | <0,10 | 16000 | **170** | 24 | 46 | 44000 | 24 | 14000 | 15000 | 910 | 1.2 | 400 | **65** | --- | 4.9 | <0,10 | 1.8 | 3300 | <1,0 | 39 | --- | 7.9 | 2300 | 0.38 | <2,0 | 89 | 2.1 | --- | 77 |
| X19156-1797.00-1336 | < 1 | < 1,5 | <0,010 | <0,50 | 17000 | <2,0 | 85 | <2,0 | 0.36 | <2,0 | <0,10 | 15000 | **150** | 19 | 42 | 32000 | 23 | 15000 | 14000 | 570 | 1.1 | 430 | **70** | --- | 4.4 | <0,10 | <0,50 | 2000 | <1,0 | 42 | --- | 6.2 | 1900 | 0.39 | <2,0 | 84 | 7.1 | --- | 69 |
| X19156-1803.00-1343 | < 1 | < 1,5 | <0,010 | <0,50 | 21000 | <2,0 | 69 | <2,0 | 0.33 | <2,0 | <0,10 | 12000 | **190** | 24 | 47 | 42000 | 30 | 17000 | 16000 | 750 | 1.8 | 450 | **94** | --- | 3.8 | <0,10 | <0,50 | 2400 | <1,0 | 29 | --- | 7.2 | 2300 | 0.47 | <2,0 | 110 | 4.9 | --- | 76 |
| X18127A-1366.00-0584 | --- | --- | 

Tableau D-5: Métaux extractibles (MA 200)

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | F | Br | Hg | Ag | Al | As | Ba | B | Be | Bi | Cd | Ca | Cr | Co | Cu | Fe | Li | K | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Te | Th | Ti | Tl | U | V | W | Y | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | % | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| **Critère de sols PPSRTC-A (Province du Supérieur) du MELCC 2019** | | | **0.3** | **0.5** | | **5.0** | **240** | | | | **0.9** | | **100** | **30** | **65** | | | | | **1000** | **8.0** | | **50** | | **40** | | **3.0** | | **5.0** | | | | | | | | | | **150** |
| **Critère de sols B du MELCC 2019** | 400 | 50 | 2.0 | 20 | | 30 | 500 | | | | 5.0 | | 250 | 50 | 100 | | | | | 1000 | 10 | | 100 | | 500 | | 3.0 | | 50 | | | | | | | | | | 500 |
| **Critère de sols C du MELCC 2019** | 2000 | 300 | 10 | 40 | | 50 | 2000 | | | | 20 | | 800 | 300 | 500 | | | | | 2200 | 40 | | 500 | | 1000 | | 10 | | 300 | | | | | | | | | | 1500 |
| **Stérile AGR** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X18108AWC-1087.20-0196 | < 1 | < 1,5 | <0,010 | <0,50 | 29000 | <2,0 | **380** | <2,0 | 0.23 | <2,0 | <0,10 | 10000 | **170** | 28 | 54 | 45000 | 38 | 20000 | 19000 | 590 | 0.89 | 630 | **110** | --- | 5.0 | <0,10 | <0,50 | 3200 | <1,0 | 44 | --- | 7.0 | 2500 | 0.47 | <2,0 | 130 | 2.0 | --- | 88 |
| X18121-1231.00-1009 | < 1 | < 1,5 | <0,010 | <0,50 | 27000 | <2,0 | 200 | <2,0 | 0.31 | <2,0 | 0.16 | 9700 | **130** | 22 | 54 | 40000 | 30 | 14000 | 16000 | 410 | 2.3 | 560 | **95** | --- | 5.7 | <0,10 | <0,50 | 3000 | <1,0 | 37 | --- | 6.4 | 1400 | 0.43 | <2,0 | 80 | <1,0 | --- | 89 |
| Y155016EXT-1758.00-0804 | < 1 | < 1,5 | <0,010 | <0,50 | 23000 | <2,0 | **300** | <2,0 | 0.16 | <2,0 | <0,10 | 3300 | **140** | 22 | 46 | 37000 | 30 | 17000 | 16000 | 490 | 2.0 | 420 | **81** | --- | 2.8 | <0,10 | <0,50 | 2000 | <1,0 | 16 | --- | 6.3 | 1900 | 0.43 | <2,0 | 80 | <1,0 | --- | 75 |
| X18127A-1122.00-0299 | < 1 | < 1,5 | <0,010 | <0,50 | 22000 | <2,0 | **460** | <2,0 | <0,10 | <2,0 | <0,10 | 2100 | **180** | 19 | 41 | 38000 | 33 | 17000 | 16000 | 500 | 1.8 | 640 | **66** | --- | 3.3 | <0,10 | <0,50 | 3000 | <1,0 | 17 | --- | 6.5 | 2300 | 0.39 | <2,0 | 95 | <1,0 | --- | 74 |
| X18131-0777.00-0578 | < 1 | < 1,5 | <0,010 | <0,50 | 18000 | <2,0 | **510** | <2,0 | <0,10 | <2,0 | <0,10 | 5400 | **180** | 18 | 41 | 33000 | 33 | 13000 | 14000 | 430 | 0.77 | 580 | **66** | --- | 3.7 | <0,10 | <0,50 | 470 | <1,0 | 17 | --- | 8.2 | 1700 | <0,10 | 2.5 | 87 | <1,0 | --- | 66 |
| X19135-1719.00-1698 | < 1 | < 1,5 | <0,010 | <0,50 | 22000 | <2,0 | **260** | <2,0 | 0.15 | <2,0 | <0,10 | 5500 | **160** | 19 | 57 | 36000 | 22 | 18000 | 16000 | 540 | 2.2 | 510 | **69** | --- | 8.9 | <0,10 | <0,50 | 2200 | <1,0 | 23 | --- | 5.8 | 2500 | 0.43 | <2,0 | 88 | 1.6 | --- | 70 |
| Y155021EXTA-1724.00-0795 | < 1 | < 1,5 | <0,010 | <0,50 | 24000 | <2,0 | **420** | <2,0 | 0.17 | <2,0 | <0,10 | 2500 | **170** | 17 | 36 | 41000 | 29 | 19000 | 23000 | 560 | 1.8 | 470 | **67** | --- | 3.2 | <0,10 | <0,50 | 3000 | <1,0 | 17 | --- | 5.9 | 2100 | 0.41 | <2,0 | 96 | <1,0 | --- | 82 |
| X19139-1738.00-1882 | < 1 | < 1,5 | <0,010 | <0,50 | 27000 | <2,0 | 210 | <2,0 | <0,10 | <2,0 | <0,10 | 2300 | **130** | 24 | 46 | 40000 | 21 | 21000 | 16000 | 450 | 1.6 | 440 | **90** | --- | 3.3 | 0.15 | <0,50 | 5200 | <1,0 | 9.7 | --- | 6.8 | 2100 | 0.57 | <2,0 | 78 | <1,0 | --- | 78 |
| X19140-1518.00-1591 | < 1 | < 1,5 | <0,010 | <0,50 | 26000 | <2,0 | **360** | <2,0 | 0.16 | <2,0 | 0.3 | 4300 | **160** | 23 | 49 | 41000 | 30 | 18000 | 18000 | 540 | 2.1 | 610 | **77** | --- | 7.2 | <0,10 | <0,50 | 4800 | <1,0 | 23 | --- | 6.2 | 1900 | 0.44 | <2,0 | 95 | <1,0 | --- | 120 |
| X19136W-1478.00-0915 | < 1 | < 1,5 | <0,010 | <0,50 | 24000 | <2,0 | **370** | <2,0 | <0,10 | <2,0 | <0,10 | 6500 | **150** | 22 | 47 | 36000 | 27 | 18000 | 16000 | 550 | 2.4 | 460 | **72** | --- | 4.3 | <0,10 | 1.2 | 3500 | <1,0 | 24 | --- | 7.5 | 2000 | 0.42 | <2,0 | 90 | <1,0 | --- | 78 |
| X19141AW-1557.75-0646 | < 1 | < 1,5 | <0,010 | <0,50 | 40000 | <2,0 | **380** | <2,0 | 0.37 | <2,0 | 0.11 | 45000 | **340** | 26 | 50 | 52000 | 58 | 31000 | 43000 | **1400** | <0,50 | 260 | **78** | --- | 4.0 | <0,10 | <0,50 | 6600 | <1,0 | 100 | --- | 4.4 | 2800 | 1.0 | <2,0 | 170 | <1,0 | --- | 77 |
| X19143-1265.10-1226 | < 1 | < 1,5 | <0,010 | <0,50 | 22000 | <2,0 | **430** | <2,0 | 0.21 | <2,0 | <0,10 | 16000 | **220** | 19 | 47 | 40000 | 26 | 18000 | 27000 | 810 | <0,50 | 380 | **65** | --- | 3.9 | <0,10 | <0,50 | 3900 | <1,0 | 42 | --- | 5.4 | 2200 | 0.47 | <2,0 | 92 | <1,0 | --- | 67 |
| X19145-1736.00-1992 | < 1 | < 1,5 | <0,010 | <0,50 | 26000 | <2,0 | **300** | <2,0 | 0.13 | <2,0 | <0,10 | 4300 | **130** | 29 | 57 | 41000 | 28 | 20000 | 19000 | 470 | 1.3 | 380 | **100** | --- | 4.2 | <0,10 | 1.2 | 3500 | <1,0 | 33 | --- | 7.5 | 2400 | 0.52 | <2,0 | 83 | <1,0 | --- | 87 |
| X19147A-1466.00-1437 | < 1 | < 1,5 | <0,010 | **3.6** | 38000 | <2,0 | **380** | <2,0 | 0.29 | 19 | 0.28 | 18000 | **230** | 28 | 53 | 48000 | 42 | 27000 | 28000 | 730 | 2.3 | 390 | **94** | --- | **70** | <0,10 | <0,50 | 3900 | <1,0 | 76 | --- | 5.8 | 2600 | 0.82 | <2,0 | 140 | 1.7 | --- | 95 |
| X19149A-1906.00-2084 | < 1 | < 1,5 | <0,010 | <0,50 | 24000 | <2,0 | **390** | <2,0 | 0.14 | <2,0 | <0,10 | 11000 | **180** | 22 | 49 | 42000 | 28 | 20000 | 17000 | 530 | 1.2 | 480 | **67** | --- | 5.0 | <0,10 | <0,50 | 3100 | <1,0 | 24 | --- | 9.5 | 2500 | 0.43 | 2.6 | 100 | 2.8 | --- | 77 |
| X19150A-1326.00-1330 | < 1 | < 1,5 | 0.027 | <0,50 | 27000 | <2,0 | **500** | 3.5 | <0,10 | <2,0 | <0,10 | 6500 | **210** | 27 | 54 | 43000 | 38 | 21000 | 17000 | 720 | 1.2 | 790 | **100** | --- | 3.6 | <0,10 | 1.5 | 3500 | <1,0 | 26 | --- | 7.7 | 2800 | 0.48 | <2,0 | 130 | <1,0 | --- | 83 |
| X19145WA-1677.00-0575 | < 1 | < 1,5 | <0,010 | <0,50 | 23000 | <2,0 | **270** | <2,0 | 0.16 | <2,0 | <0,10 | 5900 | **170** | **36** | 61 | 52000 | 35 | 28000 | 22000 | 690 | **8.2** | 410 | **120** | --- | 4.1 | <0,10 | 1.0 | 2700 | <1,0 | 13 | --- | 7.9 | 3000 | 0.72 | <2,0 | 130 | 1.5 | --- | 96 |
| X19148W-1824.00-0744 | < 1 | < 1,5 | <0,010 | <0,50 | 27000 | 3.3 | **280** | <2,0 | 0.11 | <2,0 | <0,10 | 3900 | **200** | 25 | 44 | 39000 | 42 | 20000 | 18000 | 530 | 1.5 | 580 | **86** | --- | 2.4 | <0,10 | 1.2 | 3400 | <1,0 | 21 | --- | 5.9 | 2100 | 0.54 | <2,0 | 100 | 1.8 | --- | 78 |
| X19151-1671.00-1628 | < 1 | < 1,5 | <0,010 | <0,50 | 26000 | <2,0 | **310** | <2,0 | 0.14 | <2,0 | <0,10 | 2000 | **130** | 23 | 46 | 37000 | 33 | 15000 | 18000 | 360 | 1.4 | 410 | **83** | --- | 2.7 | <0,10 | <0,50 | 3100 | <1,0 | 6.7 | --- | 5.5 | 1400 | 0.41 | <2,0 | 76 | <1,0 | --- | 70 |
| X19149AWB-1844.00-0656 | < 1 | < 1,5 | <0,010 | <0,50 | 25000 | <2,0 | **330** | <2,0 | 0.12 | <2,0 | <0,10 | 2800 | **170** | 29 | 60 | 44000 | 28 | 23000 | 20000 | 500 | 7.8 | 590 | **110** | --- | 3.7 | <0,10 | 1.2 | 2900 | <1,0 | 13 | --- | 8.3 | 2100 | 0.67 | <2,0 | 110 | <1,0 | --- | 85 |
| X19154-1403.00-0731 | --- | --- | <0,010 | <0,50 | 20000 | <2,0 | **280** | 3.4 | 0.11 | <2,0 | <0,10 | 2800 | **140** | 16 | 36 | 34000 | 21 | 15000 | 18000 | 480 | 1.5 | 350 | **62** | --- | 3.1 | <0,10 | <0,50 | 2500 | <1,0 | 12 | --- | 6.5 | 1700 | 0.41 | <2,0 | 61 | <1,0 | --- | 59 |
| Y165037EXT-1663.00-0009 | < 1 | < 1,5 | <0,010 | <0,50 | 20000 | 2.8 | **430** | <2,0 | 0.11 | <2,0 | <0,10 | 2300 | **200** | 17 | 42 | 38000 | 15 | 16000 | 20000 | 530 | 1.1 | 560 | **65** | --- | 3.3 | <0,10 | <0,50 | 3100 | <1,0 | 14 | --- | 7.4 | 2000 | 0.3 | <2,0 | 76 | 1.7 | --- | 73 |
| X18121-1189.00-0961 | < 1 | < 1,5 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| COMPTE | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 0 | 22 | 22 | 22 | 22 | 22 | 22 | 0 | 22 | 22 | 22 | 22 | 22 | 22 | 0 | 22 |
| MINIMUM | < 1 | < 1,5 | < 0,01 | < 0,5 | 18000 | < 2 | 200 | < 2 | < 0,1 | < 2 | < 0,1 | 2000 | 130 | 16 | 36 | 33000 | 15 | 13000 | 14000 | 360 | < 0,5 | 260 | 62 | NC | 2.4 | < 0,1 | < 0,5 | 470 | < 1 | 6.7 | NC | 4.4 | 1400 | < 0,1 | < 2 | 61 | < 1 | NC | 59 |
| MAXIMUM | <1 | <1,5 | 0.027 | 3.6 | 40000 | 3.3 | 510 | 3.5 | 0.37 | 19 | 0.3 | 45000 | 340 | 36 | 61 | 52000 | 58 | 31000 | 43000 | 1400 | 8.2 | 790 | 120 | NC | 70 | 0.15 | 1.5 | 6600 | <1 | 100 | NC | 9.5 | 3000 | 1.0 | 2.6 | 170 | 2.8 | NC | 120 |
| MEDIANE | NC | NC | 0.01 | 0.5 | 24500 | 2.0 | 365 | 2.0 | 0.14 | 2.0 | 0.1 | 4850 | 170 | 23 | 48 | 40000 | 30 | 18500 | 18000 | 530 | 1.6 | 475 | 80 | NC | 3.8 | 0.1 | 0.5 | 3100 | NC | 22 | NC | 6.5 | 2100 | 0.44 | 2.0 | 94 | 1.0 | NC | 78 |
| MOYENNE | NC | NC | 0.011 | 0.64 | 25455 | 2.1 | 352 | 2.1 | 0.16 | 2.8 | 0.12 | 7823 | 177 | 23 | 49 | 40773 | 31 | 19500 | 19864 | 582 | 2.1 | 495 | 83 | NC | 7.2 | 0.1 | 0.7 | 3299 | NC | 28 | NC | 6.7 | 2182 | 0.49 | 2.1 | 99 | 1.3 | NC | 80 |
| ÉCART TYPE | NC | NC | NC | NC | 5171 | 0.32 | 86 | 0.43 | 0.076 | NC | 0.056 | 9402 | 47 | 5.0 | 7.1 | 5070 | 9.0 | 4501 | 6259 | 213 | 2.0 | 122 | 17 | NC | 14 | NC | 0.34 | 1197 | NC | 22 | NC | 1.2 | 432 | 0.18 | 0.16 | 26 | 0.48 | NC | 13 |
| 25eme CENTILE | NC | NC | 0.01 | 0.5 | 22250 | 2.0 | 285 | 2.0 | 0.11 | 2.0 | 0.1 | 2800 | 143 | 19 | 45 | 37250 | 27 | 17000 | 16000 | 483 | 1.2 | 410 | 67 | NC | 3.3 | 0.1 | 0.5 | 2925 | NC | 15 | NC | 5.9 | 1925 | 0.41 | 2.0 | 81 | 1.0 | NC | 73 |
| 75eme CENTILE | NC | NC | 0.01 | 0.5 | 27000 | 2.0 | 413 | 2.0 | 0.17 | 2.0 | 0.1 | 8900 | 195 | 27 | 54 | 42750 | 35 | 20750 | 20000 | 583 | 2.2 | 580 | 95 | NC | 4.8 | 0.1 | 0.88 | 3500 | NC | 31 | NC | 7.5 | 2500 | 0.54 | 2.0 | 108 | 1.6 | NC | 87 |
| **Puits d'accès** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19140-0708.00-0706 | < 1 | < 1,5 | < 0.05 | 0.09 | 25000 | 0.9 | **330** | 1 | 0.1 | 0.75 | 0.07 | 2400 | **150** | 24 | 47 | 38000 | 25 | 18000 | 16000 | 350 | **28.0** | 570 | **88** | 700 | 3.3 | < 0.8 | < 0.7 | --- | 0.5 | 15 | --- | --- | 1700 | 0.4 | 1.60 | 88 | --- | --- | 76 |
| X19139-0887.00-0918 | < 1 | < 1,5 | < 0.05 | 0.08 | 26000 | 0.6 | **330** | < 1 | 0.1 | 0.48 | 0.07 | 3800 | **200** | 26 | 57 | 41000 | 26 | 20000 | 16000 | 520 | 3.5 | 540 | **98** | 680 | 2.9 | < 0.8 | < 0.7 | --- | 0.7 | 11 | --- | --- | 2200 | 0.41 | 1.20 | 120 | --- | --- | 85 |
| X19157-0933.00-0984 | < 1 | < 1,5 | < 0.05 | 0.06 | 22000 | 0.5 | **390** | < 1 | 0.1 | 0.43 | 0.03 | 2500 | **170** | 22 | 45 | 34000 | 24 | 15000 | 15000 | 340 | 2.0 | 430 | **84** | 630 | 2.5 | < 0.8 | < 0.7 | --- | < 0.5 | 15 | --- | --- | 1600 | 0.28 | 1.20 | 86 | --- | --- | 72 |
| X18127W-0773.00-0369 | < 1 | < 1,5 | < 0.05 | 0.05 | 26000 | 0.6 | **570** | < 1 | 0.1 | 0.39 | 0.06 | 4100 | **140** | 23 | 49 | 40000 | 32 | 21000 | 17000 | 460 | 1.2 | 520 | **81** | 510 | 3.2 | < 0.8 | < 0.7 | --- | 0.6 | 15 | --- | --- | 2100 | 0.4 | 1.80 | 100 | --- | --- | 71 |
| X19159-1392.00-1329 | < 1 | < 1,5 | < 0.05 | 0.06 | 27000 | < 0.5 | **340** | < 1 | 0.1 | 0.28 | 0.03 | 2100 | **150** | 23 | 47 | 40000 | 30 | 20000 | 16000 | 380 | 2.5 | 520 | **81** | 640 | 2.3 | < 0.8 | < 0.7 | --- | 0.5 | 8 | --- | --- | 1800 | 0.31 | 1.30 | 92 | --- | --- | 75 |
| X19148W-1752.00-0664 | < 1 | < 1,5 | < 0.05 | 0.08 | 33000 | 0.7 | **600** | < 1 | 0.1 | 0.37 | 0.06 | 2700 | **180** | 23 | 45 | 49000 | 27 | 24000 | 16000 | 410 | 1.6 | 750 | **91** | 660 | 2.9 | < 0.8 | < 0.7 | --- | 1 | 8 | --- | --- | 2000 | 0.26 | 1.70 | 110 | --- | --- | 75 |
| X19148-1583.00-1092 | < 1 | < 1,5 | <0.010 | <0.50 | 30000 | <2.0 | **380** | <2.0 | 0.16 | <2.0 | <0.10 | 2600 | **160** | 25 | 49 | 41000 | 33 | 21000 | 20000 | 480 | 4.3 | 550 | **95** | --- | 3.8 | <0.10 | 1.4 | 3800 | <1.0 | 21 | --- | 6.1 | 2000 | 0.53 | <2.0 | 100 | <1.0 | --- | 83 |
| X19148-1717.15-1564 | --- | --- | <0.010 | <0.50 | 30000 | <2.0 | **420** | <2.0 | 0.12 | <2.0 | <0.10 | 1900 | **180** | 26 | 44 | 41000 | 37 | 22000 | 18000 | 500 | 1.4 | 490 | **96** | --- | 2.8 | <0.10 | <0.50 | 3300 | <1.0 | 8.0 | --- | 4.9 | 2100 | 0.64 | <2.0 | 110 | <1.0 | --- | 83 |
| X19149AWB-1297.00-0122 | < 1 | < 1,5 | <0.010 | <0.50 | 24000 | <2.0 | **410** | <2.0 | 0.2 | <2.0 | <0.10 | 3700 | **230** | 25 | 53 | 39000 | 33 | 16000 | 21000 | 510 | 2.2 | 550 | **86** | --- | 3.3 | <0.10 | <0.50 | 2300 | <1.0 | 29 | --- | 6.5 | 2100 | 0.4 | <2.0 | 100 | <1.0 | --- | 81 |
| COMPTE | 8.0 | 8.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 6 | 9.0 | 9.0 | 9.0 | 3.0 | 9.0 | 9.0 | 0 | 3.0 | 9.0 | 9.0 | 9.0 | 9.0 | 3.0 | 0 | 9.0 |
| MINIMUM | < 1 | < 1.5 | < 0.01 | < 0.05 | 22000 | < 0.5 | 330 | < 1 | 0.08 | < 0.28 | < 0.03 | 1900 | 140 | 22 | 44 | 34000 | 24 | 15000 | 15000 | 340 | 1.2 | 430 | 81 | 510 | 2.3 | < 0.1 | < 0.5 | 2300 | < 0.5 | 7.9 | NC | 4.9 | 1600 | 0.26 | < 1.2 | 86 | < 1 | NC | 71 |
| MAXIMUM | <1 | <1.5 | <0.05 | <0.5 | 33000 | <2 | 600 | <2 | 0.2 | <2 | <0.1 | 4100 | 230 | 26 | 57 | 49000 | 37 | 24000 | 21000 | 520 | 28.0 | 750 | 98 | 700 | 3.8 | <0.8 | 1.4 | 3800 | 1.0 | 29 | NC | 6.5 | 2200 | 0.64 | <2 | 120 | <1 | NC | 85 |
| MEDIANE | NC | NC | NC | 0.08 | 26000 | 0.7 | 390 | 1.0 | 0.1 | 0.48 | 0.07 | 2600 | 170 | 24 | 47 | 40000 | 30 | 20000 | 16000 | 460 | 2.2 | 540 | 88 | 650 | 2.9 | NC | 0.7 | 3300 | 0.7 | 15 | NC | 6.1 | 2000 | 0.4 | 1.7 | 100 | NC | NC | 76 |
| MOYENNE | NC | NC | NC | 0.21 | 27000 | 1.09 | 419 | 1.3 | 0.12 | 0.97 | 0.07 | 2867 | 173 | 24 | 48 | 40333 | 30 | 19667 | 17222 | 439 | 5.2 | 547 | 89 | 637 | 3.0 | NC | 0.73 | 3133 | 0.76 | 14 | NC | 5.8 | 1956 | 0.4 | 1.64 | 101 | NC | NC | 78 |
| ÉCART TYPE | NC | NC | NC | 0.22 | 3428 | 0.69 | 100 | NC | 0.04 | 0.79 | 0.028 | 795 | 28 | 1.45 | 4.2 | 3937 | 4.4 | 2872 | 2048 | 70 | 8.6 | 87 | 6.5 | 67 | 0.46 | NC | NC | 764 | 0.2404 | 7 | NC | 0.83 | 207 | 0.12 | 0.34 | 11.2 | NC | NC | 5.2 |
| 25eme CENTILE | NC | NC | NC | 0.06 | 25000 | 0.6 | 340 | 1.0 | 0.09 | 0.39 | 0.06 | 2400 | 150 | 23 | 45 | 39000 | 26 | 18000 | 16000 | 380 | 1.6 | 520 | 84 | 633 | 2.8 | NC | 0.7 | 2800 | 0.5 | 8 | NC | 5.5 | 1800 | 0.31 | 1.30 | 92 | NC | NC | 75 |
| 75eme CENTILE | NC | NC | NC | 0.5 | 30000 | 2.0 | 420 | 2.0 | 0.12 | 2.0 | 0.1 | 3700 | 180 | 25 | 49 | 41000 | 33 | 21000 | 18000 | 500 | 3.5 | 550 | 95 | 675 | 3.3 | NC | 0.7 | 3550 | 1.0 | 15 | NC | 6.3 | 2100 | 0.41 | 2.0 | 110 | NC | NC | 83 |

Note
NC - Statistique non calculée

Tableau D-6: Essais de Lixiviation TCLP

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | pH | Conductivité | Alkalinité | $SO_4^{2-}$ | Cl | Br | Nitrite | Nitrate | Nitrate + Nitrite | F | Hg | Ag | Al | As | Ba | B | Be | Bi | Ca | Cd | Cr | Co | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µS/cm | mg/L as $CaCO_3$ | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | **860** | | **0.060** | **300** | | **4.0** | **0.0000013** | **0.00062** | | **0.34** | **0.60** | **28** | | | | **0.0011** | **0.016** | **0.37** | **0.0073** |
| EC [2] | | | | | 250 | | 1.0 | | 10 | 1.5 | 0.0010 | 0.10 | 0.10 | 0.00030 | 1.0 | 5.0 | | | | 0.0050 | 0.050 | | 1.0 |
| ***T1 A2 Dir. 019*** [3] | ***6-9.5*** | | | | | | ***100*** | | ***1000*** | ***150*** | ***0.10*** | | | ***5.0*** | ***100*** | ***500*** | | | | ***0.50*** | ***5.0*** | | |
| **Minerai AGR** | | | | | | | | | | | | | | | | | | | | | | | |
| X19135-1832.70-1829 | ***5.0*** | 4860 | 1610 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.92 | < 0,002 | **0.3** | < 0,02 | 0.00038 | **0.00015** | 70 | **0.00023** | 0.0087 | 0.0044 | < 0,002 |
| X19152-1643.00-1475 | ***5.6*** | 5500 | 2730 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.17 | **0.002** | **0.67** | < 0,02 | 0.00016 | < 0,00007 | 446 | **0.0013** | 0.0031 | 0.0064 | < 0,002 |
| X19152W-1715.00-0597 | ***5.2*** | 5270 | 2260 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.11** | < 0,00001 | < 0,0005 | 0.69 | < 0,002 | 0.72 | < 0,02 | 0.00021 | < 0,00007 | 250 | **0.0013** | 0.011 | 0.0028 | < 0,002 |
| X19152-1572.00-1382 | ***5.2*** | 5210 | 2440 | **54** | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.47 | **0.002** | 0.27 | < 0,02 | 0.00014 | 0.00011 | 231 | 0.0018 | 0.0052 | 0.0029 | < 0,002 |
| X19155-1665.00-0726 | ***5.1*** | 4900 | 2040 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.1** | < 0,00001 | < 0,0005 | 0.75 | < 0,002 | **0.31** | < 0,02 | 0.0004 | **0.0002** | 180 | 0.00069 | **0.0068** | 0.0021 | < 0,002 |
| X19135W-1914.00-0986 | ***5.9*** | 6040 | 2760 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.07 | < 0,002 | 0.68 | < 0,02 | 0.00017 | < 0,00007 | 547 | **0.0011** | < 0,0008 | 0.0014 | < 0,002 |
| X19135W-1839.00-0895 | ***5.6*** | 5910 | 2520 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.16 | < 0,002 | 0.36 | < 0,02 | 0.00026 | < 0,00007 | 460 | **0.0012** | **0.0026** | 0.0027 | < 0,002 |
| X19154-1562.00-0866 | ***5.9*** | 5920 | 3010 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | **0.00002** | < 0,0005 | 0.03 | < 0,002 | 0.56 | < 0,02 | 0.00018 | < 0,00007 | 487 | 0.0015 | < 0,0008 | 0.0049 | **0.005** |
| X19152-1648.00-1481 | ***5.4*** | 5590 | 2590 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.32 | < 0,002 | 0.17 | < 0,02 | 0.00037 | 0.00019 | 360 | **0.00068** | **0.0037** | 0.019 | < 0,002 |
| X19148W-2073.00-1036 | ***5.9*** | 6040 | 3300 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.04 | < 0,002 | **0.17** | < 0,02 | 0.00018 | 0.00008 | 536 | **0.0022** | < 0,0008 | **0.0018** | < 0,002 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 5.0 | 4860 | 1610 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.03 | < 0,002 | 0.17 | < 0,02 | 0.00014 | < 0,00007 | 70 | 0.00023 | < 0,0008 | 0.0014 | < 0,002 |
| MAXIMUM | 5.9 | 6040 | 3300 | 54 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.11 | 0.00002 | < 0,0005 | 0.92 | 0.002 | 0.72 | < 0,02 | 0.0004 | 0.0002 | 547 | 0.0022 | 0.011 | 0.019 | 0.005 |
| MEDIANE | 5.5 | 5545 | 2555 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.25 | 0.002 | 0.34 | NC | 0.0002 | 0.000075 | 403 | 0.0013 | 0.0034 | 0.0029 | 0.002 |
| MOYENNE | 5.5 | 5524 | 2526 | 23 | NC | NC | NC | NC | NC | 0.069 | 0.000011 | NC | 0.36 | 0.002 | 0.42 | NC | 0.00025 | 0.00011 | 357 | 0.0012 | 0.0043 | 0.0049 | 0.0023 |
| ECART TYPE | 0.34 | 452 | 482 | NC | NC | NC | NC | NC | NC | 0.019 | NC | NC | 0.33 | 4.6E-19 | 0.21 | NC | 0.0001 | 0.000053 | 165 | 0.00058 | 0.0034 | 0.0053 | NC |
| 25eme CENTILE | 5.2 | 5225 | 2305 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.093 | 0.002 | 0.28 | NC | 0.00017 | 0.00007 | 236 | 0.00079 | 0.0013 | 0.0022 | 0.002 |
| 75eme CENTILE | 5.8 | 5918 | 2753 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.64 | 0.002 | 0.64 | NC | 0.00034 | 0.00014 | 480 | 0.0015 | 0.0064 | 0.0048 | 0.002 |
| **Minerai SGR** | | | | | | | | | | | | | | | | | | | | | | | |
| X19136W-1730.50-1236 | 6.8 | 6450 | 3020 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.01 | < 0,002 | 0.61 | < 0,02 | < 0,00007 | 0.00009 | 625 | **0.0019** | < 0,0008 | 0.0016 | < 0,002 |
| X19140-1631.00-1727 | ***5.8*** | 6130 | 2680 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.09 | < 0,002 | 0.38 | < 0,02 | 0.00035 | 0.00009 | 521 | **0.0015** | < 0,0008 | 0.006 | < 0,002 |
| X19145WA-1854.00-0778 | 6.0 | 6100 | 3320 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | **0.03** | < 0,002 | **0.32** | < 0,02 | **0.00016** | **0.00009** | 542 | 0.0015 | < 0,0008 | 0.0087 | < 0,002 |
| X19141AW-1670.85-0796 | 6.5 | 6270 | 3500 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | < 0,01 | < 0,002 | 1.0 | < 0,02 | < 0,00007 | < 0,00007 | 610 | **0.00096** | < 0,0008 | 0.0037 | < 0,002 |
| X19135W-1883.00-0947 | ***5.3*** | 5490 | 1810 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.54 | **0.003** | 0.17 | < 0,02 | 0.00036 | **0.00008** | 271 | 0.0013 | 0.0053 | 0.0028 | < 0,002 |
| Y155016EXT-1882.50-I001 | ***5.4*** | 5610 | 2490 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.21 | < 0,002 | 0.19 | < 0,02 | 0.00018 | < 0,00007 | 369 | **0.00098** | 0.0029 | 0.0029 | **0.003** |
| Y165106EXT-1640.00-0489 | ***5.5*** | 5700 | 2700 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.24 | **0.005** | 0.27 | < 0,02 | 0.00014 | < 0,00007 | 413 | 0.0032 | 0.0022 | 0.0018 | < 0,002 |
| Y155021EXTA-1800.00-0881 | ***5.1*** | 5000 | 2080 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.1** | < 0,00001 | < 0,0005 | **0.75** | < 0,002 | **0.082** | < 0,02 | 0.00018 | < 0,00007 | 180 | **0.00031** | **0.0093** | 0.0033 | **0.006** |
| X19147AWA-1634.00-0376 | 6.8 | 6370 | 3590 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | < 0,01 | < 0,002 | 1.0 | < 0,02 | 0.00008 | < 0,00007 | 638 | **0.0018** | < 0,0008 | 0.00075 | < 0,002 |
| X19156-1768.60-1296 | 6.6 | 5700 | 3160 | **119** | < 20 | < 30 | < 3 | < 6 | < 6 | 0.09 | **0.00001** | < 0,0005 | 0.03 | < 0,002 | 0.51 | < 0,02 | 0.00022 | < 0,00007 | 2010 | **0.0066** | < 0,0008 | 0.0023 | < 0,002 |
| X19140-1560.15-1641 | ***5.2*** | 5390 | 1980 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.07** | < 0,00001 | < 0,0005 | 0.67 | < 0,002 | 0.14 | < 0,02 | 0.00026 | **0.00022** | 250 | **0.0017** | **0.008** | 0.0026 | < 0,002 |
| X19149A-2009.70-2213 | ***6.0*** | 5940 | 3290 | 32 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.02 | < 0,002 | **0.089** | < 0,02 | 0.0001 | < 0,00007 | 560 | **0.0019** | < 0,0008 | **0.0011** | < 0,002 |
| COMPTE | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| MINIMUM | 5.1 | 5000 | 1810 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | < 0,01 | < 0,002 | 0.082 | < 0,02 | < 0,00007 | < 0,00007 | 180 | 0.00031 | < 0,0008 | 0.00075 | < 0,002 |
| MAXIMUM | 6.8 | 6450 | 3590 | 119 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.1 | 0.00001 | < 0,0005 | 0.75 | 0.005 | 1.0 | < 0,02 | 0.00036 | 0.00022 | 2010 | 0.0066 | 0.0093 | 0.0087 | 0.006 |
| MEDIANE | 5.9 | 5820 | 2860 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.06 | 0.002 | 0.29 | NC | 0.00017 | 0.00007 | 532 | 0.0016 | 0.0008 | 0.0027 | 0.002 |
| MOYENNE | 5.9 | 5846 | 2802 | 29 | NC | NC | NC | NC | NC | 0.067 | 0.00001 | NC | 0.22 | 0.0023 | 0.4 | NC | 0.00018 | 0.000088 | 582 | 0.002 | 0.0028 | 0.0031 | 0.0024 |
| ECART TYPE | 0.63 | 439 | 610 | 28 | NC | NC | NC | NC | NC | 0.014 | NC | NC | 0.28 | 0.00089 | 0.33 | NC | 0.0001 | 0.000042 | 476 | 0.0016 | 0.0031 | 0.0022 | 0.0012 |
| 25eme CENTILE | 5.4 | 5580 | 2388 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.018 | 0.002 | 0.16 | NC | 0.000095 | 0.00007 | 345 | 0.0012 | 0.0008 | 0.0017 | 0.002 |
| 75eme CENTILE | 6.6 | 6165 | 3298 | 20 | NC | NC | NC | NC | NC | 0.063 | 0.00001 | NC | 0.32 | 0.002 | 0.53 | NC | 0.00023 | 0.00009 | 614 | 0.0019 | 0.0035 | 0.0034 | 0.002 |
| **Minerai SGR+** | | | | | | | | | | | | | | | | | | | | | | | |
| X19152W-1601.30-0332 | ***5.8*** | 5910 | 2990 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.06 | < 0,002 | **3.6** | < 0,02 | 0.00052 | **0.00011** | 481 | **0.0022** | < 0,0008 | 0.0025 | < 0,002 |
| X19136W-1692.40-1182 | ***5.8*** | 6140 | 2670 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.06 | < 0,002 | 1.9 | < 0,02 | 0.00027 | < 0,00007 | 530 | **0.0013** | **0.0008** | 0.0017 | < 0,002 |
| X19139WA-1778.85-0693 | ***6.0*** | 6040 | 2750 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.05 | < 0,002 | 0.45 | < 0,02 | 0.00029 | < 0,00007 | 558 | **0.0013** | < 0,0008 | 0.0018 | < 0,002 |
| X19143-1454.00-1452 | 6.4 | 6190 | 3180 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.12** | < 0,00001 | < 0,0005 | 0.02 | < 0,002 | **0.22** | < 0,02 | 0.00009 | **0.00007** | 617 | **0.0011** | < 0,0008 | 0.0031 | < 0,002 |
| X19141AW-1622.15-0730 | ***5.4*** | 5670 | 2280 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.3 | < 0,002 | **0.71** | < 0,02 | 0.00028 | < 0,00007 | 359 | 0.0029 | 0.0042 | 0.0023 | < 0,002 |
| X19152W-1596.10-0327 | ***5.5*** | 5780 | 2650 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.13 | < 0,002 | 2.0 | < 0,02 | 0.00043 | 0.0001 | 409 | **0.0009** | 0.0018 | 0.0021 | < 0,002 |
| X19142-1559.00-1528 | ***5.4*** | 5580 | 2480 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.21 | < 0,002 | 0.21 | < 0,02 | 0.00021 | **0.00008** | 362 | **0.0019** | 0.0027 | 0.00073 | < 0,002 |
| X19145WA-1901.00-0836 | ***5.6*** | 5850 | 2810 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | **0.1** | < 0,002 | 0.12 | < 0,02 | 0.00051 | < 0,00007 | 438 | **0.0013** | **0.0008** | 0.0035 | < 0,002 |
| X19149A-2030.30-2239 | 6.8 | 6340 | 3600 | **38** | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | < 0,01 | < 0,002 | 0.093 | < 0,02 | 0.00009 | < 0,00007 | 651 | **0.0027** | < 0,0008 | 0.0022 | < 0,002 |
| X19150A-1450.65-1470 | 6.3 | 5900 | 3410 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.01 | < 0,002 | **0.1** | < 0,02 | 0.00011 | < 0,00007 | 583 | **0.0031** | < 0,0008 | **0.00091** | < 0,002 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 5.4 | 5580 | 2280 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | < 0,01 | < 0,002 | 0.093 | < 0,02 | 0.00009 | < 0,00007 | 359 | 0.0009 | < 0,0008 | 0.00073 | < 0,002 |
| MAXIMUM | 6.8 | 6340 | 3600 | 38 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.12 | < 0,00001 | < 0,0005 | 0.3 | < 0,002 | 3.6 | < 0,02 | 0.00052 | 0.00011 | 651 | 0.0031 | 0.0042 | 0.0035 | < 0,002 |
| MEDIANE | 5.8 | 5905 | 2780 | 20 | NC | NC | NC | NC | NC | 0.06 | NC | NC | 0.06 | NC | 0.33 | NC | 0.00028 | 0.00007 | 506 | 0.0016 | 0.0008 | 0.0021 | NC |
| MOYENNE | 5.9 | 5940 | 2882 | 22 | NC | NC | NC | NC | NC | 0.066 | NC | NC | 0.095 | NC | 0.94 | NC | 0.00028 | 0.000078 | 499 | 0.0019 | 0.0014 | 0.0021 | NC |
| ECART TYPE | 0.45 | 238 | 414 | NC | NC | NC | NC | NC | NC | NC | NC | NC | 0.095 | NC | 1.2 | NC | 0.00016 | 0.000015 | 105 | 0.00081 | 0.0012 | 0.00086 | NC |
| 25eme CENTILE | 5.5 | 5798 | 2655 | 20 | NC | NC | NC | NC | NC | 0.06 | NC | NC | 0.028 | NC | 0.14 | NC | 0.00014 | 0.00007 | 416 | 0.0013 | 0.0008 | 0.0018 | NC |
| 75eme CENTILE | 6.2 | 6115 | 3133 | 20 | NC | NC | NC | NC | NC | 0.06 | NC | NC | 0.12 | NC | 1.6 | NC | 0.0004 | 0.000078 | 577 | 0.0025 | 0.0016 | 0.0024 | NC |
| **Minerai SGR++** | | | | | | | | | | | | | | | | | | | | | | | |
| X19155-1653.20-0711 | ***5.5*** | 5630 | 2560 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | **0.00001** | < 0,0005 | 0.09 | < 0,002 | 0.75 | < 0,02 | 0.00013 | < 0,00007 | 390 | **0.0015** | 0.0015 | 0.00059 | < 0,002 |
| X19152W-1592.75-0322 | ***5.3*** | 5440 | 2320 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.47 | < 0,002 | 0.2 | < 0,02 | 0.00028 | < 0,00007 | 305 | **0.0012** | **0.004** | 0.0025 | < 0,002 |
| X18108AC-1277.00-0058 | ***5.7*** | 6130 | 2640 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | **0.1** | < 0,002 | 0.12 | < 0,02 | **0.00012** | **0.0001** | 513 | **0.0013** | < 0,0008 | 0.0014 | < 0,002 |
| Y155013EXT-1663.00-0736 | 6.6 | 6220 | 3300 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | < 0,01 | 0.002 | 0.18 | < 0,02 | < 0,00007 | < 0,00007 | 632 | **0.0014** | < 0,0008 | 0.0045 | < 0,002 |
| X19157-1723.60-0551 | 6.0 | 6190 | 3050 | **52** | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | **0.00001** | < 0,0005 | 0.03 | **0.002** | 0.41 | < 0,02 | < 0,00007 | < 0,00007 | 614 | **0.0031** | < 0,0008 | 0.0025 | < 0,002 |
| X19143-1451.25-1448 | ***4.8*** | 3530 | 1230 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 1.2 | < 0,002 | **0.084** | < 0,02 | 0.00069 | 0.00035 | 939 | **0.0035** | **0.019** | **0.0058** | **0.004** |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 4.8 | 3530 | 1230 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | < 0,01 | < 0,002 | 0.084 | < 0,02 | < 0,00007 | < 0,00007 | 305 | 0.0012 | < 0,0008 | 0.00059 | < 0,002 |
| MAXIMUM | 6.6 | 6220 | 3300 | 52 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | 0.00001 | < 0,0005 | 1.2 | 0.002 | 0.75 | < 0,02 | 0.00069 | 0.00035 | 939 | 0.0035 | 0.019 | 0.0058 | 0.004 |
| MEDIANE | 5.6 | 5880 | 2600 | 20 | NC | NC | NC | NC | NC | NC | 0.00001 | NC | 0.095 | 0.002 | 0.19 | NC | 0.00013 | 0.00007 | 564 | 0.0014 | 0.0012 | 0.0025 | 0.002 |
| MOYENNE | 5.6 | 5523 | 2517 | 25 | NC | NC | NC | NC | NC | NC | 0.00001 | NC | 0.32 | 0.002 | 0.29 | NC | 0.00023 | 0.00012 | 566 | 0.002 | 0.0045 | 0.0029 | 0.0023 |
| ECART TYPE | 0.63 | 1029 | 722 | NC | NC | NC | NC | NC | NC | NC | 0 | NC | 0.46 | 0 | 0.25 | NC | 0.00024 | 0.00011 | 223 | 0.0010 | 0.0073 | 0.0019 | NC |
| 25eme CENTILE | 5.3 | 5488 | 2380 | 20 | NC | NC | NC | NC | NC | NC | 0.00001 | NC | 0.045 | 0.002 | 0.14 | NC | 0.000083 | 0.00007 | 421 | 0.0013 | 0.0008 | 0.0016 | 0.002 |
| 75eme CENTILE | 5.9 | 6175 | 2948 | 20 | NC | NC | NC | NC | NC | NC | 0.00001 | NC | 0.38 | 0.002 | 0.36 | NC | 0.00024 | 0.000093 | 628 | 0.0027 | 0.0034 | 0.004 | 0.002 |
| **Dilution AGR** | | | | | | | | | | | | | | | | | | | | | | | |
| X19156-1745.00-1266 | ***5.0*** | 4810 | 1840 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.1 | < 0,00001 | < 0,0005 | 1.0 | 0.004 | 0.34 | < 0,02 | 0.00021 | 0.00015 | 85 | 0.00064 | 0.0078 | 0.0042 | 0.007 |
| X19154-1588.00-0896 | ***5.0*** | 4750 | 1820 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | **0.00002** | < 0,0005 | 1.0 | < 0,002 | 0.31 | < 0,02 | 0.00015 | 0.00009 | 62 | 0.00029 | 0.0083 | 0.0039 | 0.003 |
| X19135W-1854.00-0912 | ***5.6*** | 5870 | 2500 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.18 | < 0,002 | 0.41 | < 0,02 | 0.00016 | < 0,00007 | 447 | 0.0011 | 0.0019 | 0.0029 | < 0,002 |
| X19135W-1917.00-0989 | ***5.5*** | 5790 | 2420 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.1 | < 0,00001 | < 0,0005 | 0.24 | < 0,002 | 0.23 | < 0,02 | 0.00023 | < 0,00007 | 401 | **0.0015** | 0.0035 | 0.0029 | < 0,002 |
| X19153-1721.00-1226 | ***5.1*** | 5020 | 2060 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.76 | 0.002 | 0.38 | < 0,02 | 0.0001 | 0.00008 | 175 | 0.0007 | 0.011 | 0.0023 | < 0,002 |
| X19152W-1708.00-0590 | ***5.3*** | 5280 | 2300 | 27 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.12 | < 0,00001 | < 0,0005 | 0.49 | < 0,002 | **0.91** | < 0,02 | 0.00013 | < 0,00007 | 239 | **0.0015** | 0.0062 | 0.0034 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 5.0 | 4750 | 1820 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.18 | < 0,002 | 0.23 | < 0,02 | 0.0001 | < 0,00007 | 62 | 0.00029 | 0.0019 | 0.0023 | < 0,002 |
| MAXIMUM | 5.6 | 5870 | 2500 | 27 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.12 | 0.00002 | < 0,0005 | 1.0 | 0.004 | 0.91 | < 0,02 | 0.00023 | 0.00015 | 447 | 0.0015 | 0.011 | 0.0042 | 0.007 |
| MEDIANE | 5.2 | 5150 | 2180 | 20 | NC | NC | NC | NC | NC | 0.08 | 0.00001 | NC | 0.63 | 0.002 | 0.36 | NC | 0.00016 | 0.000075 | 207 | 0.00089 | 0.007 | 0.0032 | 0.002 |
| MOYENNE | 5.3 | 5253 | 2157 | 21 | NC | NC | NC | NC | NC | 0.083 | 0.000012 | NC | 0.62 | 0.0023 | 0.43 | NC | 0.00016 | 0.000088 | 235 | 0.00095 | 0.0065 | 0.0033 | 0.003 |
| ECART TYPE | 0.24 | 484 | 294 | NC | NC | NC | NC | NC | NC | 0.027 | NC | NC | 0.37 | 0.00082 | 0.24 | NC | 0.000049 | 0.000031 | 160 | 0.00049 | 0.0034 | 0.00072 | 0.002 |
| 25eme CENTILE | 5.1 | 4863 | 1895 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.3 | 0.002 | 0.32 | NC | 0.00014 | 0.00007 | 108 | 0.00066 | 0.0042 | 0.0029 | 0.002 |
| 75eme CENTILE | 5.4 | 5663 | 2390 | 20 | NC | NC | NC | NC | NC | 0.1 | 0.00001 | NC | 0.96 | 0.002 | 0.4 | NC | 0.0002 | 0.000088 | 361 | 0.0014 | 0.0082 | 0.0038 | 0.0028 |

Tableau D-6: Essais de Lixiviation TCLP

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Fe | K | Li | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Ti | Tl | U | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | **2.3** | **29** | | **0.26** | **1.0** | **0.034** | **1.1** | **0.062** | | | | | | **0.32** | | **0.067** |
| EC [2] | | | | | 0.050 | 0.040 | 200 | 0.070 | | 0.010 | 0.0060 | 0.010 | | | | | | 0.020 | | 5.0 |
| ***T1 A2 Dir. 019***[3] | | | | | | | | | | ***5.0*** | | ***1.0*** | | | | | | ***2.0*** | | |
| **Minerai AGR** | | | | | | | | | | | | | | | | | | | | |
| X19135-1832.70-1829 | 3.7 | 23 | 0.005 | 2.6 | **0.67** | < 0,0004 | 1400 | 0.008 | 0.01 | 0.01 | < 0,009 | < 0,0004 | 2.6 | < 0,00006 | 0.23 | 0.0011 | 0.00009 | 0.0017 | 0.0013 | **0.03** |
| X19152-1643.00-1475 | 5.9 | 29 | 0.008 | 6.2 | **6.5** | < 0,0004 | 1460 | 0.008 | **0.01** | 0.013 | < 0,009 | < 0,0004 | 2.4 | 0.0001 | 1.7 | 0.0007 | **0.00006** | 0.0012 | 0.00069 | < 0,02 |
| X19152W-1715.00-0597 | 6.8 | 30 | 0.012 | 4.7 | **3.9** | < 0,0004 | 1440 | 0.013 | < 0,003 | 0.014 | < 0,009 | < 0,0004 | 4.4 | **0.00006** | 1.7 | 0.0016 | < 0,00005 | 0.0095 | 0.00069 | < 0,02 |
| X19152-1572.00-1382 | 6.3 | 25 | 0.004 | 3.5 | 4.7 | < 0,0004 | 1460 | 0.007 | < 0,003 | 0.011 | < 0,009 | < 0,0004 | 1.9 | < 0,00006 | 0.5 | 0.0012 | **0.00008** | 0.0024 | 0.0022 | < 0,02 |
| X19155-1665.00-0726 | 3.7 | 28 | 0.007 | 2.5 | **2.3** | < 0,0004 | 1440 | 0.01 | < 0,003 | 0.032 | < 0,009 | < 0,0004 | 2.8 | **0.00008** | 0.27 | **0.0012** | < 0,00005 | 0.0025 | 0.0023 | 0.02 |
| X19135W-1914.00-0986 | 5.1 | 40 | 0.006 | 4.0 | **6.3** | **0.0011** | 1420 | 0.005 | **0.04** | 0.014 | < 0,009 | < 0,0004 | 1.8 | < 0,00006 | 1.2 | < 0,0005 | 0.00021 | 0.0021 | 0.00061 | **0.04** |
| X19135W-1839.00-0895 | 5.6 | 27 | 0.004 | 4.3 | **5.8** | < 0,0004 | 1420 | 0.007 | < 0,003 | 0.0077 | < 0,009 | < 0,0004 | 2.1 | < 0,00006 | 0.93 | < 0,0005 | 0.0002 | 0.0025 | 0.00046 | < 0,02 |
| X19154-1562.00-0866 | 18 | 45 | 0.007 | 26 | **8.0** | < 0,0004 | 1400 | 0.013 | < 0,003 | 0.026 | < 0,009 | < 0,0004 | 1.6 | 0.00019 | 4.6 | < 0,0005 | 0.00025 | 0.00022 | 0.00002 | **0.03** |
| X19152-1648.00-1481 | 3.3 | 24 | 0.008 | 3.6 | **5.0** | < 0,0004 | 1420 | 0.009 | **0.02** | 0.0087 | < 0,009 | < 0,0004 | 2.4 | **0.00019** | 0.89 | < 0,0005 | 0.00012 | 0.0014 | 0.00059 | < 0,02 |
| X19148W-2073.00-1036 | 5.5 | 39 | 0.006 | 7.6 | **9.0** | < 0,0004 | 1430 | **0.01** | < 0,003 | **0.0086** | < 0,009 | < 0,0004 | 1.5 | < 0,00006 | 1.8 | < 0,0005 | 0.00021 | **0.0011** | 0.00026 | < 0,02 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 3.3 | 23 | 0.004 | 2.5 | 0.67 | < 0,0004 | 1400 | 0.005 | < 0,003 | 0.0077 | < 0,009 | < 0,0004 | 1.5 | < 0,00006 | 0.23 | < 0,0005 | < 0,00005 | 0.00022 | 0.00002 | < 0,02 |
| MAXIMUM | 18 | 45 | 0.012 | 26 | 9.0 | 0.0011 | 1460 | 0.013 | 0.04 | 0.032 | < 0,009 | < 0,0004 | 4.4 | 0.00019 | 4.6 | 0.0016 | 0.00025 | 0.0095 | 0.0023 | 0.04 |
| MEDIANE | 5.6 | 29 | 0.0065 | 4.1 | 5.4 | 0.0004 | 1425 | 0.0085 | 0.003 | 0.012 | NC | NC | 2.2 | 0.00006 | 1.1 | 0.0006 | 0.00011 | 0.0019 | 0.00065 | 0.02 |
| MOYENNE | 6.3 | 31 | 0.0067 | 6.5 | 5.2 | 0.00047 | 1429 | 0.009 | 0.0098 | 0.015 | NC | NC | 2.3 | 0.000092 | 1.4 | 0.00083 | 0.00013 | 0.0025 | 0.0009 | 0.024 |
| ÉCART TYPE | 4.1 | 7.6 | 0.0024 | 7.0 | 2.5 | NC | 21 | 0.0026 | 0.012 | 0.008 | NC | NC | 0.84 | 0.000053 | 1.3 | 0.00041 | 0.000077 | 0.0026 | 0.00077 | 0.007 |
| 25eme CENTILE | 4.1 | 26 | 0.0053 | 3.5 | 4.1 | 0.0004 | 1420 | 0.0073 | 0.003 | 0.0091 | NC | NC | 1.8 | 0.00006 | 0.6 | 0.0005 | 0.000065 | 0.0012 | 0.00049 | 0.02 |
| 75eme CENTILE | 6.2 | 37 | 0.0078 | 5.8 | 6.5 | 0.0004 | 1440 | 0.01 | 0.01 | 0.014 | NC | NC | 2.5 | 0.000095 | 1.7 | 0.0012 | 0.00021 | 0.0025 | 0.0011 | 0.028 |
| **Minerai SGR** | | | | | | | | | | | | | | | | | | | | |
| X19136W-1730.50-1236 | 2.8 | 37 | 0.003 | 11 | **12** | < 0,0004 | 1410 | 0.005 | 0.02 | 0.0036 | < 0,009 | < 0,0004 | 1.6 | **0.00011** | 2.1 | < 0,0005 | 0.00015 | 0.00053 | 0.00011 | < 0,02 |
| X19140-1631.00-1727 | 14 | 39 | 0.003 | 11 | **10.0** | < 0,0004 | 1450 | 0.007 | **0.01** | 0.018 | < 0,009 | < 0,0004 | 1.8 | < 0,00006 | 2.8 | < 0,0005 | 0.00024 | 0.00061 | 0.00041 | < 0,02 |
| X19145WA-1854.00-0778 | 7.8 | 34 | 0.004 | 7.2 | **7.6** | < 0,0004 | 1420 | 0.005 | < 0,003 | 0.014 | < 0,009 | < 0,0004 | 1.2 | **0.00007** | 2.3 | < 0,0005 | 0.00025 | 0.00045 | 0.00018 | < 0,02 |
| X19141AW-1670.85-0796 | 1.7 | 31 | 0.004 | 5.1 | **7.5** | **0.0011** | 1350 | 0.004 | < 0,003 | 0.0054 | < 0,009 | < 0,0004 | 1.2 | < 0,00006 | 1.1 | < 0,0005 | 0.00014 | 0.00027 | 0.00006 | < 0,02 |
| X19135W-1883.00-0947 | 6.6 | 29 | 0.006 | 4.5 | **5.1** | < 0,0004 | 1490 | 0.011 | **0.02** | 0.016 | < 0,009 | < 0,0004 | 2.7 | < 0,00006 | 0.6 | **0.001** | 0.00012 | 0.0016 | **0.0012** | **0.02** |
| Y155016EXT-1882.50-I001 | 26 | 35 | 0.007 | 3.1 | **5.9** | < 0,0004 | 1390 | 0.012 | < 0,003 | 0.015 | < 0,009 | < 0,0004 | 1.7 | 0.00012 | 0.66 | < 0,0005 | 0.00022 | 0.004 | < 0,00001 | **0.82** |
| Y165106EXT-1640.00-0489 | 6.2 | 30 | 0.007 | 6.1 | 7.4 | < 0,0004 | 1460 | 0.007 | < 0,003 | 0.02 | < 0,009 | < 0,0004 | 1.9 | **0.00006** | 0.84 | 0.0012 | 0.00005 | 0.0018 | 0.0013 | < 0,02 |
| Y155021EXTA-1800.00-0881 | 2.6 | 28 | 0.009 | 2.3 | **1.6** | < 0,0004 | 1400 | 0.011 | **0.04** | 0.0019 | < 0,009 | < 0,0004 | 2.4 | < 0,00006 | 0.21 | **0.0007** | 0.00012 | 0.0014 | 0.00061 | < 0,02 |
| X19147AWA-1634.00-0376 | 2.0 | 56 | 0.004 | 6.6 | **8.7** | < 0,0004 | 1420 | 0.005 | < 0,003 | **0.0084** | < 0,009 | < 0,0004 | 1.4 | < 0,00006 | 4.0 | < 0,0005 | 0.00016 | 0.00061 | 0.00002 | < 0,02 |
| X19156-1768.60-1296 | 10 | 44 | 0.006 | 15 | **19** | < 0,0004 | 1.9 | 0.006 | **0.02** | 0.044 | < 0,009 | < 0,0004 | 1.6 | < 0,00006 | 10 | 0.0005 | 0.00032 | 0.001 | 0.00057 | < 0,02 |
| X19140-1560.15-1641 | 3.3 | 26 | 0.006 | 4.0 | **4.4** | **0.0008** | 1520 | 0.014 | < 0,003 | 0.015 | < 0,009 | < 0,0004 | 2.6 | < 0,00006 | 0.39 | **0.0011** | 0.00015 | 0.0018 | **0.0013** | **0.02** |
| X19149A-2009.70-2213 | 0.58 | 24 | 0.003 | 4.9 | **8.3** | < 0,0004 | 1440 | **0.006** | < 0,003 | **0.02** | < 0,009 | < 0,0004 | 0.89 | 0.00008 | 1.4 | < 0,0005 | 0.00017 | **0.00075** | < 0,00001 | < 0,02 |
| COMPTE | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| MINIMUM | 0.58 | 24 | 0.003 | 2.3 | 1.6 | < 0,0004 | 1.9 | 0.004 | < 0,003 | 0.0019 | < 0,009 | < 0,0004 | 0.89 | < 0,00006 | 0.21 | < 0,0005 | 0.00005 | 0.00027 | < 0,00001 | < 0,02 |
| MAXIMUM | 26 | 56 | 0.009 | 15 | 19 | 0.0011 | 1520 | 0.014 | 0.04 | 0.044 | < 0,009 | < 0,0004 | 2.7 | 0.00012 | 10 | 0.0012 | 0.00032 | 0.004 | 0.0013 | 0.82 |
| MEDIANE | 4.7 | 33 | 0.005 | 5.6 | 7.5 | 0.0004 | 1420 | 0.0065 | 0.003 | 0.015 | NC | NC | 1.6 | 0.00006 | 1.3 | 0.0005 | 0.00016 | 0.00088 | 0.0003 | 0.02 |
| MOYENNE | 7.0 | 34 | 0.0052 | 6.6 | 8.1 | 0.00049 | 1313 | 0.0078 | 0.011 | 0.015 | NC | NC | 1.7 | 0.000072 | 2.2 | 0.00067 | 0.00017 | 0.0012 | 0.00049 | 0.087 |
| ÉCART TYPE | 7.2 | 8.8 | 0.0019 | 3.6 | 4.4 | 0.00022 | 415 | 0.0033 | 0.012 | 0.011 | NC | NC | 0.57 | 0.000021 | 2.8 | 0.00027 | 0.000072 | 0.001 | 0.00053 | 0.23 |
| 25eme CENTILE | 2.5 | 29 | 0.0038 | 4.3 | 5.7 | 0.0004 | 1398 | 0.005 | 0.003 | 0.0077 | NC | NC | 1.4 | 0.00006 | 0.65 | 0.0005 | 0.00014 | 0.00059 | 0.00005 | 0.02 |
| 75eme CENTILE | 8.4 | 37 | 0.0063 | 8.0 | 9.0 | 0.0004 | 1453 | 0.011 | 0.02 | 0.018 | NC | NC | 2.0 | 0.000073 | 2.4 | 0.00078 | 0.00023 | 0.0016 | 0.00076 | 0.02 |
| **Minerai SGR+** | | | | | | | | | | | | | | | | | | | | |
| X19152W-1601.30-0332 | 13 | 75 | 0.018 | 10 | **9.3** | < 0,0004 | 1400 | 0.008 | 0.01 | **0.039** | < 0,009 | < 0,0004 | 1.6 | **0.00013** | 4.4 | < 0,0005 | 0.00037 | 0.00069 | 0.00033 | **0.02** |
| X19136W-1692.40-1182 | 4.8 | 44 | 0.004 | 4.5 | **7.1** | < 0,0004 | 1410 | 0.006 | 0.04 | 0.036 | < 0,009 | < 0,0004 | 1.6 | < 0,00006 | 2.5 | < 0,0005 | 0.00021 | 0.0025 | 0.00019 | < 0,02 |
| X19139WA-1778.85-0693 | 8.1 | 34 | 0.004 | 8.5 | **9.5** | < 0,0004 | 1430 | 0.006 | **0.02** | 0.015 | < 0,009 | < 0,0004 | 1.8 | < 0,00006 | 2.5 | < 0,0005 | 0.00022 | 0.00047 | 0.00013 | **0.04** |
| X19143-1454.00-1452 | 1.2 | 38 | 0.005 | 3.8 | **7.7** | **0.0006** | 1410 | 0.008 | < 0,003 | 0.0042 | < 0,009 | < 0,0004 | 1.5 | **0.00007** | 1.3 | **0.0005** | 0.00018 | 0.0006 | 0.00045 | < 0,02 |
| X19141AW-1822.15-0730 | 3.8 | 25 | 0.004 | 4.6 | **5.8** | < 0,0004 | 1390 | 0.005 | **0.01** | **0.021** | < 0,009 | < 0,0004 | 1.7 | < 0,00006 | 1.0 | < 0,0005 | 0.00022 | 0.0034 | 0.00067 | < 0,02 |
| X19152W-1596.10-0327 | 7.7 | 57 | 0.018 | 7.5 | **5.8** | < 0,0004 | 1390 | 0.011 | < 0,003 | **0.071** | < 0,009 | < 0,0004 | 1.4 | **0.00013** | 3.2 | < 0,0005 | 0.00054 | 0.0026 | 0.00009 | < 0,02 |
| X19142-1559.00-1528 | 1.2 | 17 | 0.002 | 2.9 | **5.5** | < 0,0004 | 1430 | 0.005 | < 0,003 | 0.04 | < 0,009 | < 0,0004 | 0.91 | < 0,00006 | 1.2 | < 0,0005 | 0.00016 | 0.0028 | 0.00003 | < 0,02 |
| X19145WA-1901.00-0836 | 3.4 | 32 | 0.003 | 8.4 | **7.6** | < 0,0004 | 1410 | 0.007 | < 0,003 | 0.023 | < 0,009 | < 0,0004 | 1.2 | < 0,00006 | 2.5 | < 0,0005 | 0.00032 | 0.00069 | 0.00001 | **0.02** |
| X19149A-2030.30-2239 | 0.27 | 33 | 0.004 | 11 | **10** | < 0,0004 | 1450 | 0.009 | < 0,003 | 0.0028 | < 0,009 | < 0,0004 | 1.0 | < 0,00006 | 3.8 | < 0,0005 | 0.00024 | 0.00056 | 0.00004 | < 0,02 |
| X19150A-1450.65-1470 | 0.86 | 20 | 0.003 | 7.1 | **8.6** | 0.0008 | 1410 | **0.009** | < 0,003 | **0.01** | < 0,009 | < 0,0004 | 0.88 | < 0,00006 | 2.0 | < 0,0005 | 0.00015 | **0.00079** | 0.00004 | < 0,02 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 0.27 | 17 | 0.002 | 2.9 | 5.5 | < 0,0004 | 1390 | 0.005 | < 0,003 | 0.0028 | < 0,009 | < 0,0004 | 0.88 | < 0,00006 | 1.0 | < 0,0005 | 0.00015 | 0.00047 | 0.00001 | < 0,02 |
| MAXIMUM | 13 | 75 | 0.018 | 11 | 10 | 0.0008 | 1450 | 0.011 | 0.04 | 0.071 | < 0,009 | < 0,0004 | 1.8 | 0.00013 | 4.4 | 0.0005 | 0.00054 | 0.0034 | 0.00067 | 0.04 |
| MEDIANE | 3.6 | 33 | 0.004 | 7.3 | 7.6 | 0.0004 | 1410 | 0.0075 | 0.003 | 0.022 | NC | NC | 1.4 | 0.00006 | 2.5 | 0.0005 | 0.00022 | 0.00074 | 0.00011 | 0.02 |
| MOYENNE | 4.4 | 37 | 0.0065 | 6.8 | 7.7 | 0.00046 | 1413 | 0.0074 | 0.0098 | 0.026 | NC | NC | 1.4 | 0.000075 | 2.4 | 0.0005 | 0.00026 | 0.0015 | 0.0002 | 0.022 |
| ECART TYPE | 4.0 | 18 | 0.0061 | 2.8 | 1.6 | 0.00013 | 19 | 0.002 | 0.012 | 0.021 | NC | NC | 0.34 | 0.000029 | 1.1 | NC | 0.00012 | 0.0012 | 0.00022 | 0.0063 |
| 25eme CENTILE | 1.2 | 27 | 0.0033 | 4.5 | 6.1 | 0.0004 | 1403 | 0.006 | 0.003 | 0.012 | NC | NC | 1.0 | 0.00006 | 1.5 | 0.0005 | 0.00019 | 0.00062 | 0.00004 | 0.02 |
| 75eme CENTILE | 6.9 | 42 | 0.0048 | 8.4 | 9.2 | 0.0004 | 1425 | 0.0088 | 0.01 | 0.038 | NC | NC | 1.6 | 0.000068 | 3.0 | 0.0005 | 0.0003 | 0.0026 | 0.0003 | 0.02 |
| **Minerai SGR++** | | | | | | | | | | | | | | | | | | | | |
| X19155-1653.20-0711 | 1.1 | 14 | 0.004 | 4.9 | **4.5** | **0.0004** | 1370 | 0.006 | 0.02 | 0.05 | < 0,009 | < 0,0004 | 0.61 | 0.00016 | 1.3 | < 0,0005 | 0.00015 | 0.00064 | < 0,00001 | < 0,02 |
| X19152W-1592.75-0322 | 2.0 | 27 | 0.007 | 2.9 | **5.1** | < 0,0004 | 1400 | 0.012 | **0.01** | 0.03 | < 0,009 | < 0,0004 | 2.6 | **0.00008** | 0.48 | 0.0006 | 0.00008 | 0.0029 | 0.00083 | < 0,02 |
| X18108AC-1277.00-0058 | 0.1 | 10 | 0.001 | 4.6 | **5.6** | < 0,0004 | 1440 | 0.007 | < 0,003 | **0.0097** | < 0,009 | < 0,0004 | 0.66 | < 0,00006 | 0.97 | **0.0017** | 0.00012 | 0.0017 | 0.00014 | < 0,02 |
| Y155013EXT-1663.00-0736 | 0.24 | 24 | 0.002 | 4.3 | **9.0** | **0.0009** | 1370 | 0.01 | < 0,003 | 0.045 | < 0,009 | < 0,0004 | 1.2 | **0.00015** | 1.5 | < 0,0005 | 0.00013 | 0.0022 | **0.00009** | < 0,02 |
| X19157-1723.60-0551 | 1.9 | 21 | 0.004 | 7.9 | **9.0** | < 0,0004 | 1420 | 0.006 | < 0,003 | **0.028** | < 0,009 | < 0,0004 | 1.1 | < 0,00006 | 9.0 | < 0,0005 | 0.00008 | 0.00047 | < 0,00001 | < 0,02 |
| X19143-1451.25-1448 | 12 | 24 | 0.004 | 59 | **16** | < 0,0004 | 4.1 | **0.021** | < 0,003 | **0.05** | < 0,009 | < 0,0004 | 1.9 | < 0,00006 | 3.7 | 0.0005 | 0.00031 | **0.0076** | 0.0001 | **0.07** |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 0.1 | 10 | 0.001 | 2.9 | 4.5 | < 0,0004 | 4.1 | 0.006 | < 0,003 | 0.0097 | < 0,009 | < 0,0004 | 0.61 | < 0,00006 | 0.48 | < 0,0005 | 0.00008 | 0.00047 | < 0,00001 | < 0,02 |
| MAXIMUM | 12 | 27 | 0.007 | 59 | 16 | 0.0009 | 1440 | 0.021 | 0.02 | 0.05 | < 0,009 | < 0,0004 | 2.6 | 0.00016 | 9.0 | 0.0017 | 0.00031 | 0.0076 | 0.00083 | 0.07 |
| MEDIANE | 1.5 | 22 | 0.004 | 4.7 | 7.3 | 0.0004 | 1385 | 0.0085 | 0.003 | 0.037 | NC | NC | 1.1 | 0.00007 | 1.4 | 0.0005 | 0.00013 | 0.002 | 0.000095 | 0.02 |
| MOYENNE | 2.9 | 20 | 0.0037 | 14 | 8.1 | 0.00048 | 1167 | 0.01 | 0.007 | 0.035 | NC | NC | 1.3 | 0.000095 | 2.8 | 0.00072 | 0.00015 | 0.0026 | 0.0002 | 0.028 |
| ÉCART TYPE | 4.5 | 6.6 | 0.0021 | 22 | 4.1 | 0.0002 | 571 | 0.0058 | 0.007 | 0.016 | NC | NC | 0.77 | 0.000047 | 3.2 | 0.00048 | 0.000085 | 0.0026 | 0.00031 | NC |
| 25eme CENTILE | 0.46 | 16 | 0.0025 | 4.3 | 5.3 | 0.0004 | 1370 | 0.0063 | 0.003 | 0.029 | NC | NC | 0.76 | 0.00006 | 1.0 | 0.0005 | 0.00009 | 0.00092 | 0.00003 | 0.02 |
| 75eme CENTILE | 2.0 | 24 | 0.004 | 7.1 | 9.0 | 0.0004 | 1415 | 0.012 | 0.0083 | 0.049 | NC | NC | 1.7 | 0.00013 | 3.1 | 0.00058 | 0.00015 | 0.0027 | 0.00013 | 0.02 |
| **Dilution AGR** | | | | | | | | | | | | | | | | | | | | |
| X19156-1745.00-1266 | 9.5 | 31 | 0.011 | 5.5 | **2.4** | < 0,0004 | 1420 | 0.014 | 0.04 | 0.01 | < 0,009 | < 0,0004 | 4.8 | 0.00015 | 0.45 | 0.0014 | < 0,00005 | 0.0039 | 0.0014 | 0.04 |
| X19154-1588.00-0896 | 5.3 | 26 | 0.009 | 3.1 | **1.6** | < 0,0004 | 1410 | 0.014 | 0.01 | 0.014 | < 0,009 | < 0,0004 | 3.7 | 0.00006 | 0.14 | 0.0021 | < 0,00005 | 0.0055 | 0.0018 | 0.02 |
| X19135W-1854.00-0912 | 7.3 | 36 | 0.007 | 4.9 | **6.2** | < 0,0004 | 1440 | 0.009 | 0.03 | 0.01 | < 0,009 | < 0,0004 | 2.6 | < 0,00006 | 0.55 | < 0,0005 | 0.00013 | 0.0019 | 0.0011 | 0.02 |
| X19135W-1917.00-0989 | 5.2 | 34 | 0.007 | 3.5 | **6.2** | < 0,0004 | 1420 | 0.014 | 0.01 | 0.0091 | < 0,009 | < 0,0004 | 2.4 | < 0,00006 | 0.5 | < 0,0005 | 0.00015 | 0.0026 | 0.0015 | 0.02 |
| X19153-1721.00-1226 | 5.5 | 25 | 0.007 | 2.7 | **3.0** | < 0,0004 | 1450 | 0.009 | 0.01 | 0.014 | < 0,009 | < 0,0004 | 3.3 | 0.00019 | 0.25 | 0.0012 | < 0,00005 | 0.0031 | 0.0017 | < 0,02 |
| X19152W-1708.00-0590 | 17 | 26 | 0.009 | 17 | **6.0** | < 0,0004 | 1360 | 0.011 | 0.02 | 0.017 | < 0,009 | < 0,0004 | 2.4 | < 0,00006 | 0.98 | < 0,0005 | < 0,00005 | 0.0036 | 0.0008 | 0.03 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 5.2 | 25 | 0.007 | 2.7 | 1.6 | < 0,0004 | 1360 | 0.009 | 0.01 | 0.0091 | < 0,009 | < 0,0004 | 2.4 | < 0,00006 | 0.14 | < 0,0005 | < 0,00005 | 0.0019 | 0.0008 | < 0,02 |
| MAXIMUM | 17 | 36 | 0.011 | 17 | 6.2 | < 0,0004 | 1450 | 0.014 | 0.04 | 0.017 | < 0,009 | < 0,0004 | 4.8 | 0.00019 | 0.98 | 0.0021 | 0.00015 | 0.0055 | 0.0018 | 0.04 |
| MEDIANE | 6.4 | 28 | 0.008 | 4.2 | 4.5 | NC | 1420 | 0.013 | 0.015 | 0.012 | NC | NC | 2.9 | 0.00006 | 0.48 | 0.00085 | 0.00005 | 0.0033 | 0.0014 | 0.02 |
| MOYENNE | 8.3 | 30 | 0.0083 | 6.2 | 4.2 | NC | 1417 | 0.012 | 0.02 | 0.012 | NC | NC | 3.2 | 0.000097 | 0.48 | 0.001 | 0.00008 | 0.0034 | 0.0014 | 0.025 |
| ÉCART TYPE | 4.5 | 5.0 | 0.0016 | 5.6 | 2.1 | NC | 31 | 0.0025 | 0.013 | 0.0029 | NC | NC | 0.96 | 0.000058 | 0.29 | 0.00066 | 0.000047 | 0.0012 | 0.00036 | 0.0084 |
| 25eme CENTILE | 5.3 | 26 | 0.007 | 3.2 | 2.6 | NC | 1413 | 0.0095 | 0.01 | 0.01 | NC | NC | 2.5 | 0.00006 | 0.3 | 0.0005 | 0.00005 | 0.0027 | 0.0012 | 0.02 |
| 75eme CENTILE | 9.0 | 34 | 0.009 | 5.3 | 6.1 | NC | 1435 | 0.014 | 0.028 | 0.014 | NC | NC | 3.6 | 0.00013 | 0.54 | 0.0014 | 0.00011 | 0.0038 | 0.0016 | 0.028 |

Tableau D-6: Essais de Lixiviation TCLP

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | pH | Conductivité | Alkalinité | $SO_4^{2-}$ | Cl | Br | Nitrite | Nitrate | Nitrate + Nitrite | F | Hg | Ag | Al | As | Ba | B | Be | Bi | Ca | Cd | Cr | Co | Cu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µS/cm | mg/L as $CaCO_3$ | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | **860** | | **0.060** | **300** | | **4.0** | **0.0000013** | **0.00062** | | **0.34** | **0.60** | **28** | | | | **0.0011** | **0.016** | **0.37** | **0.0073** |
| EC [2] | | | | | 250 | | 1.0 | | 10 | 1.5 | 0.0010 | 0.10 | 0.10 | 0.00030 | 1.0 | 5.0 | | | | 0.0050 | 0.050 | | 1.0 |
| ***T1 A2 Dir. 019*** [3] | ***6-9.5*** | | | | | | ***100*** | | ***1000*** | ***150*** | ***0.10*** | | | ***5.0*** | ***100*** | ***500*** | | | | ***0.50*** | ***5.0*** | | |
| **Dilution SGR** | | | | | | | | | | | | | | | | | | | | | | | |
| X19156-1797.00-1336 | ***5.8*** | 6040 | 2970 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.08 | < 0,002 | 0.21 | < 0,02 | 0.00007 | < 0,00007 | 524 | 0.001 | 0.0012 | 0.0014 | < 0,002 |
| X18127A-1428.00-0654 | ***5.9*** | 6100 | 2730 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.05 | 0.004 | **4.1** | < 0,02 | 0.00017 | < 0,00007 | 495 | **0.0018** | < 0,0008 | 0.0034 | < 0,002 |
| X19147A-1603.00-1593 | ***5.5*** | 5580 | 2520 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.24 | < 0,002 | **0.66** | < 0,02 | 0.00031 | < 0,00007 | 384 | 0.00072 | 0.004 | 0.0016 | < 0,002 |
| Y165037EXT-1717.00-0076 | ***5.6*** | 5760 | 2820 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.15 | < 0,002 | **0.81** | < 0,02 | 0.00014 | < 0,00007 | 455 | **0.0015** | 0.0023 | 0.0066 | < 0,002 |
| X19149A-1999.00-2201 | 6.4 | 5970 | 3420 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.12 | < 0,00001 | < 0,0005 | 0.02 | < 0,002 | 0.31 | < 0,02 | 0.00009 | 0.0001 | 584 | 0.001 | < 0,0008 | 0.0019 | < 0,002 |
| X19156-1803.00-1343 | ***5.6*** | 5760 | 2760 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.2 | < 0,002 | 0.14 | < 0,02 | 0.00015 | < 0,00007 | 447 | 0.00077 | 0.0024 | 0.0023 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 5.5 | 5580 | 2520 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.02 | < 0,002 | 0.14 | < 0,02 | 0.00007 | < 0,00007 | 384 | 0.00072 | < 0,0008 | 0.0014 | < 0,002 |
| MAXIMUM | 6.4 | 6100 | 3420 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.12 | < 0,00001 | < 0,0005 | 0.24 | 0.004 | 4.1 | < 0,02 | 0.00031 | 0.0001 | 584 | 0.0018 | 0.004 | 0.0066 | < 0,002 |
| MEDIANE | 5.7 | 5865 | 2790 | NC | NC | NC | NC | NC | NC | 0.06 | NC | NC | 0.12 | 0.002 | 0.48 | NC | 0.00015 | 0.00007 | 475 | 0.001 | 0.0018 | 0.0021 | NC |
| MOYENNE | 5.8 | 5868 | 2870 | NC | NC | NC | NC | NC | NC | 0.07 | NC | NC | 0.12 | 0.0023 | 1.0 | NC | 0.00016 | 0.000075 | 482 | 0.0011 | 0.0019 | 0.0028 | NC |
| ÉCART TYPE | 0.33 | 200 | 306 | NC | NC | NC | NC | NC | NC | NC | NC | NC | 0.087 | NC | 1.5 | NC | 0.000085 | NC | 69 | 0.00042 | 0.0012 | 0.002 | NC |
| 25eme CENTILE | 5.6 | 5760 | 2738 | NC | NC | NC | NC | NC | NC | 0.06 | NC | NC | 0.058 | 0.002 | 0.24 | NC | 0.0001 | 0.00007 | 449 | 0.00083 | 0.0009 | 0.0016 | NC |
| 75eme CENTILE | 5.8 | 6023 | 2933 | NC | NC | NC | NC | NC | NC | 0.06 | NC | NC | 0.19 | 0.002 | 0.77 | NC | 0.00017 | 0.00007 | 517 | 0.0014 | 0.0024 | 0.0031 | NC |
| **Stérile AGR** | | | | | | | | | | | | | | | | | | | | | | | |
| X19141AW-1557.75-0646 | ***5.6*** | 4900 | 2380 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.08 | < 0,00001 | < 0,0005 | 0.3 | < 0,002 | **0.81** | < 0,02 | 0.00035 | < 0,00007 | 1790 | **0.003** | 0.0052 | 0.0045 | < 0,002 |
| X19151-1671.00-1628 | ***5.0*** | 4600 | 1930 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.11 | < 0,00001 | < 0,0005 | 1.0 | < 0,002 | 0.4 | < 0,02 | 0.00021 | 0.00011 | 9.5 | 0.00006 | 0.01 | 0.0051 | < 0,002 |
| X19139-1738.00-1882 | ***5.0*** | 4750 | 1480 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.07 | < 0,00001 | < 0,0005 | 0.9 | < 0,002 | 0.25 | < 0,02 | 0.00013 | 0.00008 | 21 | 0.0003 | 0.0062 | 0.0056 | < 0,002 |
| X19145-1736.00-1992 | ***5.1*** | 4750 | 2110 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.08 | < 0,00001 | < 0,0005 | 0.76 | < 0,002 | 0.28 | < 0,02 | 0.00019 | 0.00007 | 99 | 0.00062 | 0.0088 | 0.0044 | < 0,002 |
| X18131-0777.00-0578 | ***5.2*** | 5140 | 1830 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.62 | < 0,002 | **1.9** | < 0,02 | < 0,00007 | 0.00007 | 154 | **0.0012** | 0.0098 | 0.0043 | < 0,002 |
| Y155016EXT-1758.00-0804 | ***5.0*** | 4740 | 1870 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.1 | < 0,00001 | < 0,0005 | 1.1 | < 0,002 | 0.44 | < 0,02 | 0.00026 | < 0,00007 | 61 | 0.00067 | 0.0089 | 0.0051 | 0.005 |
| Y155021EXTA-1724.00-0795 | ***5.0*** | 4650 | 1740 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.08 | < 0,00001 | < 0,0005 | 0.94 | < 0,002 | **0.66** | < 0,02 | < 0,00007 | < 0,00007 | 35 | 0.00003 | 0.0098 | 0.0057 | < 0,002 |
| X19143-1265.10-1226 | ***5.8*** | 5810 | 3240 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.06 | < 0,002 | **1.3** | < 0,02 | 0.00008 | < 0,00007 | 480 | **0.0012** | < 0,0008 | 0.0033 | < 0,002 |
| X19140-1518.00-1591 | ***5.1*** | 4950 | 1600 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.06 | < 0,00001 | < 0,0005 | 0.94 | < 0,002 | 0.58 | < 0,02 | 0.00018 | 0.00021 | 75 | 0.00026 | 0.0087 | 0.0048 | < 0,002 |
| X19145WA-1677.00-0575 | ***5.2*** | 5190 | 2500 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.61 | < 0,002 | 0.36 | < 0,02 | 0.00016 | 0.00008 | 221 | 0.0011 | 0.0074 | 0.0039 | < 0,002 |
| X19149AWB-1844.00-0656 | ***5.0*** | 4640 | 1980 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.75 | < 0,002 | 0.36 | < 0,02 | 0.0001 | 0.0002 | 32 | 0.00031 | 0.0079 | 0.0076 | < 0,002 |
| X18121-1189.00-0961 | ***5.0*** | 4690 | 1730 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.06 | **0.00001** | < 0,0005 | 1.2 | < 0,002 | 0.58 | < 0,02 | 0.00009 | < 0,00007 | 42 | 0.0001 | **0.017** | 0.0081 | < 0,002 |
| X19136W-1478.00-0915 | ***5.1*** | 5130 | 1550 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.72 | < 0,002 | 0.5 | < 0,02 | 0.00012 | 0.00026 | 136 | 0.00095 | 0.0064 | 0.0029 | **0.019** |
| X18108AWC-1087.20-0196 | ***5.4*** | 5820 | 2100 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.29 | < 0,002 | **0.6** | < 0,02 | 0.00011 | < 0,00007 | 345 | 0.00031 | 0.0036 | 0.0073 | < 0,002 |
| X18127A-1122.00-0299 | ***5.0*** | 4810 | 1430 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.71 | < 0,002 | **0.85** | < 0,02 | 0.00007 | 0.00011 | 11 | 0.00023 | 0.013 | 0.0097 | < 0,002 |
| X18121-1231.00-1009 | ***5.2*** | 5330 | 1940 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.75 | < 0,002 | 0.34 | < 0,02 | 0.00033 | 0.00009 | 208 | 0.00041 | 0.0065 | 0.0037 | < 0,002 |
| X19135-1719.00-1698 | ***5.1*** | 5120 | 1700 | 43 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.71 | < 0,002 | 0.36 | < 0,02 | 0.00017 | 0.0015 | 141 | 0.00072 | 0.0078 | 0.0027 | < 0,002 |
| X19150A-1326.00-1330 | ***5.1*** | 4000 | 2280 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.58 | < 0,002 | **0.61** | < 0,02 | < 0,00007 | 0.00007 | 141 | **0.0016** | 0.0077 | 0.0061 | < 0,002 |
| Y165037EXT-1663.00-0009 | ***5.0*** | 4720 | 1750 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.06 | < 0,00001 | < 0,0005 | 0.9 | 0.007 | **0.99** | < 0,02 | < 0,00007 | 0.00009 | 39 | 0.0006 | **0.021** | 0.0094 | < 0,002 |
| X19149A-1906.00-2084 | ***5.4*** | 5530 | 2790 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.25 | 0.004 | **0.64** | < 0,02 | 0.00011 | < 0,00007 | 325 | **0.0017** | 0.0039 | 0.0032 | < 0,002 |
| X19148W-1824.00-0744 | ***5.1*** | 4810 | 2060 | 27 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.7 | < 0,002 | 0.37 | < 0,02 | 0.00009 | 0.00016 | 80 | 0.00015 | 0.013 | 0.0072 | < 0,002 |
| X19147A-1466.00-1437 | ***5.0*** | 4550 | 1980 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.07 | < 0,00001 | < 0,0005 | 1.1 | < 0,002 | 0.18 | < 0,02 | 0.00015 | 0.00016 | 8.8 | 0.00016 | 0.012 | 0.0037 | < 0,002 |
| COMPTE | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| MINIMUM | 5.0 | 4000 | 1430 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.06 | < 0,002 | 0.18 | < 0,02 | < 0,00007 | < 0,00007 | 8.8 | 0.00003 | < 0,0008 | 0.0027 | < 0,002 |
| MAXIMUM | 5.8 | 5820 | 3240 | 43 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.11 | 0.00001 | < 0,0005 | 1.2 | 0.007 | 1.9 | < 0,02 | 0.00035 | 0.0015 | 1790 | 0.003 | 0.021 | 0.0097 | 0.019 |
| MEDIANE | 5.1 | 4810 | 1935 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.74 | 0.002 | 0.54 | NC | 0.00012 | 0.00008 | 89 | 0.00051 | 0.0083 | 0.0049 | 0.002 |
| MOYENNE | 5.1 | 4938 | 1999 | 21 | NC | NC | NC | NC | NC | 0.068 | 0.00001 | NC | 0.72 | 0.0023 | 0.61 | NC | 0.00014 | 0.00017 | 202 | 0.00071 | 0.0089 | 0.0054 | 0.0029 |
| ÉCART TYPE | 0.22 | 425 | 435 | 5.1 | NC | NC | NC | NC | NC | 0.014 | NC | NC | 0.29 | 0.0011 | 0.39 | NC | 0.000082 | 0.00031 | 376 | 0.00071 | 0.0044 | 0.0021 | 0.0037 |
| 25eme CENTILE | 5.0 | 4698 | 1733 | 20 | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.61 | 0.002 | 0.36 | NC | 0.000083 | 0.00007 | 36 | 0.00024 | 0.0064 | 0.0038 | 0.002 |
| 75eme CENTILE | 5.2 | 5138 | 2108 | 20 | NC | NC | NC | NC | NC | 0.07 | 0.00001 | NC | 0.93 | 0.002 | 0.66 | NC | 0.00018 | 0.00015 | 195 | 0.0011 | 0.01 | 0.0069 | 0.002 |
| **Puits d'accès** | | | | | | | | | | | | | | | | | | | | | | | |
| X19139-0887.00-0918 | ***5.0*** | 4860 | 1540 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.06 | < 0,00001 | < 0,0005 | 0.83 | < 0,002 | 0.45 | < 0,02 | < 0,00007 | < 0,00007 | 51 | 0.0013 | 0.0074 | 0.0083 | 0.003 |
| X19140-0708.00-0706 | ***5.0*** | 4780 | 1280 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.1 | < 0,00001 | < 0,0005 | 0.93 | < 0,002 | **0.38** | < 0,02 | 0.00014 | **0.00027** | 9.3 | 0.00031 | 0.0098 | 0.0045 | 0.003 |
| X19157-0933.00-0984 | ***5.0*** | 4640 | 1720 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.12** | < 0,00001 | < 0,0005 | 1.3 | < 0,002 | **0.6** | < 0,02 | 0.00009 | < 0,00007 | 18 | 0.00028 | 0.016 | 0.0067 | **0.004** |
| X18127W-0773.00-0369 | ***5.1*** | 4950 | 1700 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.79 | < 0,002 | 1.1 | < 0,02 | 0.00007 | **0.00011** | 112 | 0.00056 | 0.0072 | 0.01 | < 0,002 |
| X19159-1392.00-1329 | ***5.0*** | 4550 | 1670 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.06** | **0.00001** | < 0,0005 | 0.92 | < 0,002 | **0.45** | < 0,02 | **0.00009** | < 0,00007 | 5.7 | 0.0001 | 0.0078 | 0.0047 | < 0,002 |
| X19148W-1752.00-0664 | ***5.0*** | 4510 | 2020 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.68 | **0.002** | 0.74 | < 0,02 | < 0,00007 | 0.00007 | 9.6 | 0.00028 | 0.0087 | 0.014 | < 0,002 |
| X19148-1583.00-1092 | ***5.0*** | 4630 | 1700 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.76 | < 0,002 | 0.4 | < 0,02 | 0.00013 | 0.00013 | 14 | 0.00003 | **0.007** | 0.0044 | < 0,002 |
| X19149AWB-1297.00-0122 | ***5.0*** | 4550 | 2040 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | **0.08** | < 0,00001 | < 0,0005 | 0.79 | < 0,002 | **0.57** | < 0,02 | 0.00019 | 0.00007 | 35 | **0.00007** | **0.019** | **0.044** | < 0,002 |
| COMPTE | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| MINIMUM | 5.0 | 4510 | 1280 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | < 0,06 | < 0,00001 | < 0,0005 | 0.68 | < 0,002 | 0.38 | < 0,02 | < 0,00007 | < 0,00007 | 5.7 | 0.00003 | 0.007 | 0.0044 | < 0,002 |
| MAXIMUM | 5.1 | 4950 | 2040 | < 20 | < 20 | < 30 | < 3 | < 6 | < 6 | 0.12 | 0.00001 | < 0,0005 | 1.3 | 0.002 | 1.1 | < 0,02 | 0.00019 | 0.00027 | 112 | 0.0013 | 0.019 | 0.044 | 0.004 |
| MEDIANE | 5.0 | 4635 | 1700 | NC | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.81 | 0.002 | 0.51 | NC | 0.00009 | 0.00007 | 16 | 0.00028 | 0.0083 | 0.0075 | 0.002 |
| MOYENNE | 5.0 | 4684 | 1709 | NC | NC | NC | NC | NC | NC | 0.075 | 0.00001 | NC | 0.88 | 0.002 | 0.59 | NC | 0.00011 | 0.00011 | 32 | 0.00036 | 0.01 | 0.012 | 0.0025 |
| ÉCART TYPE | 0.043 | 161 | 245 | NC | NC | NC | NC | NC | NC | 0.023 | NC | NC | 0.2 | NC | 0.24 | NC | 0.000043 | 0.00007 | 36 | 0.00041 | 0.0047 | 0.013 | 0.00076 |
| 25eme CENTILE | 5.0 | 4550 | 1638 | NC | NC | NC | NC | NC | NC | 0.06 | 0.00001 | NC | 0.78 | 0.002 | 0.44 | NC | 0.00007 | 0.00007 | 9.5 | 0.000093 | 0.0074 | 0.0046 | 0.002 |
| 75eme CENTILE | 5.0 | 4800 | 1795 | NC | NC | NC | NC | NC | NC | 0.085 | 0.00001 | NC | 0.92 | 0.002 | 0.64 | NC | 0.00013 | 0.00012 | 39 | 0.00037 | 0.011 | 0.011 | 0.003 |

Notes:
"-" - Données inexistantes
NC - Statistique non calculée

1 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.

2 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
3 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Tableau D-6: Essais de Lixiviation TCLP

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Fe | K | Li | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Ti | Tl | U | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | **2.3** | **29** | | **0.26** | **1.0** | **0.034** | **1.1** | **0.062** | | | | | | **0.32** | | **0.067** |
| EC [2] | | | | | 0.050 | 0.040 | 200 | 0.070 | | 0.010 | 0.0060 | 0.010 | | | | | | 0.020 | | 5.0 |
| ***T1 A2 Dir. 019*** [3] | | | | | | | | | | ***5.0*** | | ***1.0*** | | | | | | ***2.0*** | | |
| **Dilution SGR** | | | | | | | | | | | | | | | | | | | | |
| X19156-1797.00-1336 | 5.3 | 38 | 0.007 | 3.4 | **6.5** | 0.0025 | 1380 | 0.005 | < 0,003 | 0.017 | < 0,009 | < 0,0004 | 1.9 | 0.00016 | 1.0 | 0.0011 | 0.00022 | 0.0025 | 0.0011 | < 0,02 |
| X18127A-1428.00-0654 | 8.2 | 51 | 0.009 | 8.2 | **6.9** | < 0,0004 | 1400 | 0.009 | 0.01 | **0.047** | < 0,009 | < 0,0004 | 1.8 | < 0,00006 | 2.9 | < 0,0005 | 0.00035 | 0.0013 | 0.00036 | 0.04 |
| X19147A-1603.00-1593 | 5.1 | 24 | 0.006 | 3.7 | **4.3** | < 0,0004 | 1410 | 0.007 | < 0,003 | 0.0047 | < 0,009 | < 0,0004 | 2.2 | < 0,00006 | 2.4 | < 0,0005 | 0.0001 | 0.0018 | 0.00053 | < 0,02 |
| Y165037EXT-1717.00-0076 | 11 | 36 | 0.005 | 7.2 | **8.8** | < 0,0004 | 1450 | 0.008 | 0.03 | 0.019 | < 0,009 | < 0,0004 | 2.4 | < 0,00006 | 0.94 | < 0,0005 | < 0,00005 | 0.0017 | 0.00081 | 0.02 |
| X19149A-1999.00-2201 | 3.3 | 41 | 0.008 | 6.2 | **7.6** | 0.0005 | 1430 | 0.007 | < 0,003 | 0.0049 | < 0,009 | < 0,0004 | 2.0 | 0.00016 | 0.89 | < 0,0005 | 0.00012 | 0.00031 | 0.00018 | < 0,02 |
| X19156-1803.00-1343 | 3.3 | 37 | 0.009 | 3.5 | **5.7** | < 0,0004 | 1430 | 0.01 | < 0,003 | 0.0097 | < 0,009 | < 0,0004 | 2.9 | < 0,00006 | 0.59 | < 0,0005 | 0.00014 | 0.0045 | 0.00048 | < 0,02 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 3.3 | 24 | 0.005 | 3.4 | 4.3 | < 0,0004 | 1380 | 0.005 | < 0,003 | 0.0047 | < 0,009 | < 0,0004 | 1.8 | < 0,00006 | 0.59 | < 0,0005 | < 0,00005 | 0.00031 | 0.00018 | < 0,02 |
| MAXIMUM | 11 | 51 | 0.009 | 8.2 | 8.8 | 0.0025 | 1450 | 0.01 | 0.03 | 0.047 | < 0,009 | < 0,0004 | 2.9 | 0.00016 | 2.9 | 0.0011 | 0.00035 | 0.0045 | 0.0011 | 0.04 |
| MEDIANE | 5.2 | 38 | 0.0075 | 5.0 | 6.7 | 0.0004 | 1420 | 0.0075 | 0.003 | 0.013 | NC | NC | 2.1 | 0.00006 | 0.98 | 0.0005 | 0.00013 | 0.0017 | 0.00051 | 0.02 |
| MOYENNE | 6.0 | 38 | 0.0073 | 5.4 | 6.6 | 0.00077 | 1417 | 0.0077 | 0.0087 | 0.017 | NC | NC | 2.2 | 0.000093 | 1.5 | 0.0006 | 0.00016 | 0.002 | 0.00058 | 0.023 |
| ÉCART TYPE | 3.1 | 8.7 | 0.0016 | 2.1 | 1.5 | 0.00085 | 25 | 0.0018 | 0.011 | 0.016 | NC | NC | 0.42 | 0.000052 | 0.95 | NC | 0.00011 | 0.0014 | 0.00033 | 0.0082 |
| 25eme CENTILE | 3.7 | 36 | 0.0063 | 3.6 | 5.9 | 0.0004 | 1403 | 0.007 | 0.003 | 0.0061 | NC | NC | 1.9 | 0.00006 | 0.9 | 0.0005 | 0.00011 | 0.0014 | 0.00039 | 0.02 |
| 75eme CENTILE | 7.4 | 40 | 0.0088 | 7.0 | 7.4 | 0.00048 | 1430 | 0.0088 | 0.0083 | 0.018 | NC | NC | 2.3 | 0.00014 | 2.1 | 0.0005 | 0.0002 | 0.0023 | 0.00074 | 0.02 |
| **Stérile AGR** | | | | | | | | | | | | | | | | | | | | |
| X19141AW-1557.75-0646 | 27 | 42 | 0.013 | 23 | **23** | < 0,0004 | 2.0 | 0.005 | 0.04 | **0.036** | < 0,009 | < 0,0004 | 2.3 | < 0,00006 | 2.8 | < 0,0005 | 0.00043 | 0.00076 | 0.00096 | < 0,02 |
| X19151-1671.00-1628 | 6.0 | 23 | 0.01 | 3.1 | 0.14 | 0.0008 | 1500 | 0.021 | < 0,003 | 0.0053 | < 0,009 | < 0,0004 | 3.7 | 0.00021 | 0.061 | 0.0015 | 0.00006 | 0.0036 | 0.00098 | 0.02 |
| X19139-1738.00-1882 | 5.4 | 30 | 0.01 | 2.3 | 0.53 | < 0,0004 | 1410 | 0.027 | < 0,003 | 0.0079 | < 0,009 | < 0,0004 | 4.2 | < 0,00006 | 0.081 | 0.0012 | 0.00009 | 0.0035 | 0.0019 | < 0,02 |
| X19145-1736.00-1992 | 6.4 | 26 | 0.028 | 3.3 | 1.2 | < 0,0004 | 1380 | 0.013 | < 0,003 | 0.013 | < 0,009 | < 0,0004 | 3.4 | < 0,00006 | 0.21 | 0.0012 | 0.00007 | 0.0031 | 0.0012 | 0.02 |
| X18131-0777.00-0578 | 8.6 | 43 | 0.042 | 4.5 | **3.5** | < 0,0004 | 1400 | 0.014 | 0.02 | 0.02 | < 0,009 | < 0,0004 | 1.9 | < 0,00006 | 0.17 | 0.0009 | 0.00045 | 0.010 | 0.002 | 0.03 |
| Y155016EXT-1758.00-0804 | 15 | 28 | 0.014 | 13 | **3.7** | 0.002 | 1450 | 0.016 | < 0,003 | 0.012 | < 0,009 | < 0,0004 | 4.5 | 0.00008 | 0.24 | 0.0009 | < 0,00005 | 0.0023 | 0.0012 | 0.03 |
| Y155021EXTA-1724.00-0795 | 5.5 | 28 | 0.016 | 3.2 | 0.55 | < 0,0004 | 1420 | 0.013 | 0.01 | 0.014 | < 0,009 | < 0,0004 | 3.3 | < 0,00006 | 0.13 | 0.0013 | < 0,00005 | 0.0046 | 0.0022 | 0.04 |
| X19143-1265.10-1226 | 11 | 49 | 0.019 | 8.4 | **7.9** | < 0,0004 | 1410 | 0.009 | < 0,003 | 0.0084 | < 0,009 | < 0,0004 | 1.2 | < 0,00006 | 0.71 | < 0,0005 | 0.00059 | 0.0012 | 0.00071 | < 0,02 |
| X19140-1518.00-1591 | 13 | 28 | 0.013 | 9.0 | **3.3** | < 0,0004 | 1420 | 0.013 | < 0,003 | 0.019 | < 0,009 | < 0,0004 | 3.7 | < 0,00006 | 0.33 | 0.0011 | 0.0001 | 0.003 | 0.00082 | 0.03 |
| X19145WA-1677.00-0575 | 7.4 | 30 | 0.008 | 3.9 | **4.6** | 0.0004 | 1520 | 0.012 | < 0,003 | 0.025 | < 0,009 | < 0,0004 | 3.4 | 0.00016 | 0.23 | 0.0026 | 0.00006 | 0.0028 | 0.0013 | < 0,02 |
| X19149AWB-1844.00-0656 | 6.0 | 27 | 0.012 | 2.5 | 0.52 | < 0,0004 | 1440 | 0.028 | < 0,003 | 0.0083 | < 0,009 | < 0,0004 | 2.9 | < 0,00006 | 0.11 | 0.0007 | 0.0001 | 0.0031 | 0.002 | 0.02 |
| X18121-1189.00-0961 | 5.5 | 26 | 0.02 | 2.8 | 0.56 | < 0,0004 | 1470 | 0.013 | 0.02 | 0.0094 | < 0,009 | < 0,0004 | 3.1 | < 0,00006 | 0.13 | 0.0009 | 0.00006 | 0.005 | 0.002 | 0.03 |
| X19136W-1478.00-0915 | 5.3 | 25 | 0.009 | 3.3 | **3.5** | < 0,0004 | 1480 | 0.01 | < 0,003 | 0.019 | < 0,009 | < 0,0004 | 2.3 | < 0,00006 | 0.19 | 0.0015 | 0.00012 | 0.0033 | 0.0012 | < 0,02 |
| X18108AWC-1087.20-0196 | 4.1 | 35 | 0.014 | 3.9 | **2.7** | < 0,0004 | 1390 | 0.017 | < 0,003 | 0.0084 | < 0,009 | < 0,0004 | 3.8 | < 0,00006 | 0.4 | < 0,0005 | 0.00008 | 0.0053 | 0.0007 | 0.02 |
| X18127A-1122.00-0299 | 7.8 | 24 | 0.015 | 2.3 | 0.33 | < 0,0004 | 1440 | 0.029 | 0.01 | 0.0076 | < 0,009 | < 0,0004 | 2.4 | < 0,00006 | 0.054 | 0.0018 | 0.00009 | 0.006 | 0.0012 | < 0,02 |
| X18121-1231.00-1009 | 11 | 24 | 0.01 | 7.2 | **3.0** | < 0,0004 | 1390 | 0.012 | < 0,003 | 0.013 | < 0,009 | < 0,0004 | 3.0 | < 0,00006 | 0.31 | 0.0008 | 0.00016 | 0.0046 | 0.00038 | 0.03 |
| X19135-1719.00-1698 | 4.9 | 24 | 0.005 | 3.5 | **2.5** | < 0,0004 | 1400 | 0.007 | < 0,003 | 0.017 | < 0,009 | < 0,0004 | 2.7 | < 0,00006 | 0.43 | 0.0023 | 0.00008 | 0.0019 | 0.0021 | 0.03 |
| X19150A-1326.00-1330 | 7.3 | 28 | 0.012 | 3.3 | **4.0** | 0.0015 | 1450 | 0.029 | < 0,003 | 0.021 | < 0,009 | < 0,0004 | 1.8 | < 0,00006 | 0.13 | 0.0012 | 0.00011 | 0.0048 | 0.0018 | 0.04 |
| Y165037EXT-1663.00-0009 | 6.4 | 31 | 0.009 | 3.7 | 1.2 | < 0,0004 | 1470 | 0.027 | < 0,003 | 0.016 | < 0,009 | < 0,0004 | 2.5 | < 0,00006 | 0.17 | 0.0017 | 0.00007 | 0.0059 | 0.0021 | 0.03 |
| X19149A-1906.00-2084 | 12 | 28 | 0.007 | 8.5 | **7.1** | < 0,0004 | 1410 | 0.008 | < 0,003 | 0.022 | < 0,009 | < 0,0004 | 1.8 | < 0,00006 | 0.48 | 0.0009 | 0.00008 | 0.0022 | 0.001 | 0.03 |
| X19148W-1824.00-0744 | 3.8 | 21 | 0.009 | 2.0 | 0.51 | < 0,0004 | 1420 | 0.01 | < 0,003 | 0.0069 | < 0,009 | < 0,0004 | 2.3 | < 0,00006 | 0.17 | 0.001 | 0.00008 | 0.0032 | 0.0017 | < 0,02 |
| X19147A-1466.00-1437 | 4.7 | 18 | 0.009 | 2.8 | 0.15 | < 0,0004 | 1420 | 0.015 | < 0,003 | 0.0086 | < 0,009 | < 0,0004 | 3.4 | < 0,00006 | 0.062 | 0.0006 | 0.00009 | 0.0069 | 0.00047 | 0.02 |
| COMPTE | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| MINIMUM | 3.8 | 18 | 0.005 | 2.0 | 0.14 | < 0,0004 | 2.0 | 0.005 | < 0,003 | 0.0053 | < 0,009 | < 0,0004 | 1.2 | < 0,00006 | 0.054 | < 0,0005 | < 0,00005 | 0.00076 | 0.00038 | < 0,02 |
| MAXIMUM | 27 | 49 | 0.042 | 23 | 23 | 0.002 | 1520 | 0.029 | 0.04 | 0.036 | < 0,009 | < 0,0004 | 4.5 | 0.00021 | 2.8 | 0.0026 | 0.00059 | 0.010 | 0.0022 | 0.04 |
| MEDIANE | 6.4 | 28 | 0.012 | 3.4 | 2.6 | 0.0004 | 1420 | 0.013 | 0.003 | 0.013 | NC | NC | 3.0 | 0.00006 | 0.18 | 0.0011 | 0.000085 | 0.0034 | 0.0012 | 0.02 |
| MOYENNE | 8.3 | 29 | 0.014 | 5.4 | 3.4 | 0.00054 | 1368 | 0.016 | 0.0069 | 0.014 | NC | NC | 2.9 | 0.000072 | 0.34 | 0.0012 | 0.00014 | 0.004 | 0.0014 | 0.025 |
| ÉCART TYPE | 5.1 | 7.3 | 0.0081 | 4.7 | 4.9 | 0.00041 | 307 | 0.0076 | 0.009 | 0.0074 | NC | NC | 0.85 | 0.000038 | 0.57 | 0.00056 | 0.00015 | 0.0021 | 0.00059 | 0.0067 |
| 25eme CENTILE | 5.4 | 24 | 0.009 | 2.9 | 0.54 | 0.0004 | 1403 | 0.011 | 0.003 | 0.0084 | NC | NC | 2.3 | 0.00006 | 0.13 | 0.00083 | 0.00007 | 0.0029 | 0.00097 | 0.02 |
| 75eme CENTILE | 10 | 30 | 0.015 | 6.5 | 3.7 | 0.0004 | 1450 | 0.02 | 0.003 | 0.019 | NC | NC | 3.4 | 0.00006 | 0.33 | 0.0015 | 0.00011 | 0.005 | 0.002 | 0.03 |
| **Puits d'accès** | | | | | | | | | | | | | | | | | | | | |
| X19139-0887.00-0918 | 3.8 | 24 | 0.008 | 2.1 | 1.5 | < 0,0004 | 1390 | 0.024 | 0.01 | 0.0091 | < 0,009 | < 0,0004 | 2.7 | < 0,00006 | 0.064 | 0.001 | 0.00013 | 0.0054 | 0.0013 | **0.07** |
| X19140-0708.00-0706 | 4.0 | 20 | 0.008 | 3.0 | 0.17 | **0.0006** | 1450 | 0.016 | **0.03** | 0.01 | < 0,009 | < 0,0004 | 3.5 | < 0,00006 | 0.098 | 0.0022 | **0.00009** | 0.009 | 0.0015 | < 0,02 |
| X19157-0933.00-0984 | 7.1 | 28 | 0.017 | 5.0 | 0.24 | < 0,0004 | 1460 | 0.027 | < 0,003 | 0.0053 | < 0,009 | < 0,0004 | 6.1 | < 0,00006 | 0.077 | 0.0012 | < 0,00005 | 0.0053 | 0.0009 | 0.03 |
| X18127W-0773.00-0369 | 6.7 | 32 | 0.016 | 3.6 | 1.7 | < 0,0004 | 1440 | 0.017 | < 0,003 | 0.016 | < 0,009 | < 0,0004 | 3.0 | < 0,00006 | 0.23 | 0.0015 | **0.00012** | 0.011 | 0.0023 | 0.03 |
| X19159-1392.00-1329 | 5.4 | 26 | 0.02 | 2.2 | 0.12 | < 0,0004 | 1390 | 0.026 | **0.01** | 0.006 | < 0,009 | < 0,0004 | 3.8 | < 0,00006 | 0.037 | 0.0015 | < 0,00005 | 0.0033 | 0.0025 | **0.02** |
| X19148W-1752.00-0664 | 4.2 | 27 | 0.01 | 2.8 | 0.51 | < 0,0004 | 1480 | 0.025 | < 0,003 | 0.0062 | < 0,009 | < 0,0004 | 2.1 | < 0,00006 | 0.038 | 0.0015 | 0.00007 | 0.0024 | 0.0038 | < 0,02 |
| X19148-1583.00-1092 | 4.0 | 26 | 0.015 | 2.4 | 0.25 | **0.0005** | 1460 | 0.02 | < 0,003 | 0.0076 | < 0,009 | < 0,0004 | 3.0 | **0.00018** | 0.096 | 0.0013 | 0.00007 | 0.0025 | 0.0018 | < 0,02 |
| X19149AWB-1297.00-0122 | 5.4 | 21 | 0.007 | 3.7 | **0.3** | < 0,0004 | 1440 | **0.02** | < 0,003 | **0.0026** | < 0,009 | < 0,0004 | 3.0 | < 0,00006 | 0.17 | 0.0009 | 0.00009 | **0.0016** | 0.0011 | **0.02** |
| COMPTE | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| MINIMUM | 3.8 | 20 | 0.007 | 2.1 | 0.12 | < 0,0004 | 1390 | 0.016 | < 0,003 | 0.0026 | < 0,009 | < 0,0004 | 2.1 | < 0,00006 | 0.037 | 0.0009 | < 0,00005 | 0.0016 | 0.0009 | < 0,02 |
| MAXIMUM | 7.1 | 32 | 0.02 | 5.0 | 1.7 | 0.0006 | 1480 | 0.027 | 0.03 | 0.016 | < 0,009 | < 0,0004 | 6.1 | 0.00018 | 0.23 | 0.0022 | 0.00013 | 0.011 | 0.0038 | 0.07 |
| MEDIANE | 4.8 | 26 | 0.013 | 2.9 | 0.27 | 0.0004 | 1445 | 0.022 | 0.003 | 0.0069 | NC | NC | 3.0 | 0.00006 | 0.087 | 0.0014 | 0.00008 | 0.0043 | 0.0016 | 0.02 |
| MOYENNE | 5.1 | 25 | 0.013 | 3.1 | 0.6 | 0.00044 | 1439 | 0.022 | 0.0081 | 0.0078 | NC | NC | 3.4 | 0.000075 | 0.1 | 0.0014 | 0.000084 | 0.0051 | 0.0019 | 0.029 |
| ÉCART TYPE | 1.3 | 3.8 | 0.005 | 0.98 | 0.64 | 0.000074 | 33 | 0.0042 | 0.0094 | 0.0039 | NC | NC | 1.2 | NC | 0.068 | 0.0004 | 0.00003 | 0.0033 | 0.00096 | 0.017 |
| 25eme CENTILE | 4.0 | 23 | 0.008 | 2.3 | 0.22 | 0.0004 | 1428 | 0.019 | 0.003 | 0.0058 | NC | NC | 2.9 | 0.00006 | 0.057 | 0.0012 | 0.000065 | 0.0025 | 0.0013 | 0.02 |
| 75eme CENTILE | 5.7 | 27 | 0.016 | 3.6 | 0.76 | 0.00043 | 1460 | 0.025 | 0.01 | 0.0094 | NC | NC | 3.6 | 0.00006 | 0.12 | 0.0015 | 0.000098 | 0.0063 | 0.0023 | 0.03 |

Notes:
"-" - Données inexistantes
NC - Statistique non calculée

1 - RES: critère d'eau souterraine- ré
notamment le baryum, le cadmium,

2 - EC: Critère d'eau souterraine- eau
3 - Tableau 1 de l'annexe 2 de la dire

Tableau D-7:Essai de lixiviation SPLP

Zone East Gouldie
Mine Canadian Malartic

| Sample | pH | Conductivité | Acidité | Alkalinité | $SO_4^{2-}$ | Cl | Br | Nitrite | Nitrate | F | Hg | Ag | Al | As | Ba | B | Be | Bi | Ca | Cd | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µS/cm | mg/L as $CaCO_3$ | mg/L as $CaCO_3$ | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | | **860** | | **0.06** | **300** | **4.0** | **0.0000013** | **0.00062** | | **0.34** | **0.6** | **28** | | | | **0.0011** | **0.016** |
| EC[2] | | | | | | 250 | | 1.0 | | 1.5 | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | 5.0 | | | | 0.005 | 0.05 |
| *Effluent Final Dir. 019*[3] | *6-9.5* | | | | | | | | | | | | | *0.2* | | | | | | | |
| **Minerai AGR** | | | | | | | | | | | | | | | | | | | | | |
| X19135-1832.70-1829 | 8.0 | 53 | < 2 | 23 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.76 | 0.0007 | 0.0056 | < 0,002 | < 0,000007 | 0.000007 | 4.3 | 0.000004 | 0.00022 |
| X19152-1643.00-1475 | 8.0 | 61 | < 2 | 31 | 3.8 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.6 | 0.0009 | 0.0098 | < 0,002 | < 0,000007 | < 0,000007 | 5.7 | < 0,000003 | 0.00012 |
| X19152W-1715.00-0597 | 8.0 | 72 | < 2 | 30 | 6.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.8 | 0.0014 | 0.0073 | < 0,002 | < 0,000007 | < 0,000007 | 6.3 | 0.000004 | 0.00021 |
| X19152-1572.00-1382 | 7.8 | 152 | < 2 | 16 | 49 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.54 | 0.001 | 0.0076 | < 0,002 | < 0,000007 | < 0,000007 | 23 | 0.000007 | < 0,00008 |
| X19155-1665.00-0726 | 8.1 | 56 | < 2 | 25 | 3.2 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.83 | 0.0017 | 0.0041 | < 0,002 | < 0,000007 | < 0,000007 | 5.2 | < 0,000003 | 0.00029 |
| X19135W-1914.00-0986 | 8.6 | 62 | < 2 | 31 | 3.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.73 | 0.001 | 0.0045 | < 0,002 | < 0,000007 | < 0,000007 | 5.3 | < 0,000003 | 0.00012 |
| X19135W-1839.00-0895 | 8.2 | 85 | < 2 | 29 | 16 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.48 | 0.0006 | 0.0034 | < 0,002 | < 0,000007 | < 0,000007 | 8.9 | < 0,000003 | < 0,00008 |
| X19154-1562.00-0866 | 8.0 | 73 | < 2 | 29 | 4.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.44 | 0.0006 | 0.007 | < 0,002 | < 0,000007 | < 0,000007 | 6.5 | 0.000004 | < 0,00008 |
| X19152-1648.00-1481 | 8.0 | 62 | < 2 | 21 | 4.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.56 | 0.0007 | 0.0015 | < 0,002 | < 0,000007 | < 0,000007 | 6.3 | < 0,000003 | 0.00009 |
| X19148W-2073.00-1036 | 8.0 | 79 | < 2 | 26 | 8.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.61 | 0.0017 | 0.0021 | 0.003 | < 0,000007 | < 0,000007 | 7.2 | < 0,000003 | 0.00013 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 7.8 | 53 | < 2 | 16 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.44 | 0.0006 | 0.0015 | < 0,002 | < 0,000007 | < 0,000007 | 4.3 | < 0,000003 | < 0,00008 |
| MAXIMUM | 8.6 | 152 | < 2 | 31 | 49 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.83 | 0.0017 | 0.0098 | 0.003 | < 0,000007 | 0.000007 | 23 | 0.000007 | 0.00029 |
| MEDIANE | 8.0 | 67 | NC | 28 | 4.3 | NC | NC | NC | NC | NC | NC | NC | 0.61 | 0.00095 | 0.0051 | 0.002 | NC | 0.000007 | 6.3 | 0.000003 | 0.00012 |
| MOYENNE | 8.1 | 76 | NC | 26 | 10 | NC | NC | NC | NC | NC | NC | NC | 0.64 | 0.001 | 0.0053 | 0.0021 | NC | 0.000007 | 7.8 | 0.0000037 | 0.00014 |
| ÉCART TYPE | 0.2 | 29 | NC | 4.9 | 14 | NC | NC | NC | NC | NC | NC | NC | 0.14 | 0.00043 | 0.0026 | NC | NC | NC | 5.4 | 0.0000013 | 0.000073 |
| 25eme CENTILE | 8.0 | 61 | NC | 24 | 3.4 | NC | NC | NC | NC | NC | NC | NC | 0.54 | 0.0007 | 0.0036 | 0.002 | NC | 0.000007 | 5.4 | 0.000003 | 0.000083 |
| 75eme CENTILE | 8.1 | 78 | NC | 30 | 7.9 | NC | NC | NC | NC | NC | NC | NC | 0.75 | 0.0013 | 0.0072 | 0.002 | NC | 0.000007 | 7.0 | 0.000004 | 0.00019 |
| **Minerai SGR** | | | | | | | | | | | | | | | | | | | | | |
| X19136W-1730.50-1236 | 8.3 | 64 | < 2 | 26 | 5.6 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.57 | 0.0023 | 0.0051 | < 0,002 | < 0,000007 | 0.000008 | 6.1 | < 0,000003 | < 0,00008 |
| X19140-1631.00-1727 | 8.5 | 58 | < 2 | 27 | 2.6 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.72 | 0.0007 | 0.0029 | < 0,002 | < 0,000007 | 0.000008 | 5.6 | < 0,000003 | < 0,00008 |
| X19145WA-1854.00-0778 | 8.0 | 66 | < 2 | 26 | 3.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.63 | 0.0006 | 0.0036 | < 0,002 | < 0,000007 | < 0,000007 | 6.2 | < 0,000003 | 0.0001 |
| X19141AW-1670.85-0796 | 8.2 | 60 | < 2 | 27 | 4.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.53 | 0.0006 | 0.0094 | < 0,002 | < 0,000007 | 0.00001 | 5.6 | < 0,000003 | < 0,00008 |
| X19135W-1883.00-0947 | 8.0 | 87 | < 2 | 24 | 15 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.72 | 0.0016 | 0.0023 | < 0,002 | < 0,000007 | < 0,000007 | 8.3 | < 0,000003 | 0.00015 |
| Y155016EXT-1882.50-I001 | 8.0 | 63 | < 2 | 25 | 4.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.72 | 0.0008 | 0.0014 | < 0,002 | < 0,000007 | < 0,000007 | 6.6 | < 0,000003 | 0.00015 |
| Y165106EXT-1640.00-0489 | 8.3 | 90 | < 2 | 21 | 18 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.67 | 0.0023 | 0.0035 | < 0,002 | < 0,000007 | < 0,000007 | 10 | < 0,000003 | 0.00009 |
| Y155021EXTA-1800.00-0881 | 7.9 | 70 | < 2 | 21 | 10 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.55 | < 0,0002 | 0.0011 | < 0,002 | < 0,000007 | < 0,000007 | 6.8 | 0.000003 | 0.00014 |
| X19147AWA-1634.00-0376 | 8.6 | 60 | < 2 | 27 | 3.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.59 | 0.0011 | 0.0085 | 0.003 | < 0,000007 | 0.000008 | 5.4 | 0.000005 | 0.00012 |
| X19156-1768.60-1296 | 7.5 | 311 | < 2 | 11 | 136 | < 2 | < 3 | < 0.3 | < 0.6 | 0.08 | < 0,00001 | < 0,00005 | 0.38 | < 0,0002 | 0.081 | < 0,002 | < 0,000007 | 0.000012 | 55 | < 0,000003 | < 0,00008 |
| X19140-1560.15-1641 | 7.8 | 61 | < 2 | 22 | 5.7 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.66 | 0.0008 | 0.0018 | 0.002 | < 0,000007 | 0.000008 | 5.6 | 0.000004 | 0.00028 |
| X19149A-2009.70-2213 | 7.6 | 136 | < 2 | 22 | 37 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.35 | 0.0005 | 0.0052 | 0.002 | < 0,000007 | < 0,000007 | 18 | < 0,000003 | < 0,00008 |
| COMPTE | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| MINIMUM | 7.5 | 58 | < 2 | 11 | 2.6 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.35 | < 0,0002 | 0.0011 | < 0,002 | < 0,000007 | < 0,000007 | 5.4 | < 0,000003 | < 0,00008 |
| MAXIMUM | 8.6 | 311 | < 2 | 27 | 136 | < 2 | < 3 | < 0.3 | < 0.6 | 0.08 | < 0,00001 | < 0,00005 | 0.72 | 0.0023 | 0.081 | 0.003 | < 0,000007 | 0.000012 | 55 | 0.000005 | 0.00028 |
| MEDIANE | 8.0 | 65 | NC | 25 | 5.7 | NC | NC | NC | NC | 0.06 | NC | NC | 0.61 | 0.00075 | 0.0036 | 0.002 | NC | 0.0000075 | 6.4 | 0.000003 | 0.000095 |
| MOYENNE | 8.1 | 94 | NC | 23 | 20 | NC | NC | NC | NC | 0.062 | NC | NC | 0.59 | 0.00098 | 0.01 | 0.0021 | NC | 0.000008 | 12 | 0.0000033 | 0.00012 |
| ÉCART TYPE | 0.33 | 72 | NC | 4.5 | 38 | NC | NC | NC | NC | NC | NC | NC | 0.13 | 0.00072 | 0.022 | 0.00029 | NC | 0.0000015 | 14 | 0.00000062 | 0.000058 |
| 25eme CENTILE | 7.9 | 61 | NC | 22 | 3.9 | NC | NC | NC | NC | 0.06 | NC | NC | 0.55 | 0.00058 | 0.0022 | 0.002 | NC | 0.000007 | 5.6 | 0.000003 | 0.00008 |
| 75eme CENTILE | 8.3 | 88 | NC | 26 | 16 | NC | NC | NC | NC | 0.06 | NC | NC | 0.68 | 0.0012 | 0.006 | 0.002 | NC | 0.000008 | 8.7 | 0.000003 | 0.00014 |
| **Minerai SGR+** | | | | | | | | | | | | | | | | | | | | | |
| X19152W-1601.30-0332 | 8.3 | 62 | < 2 | 33 | 2.8 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.63 | 0.0011 | 0.05 | < 0,002 | < 0,000007 | < 0,000007 | 5.2 | < 0,000003 | 0.00008 |
| X19136W-1692.40-1182 | 8.4 | 62 | < 2 | 31 | 5.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.46 | 0.0007 | 0.057 | < 0,002 | < 0,000007 | 0.000007 | 5.7 | < 0,000003 | 0.00009 |
| X19139WA-1778.85-0693 | 8.7 | 64 | < 2 | 29 | 4.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.6 | 0.0007 | 0.0038 | < 0,002 | < 0,000007 | < 0,000007 | 5.8 | < 0,000003 | 0.00012 |
| X19143-1454.00-1452 | 8.0 | 72 | < 2 | 24 | 7.5 | < 2 | < 3 | < 0.3 | < 0.6 | 0.08 | < 0,00001 | < 0,00005 | 0.45 | 0.0003 | 0.0026 | < 0,002 | < 0,000007 | < 0,000007 | 6.1 | < 0,000003 | 0.00012 |
| X19141AW-1622.15-0730 | 8.0 | 75 | < 2 | 26 | 10 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.62 | 0.0008 | 0.01 | < 0,002 | < 0,000007 | 0.00001 | 8.3 | < 0,000003 | < 0,00008 |
| X19152W-1596.10-0327 | 8.1 | 64 | < 2 | 30 | 3.7 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.46 | 0.0011 | 0.03 | < 0,002 | < 0,000007 | < 0,000007 | 5.7 | < 0,000003 | 0.00012 |
| X19142-1559.00-1528 | 7.9 | 62 | < 2 | 22 | 5.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.48 | 0.0002 | 0.0031 | < 0,002 | < 0,000007 | 0.000011 | 7.5 | < 0,000003 | < 0,00008 |
| X19145WA-1901.00-0836 | 8.4 | 63 | < 2 | 25 | 4.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.57 | 0.0012 | 0.0031 | 0.004 | < 0,000007 | < 0,000007 | 7.0 | < 0,000003 | 0.00011 |
| X19149A-2030.30-2239 | 7.8 | 141 | < 2 | 22 | 38 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.35 | 0.0008 | 0.0062 | 0.002 | < 0,000007 | < 0,000007 | 18 | < 0,000003 | < 0,00008 |
| X19150A-1450.65-1470 | 7.9 | 71 | < 2 | 25 | 6.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.54 | 0.0015 | 0.0023 | 0.002 | < 0,000007 | 0.00001 | 8.8 | < 0,000003 | 0.00009 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 7.8 | 62 | < 2 | 22 | 2.8 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.35 | 0.0002 | 0.0023 | < 0,002 | < 0,000007 | < 0,000007 | 5.2 | < 0,000003 | < 0,00008 |
| MAXIMUM | 8.7 | 141 | < 2 | 33 | 38 | < 2 | < 3 | < 0.3 | < 0.6 | 0.08 | < 0,00001 | < 0,00005 | 0.63 | 0.0015 | 0.057 | 0.004 | < 0,000007 | 0.000011 | 18 | < 0,000003 | 0.00012 |
| MEDIANE | 8.1 | 64 | NC | 26 | 5.3 | NC | NC | NC | NC | 0.06 | NC | NC | 0.51 | 0.0008 | 0.005 | 0.002 | NC | 0.000007 | 6.5 | NC | 0.00009 |
| MOYENNE | 8.1 | 74 | NC | 27 | 8.7 | NC | NC | NC | NC | 0.062 | NC | NC | 0.52 | 0.00084 | 0.017 | 0.0022 | NC | 0.000008 | 7.8 | NC | 0.000097 |
| ÉCART TYPE | 0.28 | 24 | NC | 3.8 | 10 | NC | NC | NC | NC | NC | NC | NC | 0.091 | 0.0004 | 0.021 | 0.00063 | NC | 0.0000016 | 3.7 | NC | 0.000018 |
| 25eme CENTILE | 7.9 | 62 | NC | 24 | 4.2 | NC | NC | NC | NC | 0.06 | NC | NC | 0.46 | 0.0007 | 0.0031 | 0.002 | NC | 0.000007 | 5.7 | NC | 0.00008 |
| 75eme CENTILE | 8.4 | 72 | NC | 30 | 7.2 | NC | NC | NC | NC | 0.06 | NC | NC | 0.6 | 0.0011 | 0.025 | 0.002 | NC | 0.0000093 | 8.1 | NC | 0.00012 |
| **Mineral SGR++** | | | | | | | | | | | | | | | | | | | | | |
| X19155-1653.20-0711 | 7.5 | 54 | < 2 | 23 | 3.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.26 | 0.001 | 0.025 | < 0,002 | < 0,000007 | < 0,000007 | 7.9 | < 0,000003 | < 0,00008 |
| X19152W-1592.75-0322 | 7.9 | 66 | < 2 | 30 | 5.2 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.68 | 0.0013 | 0.0019 | < 0,002 | < 0,000007 | < 0,000007 | 6.4 | 0.000006 | 0.00011 |
| X18108AC-1277.00-0058 | 8.1 | 73 | < 2 | 23 | 8.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.37 | 0.0006 | 0.007 | < 0,002 | < 0,000007 | 0.000008 | 9.8 | 0.000003 | < 0,00008 |
| Y155013EXT-1663.00-0736 | 8.1 | 71 | < 2 | 25 | 6.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.47 | 0.0015 | 0.0027 | < 0,002 | < 0,000007 | < 0,000007 | 8.3 | < 0,000003 | 0.00011 |
| X19157-1723.60-0551 | 7.6 | 158 | < 2 | 23 | 49 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.23 | 0.0003 | 0.043 | < 0,002 | < 0,000007 | 0.000007 | 31 | < 0,000003 | < 0,00008 |
| X19143-1451.25-1448 | 8.0 | 85 | < 2 | 22 | 13 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.24 | 0.0008 | 0.0025 | < 0,002 | < 0,000007 | < 0,000007 | 9.1 | 0.000004 | 0.00008 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 7.5 | 54 | < 2 | 22 | 3.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.23 | 0.0003 | 0.0019 | < 0,002 | < 0,000007 | < 0,000007 | 6.4 | < 0,000003 | < 0,00008 |
| MAXIMUM | 8.1 | 158 | < 2 | 30 | 49 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.68 | 0.0015 | 0.043 | < 0,002 | < 0,000007 | 0.000008 | 31 | 0.000006 | 0.00011 |
| MEDIANE | 8.0 | 72 | NC | 23 | 7.6 | NC | NC | NC | NC | NC | NC | NC | 0.32 | 0.0009 | 0.0048 | NC | NC | 0.000007 | 8.7 | 0.000003 | 0.00008 |
| MOYENNE | 7.9 | 85 | NC | 24 | 14 | NC | NC | NC | NC | NC | NC | NC | 0.38 | 0.00092 | 0.014 | NC | NC | 0.0000072 | 12 | 0.0000037 | 0.00009 |
| ÉCART TYPE | 0.27 | 37 | NC | 2.9 | 17 | NC | NC | NC | NC | NC | NC | NC | 0.17 | 0.00044 | 0.017 | NC | NC | 0.00000041 | 9.2 | 0.0000012 | 0.000015 |
| 25eme CENTILE | 7.7 | 67 | NC | 23 | 5.6 | NC | NC | NC | NC | NC | NC | NC | 0.25 | 0.00065 | 0.0026 | NC | NC | 0.000007 | 8.0 | 0.000003 | 0.00008 |
| 75eme CENTILE | 8.1 | 82 | NC | 25 | 12 | NC | NC | NC | NC | NC | NC | NC | 0.45 | 0.0012 | 0.021 | NC | NC | 0.000007 | 9.6 | 0.0000038 | 0.0001 |
| **Dilution AGR** | | | | | | | | | | | | | | | | | | | | | |
| X19156-1745.00-1266 | 8.8 | 58 | < 2 | 27 | 2.5 | < 2 | < 3 | < 0.3 | < 0.6 | 0.08 | < 0,00001 | < 0,00005 | 0.99 | 0.0003 | 0.002 | < 0,002 | < 0,000007 | < 0,000007 | 4.3 | 0.000003 | 0.00022 |
| X19154-1588.00-0896 | 8.2 | 58 | < 2 | 28 | 3.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 1.1 | 0.0021 | 0.0026 | < 0,002 | < 0,000007 | 0.000007 | 4.5 | 0.000003 | 0.00029 |
| X19135W-1854.00-0912 | 8.5 | 84 | < 2 | 22 | 16 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.67 | 0.0007 | 0.0031 | < 0,002 | < 0,000007 | < 0,000007 | 8.0 | < 0,000003 | 0.00013 |
| X19135W-1917.00-0989 | 8.1 | 60 | < 2 | 27 | 3.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.78 | 0.0005 | 0.0016 | < 0,002 | < 0,000007 | < 0,000007 | 4.8 | < 0,000003 | 0.00016 |
| X19153-1721.00-1226 | 8.1 | 61 | < 2 | 30 | 5.2 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.79 | 0.0012 | 0.0028 | < 0,002 | < 0,000007 | < 0,000007 | 5.5 | 0.000003 | 0.00018 |
| X19152W-1708.00-0590 | 7.9 | 110 | < 2 | 26 | 29 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.59 | 0.0009 | 0.053 | < 0,002 | < 0,000007 | < 0,000007 | 13 | < 0,000003 | < 0,00008 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 7.9 | 58 | < 2 | 22 | 2.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.59 | 0.0003 | 0.0016 | < 0,002 | < 0,000007 | < 0,000007 | 4.3 | < 0,000003 | < 0,00008 |
| MAXIMUM | 8.8 | 110 | < 2 | 30 | 29 | < 2 | < 3 | < 0.3 | < 0.6 | 0.08 | < 0,00001 | < 0,00005 | 1.1 | 0.0021 | 0.053 | < 0,002 | < 0,000007 | 0.000007 | 13 | 0.000003 | 0.00029 |
| MEDIANE | 8.1 | 61 | NC | 27 | 4.2 | NC | NC | NC | NC | 0.06 | NC | NC | 0.79 | 0.0008 | 0.0027 | NC | NC | 0.000007 | 5.2 | 0.000003 | 0.00017 |
| MOYENNE | 8.2 | 72 | NC | 27 | 9.8 | NC | NC | NC | NC | 0.063 | NC | NC | 0.81 | 0.00095 | 0.011 | NC | NC | 0.000007 | 6.7 | 0.000003 | 0.00018 |
| ÉCART TYPE | 0.33 | 21 | NC | 2.7 | 11 | NC | NC | NC | NC | NC | NC | NC | 0.18 | 0.00064 | 0.021 | NC | NC | NC | 3.3 | 0 | 0.000073 |
| 25eme CENTILE | 8.1 | 59 | NC | 26 | 3.1 | NC | NC | NC | NC | 0.06 | NC | NC | 0.7 | 0.00055 | 0.0021 | NC | NC | 0.000007 | 4.6 | 0.000003 | 0.00014 |
| 75eme CENTILE | 8.4 | 78 | NC | 28 | 13 | NC | NC | NC | NC | 0.06 | NC | NC | 0.94 | 0.0011 | 0.0031 | NC | NC | 0.000007 | 7.4 | 0.000003 | 0.00021 |

Tableau D-7:Essai de lixiviation SPLP

Zone East Gouldie
Mine Canadian Malartic

| Sample | Co | Cu | Fe | K | Li | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Ti | Tl | U | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES[1]** | **0.37** | **0.0073** | | | | | **2.3** | **29** | | **0.26** | **1** | **0.034** | **1.1** | **0.062** | | | | | | **0.32** | | **0.067** |
| EC [2] | | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | | 0.01 | 0.006 | 0.01 | | | | | | 0.02 | | 5.0 |
| *Effluent Final Dir. 019*[3] | | *0.3* | *3.0* | | | | | | | *0.5* | | *0.2* | | | | | | | | | | *0.5* |
| **Minerai AGR** | | | | | | | | | | | | | | | | | | | | | | |
| X19135-1832.70-1829 | 0.000021 | 0.0003 | 0.052 | 6.0 | 0.0007 | 0.32 | 0.00075 | 0.00009 | 1.6 | < 0,0001 | 0.006 | 0.00005 | < 0,0009 | < 0,00004 | 1.9 | 0.031 | 0.00016 | 0.003 | < 0,000005 | 0.00015 | 0.0029 | < 0,002 |
| X19152-1643.00-1475 | 0.000004 | < 0,0002 | < 0,007 | 6.2 | 0.0018 | 0.44 | 0.00079 | 0.00016 | 2.1 | < 0,0001 | 0.003 | < 0,00001 | < 0,0009 | 0.00006 | 2.2 | 0.068 | < 0,00006 | 0.00033 | < 0,000005 | 0.00001 | 0.0038 | < 0,002 |
| X19152W-1715.00-0597 | 0.000006 | < 0,0002 | 0.009 | 8.9 | 0.0018 | 0.39 | 0.0006 | 0.00018 | 3.0 | 0.0003 | 0.004 | 0.00004 | < 0,0009 | 0.00024 | 2.0 | 0.5 | < 0,00006 | 0.00081 | 0.000005 | 0.00013 | 0.0061 | < 0,002 |
| X19152-1572.00-1382 | 0.000008 | < 0,0002 | < 0,007 | 7.5 | 0.0017 | 0.53 | 0.0023 | 0.00009 | 1.7 | 0.0002 | 0.005 | 0.00026 | < 0,0009 | 0.00006 | 1.7 | 0.16 | < 0,00006 | 0.00012 | < 0,000005 | 0.00012 | 0.0033 | < 0,002 |
| X19155-1665.00-0726 | 0.000008 | < 0,0002 | 0.02 | 6.5 | 0.0015 | 0.34 | 0.0008 | 0.00027 | 1.4 | 0.0003 | 0.008 | 0.00006 | 0.001 | 0.00022 | 2.4 | 0.015 | < 0,00006 | 0.0018 | < 0,000005 | 0.000091 | 0.0051 | < 0,002 |
| X19135W-1914.00-0986 | < 0,000004 | < 0,0002 | 0.009 | 6.5 | 0.0022 | 0.34 | 0.00057 | 0.00008 | 2.0 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00012 | 2.2 | 0.026 | < 0,00006 | 0.00053 | < 0,000005 | 0.000089 | 0.0047 | < 0,002 |
| X19135W-1839.00-0895 | 0.000005 | < 0,0002 | < 0,007 | 5.2 | 0.001 | 0.48 | 0.00082 | 0.00016 | 2.4 | < 0,0001 | < 0,003 | 0.00025 | < 0,0009 | 0.0001 | 2.0 | 0.073 | < 0,00006 | 0.00018 | < 0,000005 | 0.000075 | 0.003 | < 0,002 |
| X19154-1562.00-0866 | 0.000005 | < 0,0002 | < 0,007 | 5.6 | 0.0013 | 0.95 | 0.00097 | 0.00011 | 2.0 | 0.0005 | 0.003 | 0.00002 | < 0,0009 | 0.00015 | 1.8 | 0.11 | < 0,00006 | 0.00018 | < 0,000005 | 0.000009 | 0.0017 | < 0,002 |
| X19152-1648.00-1481 | 0.000008 | < 0,0002 | < 0,007 | 5.2 | 0.0015 | 0.43 | 0.00071 | 0.00009 | 2.0 | 0.0001 | < 0,003 | 0.00004 | < 0,0009 | 0.00006 | 2.0 | 0.037 | < 0,00006 | 0.00044 | < 0,000005 | 0.00001 | 0.0054 | < 0,002 |
| X19148W-2073.00-1036 | 0.000004 | < 0,0002 | < 0,007 | 7.6 | 0.0026 | 0.5 | 0.0012 | 0.00013 | 1.6 | 0.0001 | 0.003 | < 0,00001 | < 0,0009 | 0.00008 | 1.9 | 0.11 | < 0,00006 | 0.00034 | < 0,000005 | 0.000022 | 0.0056 | < 0,002 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | < 0,000004 | < 0,0002 | < 0,007 | 5.2 | 0.0007 | 0.32 | 0.00057 | 0.00008 | 1.4 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | < 0,00004 | 1.7 | 0.015 | < 0,00006 | 0.00012 | < 0,000005 | 0.000009 | 0.0017 | < 0,002 |
| MAXIMUM | 0.000021 | 0.0003 | 0.052 | 8.9 | 0.0026 | 0.95 | 0.0023 | 0.00027 | 3.0 | 0.0005 | 0.008 | 0.00026 | 0.001 | 0.00024 | 2.4 | 0.5 | 0.00016 | 0.003 | 0.000005 | 0.00015 | 0.0061 | < 0,002 |
| MEDIANE | 0.0000055 | 0.0002 | 0.007 | 6.3 | 0.0016 | 0.43 | 0.0008 | 0.00012 | 2.0 | 0.0001 | 0.003 | 0.00004 | 0.0009 | 0.00009 | 2.0 | 0.071 | 0.00006 | 0.00039 | 0.000005 | 0.000082 | 0.0043 | NC |
| MOYENNE | 0.0000073 | 0.00021 | 0.013 | 6.5 | 0.0016 | 0.47 | 0.00094 | 0.00014 | 2.0 | 0.00019 | 0.0041 | 0.000075 | 0.00091 | 0.00011 | 2.0 | 0.11 | 0.00007 | 0.00077 | 0.000005 | 0.000071 | 0.0042 | NC |
| ÉCART TYPE | 0.0000051 | NC | 0.014 | 1.2 | 0.00055 | 0.18 | 0.00049 | 0.000059 | 0.45 | 0.00014 | 0.0017 | 0.000097 | NC | 0.00007 | 0.2 | 0.14 | NC | 0.00092 | NC | 0.000055 | 0.0014 | NC |
| 25eme CENTILE | 0.0000043 | 0.0002 | 0.007 | 5.7 | 0.0014 | 0.35 | 0.00072 | 0.00009 | 1.6 | 0.0001 | 0.003 | 0.000013 | 0.0009 | 0.00006 | 1.9 | 0.032 | 0.00006 | 0.00022 | 0.000005 | 0.000013 | 0.003 | NC |
| 75eme CENTILE | 0.000008 | 0.0002 | 0.009 | 7.2 | 0.0018 | 0.49 | 0.00093 | 0.00016 | 2.1 | 0.00028 | 0.0048 | 0.000058 | 0.0009 | 0.00014 | 2.2 | 0.11 | 0.00006 | 0.00074 | 0.000005 | 0.00011 | 0.0053 | NC |
| **Minerai SGR** | | | | | | | | | | | | | | | | | | | | | | |
| X19136W-1730.50-1236 | 0.000006 | < 0,0002 | < 0,007 | 5.7 | 0.0012 | 0.45 | 0.0011 | 0.00019 | 1.8 | < 0,0001 | < 0,003 | 0.00029 | 0.0012 | 0.00007 | 1.9 | 0.18 | 0.00019 | 0.00028 | < 0,000005 | 0.00007 | 0.003 | < 0,002 |
| X19140-1631.00-1727 | 0.000005 | < 0,0002 | 0.014 | 5.9 | 0.0008 | 0.44 | 0.00073 | 0.00031 | 1.5 | < 0,0001 | < 0,003 | 0.00004 | 0.0011 | 0.00004 | 1.9 | 0.035 | 0.00015 | 0.001 | < 0,000005 | 0.000019 | 0.0055 | < 0,002 |
| X19145WA-1854.00-0778 | < 0,000004 | 0.0002 | < 0,007 | 5.4 | 0.0015 | 0.41 | 0.00066 | 0.00009 | 1.9 | < 0,0001 | < 0,003 | 0.00002 | < 0,0009 | 0.00007 | 2.0 | 0.13 | < 0,00006 | 0.00037 | < 0,000005 | 0.000023 | 0.0035 | 0.021 |
| X19141AW-1670.85-0796 | < 0,000004 | < 0,0002 | < 0,007 | 4.2 | 0.0008 | 0.37 | 0.00059 | 0.00031 | 2.1 | < 0,0001 | < 0,003 | 0.00008 | < 0,0009 | 0.0001 | 1.8 | 0.046 | < 0,00006 | 0.00015 | < 0,000005 | 0.000024 | 0.003 | < 0,002 |
| X19135W-1883.00-0947 | 0.00001 | < 0,0002 | 0.015 | 7.6 | 0.0022 | 0.43 | 0.00091 | 0.0021 | 1.8 | < 0,0001 | 0.003 | 0.00003 | < 0,0009 | 0.00017 | 2.2 | 0.053 | < 0,00006 | 0.001 | 0.000005 | 0.000055 | 0.0046 | < 0,002 |
| Y155016EXT-1882.50-I001 | 0.000008 | < 0,0002 | 0.01 | 6.6 | 0.0016 | 0.41 | 0.001 | 0.00026 | 1.7 | < 0,0001 | 0.012 | 0.00024 | < 0,0009 | 0.00015 | 1.9 | 0.027 | < 0,00006 | 0.00081 | < 0,000005 | 0.000074 | 0.0042 | < 0,002 |
| Y165106EXT-1640.00-0489 | 0.000007 | < 0,0002 | < 0,007 | 7.1 | 0.0019 | 0.5 | 0.0013 | 0.0001 | 1.5 | < 0,0001 | 0.009 | 0.00003 | < 0,0009 | 0.00007 | 1.8 | 0.083 | < 0,00006 | 0.00043 | < 0,000005 | 0.000047 | 0.004 | < 0,002 |
| Y155021EXTA-1800.00-0881 | 0.00001 | < 0,0002 | 0.015 | 5.7 | 0.0024 | 0.62 | 0.0011 | 0.00021 | 1.7 | < 0,0001 | < 0,003 | 0.00007 | < 0,0009 | 0.0001 | 1.5 | 0.031 | < 0,00006 | 0.0015 | < 0,000005 | 0.000014 | 0.0027 | < 0,002 |
| X19147AWA-1634.00-0376 | 0.000005 | < 0,0002 | < 0,007 | 6.3 | 0.0013 | 0.37 | 0.00059 | 0.00013 | 2.5 | 0.0003 | < 0,003 | 0.00049 | 0.0012 | 0.00018 | 2.2 | 0.055 | < 0,00006 | 0.00035 | < 0,000005 | 0.000021 | 0.0022 | < 0,002 |
| X19156-1768.60-1296 | 0.000011 | < 0,0002 | < 0,007 | 13 | 0.0023 | 1.3 | 0.0062 | 0.00022 | 0.62 | 0.0002 | < 0,003 | < 0,00001 | < 0,0009 | 0.00008 | 1.2 | 2.0 | < 0,00006 | < 0,00005 | 0.000008 | 0.000052 | 0.0027 | < 0,002 |
| X19140-1560.15-1641 | 0.000009 | < 0,0002 | 0.029 | 6.7 | 0.0022 | 0.45 | 0.0013 | 0.00046 | 0.94 | < 0,0001 | 0.003 | 0.00006 | < 0,0009 | 0.00007 | 1.9 | 0.016 | 0.00011 | 0.0023 | 0.000005 | 0.000075 | 0.0053 | < 0,002 |
| X19149A-2009.70-2213 | 0.000007 | < 0,0002 | < 0,007 | 5.2 | 0.0017 | 0.55 | 0.0039 | 0.00068 | 1.3 | < 0,0001 | < 0,003 | 0.00005 | < 0,0009 | 0.0001 | 1.7 | 0.18 | < 0,00006 | 0.00013 | 0.000005 | 0.000037 | 0.0016 | < 0,002 |
| COMPTE | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| MINIMUM | < 0,000004 | < 0,0002 | < 0,007 | 4.2 | 0.0008 | 0.37 | 0.00059 | 0.00009 | 0.62 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00004 | 1.2 | 0.016 | < 0,00006 | < 0,00005 | < 0,000005 | 0.000014 | 0.0016 | < 0,002 |
| MAXIMUM | 0.000011 | 0.0002 | 0.029 | 13 | 0.0024 | 1.3 | 0.0062 | 0.0021 | 2.5 | 0.0003 | 0.012 | 0.00049 | 0.0012 | 0.00018 | 2.2 | 2.0 | 0.00019 | 0.0023 | 0.000008 | 0.000075 | 0.0055 | 0.021 |
| MEDIANE | 0.000007 | 0.0002 | 0.007 | 6.1 | 0.0017 | 0.44 | 0.0011 | 0.00024 | 1.7 | 0.0001 | 0.003 | 0.000055 | 0.0009 | 0.00009 | 1.9 | 0.054 | 0.00006 | 0.0004 | 0.000005 | 0.000042 | 0.0032 | 0.002 |
| MOYENNE | 0.0000072 | 0.0002 | 0.011 | 6.6 | 0.0017 | 0.52 | 0.0016 | 0.00042 | 1.6 | 0.00013 | 0.0043 | 0.00012 | 0.00097 | 0.0001 | 1.8 | 0.23 | 0.000083 | 0.0007 | 0.0000053 | 0.000043 | 0.0035 | 0.0036 |
| ÉCART TYPE | 0.0000024 | NC | 0.0066 | 2.3 | 0.00056 | 0.24 | 0.0017 | 0.00054 | 0.49 | 0.000062 | 0.003 | 0.00015 | 0.00012 | 0.000044 | 0.27 | 0.55 | 0.000044 | 0.00067 | 0.00000087 | 0.000023 | 0.0012 | NC |
| 25eme CENTILE | 0.000005 | 0.0002 | 0.007 | 5.6 | 0.0013 | 0.41 | 0.00071 | 0.00018 | 1.5 | 0.0001 | 0.003 | 0.00003 | 0.0009 | 0.00007 | 1.7 | 0.034 | 0.00006 | 0.00025 | 0.000005 | 0.000023 | 0.0027 | 0.002 |
| 75eme CENTILE | 0.0000093 | 0.0002 | 0.014 | 6.8 | 0.0022 | 0.52 | 0.0013 | 0.00035 | 1.8 | 0.0001 | 0.003 | 0.00012 | 0.00095 | 0.00011 | 1.9 | 0.14 | 0.000073 | 0.001 | 0.000005 | 0.000059 | 0.0043 | 0.002 |
| **Minerai SGR+** | | | | | | | | | | | | | | | | | | | | | | |
| X19152W-1601.30-0332 | 0.000004 | < 0,0002 | < 0,007 | 8.3 | 0.0026 | 0.34 | 0.00053 | 0.00011 | 2.3 | 0.0002 | 0.006 | 0.00001 | 0.0009 | 0.00009 | 2.1 | 0.063 | < 0,00006 | 0.00044 | < 0,000005 | 0.000008 | 0.0044 | < 0,002 |
| X19136W-1692.40-1182 | 0.000005 | < 0,0002 | 0.007 | 5.7 | 0.0008 | 0.34 | 0.0007 | 0.00014 | 1.9 | < 0,0001 | < 0,003 | 0.00015 | < 0,0009 | 0.00012 | 1.8 | 0.087 | 0.0002 | 0.00046 | < 0,000005 | 0.000067 | 0.002 | < 0,002 |
| X19139WA-1778.85-0693 | 0.000005 | < 0,0002 | 0.008 | 5.5 | 0.0011 | 0.48 | 0.00082 | 0.00016 | 1.8 | < 0,0001 | < 0,003 | 0.00001 | < 0,0009 | 0.00009 | 2.0 | 0.073 | 0.00025 | 0.00039 | < 0,000005 | 0.000021 | 0.0033 | < 0,002 |
| X19143-1454.00-1452 | < 0,000004 | 0.0003 | < 0,007 | 6.8 | 0.0018 | 0.49 | 0.0007 | 0.00074 | 2.4 | < 0,0001 | < 0,003 | 0.00002 | < 0,0009 | 0.00006 | 1.7 | 0.05 | 0.00048 | 0.00016 | 0.000005 | 0.00001 | 0.004 | < 0,002 |
| X19141AW-1622.15-0730 | 0.000008 | < 0,0002 | 0.008 | 5.0 | 0.0013 | 0.42 | 0.00096 | 0.00026 | 1.8 | < 0,0001 | 0.005 | 0.00021 | < 0,0009 | 0.00006 | 2.0 | 0.16 | < 0,00006 | 0.00055 | < 0,000005 | 0.0001 | 0.003 | < 0,002 |
| X19152W-1596.10-0327 | 0.000005 | < 0,0002 | < 0,007 | 7.3 | 0.0024 | 0.45 | 0.00053 | 0.00046 | 2.7 | 0.0003 | < 0,003 | 0.00006 | 0.0013 | 0.00018 | 2.1 | 0.071 | < 0,00006 | 0.00026 | 0.000005 | 0.000016 | 0.0033 | < 0,002 |
| X19142-1559.00-1528 | 0.000007 | < 0,0002 | < 0,007 | 2.8 | 0.0007 | 0.31 | 0.0017 | 0.00022 | 2.0 | < 0,0001 | < 0,003 | 0.00003 | < 0,0009 | 0.00012 | 1.8 | 0.04 | 0.00019 | 0.00024 | < 0,000005 | 0.00012 | 0.0015 | < 0,002 |
| X19145WA-1901.00-0836 | < 0,000004 | < 0,0002 | < 0,007 | 6.1 | 0.0011 | 0.52 | 0.00094 | 0.00015 | 1.2 | 0.0005 | < 0,003 | 0.00001 | < 0,0009 | 0.00012 | 1.9 | 0.06 | < 0,00006 | 0.00044 | < 0,000005 | 0.00001 | 0.0053 | < 0,002 |
| X19149A-2030.30-2239 | 0.000007 | < 0,0002 | < 0,007 | 6.1 | 0.0017 | 0.94 | 0.0037 | 0.00014 | 1.8 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00005 | 1.6 | 0.56 | < 0,00006 | 0.00009 | < 0,000005 | 0.000039 | 0.0014 | < 0,002 |
| X19150A-1450.65-1470 | 0.000004 | < 0,0002 | < 0,007 | 4.1 | 0.0018 | 0.47 | 0.0021 | 0.00032 | 1.8 | < 0,0001 | < 0,003 | 0.00003 | < 0,0009 | 0.00026 | 1.8 | 0.062 | < 0,00006 | 0.00012 | < 0,000005 | 0.000047 | 0.0017 | < 0,002 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | < 0,000004 | < 0,0002 | < 0,007 | 2.8 | 0.0007 | 0.31 | 0.00053 | 0.00011 | 1.2 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00005 | 1.6 | 0.04 | < 0,00006 | 0.00009 | < 0,000005 | 0.000008 | 0.0014 | < 0,002 |
| MAXIMUM | 0.000008 | 0.0003 | 0.008 | 8.3 | 0.0026 | 0.94 | 0.0037 | 0.00074 | 2.7 | 0.0005 | 0.006 | 0.00021 | 0.0013 | 0.00026 | 2.1 | 0.56 | 0.00048 | 0.00055 | 0.000005 | 0.00012 | 0.0053 | < 0,002 |
| MEDIANE | 0.000005 | 0.0002 | 0.007 | 5.9 | 0.0015 | 0.46 | 0.00088 | 0.00019 | 1.9 | 0.0001 | 0.003 | 0.000025 | 0.0009 | 0.00011 | 1.9 | 0.067 | 0.00006 | 0.00033 | 0.000005 | 0.00003 | 0.0031 | NC |
| MOYENNE | 0.0000053 | 0.00021 | 0.0072 | 5.8 | 0.0015 | 0.48 | 0.0013 | 0.00027 | 2.0 | 0.00017 | 0.0035 | 0.000054 | 0.00094 | 0.00012 | 1.9 | 0.12 | 0.00015 | 0.00032 | 0.000005 | 0.000044 | 0.003 | NC |
| ÉCART TYPE | 0.0000015 | NC | 0.00042 | 1.6 | 0.00064 | 0.18 | 0.001 | 0.0002 | 0.41 | 0.00013 | 0.0011 | 0.00007 | 0.00013 | 0.000064 | 0.19 | 0.16 | 0.00014 | 0.00016 | 0 | 0.00004 | 0.0013 | NC |
| 25eme CENTILE | 0.000004 | 0.0002 | 0.007 | 5.1 | 0.0011 | 0.36 | 0.0007 | 0.00014 | 1.8 | 0.0001 | 0.003 | 0.00001 | 0.0009 | 0.000068 | 1.8 | 0.06 | 0.00006 | 0.00018 | 0.000005 | 0.000012 | 0.0018 | NC |
| 75eme CENTILE | 0.0000065 | 0.0002 | 0.007 | 6.6 | 0.0018 | 0.49 | 0.0015 | 0.00031 | 2.2 | 0.00018 | 0.003 | 0.000053 | 0.0009 | 0.00012 | 2.0 | 0.084 | 0.0002 | 0.00044 | 0.000005 | 0.000062 | 0.0038 | NC |
| **Minerai SGR++** | | | | | | | | | | | | | | | | | | | | | | |
| X19155-1653.20-0711 | 0.000005 | < 0,0002 | < 0,007 | 2.7 | 0.0009 | 0.34 | 0.0015 | 0.00006 | 1.1 | 0.0004 | < 0,003 | 0.00001 | < 0,0009 | 0.00011 | 1.8 | 0.06 | < 0,00006 | 0.00007 | < 0,000005 | 0.000017 | 0.00057 | < 0,002 |
| X19152W-1592.75-0322 | 0.000013 | 0.0006 | 0.02 | 6.3 | 0.0024 | 0.42 | 0.0011 | 0.00055 | 1.6 | 0.0002 | 0.004 | 0.00006 | < 0,0009 | 0.00007 | 1.8 | 0.032 | < 0,00006 | 0.00095 | < 0,000005 | 0.000018 | 0.0032 | 0.002 |
| X18108AC-1277.00-0058 | 0.00001 | < 0,0002 | < 0,007 | 2.4 | 0.0005 | 0.33 | 0.0022 | 0.00037 | 1.5 | < 0,0001 | < 0,003 | 0.00078 | < 0,0009 | 0.00006 | 1.8 | 0.042 | 0.00014 | 0.00022 | < 0,000005 | 0.00011 | 0.00066 | < 0,002 |
| Y155013EXT-1663.00-0736 | 0.000004 | < 0,0002 | < 0,007 | 4.2 | 0.0013 | 0.57 | 0.0013 | 0.0004 | 2.0 | < 0,0001 | < 0,003 | 0.00003 | < 0,0009 | 0.00014 | 1.6 | 0.078 | 0.00012 | 0.00017 | < 0,000005 | 0.000039 | 0.0017 | < 0,002 |
| X19157-1723.60-0551 | 0.000009 | < 0,0002 | < 0,007 | 4.0 | 0.001 | 0.55 | 0.004 | 0.00021 | 1.9 | < 0,0001 | < 0,003 | 0.0001 | < 0,0009 | 0.00028 | 1.4 | 4.9 | < 0,00006 | 0.00005 | < 0,000005 | 0.000022 | 0.00006 | < 0,002 |
| X19143-1451.25-1448 | 0.00001 | < 0,0002 | < 0,007 | 4.1 | 0.001 | 0.84 | 0.0023 | 0.00027 | 2.1 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00012 | 1.7 | 0.12 | < 0,00006 | 0.00025 | 0.000005 | 0.000034 | 0.001 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 0.000004 | < 0,0002 | < 0,007 | 2.4 | 0.0005 | 0.33 | 0.0011 | 0.00006 | 1.1 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00006 | 1.4 | 0.032 | < 0,00006 | 0.00005 | < 0,000005 | 0.000017 | 0.00006 | < 0,002 |
| MAXIMUM | 0.000013 | 0.0006 | 0.02 | 6.3 | 0.0024 | 0.84 | 0.004 | 0.00055 | 2.1 | 0.0004 | 0.004 | 0.00078 | < 0,0009 | 0.00028 | 1.8 | 4.9 | 0.00014 | 0.00095 | 0.000005 | 0.00011 | 0.0032 | 0.002 |
| MEDIANE | 0.0000095 | 0.0002 | 0.007 | 4.0 | 0.001 | 0.49 | 0.0018 | 0.00032 | 1.7 | 0.0001 | 0.003 | 0.000045 | NC | 0.00012 | 1.7 | 0.069 | 0.00006 | 0.0002 | 0.000005 | 0.000028 | 0.00084 | 0.002 |
| MOYENNE | 0.0000085 | 0.00027 | 0.0092 | 3.9 | 0.0012 | 0.51 | 0.0021 | 0.00031 | 1.7 | 0.00017 | 0.0032 | 0.00017 | NC | 0.00013 | 1.7 | 0.87 | 0.000083 | 0.00029 | 0.000005 | 0.000039 | 0.0012 | 0.002 |
| ÉCART TYPE | 0.0000034 | NC | NC | 1.4 | 0.00065 | 0.19 | 0.0011 | 0.00017 | 0.36 | 0.00012 | NC | 0.0003 | NC | 0.000079 | 0.17 | 2.0 | 0.000037 | 0.00034 | NC | 0.000034 | 0.0011 | NC |
| 25eme CENTILE | 0.000006 | 0.0002 | 0.007 | 3.0 | 0.00093 | 0.36 | 0.0013 | 0.00023 | 1.5 | 0.0001 | 0.003 | 0.000015 | NC | 0.00008 | 1.6 | 0.046 | 0.00006 | 0.000095 | 0.000005 | 0.000019 | 0.00059 | 0.002 |
| 75eme CENTILE | 0.00001 | 0.0002 | 0.007 | 4.2 | 0.0012 | 0.57 | 0.0023 | 0.00039 | 1.9 | 0.00018 | 0.003 | 0.00009 | NC | 0.00014 | 1.8 | 0.11 | 0.00011 | 0.00024 | 0.000005 | 0.000038 | 0.0015 | 0.002 |
| **Dilution AGR** | | | | | | | | | | | | | | | | | | | | | | |
| X19156-1745.00-1266 | 0.000011 | < 0,0002 | 0.028 | 9.7 | 0.0016 | 0.36 | 0.00097 | 0.00011 | 1.6 | 0.0003 | 0.006 | 0.00008 | < 0,0009 | 0.00019 | 2.2 | 0.022 | < 0,00006 | 0.0029 | < 0,000005 | 0.00018 | 0.0043 | < 0,002 |
| X19154-1588.00-0896 | 0.00003 | < 0,0002 | 0.044 | 8.7 | 0.0026 | 0.38 | 0.0015 | 0.0004 | 1.7 | 0.0007 | 0.006 | 0.00007 | < 0,0009 | 0.00028 | 2.2 | 0.016 | < 0,00006 | 0.0044 | < 0,000005 | 0.00035 | 0.005 | 0.003 |
| X19135W-1854.00-0912 | 0.00001 | < 0,0002 | 0.011 | 8.0 | 0.002 | 0.4 | 0.00067 | 0.00025 | 1.5 | < 0,0001 | < 0,003 | 0.00001 | 0.0009 | 0.00013 | 2.0 | 0.038 | 0.00018 | 0.00058 | < 0,000005 | 0.0003 | 0.0039 | < 0,002 |
| X19135W-1917.00-0989 | 0.000007 | < 0,0002 | 0.02 | 7.5 | 0.0026 | 0.32 | 0.00075 | 0.00022 | 1.4 | < 0,0001 | 0.003 | 0.00018 | < 0,0009 | 0.00014 | 2.3 | 0.017 | 0.00019 | 0.0014 | < 0,000005 | 0.00012 | 0.0048 | < 0,002 |
| X19153-1721.00-1226 | 0.000009 | < 0,0002 | 0.022 | 6.0 | 0.0017 | 0.34 | 0.001 | 0.00021 | 2.0 | 0.0009 | 0.005 | 0.00008 | < 0,0009 | 0.00019 | 2.2 | 0.025 | < 0,00006 | 0.0022 | < 0,000005 | 0.000087 | 0.0032 | < 0,002 |
| X19152W-1708.00-0590 | 0.000006 | < 0,0002 | < 0,007 | 6.0 | 0.0028 | 1.1 | 0.0028 | 0.00009 | 1.5 | 0.0002 | < 0,003 | < 0,00001 | < 0,0009 | 0.00008 | 1.5 | 0.31 | < 0,00006 | 0.00033 | < 0,000005 | 0.00018 | 0.0022 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 0.000006 | < 0,0002 | < 0,007 | 6.0 | 0.0016 | 0.32 | 0.00067 | 0.00009 | 1.4 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00008 | 1.5 | 0.016 | < 0,00006 | 0.00033 | < 0,000005 | 0.000087 | 0.0022 | < 0,002 |
| MAXIMUM | 0.00003 | < 0,0002 | 0.044 | 9.7 | 0.0028 | 1.1 | 0.0028 | 0.0004 | 2.0 | 0.0009 | 0.006 | 0.00018 | 0.0009 | 0.00028 | 2.3 | 0.31 | 0.00019 | 0.0044 | < 0,000005 | 0.00035 | 0.005 | 0.003 |
| MEDIANE | 0.0000095 | NC | 0.021 | 7.7 | 0.0023 | 0.37 | 0.001 | 0.00022 | 1.6 | 0.00025 | 0.004 | 0.000075 | 0.0009 | 0.00017 | 2.2 | 0.023 | 0.00006 | 0.0018 | NC | 0.00018 | 0.0041 | 0.002 |
| MOYENNE | 0.000012 | NC | 0.022 | 7.6 | 0.0022 | 0.48 | 0.0013 | 0.00021 | 1.6 | 0.00038 | 0.0043 | 0.000072 | 0.0009 | 0.00017 | 2.0 | 0.072 | 0.0001 | 0.0019 | NC | 0.0002 | 0.0039 | 0.0022 |
| ÉCART TYPE | 0.0000089 | NC | 0.013 | 1.5 | 0.00052 | 0.29 | 0.00081 | 0.00011 | 0.22 | 0.00034 | 0.0015 | 0.000062 | NC | 0.000069 | 0.31 | 0.12 | 0.000065 | 0.0015 | NC | 0.0001 | 0.001 | NC |
| 25eme CENTILE | 0.0000075 | NC | 0.013 | 6.4 | 0.0018 | 0.34 | 0.00081 | 0.00014 | 1.5 | 0.00013 | 0.003 | 0.000025 | 0.0009 | 0.00013 | 2.0 | 0.018 | 0.00006 | 0.00077 | NC | 0.00013 | 0.0034 | 0.002 |
| 75eme CENTILE | 0.000011 | NC | 0.027 | 8.5 | 0.0026 | 0.4 | 0.0014 | 0.00024 | 1.7 | 0.0006 | 0.0058 | 0.00008 | 0.0009 | 0.00019 | 2.2 | 0.035 | 0.00015 | 0.0027 | NC | 0.00027 | 0.0046 | 0.002 |

Tableau D-7:Essai de lixiviation SPLP

Zone East Gouldie
Mine Canadian Malartic

| Sample | pH | Conductivité | Acidité | Alkalinité | $SO_4^{2-}$ | Cl | Br | Nitrite | Nitrate | F | Hg | Ag | Al | As | Ba | B | Be | Bi | Ca | Cd | Cr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µS/cm | mg/L as $CaCO_3$ | mg/L as $CaCO_3$ | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | | **860** | | **0.06** | **300** | **4.0** | **0.0000013** | **0.00062** | | **0.34** | **0.6** | **28** | | | | **0.0011** | **0.016** |
| EC[2] | | | | | | 250 | | 1.0 | | 1.5 | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | 5.0 | | | | 0.005 | 0.05 |
| *Effluent Final Dir. 019*[3] | *6-9.5* | | | | | | | | | | | | | *0.2* | | | | | | | |
| **Dilution SGR** | | | | | | | | | | | | | | | | | | | | | |
| X19156-1797.00-1336 | 8.9 | 56 | < 2 | 31 | 4.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.79 | 0.0006 | 0.0014 | < 0,002 | < 0,000007 | < 0,000007 | 5.8 | < 0,000003 | < 0,00008 |
| X18127A-1428.00-0654 | 9.0 | 65 | < 2 | 28 | 4.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.47 | 0.0016 | 0.098 | < 0,002 | < 0,000007 | < 0,000007 | 5.0 | 0.000003 | 0.00016 |
| X19147A-1603.00-1593 | 7.9 | 86 | < 2 | 23 | 12 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.59 | 0.0006 | 0.031 | 0.004 | < 0,000007 | < 0,000007 | 10 | < 0,000003 | 0.00008 |
| Y165037EXT-1717.00-0076 | 8.0 | 60 | < 2 | 27 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.81 | 0.0022 | 0.0062 | < 0,002 | < 0,000007 | < 0,000007 | 5.3 | < 0,000003 | 0.00013 |
| X19149A-1999.00-2201 | 8.1 | 72 | < 2 | 33 | 3.3 | < 2 | < 3 | < 0.3 | < 0.6 | 0.06 | < 0,00001 | < 0,00005 | 0.73 | 0.0006 | 0.0016 | 0.002 | < 0,000007 | < 0,000007 | 5.4 | < 0,000003 | 0.00013 |
| X19156-1803.00-1343 | 8.0 | 78 | < 2 | 25 | 10 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.73 | 0.0003 | 0.0018 | < 0,002 | < 0,000007 | 0.000007 | 7.1 | 0.000004 | 0.00011 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 7.9 | 56 | < 2 | 23 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.47 | 0.0003 | 0.0014 | < 0,002 | < 0,000007 | < 0,000007 | 5.0 | < 0,000003 | < 0,00008 |
| MAXIMUM | 9.0 | 86 | < 2 | 33 | 12 | < 2 | < 3 | < 0.3 | < 0.6 | 0.06 | < 0,00001 | < 0,00005 | 0.81 | 0.0022 | 0.098 | 0.004 | < 0,000007 | 0.000007 | 10 | 0.000004 | 0.00016 |
| MEDIANE | 8.0 | 69 | NC | 28 | 4.1 | NC | NC | NC | NC | 0.06 | NC | NC | 0.73 | 0.0006 | 0.004 | 0.002 | NC | 0.000007 | 5.6 | 0.000003 | 0.00012 |
| MOYENNE | 8.3 | 70 | NC | 28 | 6.1 | NC | NC | NC | NC | 0.06 | NC | NC | 0.69 | 0.00098 | 0.023 | 0.0023 | NC | 0.000007 | 6.5 | 0.0000032 | 0.00012 |
| ÉCART TYPE | 0.51 | 11 | NC | 3.7 | 3.9 | NC | NC | NC | NC | NC | NC | NC | 0.13 | 0.00074 | 0.038 | 0.00082 | NC | NC | 1.9 | 0.00000041 | 0.000031 |
| 25eme CENTILE | 8.0 | 61 | NC | 26 | 3.5 | NC | NC | NC | NC | 0.06 | NC | NC | 0.62 | 0.0006 | 0.0017 | 0.002 | NC | 0.000007 | 5.4 | 0.000003 | 0.000088 |
| 75eme CENTILE | 8.7 | 77 | NC | 30 | 8.5 | NC | NC | NC | NC | 0.06 | NC | NC | 0.78 | 0.0014 | 0.025 | 0.002 | NC | 0.000007 | 6.8 | 0.000003 | 0.00013 |
| **Stérile AGR** | | | | | | | | | | | | | | | | | | | | | |
| X19141AW-1557.75-0646 | 8.4 | 62 | < 2 | 30 | 2.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.62 | < 0,0002 | 0.011 | < 0,002 | < 0,000007 | 0.000011 | 4.7 | 0.000003 | 0.00015 |
| X19151-1671.00-1628 | 7.9 | 38 | < 2 | 14 | 2.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.85 | < 0,0002 | 0.004 | < 0,002 | < 0,000007 | < 0,000007 | 1.8 | < 0,000003 | 0.00031 |
| X19139-1738.00-1882 | 8.1 | 55 | < 2 | 25 | 3.0 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.95 | 0.0007 | 0.002 | < 0,002 | < 0,000007 | < 0,000007 | 3.6 | < 0,000003 | 0.00025 |
| X19145-1736.00-1992 | 8.3 | 56 | < 2 | 25 | 3.0 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.79 | 0.0003 | 0.0023 | 0.003 | < 0,000007 | 0.000009 | 4.2 | < 0,000003 | 0.00026 |
| X18131-0777.00-0578 | 8.6 | 56 | < 2 | 30 | 3.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.61 | 0.0024 | 0.02 | < 0,002 | < 0,000007 | 0.000007 | 4.6 | 0.000003 | 0.00026 |
| Y155016EXT-1758.00-0804 | 8.0 | 56 | < 2 | 25 | 2.8 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.73 | 0.0006 | 0.0026 | < 0,002 | < 0,000007 | < 0,000007 | 4.4 | 0.000004 | 0.00025 |
| Y155021EXTA-1724.00-0795 | 8.7 | 51 | < 2 | 23 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.69 | < 0,0002 | 0.0069 | < 0,002 | < 0,000007 | < 0,000007 | 4.3 | < 0,000003 | 0.0002 |
| X19143-1265.10-1226 | 8.3 | 57 | < 2 | 24 | 2.7 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.56 | < 0,0002 | 0.02 | < 0,002 | < 0,000007 | < 0,000007 | 5.5 | < 0,000003 | < 0,00008 |
| X19140-1518.00-1591 | 8.3 | 58 | < 2 | 27 | 3.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.62 | 0.0005 | 0.0035 | 0.003 | < 0,000007 | < 0,000007 | 4.3 | 0.000003 | 0.00023 |
| X19145WA-1677.00-0575 | 8.5 | 71 | < 2 | 32 | 9.2 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.72 | 0.0007 | 0.0026 | < 0,002 | < 0,000007 | < 0,000007 | 6.1 | 0.000003 | 0.00025 |
| X19149AWB-1844.00-0656 | 8.1 | 64 | < 2 | 25 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 1.1 | 0.0012 | 0.0027 | 0.002 | < 0,000007 | < 0,000007 | 4.1 | 0.000003 | 0.00031 |
| X18121-1189.00-0961 | 8.4 | 50 | < 2 | 28 | 3.0 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.76 | 0.0005 | 0.0052 | < 0,002 | < 0,000007 | < 0,000007 | 4.5 | < 0,000003 | 0.00022 |
| X19136W-1478.00-0915 | 8.0 | 59 | < 2 | 24 | 4.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.68 | 0.0005 | 0.0045 | < 0,002 | < 0,000007 | 0.000016 | 5.0 | < 0,000003 | 0.00032 |
| X18108AWC-1087.20-0196 | 8.2 | 67 | < 2 | 28 | 3.8 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.77 | 0.0006 | 0.0024 | < 0,002 | < 0,000007 | < 0,000007 | 4.5 | < 0,000003 | 0.00017 |
| X18127A-1122.00-0299 | 7.8 | 45 | < 2 | 12 | 4.3 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.5 | < 0,0002 | 0.0083 | < 0,002 | < 0,000007 | 0.000013 | 2.7 | < 0,000003 | 0.00042 |
| X18121-1231.00-1009 | 8.1 | 59 | < 2 | 26 | 3.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.81 | 0.0006 | 0.0052 | < 0,002 | < 0,000007 | < 0,000007 | 5.4 | 0.000004 | 0.00008 |
| X19135-1719.00-1698 | 7.9 | 153 | < 2 | 15 | 50 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.46 | 0.0005 | 0.0084 | < 0,002 | < 0,000007 | 0.000008 | 20 | < 0,000003 | < 0,00008 |
| X19150A-1326.00-1330 | 8.0 | 61 | < 2 | 25 | 3.1 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.91 | 0.0012 | 0.0083 | 0.002 | < 0,000007 | < 0,000007 | 5.4 | < 0,000003 | 0.00022 |
| Y165037EXT-1663.00-0009 | 8.1 | 51 | < 2 | 23 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.76 | 0.0041 | 0.014 | < 0,002 | < 0,000007 | < 0,000007 | 4.1 | 0.000003 | 0.00036 |
| X19149A-1906.00-2084 | 8.0 | 70 | < 2 | 26 | 3.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 1.2 | 0.0014 | 0.007 | 0.003 | < 0,000007 | < 0,000007 | 5.9 | 0.000004 | 0.00014 |
| X19148W-1824.00-0744 | 7.8 | 146 | < 2 | 15 | 44 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.59 | 0.0007 | 0.014 | 0.003 | < 0,000007 | < 0,000007 | 19 | < 0,000003 | 0.00009 |
| X19147A-1466.00-1437 | 8.1 | 36 | < 2 | 13 | 2.6 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.84 | < 0,0002 | 0.0021 | 0.005 | < 0,000007 | < 0,000007 | 2.4 | < 0,000003 | 0.00035 |
| COMPTE | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| MINIMUM | 7.8 | 36 | < 2 | 12 | 2.4 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.46 | < 0,0002 | 0.002 | < 0,002 | < 0,000007 | < 0,000007 | 1.8 | < 0,000003 | < 0,00008 |
| MAXIMUM | 8.7 | 153 | < 2 | 32 | 50 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 1.2 | 0.0041 | 0.02 | 0.005 | < 0,000007 | 0.000016 | 20 | 0.000004 | 0.00042 |
| MEDIANE | 8.1 | 58 | NC | 25 | 3.1 | NC | NC | NC | NC | NC | NC | NC | 0.75 | 0.00055 | 0.0052 | 0.002 | NC | 0.000007 | 4.5 | 0.000003 | 0.00024 |
| MOYENNE | 8.1 | 65 | NC | 23 | 7.4 | NC | NC | NC | NC | NC | NC | NC | 0.75 | 0.0008 | 0.0072 | 0.0023 | NC | 0.000008 | 5.7 | 0.0000031 | 0.00023 |
| ECART TYPE | 0.25 | 29 | NC | 5.8 | 13 | NC | NC | NC | NC | NC | NC | NC | 0.19 | 0.0009 | 0.0056 | 0.00072 | NC | 0.0000024 | 4.5 | 0.00000035 | 0.000097 |
| 25eme CENTILE | 8.0 | 52 | NC | 23 | 2.9 | NC | NC | NC | NC | NC | NC | NC | 0.62 | 0.00023 | 0.0027 | 0.002 | NC | 0.000007 | 4.1 | 0.000003 | 0.00016 |
| 75eme CENTILE | 8.3 | 64 | NC | 27 | 3.7 | NC | NC | NC | NC | NC | NC | NC | 0.83 | 0.0007 | 0.0084 | 0.002 | NC | 0.000007 | 5.4 | 0.000003 | 0.0003 |
| **Puits d'accès** | | | | | | | | | | | | | | | | | | | | | |
| X19139-0887.00-0918 | 8.2 | 52 | < 2 | 24 | 3.6 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.84 | < 0,0002 | 0.0035 | < 0,002 | < 0,000007 | 0.000008 | 5.1 | < 0,000003 | 0.00032 |
| X19140-0708.00-0706 | 8.0 | 36 | < 2 | 12 | 3.6 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.6 | < 0,0002 | 0.0035 | < 0,002 | < 0,000007 | 0.000021 | 1.5 | 0.000005 | 0.00033 |
| X19157-0933.00-0984 | 7.5 | 96 | < 2 | 37 | 2.7 | < 2 | < 3 | < 0.3 | < 0.6 | 0.06 | < 0,00001 | < 0,00005 | 0.2 | < 0,0002 | 0.013 | 0.003 | < 0,000007 | < 0,000007 | 8.9 | < 0,000003 | < 0,00008 |
| X18127W-0773.00-0369 | 8.7 | 57 | < 2 | 32 | 2.9 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.8 | 0.0004 | 0.0086 | < 0,002 | < 0,000007 | < 0,000007 | 4.0 | < 0,000003 | 0.00022 |
| X19159-1392.00-1329 | 7.8 | 32 | < 2 | 11 | 2.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.71 | 0.0002 | 0.002 | < 0,002 | < 0,000007 | < 0,000007 | 0.81 | < 0,000003 | 0.00031 |
| X19148W-1752.00-0664 | 7.8 | 38 | < 2 | 12 | 2.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.72 | 0.0014 | 0.007 | 0.003 | < 0,000007 | < 0,000007 | 1.2 | < 0,000003 | 0.00036 |
| X19148-1583.00-1092 | 8.0 | 54 | < 2 | 17 | 3.7 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.8 | 0.0027 | 0.0037 | 0.004 | < 0,000007 | < 0,000007 | 3.1 | 0.000004 | 0.00026 |
| X19149AWB-1297.00-0122 | 8.1 | 58 | < 2 | 24 | 3.2 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.67 | 0.0002 | 0.0072 | 0.003 | < 0,000007 | < 0,000007 | 4.5 | 0.000003 | 0.00032 |
| COMPTE | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| MINIMUM | 7.5 | 32 | < 2 | 11 | 2.5 | < 2 | < 3 | < 0.3 | < 0.6 | < 0,06 | < 0,00001 | < 0,00005 | 0.2 | < 0,0002 | 0.002 | < 0,002 | < 0,000007 | < 0,000007 | 0.81 | < 0,000003 | < 0,00008 |
| MAXIMUM | 8.7 | 96 | < 2 | 37 | 3.7 | < 2 | < 3 | < 0.3 | < 0.6 | 0.06 | < 0,00001 | < 0,00005 | 0.84 | 0.0027 | 0.013 | 0.004 | < 0,000007 | 0.000021 | 8.9 | 0.000005 | 0.00036 |
| MEDIANE | 8.0 | 53 | NC | 21 | 3.1 | NC | NC | NC | NC | 0.06 | NC | NC | 0.72 | 0.0002 | 0.0054 | 0.0025 | NC | 0.000007 | 3.6 | 0.000003 | 0.00032 |
| MOYENNE | 8.0 | 53 | NC | 21 | 3.1 | NC | NC | NC | NC | 0.06 | NC | NC | 0.67 | 0.00069 | 0.0061 | 0.0026 | NC | 0.0000089 | 3.6 | 0.0000034 | 0.00028 |
| ECART TYPE | 0.35 | 20 | NC | 9.8 | 0.51 | NC | NC | NC | NC | NC | NC | NC | 0.2 | 0.00091 | 0.0036 | 0.00074 | NC | 0.0000049 | 2.7 | 0.00000074 | 0.00009 |
| 25eme CENTILE | 7.8 | 38 | NC | 12 | 2.7 | NC | NC | NC | NC | 0.06 | NC | NC | 0.65 | 0.0002 | 0.0035 | 0.002 | NC | 0.000007 | 1.4 | 0.000003 | 0.00025 |
| 75eme CENTILE | 8.1 | 57 | NC | 26 | 3.6 | NC | NC | NC | NC | 0.06 | NC | NC | 0.8 | 0.00065 | 0.0075 | 0.003 | NC | 0.0000073 | 4.6 | 0.0000033 | 0.00032 |

Notes:
"-" - Données inexistantes
NC - Statistique non calculée

1 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du Guide d'intervention - Protection des sols et réabilitation des terrains contaminés. MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.

2 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.

3 - Critère d'efffluent final de la directive 019 sur l'industrie minière, MELCC,2012.

Tableau D-7:Essai de lixiviation SPLP

Zone East Gouldie
Mine Canadian Malartic

| Sample | Co | Cu | Fe | K | Li | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Ti | Tl | U | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES[1]** | **0.37** | **0.0073** | | | | | **2.3** | **29** | | **0.26** | **1** | **0.034** | **1.1** | **0.062** | | | | | | **0.32** | | **0.067** |
| EC [2] | | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | | 0.01 | 0.006 | 0.01 | | | | | | 0.02 | | 5.0 |
| *Effluent Final Dir. 019[3]* | | *0.3* | *3.0* | | | | | | | *0.5* | | *0.2* | | | | | | | | | | *0.5* |
| **Dilution SGR** | | | | | | | | | | | | | | | | | | | | | | |
| X19156-1797.00-1336 | < 0,000004 | < 0,0002 | < 0,007 | 5.8 | 0.0017 | 0.32 | 0.00062 | 0.00007 | 1.7 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00005 | 2.0 | 0.031 | < 0,00006 | 0.00033 | < 0,000005 | 0.000094 | 0.0038 | < 0,002 |
| X18127A-1428.00-0654 | < 0,000004 | < 0,0002 | 0.015 | 7.5 | 0.0018 | 0.38 | 0.00047 | 0.00013 | 2.5 | < 0,0001 | 0.005 | 0.00003 | 0.0017 | 0.00022 | 2.1 | 0.077 | < 0,00006 | 0.00023 | < 0,000005 | 0.00013 | 0.004 | < 0,002 |
| X19147A-1603.00-1593 | 0.000014 | < 0,0002 | 0.011 | 5.4 | 0.0011 | 0.42 | 0.00063 | 0.00023 | 2.5 | 0.0003 | < 0,003 | 0.00002 | < 0,0009 | 0.00009 | 2.0 | 1.2 | < 0,00006 | 0.00059 | < 0,000005 | 0.000016 | 0.0039 | 0.004 |
| Y165037EXT-1717.00-0076 | 0.000007 | < 0,0002 | 0.009 | 6.2 | 0.0011 | 0.38 | 0.00071 | 0.0001 | 2.0 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00009 | 2.3 | 0.027 | < 0,00006 | 0.0011 | < 0,000005 | 0.000059 | 0.0049 | < 0,002 |
| X19149A-1999.00-2201 | 0.000004 | < 0,0002 | < 0,007 | 8.8 | 0.0029 | 0.47 | 0.00066 | 0.00037 | 1.8 | < 0,0001 | < 0,003 | 0.00001 | < 0,0009 | 0.00015 | 2.3 | 0.021 | < 0,00006 | 0.00016 | 0.000006 | 0.000027 | 0.0044 | < 0,002 |
| X19156-1803.00-1343 | 0.000007 | < 0,0002 | < 0,007 | 8.5 | 0.0023 | 0.5 | 0.00069 | 0.00018 | 1.9 | < 0,0001 | < 0,003 | 0.00007 | < 0,0009 | 0.00012 | 2.1 | 0.033 | < 0,00006 | 0.00043 | 0.000005 | 0.00014 | 0.0047 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | < 0,000004 | < 0,0002 | < 0,007 | 5.4 | 0.0011 | 0.32 | 0.00047 | 0.00007 | 1.7 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00005 | 2.0 | 0.021 | < 0,00006 | 0.00016 | < 0,000005 | 0.000016 | 0.0038 | < 0,002 |
| MAXIMUM | 0.000014 | < 0,0002 | 0.015 | 8.8 | 0.0029 | 0.5 | 0.00071 | 0.00037 | 2.5 | 0.0003 | 0.005 | 0.00007 | 0.0017 | 0.00022 | 2.3 | 1.2 | < 0,00006 | 0.0011 | 0.000006 | 0.00014 | 0.0049 | 0.004 |
| MEDIANE | 0.0000055 | NC | 0.008 | 6.9 | 0.0018 | 0.4 | 0.00065 | 0.00016 | 2.0 | 0.0001 | 0.003 | 0.000015 | 0.0009 | 0.00011 | 2.1 | 0.032 | NC | 0.00038 | 0.000005 | 0.000077 | 0.0042 | 0.002 |
| MOYENNE | 0.0000067 | NC | 0.0093 | 7.0 | 0.0018 | 0.41 | 0.00063 | 0.00018 | 2.1 | 0.00013 | 0.0033 | 0.000025 | 0.001 | 0.00012 | 2.1 | 0.23 | NC | 0.00047 | 0.0000052 | 0.000078 | 0.0043 | 0.0023 |
| ÉCART TYPE | 0.0000039 | NC | 0.0032 | 1.4 | 0.0007 | 0.065 | 0.000086 | 0.00011 | 0.35 | NC | NC | 0.000023 | NC | 0.000059 | 0.12 | 0.48 | NC | 0.00032 | 0.00000041 | 0.000052 | 0.00046 | NC |
| 25eme CENTILE | 0.000004 | NC | 0.007 | 5.9 | 0.0013 | 0.38 | 0.00062 | 0.00011 | 1.8 | 0.0001 | 0.003 | 0.00001 | 0.0009 | 0.00009 | 2.1 | 0.028 | NC | 0.00026 | 0.000005 | 0.000035 | 0.0039 | 0.002 |
| 75eme CENTILE | 0.000007 | NC | 0.011 | 8.2 | 0.0022 | 0.45 | 0.00068 | 0.00022 | 2.4 | 0.0001 | 0.003 | 0.000028 | 0.0009 | 0.00014 | 2.2 | 0.066 | NC | 0.00055 | 0.000005 | 0.00012 | 0.0046 | 0.002 |
| **Stérile AGR** | | | | | | | | | | | | | | | | | | | | | | |
| X19141AW-1557.75-0646 | < 0,000004 | < 0,0002 | < 0,007 | 9.7 | 0.0027 | 0.24 | 0.00024 | 0.00006 | 0.76 | < 0,0001 | < 0,003 | 0.00003 | < 0,0009 | 0.00006 | 1.8 | 0.03 | < 0,00006 | 0.0002 | 0.000005 | 0.000009 | 0.0049 | < 0,002 |
| X19151-1671.00-1628 | 0.000041 | < 0,0002 | 0.056 | 5.7 | 0.002 | 0.34 | 0.00086 | 0.00031 | 1.5 | 0.0003 | 0.01 | 0.00013 | < 0,0009 | 0.00006 | 1.7 | 0.0065 | < 0,00006 | 0.0038 | < 0,000005 | 0.000034 | 0.0028 | < 0,002 |
| X19139-1738.00-1882 | 0.000026 | < 0,0002 | 0.052 | 8.6 | 0.0025 | 0.25 | 0.0011 | 0.0001 | 1.2 | 0.0001 | 0.013 | 0.00003 | 0.0011 | 0.00009 | 2.1 | 0.0086 | < 0,00006 | 0.0029 | 0.000005 | 0.00012 | 0.0035 | < 0,002 |
| X19145-1736.00-1992 | 0.000035 | < 0,0002 | 0.051 | 7.3 | 0.006 | 0.3 | 0.0008 | 0.00006 | 1.4 | 0.0002 | 0.015 | 0.00008 | < 0,0009 | 0.00021 | 2.0 | 0.023 | 0.0002 | 0.0033 | 0.000005 | 0.000052 | 0.0039 | < 0,002 |
| X18131-0777.00-0578 | 0.000012 | < 0,0002 | 0.029 | 7.3 | 0.0074 | 0.31 | 0.00094 | 0.00004 | 1.3 | < 0,0001 | 0.009 | 0.00004 | 0.0011 | 0.00014 | 1.6 | 0.018 | 0.00025 | 0.0015 | 0.000005 | 0.000071 | 0.0033 | < 0,002 |
| Y155016EXT-1758.00-0804 | 0.00002 | 0.0003 | 0.027 | 8.0 | 0.0028 | 0.53 | 0.0021 | 0.00016 | 1.6 | < 0,0001 | 0.011 | 0.00004 | < 0,0009 | 0.00012 | 1.9 | 0.017 | < 0,00006 | 0.0022 | < 0,000005 | 0.000026 | 0.003 | < 0,002 |
| Y155021EXTA-1724.00-0795 | 0.000016 | < 0,0002 | 0.026 | 6.1 | 0.0034 | 0.32 | 0.00081 | 0.00017 | 1.6 | < 0,0001 | 0.015 | 0.00009 | < 0,0009 | 0.00008 | 1.6 | 0.03 | < 0,00006 | 0.0021 | < 0,000005 | 0.000013 | 0.0027 | < 0,002 |
| X19143-1265.10-1226 | 0.000004 | < 0,0002 | < 0,007 | 6.4 | 0.0038 | 0.28 | 0.00033 | < 0,00004 | 1.0 | < 0,0001 | < 0,003 | 0.00002 | < 0,0009 | 0.00005 | 1.9 | 0.026 | < 0,00006 | 0.00038 | 0.000005 | 0.00007 | 0.003 | < 0,002 |
| X19140-1518.00-1591 | 0.00001 | 0.0003 | 0.027 | 6.9 | 0.0024 | 0.46 | 0.0014 | 0.00012 | 2.0 | < 0,0001 | 0.008 | 0.00003 | < 0,0009 | 0.00006 | 2.0 | 0.027 | 0.00008 | 0.0017 | < 0,000005 | 0.00014 | 0.0026 | < 0,002 |
| X19145WA-1677.00-0575 | 0.000022 | < 0,0002 | 0.036 | 7.9 | 0.0027 | 0.42 | 0.0011 | 0.00022 | 1.7 | < 0,0001 | 0.004 | 0.00006 | < 0,0009 | 0.0002 | 2.1 | 0.021 | < 0,00006 | 0.0026 | < 0,000005 | 0.00012 | 0.0039 | < 0,002 |
| X19149AWB-1844.00-0656 | 0.000033 | < 0,0002 | 0.049 | 8.0 | 0.0046 | 0.3 | 0.0011 | 0.00038 | 1.4 | 0.0001 | 0.013 | 0.00017 | < 0,0009 | 0.00017 | 2.1 | 0.016 | < 0,00006 | 0.0037 | 0.000005 | 0.0001 | 0.0047 | < 0,002 |
| X18121-1189.00-0961 | 0.000017 | < 0,0002 | 0.025 | 5.7 | 0.0034 | 0.32 | 0.00076 | 0.00006 | 1.6 | 0.001 | 0.012 | 0.00013 | < 0,0009 | 0.0001 | 1.8 | 0.019 | < 0,00006 | 0.0019 | < 0,000005 | 0.000038 | 0.0032 | < 0,002 |
| X19136W-1478.00-0915 | 0.000025 | 0.0002 | 0.061 | 5.9 | 0.0023 | 0.4 | 0.002 | 0.0002 | 1.7 | 0.0001 | 0.007 | 0.00013 | < 0,0009 | 0.00016 | 1.6 | 0.018 | < 0,00006 | 0.004 | < 0,000005 | 0.000051 | 0.0026 | < 0,002 |
| X18108AWC-1087.20-0196 | 0.000006 | < 0,0002 | 0.014 | 9.5 | 0.003 | 0.33 | 0.00035 | 0.00023 | 2.0 | < 0,0001 | < 0,003 | 0.00002 | < 0,0009 | 0.00019 | 2.1 | 0.019 | < 0,00006 | 0.00084 | 0.000005 | 0.000071 | 0.0055 | < 0,002 |
| X18127A-1122.00-0299 | 0.000042 | < 0,0002 | 0.075 | 6.1 | 0.0043 | 0.35 | 0.0014 | 0.00017 | 1.3 | 0.0001 | 0.013 | 0.0001 | < 0,0009 | 0.0001 | 1.5 | 0.014 | 0.00022 | 0.0048 | < 0,000005 | 0.00075 | 0.0022 | < 0,002 |
| X18121-1231.00-1009 | 0.000007 | < 0,0002 | 0.016 | 6.7 | 0.0013 | 0.38 | 0.00067 | 0.00023 | 1.5 | < 0,0001 | < 0,003 | 0.00079 | < 0,0009 | 0.00018 | 1.7 | 0.018 | 0.00006 | 0.00067 | < 0,000005 | 0.00014 | 0.003 | < 0,002 |
| X19135-1719.00-1698 | 0.000007 | < 0,0002 | < 0,007 | 7.4 | 0.0018 | 0.53 | 0.0014 | 0.00018 | 1.6 | < 0,0001 | 0.008 | 0.00002 | < 0,0009 | 0.00015 | 1.7 | 0.13 | 0.00011 | 0.00032 | < 0,000005 | 0.000046 | 0.0022 | < 0,002 |
| X19150A-1326.00-1330 | 0.000016 | < 0,0002 | 0.024 | 6.5 | 0.0045 | 0.28 | 0.0017 | 0.0001 | 1.2 | 0.0001 | 0.005 | 0.00016 | < 0,0009 | 0.00016 | 1.9 | 0.017 | < 0,00006 | 0.0024 | < 0,000005 | 0.00013 | 0.0043 | < 0,002 |
| Y165037EXT-1663.00-0009 | 0.000025 | < 0,0002 | 0.04 | 6.3 | 0.0019 | 0.34 | 0.0015 | 0.00007 | 1.5 | 0.0001 | 0.005 | 0.00006 | < 0,0009 | 0.00011 | 1.7 | 0.02 | < 0,00006 | 0.0031 | < 0,000005 | 0.000081 | 0.0029 | < 0,002 |
| X19149A-1906.00-2084 | 0.000009 | < 0,0002 | 0.012 | 5.6 | 0.0023 | 0.43 | 0.0011 | 0.00015 | 1.7 | 0.0001 | 0.008 | 0.00019 | < 0,0009 | 0.00007 | 2.0 | 0.027 | < 0,00006 | 0.0011 | < 0,000005 | 0.00002 | 0.0033 | < 0,002 |
| X19148W-1824.00-0744 | 0.000018 | < 0,0002 | 0.01 | 7.9 | 0.0031 | 0.48 | 0.00071 | 0.00013 | 1.3 | 0.0002 | < 0,003 | 0.00015 | < 0,0009 | 0.00008 | 1.5 | 0.074 | < 0,00006 | 0.00063 | < 0,000005 | 0.0001 | 0.0023 | < 0,002 |
| X19147A-1466.00-1437 | 0.000045 | 0.0002 | 0.11 | 5.2 | 0.0011 | 0.34 | 0.0012 | 0.00015 | 1.2 | 0.0005 | 0.009 | 0.00006 | < 0,0009 | 0.00014 | 1.3 | 0.0098 | < 0,00006 | 0.0044 | < 0,000005 | 0.000024 | 0.0021 | 0.01 |
| COMPTE | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| MINIMUM | < 0,000004 | < 0,0002 | < 0,007 | 5.2 | 0.0011 | 0.24 | 0.00024 | < 0,00004 | 0.76 | < 0,0001 | < 0,003 | 0.00002 | < 0,0009 | 0.00005 | 1.3 | 0.0065 | < 0,00006 | 0.0002 | < 0,000005 | 0.000009 | 0.0021 | < 0,002 |
| MAXIMUM | 0.000045 | 0.0003 | 0.11 | 9.7 | 0.0074 | 0.53 | 0.0021 | 0.00038 | 2.0 | 0.001 | 0.015 | 0.00079 | 0.0011 | 0.00021 | 2.1 | 0.13 | 0.00025 | 0.0048 | 0.000005 | 0.00075 | 0.0055 | 0.01 |
| MEDIANE | 0.000018 | 0.0002 | 0.027 | 6.8 | 0.0028 | 0.34 | 0.0011 | 0.00015 | 1.5 | 0.0001 | 0.008 | 0.00007 | 0.0009 | 0.00012 | 1.8 | 0.019 | 0.00006 | 0.0021 | 0.000005 | 0.000071 | 0.003 | 0.002 |
| MOYENNE | 0.00002 | 0.00021 | 0.035 | 7.0 | 0.0032 | 0.36 | 0.0011 | 0.00015 | 1.4 | 0.00018 | 0.0082 | 0.00012 | 0.00092 | 0.00012 | 1.8 | 0.027 | 0.000085 | 0.0022 | 0.000005 | 0.0001 | 0.0033 | 0.0024 |
| ÉCART TYPE | 0.000013 | 0.000029 | 0.026 | 1.3 | 0.0015 | 0.083 | 0.0005 | 0.000088 | 0.29 | 0.00021 | 0.0042 | 0.00016 | 0.000059 | 0.00005 | 0.22 | 0.026 | 0.000058 | 0.0014 | 0 | 0.00015 | 0.00092 | NC |
| 25eme CENTILE | 0.0000093 | 0.0002 | 0.015 | 6.1 | 0.0023 | 0.31 | 0.00077 | 0.000078 | 1.3 | 0.0001 | 0.0043 | 0.000033 | 0.0009 | 0.00008 | 1.6 | 0.017 | 0.00006 | 0.0009 | 0.000005 | 0.000035 | 0.0026 | 0.002 |
| 75eme CENTILE | 0.000026 | 0.0002 | 0.051 | 7.9 | 0.0037 | 0.42 | 0.0014 | 0.0002 | 1.6 | 0.0001 | 0.012 | 0.00013 | 0.0009 | 0.00016 | 2.0 | 0.027 | 0.00006 | 0.0032 | 0.000005 | 0.00012 | 0.0038 | 0.002 |
| **Puits d'accès** | | | | | | | | | | | | | | | | | | | | | | |
| X19139-0887.00-0918 | 0.000033 | 0.0002 | 0.055 | 5.7 | 0.0023 | 0.31 | 0.0018 | 0.0002 | 0.71 | 0.0001 | 0.009 | 0.00006 | < 0,0009 | 0.0001 | 2.0 | 0.013 | 0.0002 | 0.0038 | 0.000005 | 0.00043 | 0.0035 | < 0,002 |
| X19140-0708.00-0706 | 0.000032 | < 0,0002 | 0.067 | 5.6 | 0.0022 | 0.3 | 0.0011 | 0.0024 | 1.4 | 0.0002 | 0.012 | 0.00083 | 0.0009 | 0.00012 | 1.5 | 0.0091 | 0.0002 | 0.0034 | < 0,000005 | 0.000018 | 0.0024 | < 0,002 |
| X19157-0933.00-0984 | 0.000014 | < 0,0002 | 0.008 | 11 | 0.0041 | 1.2 | 0.0035 | 0.00027 | 2.7 | < 0,0001 | 0.008 | 0.00003 | < 0,0009 | 0.00005 | 1.7 | 0.027 | < 0,00006 | 0.00068 | 0.000009 | 0.000009 | 0.0013 | < 0,002 |
| X18127W-0773.00-0369 | 0.000033 | 0.0002 | 0.051 | 7.9 | 0.0041 | 0.3 | 0.001 | 0.00016 | 1.5 | 0.0001 | 0.011 | 0.00048 | < 0,0009 | 0.00014 | 2.0 | 0.019 | 0.00011 | 0.0034 | < 0,000005 | 0.00024 | 0.004 | < 0,002 |
| X19159-1392.00-1329 | 0.000038 | 0.0003 | 0.055 | 5.6 | 0.0044 | 0.23 | 0.00098 | < 0,00004 | 1.2 | 0.0001 | 0.015 | 0.00004 | < 0,0009 | 0.00005 | 1.4 | 0.0049 | < 0,00006 | 0.0044 | < 0,000005 | 0.00001 | 0.0025 | 0.002 |
| X19148W-1752.00-0664 | 0.000047 | < 0,0002 | 0.06 | 5.8 | 0.0035 | 0.32 | 0.0017 | 0.00005 | 1.3 | 0.0003 | 0.014 | 0.00005 | 0.0012 | 0.00005 | 1.4 | 0.0054 | < 0,00006 | 0.0043 | < 0,000005 | 0.000012 | 0.0028 | < 0,002 |
| X19148-1583.00-1092 | 0.000035 | < 0,0002 | 0.046 | 6.2 | 0.0048 | 0.28 | 0.0011 | 0.00042 | 1.6 | 0.0003 | 0.015 | 0.00003 | < 0,0009 | 0.00009 | 1.7 | 0.019 | < 0,00006 | 0.0038 | < 0,000005 | 0.000013 | 0.0029 | < 0,002 |
| X19149AWB-1297.00-0122 | 0.000019 | < 0,0002 | 0.032 | 5.3 | 0.0012 | 0.38 | 0.00065 | 0.0003 | 2.7 | 0.0001 | 0.015 | 0.00002 | < 0,0009 | 0.00013 | 2.2 | 0.042 | < 0,00006 | 0.0026 | < 0,000005 | 0.00002 | 0.0039 | < 0,002 |
| COMPTE | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| MINIMUM | 0.000014 | < 0,0002 | 0.008 | 5.3 | 0.0012 | 0.23 | 0.00065 | < 0,00004 | 0.71 | < 0,0001 | 0.008 | 0.00002 | < 0,0009 | 0.00005 | 1.4 | 0.0049 | < 0,00006 | 0.00068 | < 0,000005 | 0.000009 | 0.0013 | < 0,002 |
| MAXIMUM | 0.000047 | 0.0003 | 0.067 | 11 | 0.0048 | 1.2 | 0.0035 | 0.0024 | 2.7 | 0.0003 | 0.015 | 0.00083 | 0.0012 | 0.00014 | 2.2 | 0.042 | 0.0002 | 0.0044 | 0.000009 | 0.00043 | 0.004 | 0.002 |
| MEDIANE | 0.000033 | 0.0002 | 0.053 | 5.7 | 0.0038 | 0.31 | 0.0011 | 0.00024 | 1.4 | 0.0001 | 0.013 | 0.000045 | 0.0009 | 0.000095 | 1.7 | 0.016 | 0.00006 | 0.0036 | 0.000005 | 0.000016 | 0.0028 | 0.002 |
| MOYENNE | 0.000031 | 0.00021 | 0.047 | 6.7 | 0.0033 | 0.42 | 0.0015 | 0.00049 | 1.6 | 0.00016 | 0.012 | 0.00019 | 0.00094 | 0.000091 | 1.7 | 0.017 | 0.0001 | 0.0033 | 0.0000055 | 0.000093 | 0.0029 | 0.002 |
| ÉCART TYPE | 0.00001 | 0.000035 | 0.019 | 2.1 | 0.0013 | 0.33 | 0.00091 | 0.0008 | 0.7 | 0.000092 | 0.0028 | 0.0003 | 0.00011 | 0.000038 | 0.32 | 0.013 | 0.000063 | 0.0012 | 0.0000014 | 0.00016 | 0.0009 | NC |
| 25eme CENTILE | 0.000029 | 0.0002 | 0.043 | 5.6 | 0.0023 | 0.3 | 0.001 | 0.00013 | 1.3 | 0.0001 | 0.011 | 0.00003 | 0.0009 | 0.00005 | 1.4 | 0.0082 | 0.00006 | 0.0032 | 0.000005 | 0.000012 | 0.0025 | 0.002 |
| 75eme CENTILE | 0.000036 | 0.0002 | 0.056 | 6.6 | 0.0042 | 0.33 | 0.0018 | 0.00033 | 1.9 | 0.00023 | 0.015 | 0.00017 | 0.0009 | 0.00012 | 2.0 | 0.021 | 0.00013 | 0.0039 | 0.000005 | 0.000074 | 0.0036 | 0.002 |

Notes:
"-" - Données inexistantes
NC - Statistique non calculée

1 - RES: critère d'eau souterraine- résurgenc
notamment le baryum, le cadmium, le chror

2 - EC: Critère d'eau souterraine- eau de cor

3 - Critère d'efffluent final de la directive

Tableau D-8: Essais de lixiviation CTEU-9

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | pH | Conductivité | Alkalinité | $SO_4^{2-}$ | Cl | Br | Nitrite | Nitrate | Nitrate + Nitrite | F | Hg | Ag | Al | As | Ba | B | Be | Bi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µS/cm | mg/L as $CaCO_3$ | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | **860** | | **0.06** | **300** | | **4.0** | **0.0000013** | **0.00062** | | **0.34** | **0.6** | **28** | | |
| EC [2] | | | | | 250 | | 1.0 | | 10 | 1.5 | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | 5.0 | | |
| *Effluent Final Dir. 019* [3] | *6-9.5* | | | | | | | | | | | | | *0.2* | | | | |
| **Minerai AGR** | | | | | | | | | | | | | | | | | | |
| X19135-1832.70-1829 | 8.7 | 230 | 65 | 17 | 5.1 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.77 | < 0,00001 | 0.00008 | 1.7 | 0.0019 | 0.012 | 0.012 | 0.000018 | 0.000049 |
| X19152-1643.00-1475 | 8.3 | 321 | 77 | 40 | 3.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.82 | < 0,00001 | 0.00033 | 0.28 | 0.002 | 0.02 | 0.008 | < 0,000007 | < 0,000007 |
| X19152W-1715.00-0597 | 8.7 | 325 | 72 | 45 | 4.3 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.78 | < 0,00001 | 0.00025 | 0.42 | 0.0028 | 0.016 | 0.009 | < 0,000007 | < 0,000007 |
| X19152-1572.00-1382 | 7.8 | 854 | 29 | 380 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.52 | < 0,00001 | 0.00029 | 0.17 | 0.0009 | 0.043 | 0.006 | < 0,000007 | < 0,000007 |
| X19155-1665.00-0726 | 8.4 | 314 | 71 | 27 | 3.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.84 | < 0,00001 | 0.00045 | 1.3 | 0.0041 | 0.014 | 0.009 | 0.000012 | 0.000075 |
| X19135W-1914.00-0986 | 8.5 | 307 | 75 | 35 | 3.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.63 | < 0,00001 | 0.00026 | 0.37 | 0.0012 | 0.0082 | 0.008 | < 0,000007 | < 0,000007 |
| X19135W-1839.00-0895 | 8.1 | 442 | 52 | 120 | 2.4 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.63 | < 0,00001 | 0.00021 | 0.21 | 0.0006 | 0.015 | 0.012 | < 0,000007 | < 0,000007 |
| X19154-1562.00-0866 | 8.5 | 352 | 111 | 35 | 3.8 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.35 | < 0,00001 | 0.00032 | 0.15 | 0.0008 | 0.015 | 0.009 | < 0,000007 | 0.000016 |
| X19152-1648.00-1481 | 8.2 | 396 | 74 | 57 | 6.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.8 | < 0,00001 | 0.00043 | 0.2 | 0.0009 | 0.0081 | 0.009 | < 0,000007 | < 0,000007 |
| X19148W-2073.00-1036 | 8.3 | 425 | 74 | 82 | 3.5 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.65 | < 0,00001 | **0.001** | 0.25 | 0.0016 | 0.012 | 0.006 | < 0,000007 | < 0,000007 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 7.8 | 230 | 29 | 17 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.35 | < 0,00001 | 0.00008 | 0.15 | 0.0006 | 0.0081 | 0.006 | < 0,000007 | < 0,000007 |
| MAXIMUM | 8.7 | 854 | 111 | 380 | 6.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.84 | < 0,00001 | 0.001 | 1.7 | 0.0041 | 0.043 | 0.012 | 0.000018 | 0.000075 |
| MEDIANE | 8.3 | 339 | 73 | 43 | 3.7 | NC | NC | NC | NC | 0.71 | NC | 0.00031 | 0.27 | 0.0014 | 0.014 | 0.009 | 0.000007 | 0.000007 |
| MOYENNE | 8.3 | 397 | 70 | 84 | 3.7 | NC | NC | NC | NC | 0.68 | NC | 0.00036 | 0.51 | 0.0017 | 0.016 | 0.0088 | 0.0000086 | 0.000019 |
| ÉCART TYPE | 0.28 | 172 | 21 | 108 | 1.2 | NC | NC | NC | NC | 0.16 | NC | 0.00025 | 0.55 | 0.0011 | 0.01 | 0.002 | 0.0000037 | 0.000024 |
| 25eme CENTILE | 8.2 | 316 | 67 | 35 | 3.1 | NC | NC | NC | NC | 0.63 | NC | 0.00025 | 0.2 | 0.0009 | 0.012 | 0.008 | 0.000007 | 0.000007 |
| 75eme CENTILE | 8.5 | 418 | 75 | 76 | 4.2 | NC | NC | NC | NC | 0.8 | NC | 0.00041 | 0.41 | 0.002 | 0.016 | 0.009 | 0.000007 | 0.000014 |
| **Minerai SGR** | | | | | | | | | | | | | | | | | | |
| X19136W-1730.50-1236 | 8.5 | 306 | 84 | 42 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.61 | < 0,00001 | 0.00014 | 0.38 | 0.0048 | 0.01 | 0.007 | < 0,000007 | 0.000019 |
| X19140-1631.00-1727 | 8.6 | 274 | 86 | 22 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.63 | < 0,00001 | 0.00025 | 0.52 | 0.0029 | 0.0062 | 0.006 | < 0,000007 | 0.000009 |
| X19145WA-1854.00-0778 | 8.5 | 296 | 81 | 34 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.68 | < 0,00001 | 0.00021 | 0.33 | 0.0018 | 0.0088 | 0.009 | < 0,000007 | < 0,000007 |
| X19141AW-1670.85-0796 | 8.4 | 313 | 77 | 36 | 8.5 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.52 | < 0,00001 | 0.00025 | 0.34 | 0.0011 | 0.02 | 0.008 | < 0,000007 | < 0,000007 |
| X19135W-1883.00-0947 | 8.1 | 436 | 56 | 110 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.76 | < 0,00001 | 0.00029 | 0.28 | 0.0017 | 0.008 | 0.008 | < 0,000007 | < 0,000007 |
| Y155016EXT-1882.50-I001 | 8.0 | 352 | 72 | 50 | 4.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.82 | < 0,00001 | **0.00099** | 0.29 | 0.0017 | 0.006 | 0.014 | < 0,000007 | < 0,000007 |
| Y165106EXT-1640.00-0489 | 7.8 | 452 | 48 | 130 | 2.1 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.57 | < 0,00001 | 0.00026 | 0.27 | 0.0016 | 0.018 | 0.007 | < 0,000007 | < 0,000007 |
| Y155021EXTA-1800.00-0881 | 7.9 | 381 | 52 | 77 | 11 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.85 | **0.00001** | 0.00062 | 0.22 | 0.0003 | 0.005 | 0.011 | < 0,000007 | < 0,000007 |
| X19147AWA-1634.00-0376 | 8.2 | 362 | 85 | 49 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.31 | < 0,00001 | **0.0007** | 0.24 | 0.0014 | 0.017 | 0.007 | < 0,000007 | 0.000008 |
| X19156-1768.60-1296 | 7.4 | 1730 | 23 | 900 | 2.7 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.87 | < 0,00001 | 0.00013 | 0.085 | < 0,0002 | 0.096 | 0.006 | < 0,000007 | < 0,000007 |
| X19140-1560.15-1641 | 8.3 | 401 | 67 | 66 | 4.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.69 | < 0,00001 | **0.00087** | 0.26 | 0.0015 | 0.0081 | 0.009 | < 0,000007 | 0.000015 |
| X19149A-2009.70-2213 | 8.0 | 712 | 46 | 240 | 3.4 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.33 | < 0,00001 | **0.00076** | 0.1 | 0.0007 | 0.028 | 0.007 | < 0,000007 | < 0,000007 |
| COMPTE | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| MINIMUM | 7.4 | 274 | 23 | 22 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.31 | < 0,00001 | 0.00013 | 0.085 | < 0,0002 | 0.005 | 0.006 | < 0,000007 | < 0,000007 |
| MAXIMUM | 8.6 | 1730 | 86 | 900 | 11 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.87 | 0.00001 | 0.00099 | 0.52 | 0.0048 | 0.096 | 0.014 | < 0,000007 | 0.000019 |
| MEDIANE | 8.1 | 372 | 70 | 58 | 2.4 | NC | NC | NC | NC | 0.66 | 0.00001 | 0.00028 | 0.28 | 0.0016 | 0.0096 | 0.0075 | NC | 0.000007 |
| MOYENNE | 8.1 | 501 | 65 | 146 | 3.8 | NC | NC | NC | NC | 0.64 | 0.00001 | 0.00046 | 0.28 | 0.0016 | 0.019 | 0.0083 | NC | 0.0000089 |
| ÉCART TYPE | 0.33 | 404 | 20 | 245 | 2.9 | NC | NC | NC | NC | 0.18 | NC | 0.00031 | 0.12 | 0.0012 | 0.025 | 0.0023 | NC | 0.0000039 |
| 25eme CENTILE | 7.9 | 311 | 51 | 41 | 2.0 | NC | NC | NC | NC | 0.56 | 0.00001 | 0.00024 | 0.24 | 0.001 | 0.0076 | 0.007 | NC | 0.000007 |
| 75eme CENTILE | 8.4 | 440 | 82 | 115 | 4.1 | NC | NC | NC | NC | 0.78 | 0.00001 | 0.00072 | 0.33 | 0.0017 | 0.019 | 0.009 | NC | 0.0000083 |
| **Minerai SGR+** | | | | | | | | | | | | | | | | | | |
| X19152W-1601.30-0332 | 8.8 | 300 | 86 | 29 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.34 | < 0,00001 | 0.00049 | 0.31 | 0.0042 | 0.034 | 0.007 | < 0,000007 | < 0,000007 |
| X19136W-1692.40-1182 | 8.3 | 350 | 67 | 54 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.44 | < 0,00001 | 0.0004 | 0.21 | 0.0013 | 0.087 | 0.009 | < 0,000007 | < 0,000007 |
| X19139WA-1778.85-0693 | 8.6 | 307 | 87 | 33 | 2.4 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.69 | < 0,00001 | 0.00023 | 0.3 | 0.0014 | 0.012 | 0.008 | < 0,000007 | < 0,000007 |
| X19143-1454.00-1452 | 8.3 | 410 | 79 | 66 | 9.7 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.98 | < 0,00001 | 0.00049 | 0.21 | 0.0005 | 0.013 | 0.011 | < 0,000007 | < 0,000007 |
| X19141AW-1622.15-0730 | 8.2 | 435 | 70 | 98 | 2.1 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.68 | < 0,00001 | **0.00076** | 0.22 | 0.001 | 0.055 | 0.008 | < 0,000007 | 0.000008 |
| X19152W-1596.10-0327 | 8.2 | 348 | 79 | 50 | 2.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.31 | < 0,00001 | **0.0013** | 0.12 | 0.0016 | 0.035 | 0.008 | < 0,000007 | < 0,000007 |
| X19142-1559.00-1528 | 8.2 | 423 | 76 | 85 | 3.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.73 | < 0,00001 | **0.0025** | 0.15 | 0.0005 | 0.016 | 0.009 | < 0,000007 | < 0,000007 |
| X19145WA-1901.00-0836 | 8.3 | 450 | 83 | 75 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.54 | < 0,00001 | **0.0012** | 0.14 | 0.0013 | 0.017 | 0.008 | < 0,000007 | < 0,000007 |
| X19149A-2030.30-2239 | 8.0 | 722 | 46 | 240 | 3.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.31 | < 0,00001 | **0.00064** | 0.093 | 0.0007 | 0.028 | 0.007 | < 0,000007 | < 0,000007 |
| X19150A-1450.65-1470 | 8.2 | 537 | 92 | 110 | 4.6 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.27 | < 0,00001 | **0.0014** | 0.095 | 0.001 | 0.016 | 0.011 | < 0,000007 | 0.000009 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 8.0 | 300 | 46 | 29 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.27 | < 0,00001 | 0.00023 | 0.093 | 0.0005 | 0.012 | 0.007 | < 0,000007 | < 0,000007 |
| MAXIMUM | 8.8 | 722 | 92 | 240 | 9.7 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.98 | < 0,00001 | 0.0025 | 0.31 | 0.0042 | 0.087 | 0.011 | < 0,000007 | 0.000009 |
| MEDIANE | 8.2 | 417 | 79 | 71 | 2.3 | NC | NC | NC | NC | 0.49 | NC | 0.0007 | 0.18 | 0.0012 | 0.022 | 0.008 | NC | 0.000007 |
| MOYENNE | 8.3 | 428 | 77 | 84 | 3.3 | NC | NC | NC | NC | 0.53 | NC | 0.00095 | 0.18 | 0.0014 | 0.031 | 0.0086 | NC | 0.0000073 |
| ÉCART TYPE | 0.21 | 126 | 13 | 61 | 2.4 | NC | NC | NC | NC | 0.24 | NC | 0.00069 | 0.078 | 0.0011 | 0.024 | 0.0014 | NC | 0.00000067 |
| 25eme CENTILE | 8.2 | 349 | 72 | 51 | 2.0 | NC | NC | NC | NC | 0.32 | NC | 0.00049 | 0.13 | 0.00078 | 0.016 | 0.008 | NC | 0.000007 |
| 75eme CENTILE | 8.3 | 446 | 85 | 95 | 3.2 | NC | NC | NC | NC | 0.69 | NC | 0.0013 | 0.22 | 0.0014 | 0.035 | 0.009 | NC | 0.000007 |
| **Minerai SGR++** | | | | | | | | | | | | | | | | | | |
| X19155-1653.20-0711 | 8.2 | 273 | | 37 | 3.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.2 | < 0,00001 | **0.00088** | 0.047 | 0.0019 | 0.023 | 0.012 | < 0,000007 | 0.000024 |
| X19152W-1592.75-0322 | 8.2 | 413 | | 67 | 5.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.73 | < 0,00001 | **0.0017** | 0.25 | 0.0016 | 0.012 | 0.009 | < 0,000007 | 0.000008 |
| X18108AC-1277.00-0058 | 8.2 | 503 | | 120 | 4.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.34 | < 0,00001 | **0.00083** | 0.089 | 0.0013 | 0.022 | 0.01 | < 0,000007 | 0.00001 |
| Y155013EXT-1663.00-0736 | 8.0 | 439 | | 80 | 12 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.38 | **0.00001** | **0.0016** | 0.12 | 0.0021 | 0.014 | 0.01 | < 0,000007 | < 0,000007 |
| X19157-1723.60-0551 | 7.7 | 768 | | 300 | 2.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.31 | < 0,00001 | 0.00006 | 0.064 | 0.001 | 0.06 | 0.013 | < 0,000007 | 0.000014 |
| X19143-1451.25-1448 | 8.2 | 546 | | 110 | 7.3 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.19 | < 0,00001 | **0.004** | 0.065 | 0.0007 | 0.015 | 0.007 | < 0,000007 | < 0,000007 |
| COMPTE | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 7.7 | 273 | | 37 | 2.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.19 | < 0,00001 | 0.00006 | 0.047 | 0.0007 | 0.012 | 0.007 | < 0,000007 | < 0,000007 |
| MAXIMUM | 8.2 | 768 | | 300 | 12 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.73 | 0.00001 | 0.004 | 0.25 | 0.0021 | 0.06 | 0.013 | < 0,000007 | 0.000024 |
| MEDIANE | 8.2 | 471 | | 95 | 5.4 | NC | NC | NC | NC | 0.33 | 0.00001 | 0.0012 | 0.077 | 0.0015 | 0.018 | 0.01 | NC | 0.000009 |
| MOYENNE | 8.1 | 490 | | 119 | 6.2 | NC | NC | NC | NC | 0.36 | 0.00001 | 0.0015 | 0.11 | 0.0014 | 0.024 | 0.01 | NC | 0.000012 |
| ÉCART TYPE | 0.19 | 165 | | 94 | 3.2 | NC | NC | NC | NC | 0.2 | NC | 0.0013 | 0.075 | 0.00054 | 0.018 | 0.0021 | NC | 0.0000066 |
| 25eme CENTILE | 8.0 | 420 | | 70 | 4.2 | NC | NC | NC | NC | 0.23 | 0.00001 | 0.00084 | 0.064 | 0.0011 | 0.014 | 0.0093 | NC | 0.0000073 |
| 75eme CENTILE | 8.2 | 535 | | 118 | 7.0 | NC | NC | NC | NC | 0.37 | 0.00001 | 0.0017 | 0.11 | 0.0018 | 0.023 | 0.012 | NC | 0.000013 |

Tableau D-8: Essais de lixiviation CTEU-9

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Ca | Cd | Cr | Co | Cu | Fe | K | Li | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Ti | Tl | U | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | **0.0011** | **0.016** | **0.37** | **0.0073** | | | | | **2.3** | **29** | | **0.26** | **1** | **0.034** | **1.1** | **0.062** | | | | | | **0.32** | | **0.067** |
| EC [2] | | 0.005 | 0.05 | | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | | 0.01 | 0.006 | 0.01 | | | | | | 0.02 | | 5.0 |
| *Effluent Final Dir. 019*[3] | | | | | *0.3* | *3.0* | | | | | | | *0.5* | | *0.2* | | | | | | | | | | *0.5* |
| **Mineral AGR** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19135-1832.70-1829 | 3.2 | 0.000004 | 0.0041 | 0.00033 | 0.0008 | 0.84 | 40 | 0.0021 | 0.85 | 0.0095 | 0.0049 | 17 | 0.0018 | 0.037 | 0.00055 | 0.0021 | 0.00078 | 3.8 | < 0,00006 | 0.04 | 0.047 | 0.000025 | 0.0005 | 0.028 | 0.003 |
| X19152-1643.00-1475 | 7.8 | 0.000004 | 0.00094 | 0.000017 | 0.0003 | 0.012 | 49 | 0.011 | 1.6 | 0.0018 | 0.01 | 25 | < 0,0001 | 0.014 | 0.00002 | 0.0019 | 0.00048 | 3.9 | < 0,00006 | 0.12 | 0.001 | 0.000034 | 0.00067 | 0.016 | < 0,002 |
| X19152W-1715.00-0597 | 7.5 | 0.000005 | 0.0016 | 0.000038 | 0.0005 | 0.05 | 48 | 0.0065 | 1.3 | 0.0019 | 0.0062 | 27 | 0.0002 | 0.011 | 0.00006 | 0.0015 | 0.0014 | 2.7 | < 0,00006 | 0.62 | 0.0045 | 0.000024 | 0.0025 | 0.019 | < 0,002 |
| X19152-1572.00-1382 | 98 | 0.000006 | 0.00044 | 0.000073 | 0.0003 | < 0,007 | 69 | 0.024 | 6.7 | 0.014 | 0.013 | 27 | 0.0001 | 0.004 | < 0,00001 | 0.0019 | 0.00041 | 3.6 | < 0,00006 | 0.78 | 0.00055 | 0.00003 | 0.0012 | 0.0059 | < 0,002 |
| X19155-1665.00-0726 | 4.6 | 0.000011 | 0.0046 | 0.00026 | 0.0013 | 0.64 | 46 | 0.0092 | 1.1 | 0.0095 | 0.0079 | 23 | 0.0017 | 0.046 | 0.00074 | 0.0053 | 0.0013 | 3.3 | < 0,00006 | 0.022 | 0.041 | 0.000025 | 0.0015 | 0.029 | 0.003 |
| X19135W-1914.00-0986 | 5.6 | < 0,000003 | 0.00095 | 0.000009 | 0.0002 | 0.009 | 44 | 0.016 | 0.89 | 0.0012 | 0.0049 | 25 | < 0,0001 | 0.009 | 0.00002 | 0.002 | 0.00069 | 3.5 | < 0,00006 | 0.043 | 0.00079 | 0.000018 | 0.0011 | 0.023 | < 0,002 |
| X19135W-1839.00-0895 | 26 | 0.000008 | 0.00063 | 0.000021 | 0.0003 | < 0,007 | 41 | 0.0088 | 4.1 | 0.0064 | 0.01 | 31 | 0.0002 | 0.007 | 0.00001 | 0.0017 | 0.00056 | 4.0 | < 0,00006 | 0.26 | 0.0004 | 0.000032 | 0.0019 | 0.0067 | < 0,002 |
| X19154-1562.00-0866 | 10 | < 0,000003 | 0.00041 | 0.000096 | 0.0004 | 0.013 | 40 | 0.0085 | 6.9 | 0.0053 | 0.0085 | 30 | 0.0004 | 0.006 | 0.00005 | 0.0056 | 0.0014 | 3.6 | < 0,00006 | 0.26 | 0.0012 | 0.000013 | 0.00029 | 0.0036 | < 0,002 |
| X19152-1648.00-1481 | 15 | < 0,000003 | 0.00043 | 0.000035 | 0.0003 | 0.011 | 51 | 0.012 | 3.1 | 0.0053 | 0.0082 | 26 | < 0,0001 | 0.013 | < 0,00001 | 0.0014 | 0.0003 | 3.5 | < 0,00006 | 0.12 | 0.00087 | 0.000027 | 0.00069 | 0.012 | < 0,002 |
| X19148W-2073.00-1036 | 17 | < 0,000003 | 0.00062 | 0.000022 | 0.0004 | 0.01 | 75 | 0.033 | 3.6 | 0.006 | 0.0084 | 24 | 0.0003 | 0.009 | 0.00009 | 0.0019 | 0.0004 | 4.0 | < 0,00006 | 0.32 | 0.0015 | 0.000041 | 0.00098 | 0.012 | 0.002 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 3.2 | < 0,000003 | 0.00041 | 0.000009 | 0.0002 | < 0,007 | 40 | 0.0021 | 0.85 | 0.0012 | 0.0049 | 17 | < 0,0001 | 0.004 | < 0,00001 | 0.0014 | 0.0003 | 2.7 | < 0,00006 | 0.022 | 0.0004 | 0.000013 | 0.00029 | 0.0036 | < 0,002 |
| MAXIMUM | 98 | 0.000011 | 0.0046 | 0.00033 | 0.0013 | 0.84 | 75 | 0.033 | 6.9 | 0.014 | 0.013 | 31 | 0.0018 | 0.046 | 0.00074 | 0.0056 | 0.0014 | 4.0 | < 0,00006 | 0.78 | 0.047 | 0.000041 | 0.0025 | 0.029 | 0.003 |
| MEDIANE | 9.1 | 0.000004 | 0.00079 | 0.000037 | 0.00035 | 0.012 | 47 | 0.01 | 2.3 | 0.0056 | 0.0083 | 25 | 0.0002 | 0.010 | 0.000035 | 0.0019 | 0.00063 | 3.6 | NC | 0.19 | 0.0011 | 0.000026 | 0.001 | 0.014 | 0.002 |
| MOYENNE | 19 | 0.000005 | 0.0015 | 0.00009 | 0.00048 | 0.16 | 50 | 0.013 | 3.0 | 0.0061 | 0.0082 | 25 | 0.0005 | 0.016 | 0.00016 | 0.0025 | 0.00077 | 3.6 | NC | 0.26 | 0.0099 | 0.000027 | 0.0011 | 0.016 | 0.0022 |
| ÉCART TYPE | 28 | 0.0000027 | 0.0016 | 0.00011 | 0.00033 | 0.31 | 12 | 0.0091 | 2.3 | 0.0041 | 0.0025 | 3.9 | 0.00067 | 0.014 | 0.00026 | 0.0016 | 0.00043 | 0.41 | NC | 0.26 | 0.018 | 0.000008 | 0.00067 | 0.0091 | 0.00042 |
| 25eme CENTILE | 6.1 | 0.000003 | 0.00049 | 0.000021 | 0.0003 | 0.0093 | 41 | 0.0086 | 1.2 | 0.0027 | 0.0066 | 24 | 0.0001 | 0.0075 | 0.000013 | 0.0018 | 0.00043 | 3.5 | NC | 0.062 | 0.00081 | 0.000024 | 0.00067 | 0.008 | 0.002 |
| 75eme CENTILE | 17 | 0.0000058 | 0.0015 | 0.00009 | 0.00048 | 0.041 | 51 | 0.015 | 4.0 | 0.0087 | 0.0097 | 27 | 0.00038 | 0.014 | 0.000083 | 0.0021 | 0.0012 | 3.9 | NC | 0.3 | 0.0037 | 0.000032 | 0.0014 | 0.022 | 0.002 |
| **Mineral SGR** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19136W-1730.50-1236 | 7.3 | < 0,000003 | 0.00066 | 0.000009 | 0.0002 | 0.007 | 46 | 0.01 | 1.5 | 0.0025 | 0.0071 | 24 | < 0,0001 | 0.006 | 0.00001 | 0.0076 | 0.00073 | 3.7 | < 0,00006 | 0.18 | 0.00047 | 0.000026 | 0.0012 | 0.018 | < 0,002 |
| X19140-1631.00-1727 | 4.5 | < 0,000003 | 0.0015 | 0.000029 | 0.0005 | 0.041 | 47 | 0.0041 | 1.1 | 0.0014 | 0.0052 | 25 | 0.0003 | 0.023 | 0.00032 | 0.0051 | 0.00073 | 3.0 | < 0,00006 | 0.055 | 0.0028 | 0.000016 | 0.00064 | 0.04 | < 0,002 |
| X19145WA-1854.00-0778 | 7.8 | < 0,000003 | 0.00058 | 0.000008 | < 0,0002 | 0.007 | 44 | 0.0081 | 1.5 | 0.0019 | 0.0084 | 26 | 0.0001 | 0.011 | 0.00003 | 0.0018 | 0.00047 | 4.1 | 0.00006 | 0.22 | 0.00095 | 0.000022 | 0.00061 | 0.016 | 0.005 |
| X19141AW-1670.85-0796 | 9.1 | < 0,000003 | 0.00076 | 0.000013 | 0.0002 | 0.009 | 35 | 0.0051 | 2.3 | 0.0034 | 0.0059 | 34 | 0.0001 | 0.009 | 0.00004 | < 0,0009 | 0.00078 | 3.6 | < 0,00006 | 0.1 | 0.00082 | 0.00001 | 0.00062 | 0.011 | < 0,002 |
| X19135W-1883.00-0947 | 20 | < 0,000003 | 0.00067 | 0.000016 | 0.0003 | 0.009 | 66 | 0.018 | 3.1 | 0.0051 | 0.008 | 22 | 0.0002 | 0.017 | < 0,00001 | 0.0028 | 0.00063 | 3.2 | < 0,00006 | 0.16 | 0.00095 | 0.000045 | 0.00074 | 0.0084 | < 0,002 |
| Y155016EXT-1882.50-I001 | 11 | 0.000009 | 0.00094 | 0.000023 | 0.0008 | 0.027 | 55 | 0.016 | 1.9 | 0.0032 | 0.011 | 21 | 0.0002 | 0.023 | 0.00005 | 0.0018 | 0.00075 | 2.9 | < 0,00006 | 0.07 | 0.0027 | 0.000039 | 0.002 | 0.012 | < 0,002 |
| Y165106EXT-1640.00-0489 | 22 | 0.000003 | 0.00014 | 0.000026 | 0.0004 | 0.011 | 66 | 0.022 | 3.1 | 0.0054 | 0.01 | 22 | < 0,0001 | 0.015 | 0.00005 | 0.0016 | 0.00036 | 2.3 | < 0,00006 | 0.26 | 0.001 | 0.000043 | 0.00065 | 0.0039 | < 0,002 |
| Y155021EXTA-1800.00-0881 | 17 | 0.000004 | 0.00098 | 0.000045 | 0.0004 | 0.036 | 52 | 0.016 | 3.2 | 0.0036 | 0.008 | 24 | 0.0003 | 0.012 | < 0,00001 | < 0,0009 | 0.00049 | 3.2 | < 0,00006 | 0.11 | 0.0033 | 0.000041 | 0.00027 | 0.0091 | < 0,002 |
| X19147AWA-1634.00-0376 | 8.8 | < 0,000003 | 0.00054 | 0.000012 | 0.0006 | 0.007 | 45 | 0.015 | 1.6 | 0.0024 | 0.010 | 37 | 0.0002 | 0.014 | 0.00006 | 0.0061 | 0.00069 | 4.4 | < 0,00006 | 0.14 | 0.0011 | 0.00001 | 0.0012 | 0.0069 | < 0,002 |
| X19156-1768.60-1296 | 364 | < 0,000003 | 0.001 | 0.00011 | 0.0003 | < 0,007 | 119 | 0.027 | 19 | 0.054 | 0.0059 | 9.4 | 0.0004 | < 0,003 | 0.00001 | 0.001 | 0.00057 | 2.8 | < 0,00006 | 11 | 0.00026 | 0.00016 | 0.00051 | 0.0039 | < 0,002 |
| X19140-1560.15-1641 | 17 | 0.00001 | 0.00065 | 0.00003 | 0.0003 | 0.044 | 68 | 0.022 | 3.2 | 0.007 | 0.0092 | 13 | 0.0005 | 0.013 | 0.00007 | 0.0018 | 0.00045 | 3.2 | < 0,00006 | 0.076 | 0.0046 | 0.000031 | 0.00095 | 0.0081 | < 0,002 |
| X19149A-2009.70-2213 | 71 | 0.000004 | 0.00023 | 0.000048 | 0.0005 | < 0,007 | 63 | 0.031 | 12 | 0.031 | 0.012 | 30 | 0.0004 | 0.007 | 0.00005 | 0.0016 | 0.00035 | 5.3 | < 0,00006 | 1.6 | 0.00028 | 0.000026 | 0.0012 | 0.0024 | < 0,002 |
| COMPTE | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| MINIMUM | 4.5 | < 0,000003 | 0.00014 | 0.000008 | < 0,0002 | < 0,007 | 35 | 0.0041 | 1.1 | 0.0014 | 0.0052 | 9.4 | < 0,0001 | < 0,003 | < 0,00001 | < 0,0009 | 0.00035 | 2.3 | < 0,00006 | 0.055 | 0.00026 | 0.00001 | 0.00027 | 0.0024 | < 0,002 |
| MAXIMUM | 364 | 0.00001 | 0.0015 | 0.00011 | 0.0008 | 0.044 | 119 | 0.031 | 19 | 0.054 | 0.012 | 37 | 0.0005 | 0.023 | 0.00032 | 0.0076 | 0.00078 | 5.3 | 0.00006 | 11 | 0.0046 | 0.00016 | 0.002 | 0.04 | 0.005 |
| MEDIANE | 14 | 0.000003 | 0.00067 | 0.000025 | 0.00035 | 0.009 | 54 | 0.016 | 2.7 | 0.0035 | 0.0082 | 24 | 0.0002 | 0.013 | 0.000045 | 0.0018 | 0.0006 | 3.2 | 0.00006 | 0.15 | 0.0010 | 0.000029 | 0.00069 | 0.0087 | 0.002 |
| MOYENNE | 46 | 0.0000043 | 0.00072 | 0.000031 | 0.00039 | 0.018 | 59 | 0.016 | 4.5 | 0.01 | 0.0084 | 24 | 0.00024 | 0.013 | 0.000059 | 0.0028 | 0.00058 | 3.5 | 0.00006 | 1.2 | 0.0016 | 0.000039 | 0.00088 | 0.012 | 0.0023 |
| ÉCART TYPE | 102 | 0.0000025 | 0.00036 | 0.000027 | 0.00018 | 0.015 | 22 | 0.0085 | 5.5 | 0.016 | 0.0021 | 7.7 | 0.00014 | 0.0062 | 0.000085 | 0.0022 | 0.00016 | 0.8 | NC | 3.2 | 0.0014 | 0.00004 | 0.00046 | 0.01 | NC |
| 25eme CENTILE | 8.6 | 0.000003 | 0.00057 | 0.000013 | 0.00028 | 0.007 | 46 | 0.0095 | 1.6 | 0.0025 | 0.0068 | 22 | 0.0001 | 0.0085 | 0.00001 | 0.0015 | 0.00047 | 3.0 | 0.00006 | 0.095 | 0.00073 | 0.000021 | 0.00061 | 0.0061 | 0.002 |
| 75eme CENTILE | 20 | 0.000004 | 0.00095 | 0.000034 | 0.0005 | 0.029 | 66 | 0.022 | 3.2 | 0.0058 | 0.01 | 27 | 0.00033 | 0.016 | 0.000053 | 0.0034 | 0.00073 | 3.8 | 0.00006 | 0.23 | 0.0027 | 0.000042 | 0.0012 | 0.013 | 0.002 |
| **Mineral SGR+** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19152W-1601.30-0332 | 4.4 | < 0,000003 | 0.00082 | 0.000014 | 0.0005 | 0.014 | 40 | 0.013 | 0.81 | 0.0011 | 0.0076 | 34 | < 0,0001 | 0.015 | 0.00004 | 0.0073 | 0.0011 | 4.1 | < 0,00006 | 0.09 | 0.0009 | 0.000008 | 0.00035 | 0.032 | < 0,002 |
| X19136W-1692.40-1182 | 10 | 0.000003 | 0.00056 | 0.00009 | 0.0002 | < 0,007 | 43 | 0.0094 | 1.6 | 0.0024 | 0.0071 | 32 | < 0,0001 | 0.008 | 0.00003 | 0.0034 | 0.00077 | 4.0 | < 0,00006 | 0.21 | 0.00054 | 0.000008 | 0.00087 | 0.0073 | < 0,002 |
| X19139WA-1778.85-0693 | 7.7 | < 0,000003 | 0.00066 | 0.000011 | 0.0002 | 0.007 | 47 | 0.007 | 2.5 | 0.0025 | 0.0057 | 23 | < 0,0001 | 0.006 | 0.00002 | 0.0036 | 0.00052 | 3.3 | < 0,00006 | 0.17 | 0.00047 | 0.000027 | 0.00054 | 0.011 | < 0,002 |
| X19143-1454.00-1452 | 16 | < 0,000003 | 0.0012 | 0.000021 | 0.0003 | < 0,007 | 65 | 0.014 | 4.0 | 0.0051 | 0.01 | 27 | 0.0002 | 0.007 | 0.00002 | 0.0009 | 0.00022 | 4.1 | < 0,00006 | 0.18 | 0.00057 | 0.000046 | 0.00048 | 0.0083 | < 0,002 |
| X19141AW-1622.15-0730 | 23 | 0.000004 | 0.00054 | 0.000021 | < 0,0002 | < 0,007 | 50 | 0.016 | 4.3 | 0.007 | 0.01 | 31 | 0.0002 | 0.011 | 0.00002 | < 0,0009 | 0.00033 | 3.6 | < 0,00006 | 0.54 | 0.00087 | 0.000029 | 0.0016 | 0.006 | < 0,002 |
| X19152W-1596.10-0327 | 13 | 0.000017 | 0.00048 | 0.000023 | 0.0008 | 0.007 | 31 | 0.012 | 2.5 | 0.0031 | 0.018 | 42 | 0.0001 | 0.014 | 0.00005 | 0.0064 | 0.0011 | 5.1 | < 0,00006 | 0.21 | 0.00043 | 0.000007 | 0.0021 | 0.01 | < 0,002 |
| X19142-1559.00-1528 | 26 | 0.000006 | 0.00032 | 0.000024 | 0.0007 | < 0,007 | 34 | 0.017 | 4.9 | 0.012 | 0.013 | 39 | 0.0002 | 0.005 | 0.00004 | 0.001 | 0.00071 | 5.0 | 0.00012 | 0.23 | 0.00044 | 0.000013 | 0.0017 | 0.0043 | < 0,002 |
| X19145WA-1901.00-0836 | 21 | 0.000005 | 0.0004 | 0.000024 | 0.0004 | < 0,007 | 75 | 0.019 | 4.9 | 0.0088 | 0.013 | 21 | 0.0003 | 0.006 | 0.00002 | 0.0017 | 0.00028 | 4.4 | < 0,00006 | 0.28 | 0.00078 | 0.000037 | 0.00046 | 0.0075 | < 0,002 |
| X19149A-2030.30-2239 | 72 | 0.000005 | 0.00024 | 0.000043 | 0.0003 | < 0,007 | 64 | 0.029 | 13 | 0.032 | 0.012 | 32 | 0.0004 | 0.006 | 0.00003 | 0.0015 | 0.00029 | 5.5 | 0.00008 | 1.8 | 0.00023 | 0.000027 | 0.0011 | 0.0023 | < 0,002 |
| X19150A-1450.65-1470 | 42 | 0.000005 | 0.0003 | 0.000085 | 0.0003 | < 0,007 | 47 | 0.017 | 5.9 | 0.031 | 0.012 | 34 | 0.0005 | 0.005 | 0.00003 | 0.0031 | 0.00083 | 4.1 | < 0,00006 | 0.41 | 0.00058 | 0.000017 | 0.0015 | 0.0029 | < 0,002 |
| COMPTE | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| MINIMUM | 4.4 | < 0,000003 | 0.00024 | 0.000011 | < 0,0002 | < 0,007 | 31 | 0.007 | 0.81 | 0.0011 | 0.0057 | 21 | < 0,0001 | 0.005 | 0.00002 | < 0,0009 | 0.00022 | 3.3 | < 0,00006 | 0.09 | 0.00023 | 0.000007 | 0.00035 | 0.0023 | < 0,002 |
| MAXIMUM | 72 | 0.000017 | 0.0012 | 0.00009 | 0.0008 | 0.014 | 75 | 0.029 | 13 | 0.032 | 0.018 | 42 | 0.0005 | 0.015 | 0.00005 | 0.0073 | 0.0011 | 5.5 | 0.00012 | 1.8 | 0.0009 | 0.000046 | 0.0021 | 0.032 | < 0,002 |
| MEDIANE | 18 | 0.0000045 | 0.00051 | 0.000024 | 0.0003 | 0.007 | 47 | 0.015 | 4.2 | 0.0061 | 0.011 | 32 | 0.0002 | 0.0065 | 0.00003 | 0.0024 | 0.00062 | 4.1 | 0.00006 | 0.22 | 0.00056 | 0.000022 | 0.0010 | 0.0074 | NC |
| MOYENNE | 23 | 0.0000054 | 0.00055 | 0.000036 | 0.00039 | 0.0077 | 50 | 0.015 | 4.4 | 0.01 | 0.011 | 31 | 0.00022 | 0.0083 | 0.00003 | 0.003 | 0.00061 | 4.3 | 0.000068 | 0.41 | 0.00058 | 0.000022 | 0.0011 | 0.0092 | NC |
| ÉCART TYPE | 20 | 0.0000042 | 0.00028 | 0.000029 | 0.00021 | 0.0022 | 14 | 0.0061 | 3.4 | 0.011 | 0.0035 | 6.5 | 0.00014 | 0.0037 | 0.000011 | 0.0023 | 0.00033 | 0.68 | 0.000019 | 0.49 | 0.00021 | 0.000013 | 0.00062 | 0.0086 | NC |
| 25eme CENTILE | 11 | 0.000003 | 0.00034 | 0.000021 | 0.00023 | 0.007 | 41 | 0.012 | 2.5 | 0.0027 | 0.0083 | 28 | 0.0001 | 0.006 | 0.00002 | 0.0011 | 0.0003 | 4.0 | 0.00006 | 0.19 | 0.00045 | 0.0000093 | 0.00049 | 0.0047 | NC |
| 75eme CENTILE | 25 | 0.000005 | 0.00064 | 0.000038 | 0.00048 | 0.007 | 60 | 0.017 | 4.9 | 0.011 | 0.013 | 34 | 0.00028 | 0.01 | 0.000038 | 0.0036 | 0.00082 | 4.8 | 0.00006 | 0.38 | 0.00073 | 0.000029 | 0.0016 | 0.0097 | NC |
| **Mineral SGR++** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19155-1653.20-0711 | 15 | 0.000006 | 0.00026 | 0.000022 | 0.0004 | < 0,007 | 15 | 0.0084 | 2.5 | 0.0058 | 0.0092 | 28 | 0.0004 | 0.005 | 0.00008 | 0.0019 | 0.001 | 8.1 | < 0,00006 | 0.18 | 0.00053 | < 0,000005 | 0.00067 | 0.0034 | < 0,002 |
| X19152W-1592.75-0322 | 19 | 0.000012 | 0.00073 | 0.000053 | 0.0007 | 0.051 | 56 | 0.017 | 3.1 | 0.0085 | 0.0091 | 22 | 0.0003 | 0.009 | 0.00024 | 0.0034 | 0.00037 | 3.3 | < 0,00006 | 0.12 | 0.005 | 0.000031 | 0.0017 | 0.0077 | < 0,002 |
| X18108AC-1277.00-0058 | 47 | 0.000011 | 0.00016 | 0.000067 | < 0,0002 | < 0,007 | 33 | 0.014 | 6.1 | 0.023 | 0.015 | 26 | 0.0006 | 0.004 | 0.00002 | 0.0025 | 0.00027 | 5.9 | < 0,00006 | 0.34 | 0.00011 | 0.000012 | 0.0018 | 0.0017 | < 0,002 |
| Y155013EXT-1663.00-0736 | 26 | 0.000007 | 0.00043 | 0.000038 | < 0,0002 | < 0,007 | 40 | 0.015 | 4.8 | 0.012 | 0.0075 | 33 | 0.0002 | 0.005 | 0.00005 | 0.0032 | 0.00045 | 3.9 | < 0,00006 | 0.37 | 0.00022 | 0.000021 | 0.0019 | 0.0041 | < 0,002 |
| X19157-1723.60-0551 | 156 | 0.000012 | 0.00018 | 0.00008 | < 0,0002 | 0.018 | 35 | 0.012 | 9.0 | 0.048 | 0.013 | 34 | 0.0005 | 0.006 | 0.00001 | 0.0024 | 0.0012 | 4.4 | < 0,00006 | 18 | 0.00012 | 0.000018 | 0.00064 | 0.00047 | < 0,002 |
| X19143-1451.25-1448 | 43 | 0.00001 | 0.00022 | 0.000062 | 0.0003 | < 0,007 | 41 | 0.018 | 11 | 0.024 | 0.01 | 37 | 0.0005 | 0.009 | 0.00005 | 0.0014 | 0.00049 | 6.5 | < 0,00006 | 0.64 | 0.00015 | 0.000013 | 0.002 | 0.0016 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 15 | 0.000006 | 0.00016 | 0.000022 | < 0,0002 | < 0,007 | 15 | 0.0084 | 2.5 | 0.0058 | 0.0075 | 22 | 0.0002 | 0.004 | 0.00001 | 0.0014 | 0.00027 | 3.3 | < 0,00006 | 0.12 | 0.00011 | < 0,000005 | 0.00064 | 0.00047 | < 0,002 |
| MAXIMUM | 156 | 0.000012 | 0.00073 | 0.00008 | 0.0007 | 0.051 | 56 | 0.018 | 11 | 0.048 | 0.015 | 37 | 0.0006 | 0.009 | 0.00024 | 0.0034 | 0.0012 | 8.1 | < 0,00006 | 18 | 0.005 | 0.000031 | 0.002 | 0.0077 | < 0,002 |
| MEDIANE | 34 | 0.000011 | 0.00024 | 0.000058 | 0.00025 | 0.007 | 37 | 0.015 | 5.4 | 0.017 | 0.0097 | 30 | 0.00045 | 0.0055 | 0.00005 | 0.0025 | 0.00047 | 5.2 | NC | 0.36 | 0.00019 | 0.000016 | 0.0018 | 0.0026 | NC |
| MOYENNE | 51 | 0.0000097 | 0.00033 | 0.000054 | 0.00033 | 0.016 | 37 | 0.014 | 6.1 | 0.02 | 0.011 | 30 | 0.00042 | 0.0063 | 0.000075 | 0.0025 | 0.00064 | 5.3 | NC | 3.2 | 0.001 | 0.000017 | 0.0015 | 0.0032 | NC |
| ÉCART TYPE | 53 | 0.0000026 | 0.00022 | 0.000021 | 0.0002 | 0.018 | 13 | 0.0035 | 3.3 | 0.015 | 0.0028 | 5.3 | 0.00015 | 0.0022 | 0.000085 | 0.00076 | 0.00038 | 1.8 | NC | 7.1 | 0.002 | 0.0000089 | 0.00063 | 0.0026 | NC |
| 25eme CENTILE | 20 | 0.0000078 | 0.00019 | 0.000042 | 0.0002 | 0.007 | 33 | 0.013 | 3.5 | 0.0093 | 0.0091 | 27 | 0.00033 | 0.005 | 0.000028 | 0.002 | 0.00039 | 4.0 | NC | 0.22 | 0.00013 | 0.000012 | 0.00092 | 0.0016 | NC |
| 75eme CENTILE | 46 | 0.000012 | 0.00039 | 0.000066 | 0.00038 | 0.015 | 41 | 0.017 | 8.2 | 0.024 | 0.012 | 34 | 0.0005 | 0.0083 | 0.000073 | 0.003 | 0.0009 | 6.3 | NC | 0.57 | 0.00045 | 0.00002 | 0.0019 | 0.0039 | NC |

Tableau D-8: Essais de lixiviation CTEU-9

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | pH | Conductivité | Alkalinité | $SO_4^{2-}$ | Cl | Br | Nitrite | Nitrate | Nitrate + Nitrite | F | Hg | Ag | Al | As | Ba | B | Be | Bi |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | µS/cm | mg/L as $CaCO_3$ | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES**[1] | | | | | **860** | | **0.06** | **300** | | **4.0** | **0.0000013** | **0.00062** | | **0.34** | **0.6** | **28** | | |
| EC[2] | | | | | 250 | | 1.0 | | 10 | 1.5 | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | 5.0 | | |
| *Effluent Final Dir. 019*[3] | *6-9.5* | | | | | | | | | | | | | *0.2* | | | | |
| **Dilution AGR** | | | | | | | | | | | | | | | | | | |
| X19156-1745.00-1266 | 8.9 | 248 | | 14 | 2.8 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.62 | < 0,00001 | 0.00007 | 1.7 | 0.0012 | 0.0099 | 0.009 | 0.000007 | 0.000077 |
| X19154-1588.00-0896 | 9.0 | 251 | | 16 | 3.6 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.69 | < 0,00001 | 0.0001 | 2.4 | 0.0087 | 0.018 | 0.01 | 0.00002 | 0.0002 |
| X19135W-1854.00-0912 | 8.2 | 451 | | 130 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.6 | < 0,00001 | 0.0001 | 0.33 | 0.0012 | 0.016 | 0.011 | < 0,000007 | < 0,000007 |
| X19135W-1917.00-0989 | 8.9 | 273 | | 25 | 2.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.98 | < 0,00001 | 0.00013 | 0.72 | 0.0018 | 0.003 | 0.01 | < 0,000007 | < 0,000007 |
| X19153-1721.00-1226 | 8.5 | 295 | | 43 | 3.1 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.62 | < 0,00001 | 0.0004 | 0.41 | 0.0036 | 0.0059 | 0.008 | < 0,000007 | 0.000039 |
| X19152W-1708.00-0590 | 8.1 | 496 | | 160 | 2.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.47 | < 0,00001 | 0.00009 | 0.19 | 0.0009 | 0.069 | 0.005 | < 0,000007 | < 0,000007 |
| COMPTE | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 8.1 | 248 | | 14 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.47 | < 0,00001 | 0.00007 | 0.19 | 0.0009 | 0.003 | 0.005 | < 0,000007 | < 0,000007 |
| MAXIMUM | 9.0 | 496 | | 160 | 3.6 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.98 | < 0,00001 | 0.0004 | 2.4 | 0.0087 | 0.069 | 0.011 | 0.00002 | 0.0002 |
| MEDIANE | 8.7 | 284 | | 34 | 2.5 | NC | NC | NC | NC | 0.62 | NC | 0.0001 | 0.56 | 0.0015 | 0.013 | 0.0095 | 0.000007 | 0.000023 |
| MOYENNE | 8.6 | 336 | | 65 | 2.6 | NC | NC | NC | NC | 0.66 | NC | 0.00015 | 0.95 | 0.0029 | 0.02 | 0.0088 | 0.0000092 | 0.000056 |
| ÉCART TYPE | 0.39 | 109 | | 64 | 0.66 | NC | NC | NC | NC | 0.17 | NC | 0.00012 | 0.88 | 0.003 | 0.025 | 0.0021 | 0.0000053 | 0.000075 |
| 25eme CENTILE | 8.2 | 257 | | 18 | 2.1 | NC | NC | NC | NC | 0.61 | NC | 0.000093 | 0.35 | 0.0012 | 0.0069 | 0.0083 | 0.000007 | 0.000007 |
| 75eme CENTILE | 8.9 | 412 | | 108 | 3.0 | NC | NC | NC | NC | 0.67 | NC | 0.00012 | 1.5 | 0.0032 | 0.017 | 0.01 | 0.000007 | 0.000068 |
| **Dilution SGR** | | | | | | | | | | | | | | | | | | |
| X19156-1797.00-1336 | 8.8 | 263 | | 33 | 2.4 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.68 | < 0,00001 | 0.00015 | 0.41 | 0.0022 | 0.002 | 0.007 | < 0,000007 | 0.000017 |
| X18127A-1428.00-0654 | 8.6 | 326 | | 43 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.42 | < 0,00001 | 0.00039 | 0.17 | 0.0078 | 0.13 | 0.011 | < 0,000007 | 0.000035 |
| X19147A-1603.00-1593 | 8.3 | 346 | | 76 | 4.6 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.65 | < 0,00001 | 0.00007 | 0.32 | 0.0011 | 0.045 | 0.011 | < 0,000007 | < 0,000007 |
| Y165037EXT-1717.00-0076 | 8.5 | 273 | | 25 | 2.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.73 | < 0,00001 | 0.00027 | 0.58 | 0.0072 | 0.0096 | 0.007 | < 0,000007 | < 0,000007 |
| X19149A-1999.00-2201 | 8.5 | 331 | | 34 | 4.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.93 | < 0,00001 | 0.00026 | 0.4 | 0.0012 | 0.0065 | 0.008 | < 0,000007 | < 0,000007 |
| X19156-1803.00-1343 | 8.2 | 393 | | 79 | 5.3 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.77 | < 0,00001 | 0.00026 | 0.25 | 0.0003 | 0.0044 | 0.008 | < 0,000007 | < 0,000007 |
| COMPTE | 6.0 | 6.0 | | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 8.2 | 263 | | 25 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.42 | < 0,00001 | 0.00007 | 0.17 | 0.0003 | 0.002 | 0.007 | < 0,000007 | < 0,000007 |
| MAXIMUM | 8.8 | 393 | | 79 | 5.3 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.93 | < 0,00001 | 0.00039 | 0.58 | 0.0078 | 0.13 | 0.011 | < 0,000007 | 0.000035 |
| MEDIANE | 8.5 | 329 | | 39 | 3.3 | NC | NC | NC | NC | 0.71 | NC | 0.00026 | 0.36 | 0.0017 | 0.008 | 0.008 | NC | 0.000007 |
| MOYENNE | 8.5 | 322 | | 48 | 3.5 | NC | NC | NC | NC | 0.7 | NC | 0.00023 | 0.35 | 0.0033 | 0.034 | 0.0087 | NC | 0.000013 |
| ÉCART TYPE | 0.22 | 48 | | 23 | 1.4 | NC | NC | NC | NC | 0.17 | NC | 0.00011 | 0.14 | 0.0033 | 0.052 | 0.0019 | NC | 0.000011 |
| 25eme CENTILE | 8.3 | 286 | | 33 | 2.3 | NC | NC | NC | NC | 0.66 | NC | 0.00018 | 0.27 | 0.0011 | 0.0049 | 0.0073 | NC | 0.000007 |
| 75eme CENTILE | 8.6 | 342 | | 68 | 4.5 | NC | NC | NC | NC | 0.76 | NC | 0.00027 | 0.41 | 0.006 | 0.036 | 0.01 | NC | 0.000015 |
| **Stérile AGR** | | | | | | | | | | | | | | | | | | |
| X19141AW-1557.75-0646 | 9.2 | 249 | | 12 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 1.1 | < 0,00001 | 0.00006 | 0.47 | 0.0006 | 0.0086 | 0.006 | < 0,000007 | < 0,000007 |
| X19151-1671.00-1628 | 8.3 | 218 | | 16 | 2.1 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.62 | < 0,00001 | 0.00009 | 1.8 | 0.0007 | 0.013 | 0.008 | < 0,000007 | 0.000044 |
| X19139-1738.00-1882 | 8.9 | 233 | | 15 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.61 | < 0,00001 | 0.00009 | 3.2 | 0.0014 | 0.017 | 0.006 | 0.000019 | 0.00016 |
| X19145-1736.00-1992 | 8.6 | 233 | | 17 | 2.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.69 | < 0,00001 | < 0,00005 | 1.9 | 0.0015 | 0.014 | 0.02 | < 0,000007 | 0.000054 |
| X18131-0777.00-0578 | 8.7 | 226 | | 15 | 2.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.5 | < 0,00001 | < 0,00005 | 1.1 | 0.013 | 0.018 | 0.017 | < 0,000007 | 0.00002 |
| Y155016EXT-1758.00-0804 | 8.4 | 266 | | 17 | 2.1 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.75 | < 0,00001 | 0.00012 | 2.6 | 0.0035 | 0.018 | 0.008 | 0.000012 | 0.000055 |
| Y155021EXTA-1724.00-0795 | 8.2 | 257 | | 21 | 6.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.69 | **0.00001** | < 0,00005 | 1.7 | 0.0009 | 0.023 | 0.011 | 0.00001 | 0.000038 |
| X19143-1265.10-1226 | 8.6 | 266 | | 20 | 4.8 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.62 | < 0,00001 | 0.00012 | 0.41 | 0.0004 | 0.019 | 0.01 | < 0,000007 | < 0,000007 |
| X19140-1518.00-1591 | 8.6 | 266 | | 18 | 2.6 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.6 | < 0,00001 | 0.00012 | 1.2 | 0.0011 | 0.011 | 0.007 | 0.000007 | 0.000012 |
| X19145WA-1677.00-0575 | 8.3 | 330 | | 58 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.63 | < 0,00001 | 0.00019 | 0.46 | 0.0019 | 0.0096 | 0.007 | < 0,000007 | < 0,000007 |
| X19149AWB-1844.00-0656 | 8.2 | 260 | | 22 | 2.4 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.6 | < 0,00001 | < 0,00005 | 1.2 | 0.004 | 0.0095 | 0.009 | < 0,000007 | 0.000049 |
| X18121-1189.00-0961 | 8.6 | 213 | | 15 | 4.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.57 | < 0,00001 | 0.00006 | 1.3 | 0.0027 | 0.012 | 0.009 | < 0,000007 | 0.00005 |
| X19136W-1478.00-0915 | 8.6 | 221 | | 16 | 3.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.55 | < 0,00001 | 0.00007 | 2.0 | 0.0032 | 0.012 | 0.009 | 0.000009 | 0.000043 |
| X18108AWC-1087.20-0196 | 8.5 | 335 | | 31 | 6.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.8 | **0.00001** | < 0,00005 | 0.98 | 0.0023 | 0.0088 | 0.013 | < 0,000007 | 0.00001 |
| X18127A-1122.00-0299 | 8.2 | 307 | | 27 | 4.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.62 | < 0,00001 | 0.00014 | 0.89 | 0.0006 | 0.028 | 0.008 | < 0,000007 | 0.000047 |
| X18121-1231.00-1009 | 8.4 | 281 | | 20 | 5.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.59 | < 0,00001 | < 0,00005 | 0.75 | 0.0025 | 0.0066 | 0.012 | < 0,000007 | 0.00002 |
| X19135-1719.00-1698 | 7.7 | 741 | | 300 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.51 | < 0,00001 | 0.0001 | 0.21 | 0.0005 | 0.044 | 0.008 | < 0,000007 | 0.000007 |
| X19150A-1326.00-1330 | 8.6 | 237 | | 16 | 2.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.52 | < 0,00001 | < 0,00005 | 1.4 | 0.0048 | 0.013 | 0.011 | < 0,000007 | 0.00002 |
| Y165037EXT-1663.00-0009 | 8.2 | 255 | | 21 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.57 | < 0,00001 | 0.0002 | 1.2 | 0.023 | 0.027 | 0.006 | 0.000008 | 0.000075 |
| X19149A-1906.00-2084 | 8.9 | 303 | | 31 | 4.6 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.6 | < 0,00001 | 0.00028 | 0.44 | 0.0036 | 0.012 | 0.007 | < 0,000007 | 0.000019 |
| X19148W-1824.00-0744 | 8.0 | 506 | | 160 | 3.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.45 | < 0,00001 | 0.00007 | 0.4 | 0.0008 | 0.032 | 0.008 | < 0,000007 | 0.000015 |
| X19147A-1466.00-1437 | 8.3 | 192 | | 13 | 2.8 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.63 | < 0,00001 | < 0,00005 | 2.0 | 0.0007 | 0.0081 | 0.013 | 0.00001 | 0.000087 |
| COMPTE | 22 | 22 | | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| MINIMUM | 7.7 | 192 | | 12 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.45 | < 0,00001 | < 0,00005 | 0.21 | 0.0004 | 0.0066 | 0.006 | < 0,000007 | < 0,000007 |
| MAXIMUM | 9.2 | 741 | | 300 | 6.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 1.1 | 0.00001 | 0.00028 | 3.2 | 0.023 | 0.044 | 0.02 | 0.000019 | 0.00016 |
| MEDIANE | 8.4 | 259 | | 19 | 2.9 | NC | NC | NC | NC | 0.61 | 0.00001 | 0.00007 | 1.2 | 0.0017 | 0.013 | 0.0085 | 0.000007 | 0.000029 |
| MOYENNE | 8.4 | 291 | | 40 | 3.2 | NC | NC | NC | NC | 0.63 | 0.00001 | 0.000096 | 1.3 | 0.0033 | 0.017 | 0.0097 | 0.0000082 | 0.000038 |
| ÉCART TYPE | 0.33 | 119 | | 66 | 1.4 | NC | NC | NC | NC | 0.13 | 0 | 0.000061 | 0.78 | 0.005 | 0.0093 | 0.0036 | 0.0000028 | 0.000035 |
| 25eme CENTILE | 8.2 | 233 | | 16 | 2.1 | NC | NC | NC | NC | 0.57 | 0.00001 | 0.00005 | 0.54 | 0.00073 | 0.01 | 0.0073 | 0.000007 | 0.000013 |
| 75eme CENTILE | 8.6 | 298 | | 26 | 4.2 | NC | NC | NC | NC | 0.63 | 0.00001 | 0.00012 | 1.8 | 0.0034 | 0.019 | 0.011 | 0.0000078 | 0.00005 |
| **Puits d'accès** | | | | | | | | | | | | | | | | | | |
| X19139-0887.00-0918 | 8.1 | 232 | | 23 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.7 | < 0,00001 | < 0,00005 | 1.6 | 0.0008 | 0.013 | 0.013 | 0.000011 | 0.000047 |
| X19140-0708.00-0706 | 8.2 | 296 | | 37 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.74 | < 0,00001 | 0.00015 | 1.1 | 0.0015 | 0.015 | 0.017 | 0.000007 | 0.000073 |
| X19157-0933.00-0984 | 8.2 | 259 | | 22 | 3.9 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.78 | < 0,00001 | < 0,00005 | 2.8 | 0.0017 | 0.037 | 0.015 | 0.000018 | 0.00017 |
| X18127W-0773.00-0369 | 8.8 | 263 | | 20 | 2.4 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.64 | < 0,00001 | < 0,00005 | 1.3 | 0.0016 | 0.018 | 0.01 | 0.000009 | 0.000024 |
| X19159-1392.00-1329 | 8.3 | 208 | | 12 | 2.0 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.63 | **0.00001** | 0.00006 | 3.3 | 0.0023 | 0.033 | 0.008 | 0.000013 | 0.00016 |
| X19148W-1752.00-0664 | 9.3 | 233 | | 11 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.61 | < 0,00001 | < 0,00005 | 2.7 | 0.017 | 0.051 | 0.006 | 0.000012 | 0.00016 |
| X19148-1583.00-1092 | 8.4 | 227 | | 19 | 5.2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.49 | < 0,00001 | < 0,00005 | 2.5 | 0.015 | 0.02 | 0.01 | 0.000014 | 0.000093 |
| X19149AWB-1297.00-0122 | 8.2 | 276 | | 28 | 6.3 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.78 | < 0,00001 | 0.00014 | 0.46 | 0.001 | 0.016 | 0.017 | < 0,000007 | 0.00003 |
| COMPTE | 8.0 | 8.0 | | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| MINIMUM | 8.1 | 208 | | 11 | < 2 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.49 | < 0,00001 | < 0,00005 | 0.46 | 0.0008 | 0.013 | 0.006 | < 0,000007 | 0.000024 |
| MAXIMUM | 9.3 | 296 | | 37 | 6.3 | < 3 | < 0.3 | < 0.6 | < 0.6 | 0.78 | 0.00001 | 0.00015 | 3.3 | 0.017 | 0.051 | 0.017 | 0.000018 | 0.00017 |
| MEDIANE | 8.3 | 246 | | 21 | 2.2 | NC | NC | NC | NC | 0.67 | 0.00001 | 0.00005 | 2.1 | 0.0017 | 0.019 | 0.012 | 0.000012 | 0.000083 |
| MOYENNE | 8.4 | 249 | | 22 | 3.2 | NC | NC | NC | NC | 0.67 | 0.00001 | 0.000075 | 2.0 | 0.0051 | 0.025 | 0.012 | 0.000011 | 0.000094 |
| ÉCART TYPE | 0.41 | 29 | | 8.4 | 1.7 | NC | NC | NC | NC | 0.099 | NC | 0.000043 | 1.0 | 0.0068 | 0.013 | 0.0041 | 0.0000037 | 0.000061 |
| 25eme CENTILE | 8.2 | 231 | | 17 | 2.0 | NC | NC | NC | NC | 0.63 | 0.00001 | 0.00005 | 1.3 | 0.0014 | 0.016 | 0.0095 | 0.0000085 | 0.000043 |
| 75eme CENTILE | 8.5 | 266 | | 24 | 4.2 | NC | NC | NC | NC | 0.75 | 0.00001 | 0.00008 | 2.7 | 0.0054 | 0.034 | 0.016 | 0.000013 | 0.00016 |

Notes:
"-" - Données inexistantes
NC - Statistique non calculée

1 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019.
Les critères applicables aux eaux souterraines varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.

2 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.

3 - Critère d'effluent final de la directive 019 sur l'industrie minière, MELCC,2012.

Tableau D-8: Essais de lixiviation CTEU-9

Zone East Gouldie
Mine Canadian Malartic

| Échantillon | Ca | Cd | Cr | Co | Cu | Fe | K | Li | Mg | Mn | Mo | Na | Ni | P | Pb | Sb | Se | Si | Sn | Sr | Ti | Tl | U | V | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **RES[1]** | | **0.0011** | **0.016** | **0.37** | **0.0073** | | | | | **2.3** | **29** | | **0.26** | **1** | **0.034** | **1.1** | **0.062** | | | | | | **0.32** | | **0.067** |
| EC [2] | | 0.005 | 0.05 | | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | | 0.01 | 0.006 | 0.01 | | | | | | 0.02 | | 5.0 |
| *Effluent Final Dir. 019*[3] | | | | | *0.3* | *3.0* | | | | | | | *0.5* | | *0.2* | | | | | | | | | | *0.5* |
| **Dilution AGR** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19156-1745.00-1266 | 2.5 | 0.000021 | 0.0037 | 0.00034 | 0.0017 | 0.7 | 49 | 0.0036 | 0.78 | 0.011 | 0.0051 | 17 | 0.0015 | 0.052 | 0.00058 | 0.0023 | 0.0019 | 3.5 | < 0,00006 | 0.015 | 0.048 | 0.000024 | 0.0021 | 0.033 | 0.005 |
| X19154-1588.00-0896 | 1.9 | 0.000023 | 0.0068 | 0.00072 | 0.0033 | 1.3 | 47 | 0.0064 | 0.87 | 0.019 | 0.0069 | 17 | 0.0031 | 0.054 | 0.0011 | 0.0036 | 0.0019 | 3.9 | 0.00006 | 0.0098 | 0.091 | 0.00003 | 0.0015 | 0.05 | 0.005 |
| X19135W-1854.00-0912 | 18 | < 0,000003 | 0.00068 | 0.000019 | 0.0004 | 0.008 | 74 | 0.031 | 2.6 | 0.003 | 0.0094 | 20 | 0.0001 | 0.011 | < 0,00001 | 0.0048 | 0.00074 | 3.3 | < 0,00006 | 0.12 | 0.00063 | 0.000035 | 0.00078 | 0.013 | 0.002 |
| X19135W-1917.00-0989 | 3.7 | 0.000006 | 0.0015 | 0.000021 | 0.0005 | 0.037 | 54 | 0.014 | 0.59 | 0.0013 | 0.0082 | 16 | 0.0002 | 0.029 | 0.00004 | 0.0017 | 0.0012 | 3.0 | < 0,00006 | 0.02 | 0.0026 | 0.00003 | 0.0011 | 0.034 | < 0,002 |
| X19153-1721.00-1226 | 6.2 | 0.000003 | 0.00086 | 0.000042 | 0.001 | 0.064 | 44 | 0.0089 | 1.1 | 0.0019 | 0.0086 | 26 | 0.0006 | 0.027 | 0.00008 | 0.0011 | 0.0014 | 3.0 | < 0,00006 | 0.04 | 0.0055 | 0.000023 | 0.0018 | 0.016 | < 0,002 |
| X19152W-1708.00-0590 | 33 | < 0,000003 | 0.00051 | 0.000018 | < 0,0002 | 0.007 | 57 | 0.021 | 8.3 | 0.011 | 0.0074 | 22 | < 0,0001 | 0.005 | 0.00003 | 0.0014 | 0.00059 | 3.1 | < 0,00006 | 1.3 | 0.00038 | 0.000036 | 0.0017 | 0.0049 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 1.9 | < 0,000003 | 0.00051 | 0.000018 | < 0,0002 | 0.007 | 44 | 0.0036 | 0.59 | 0.0013 | 0.0051 | 16 | < 0,0001 | 0.005 | < 0,00001 | 0.0011 | 0.00059 | 3.0 | < 0,00006 | 0.0098 | 0.00038 | 0.000023 | 0.00078 | 0.0049 | < 0,002 |
| MAXIMUM | 33 | 0.000023 | 0.0068 | 0.00072 | 0.0033 | 1.3 | 74 | 0.031 | 8.3 | 0.019 | 0.0094 | 26 | 0.0031 | 0.054 | 0.0011 | 0.0048 | 0.0019 | 3.9 | 0.00006 | 1.3 | 0.091 | 0.000036 | 0.0021 | 0.05 | 0.005 |
| MEDIANE | 5.0 | 0.0000045 | 0.0012 | 0.000032 | 0.00075 | 0.051 | 51 | 0.012 | 0.98 | 0.0068 | 0.0078 | 19 | 0.0004 | 0.028 | 0.00006 | 0.002 | 0.0013 | 3.2 | 0.00006 | 0.03 | 0.004 | 0.00003 | 0.0016 | 0.025 | 0.002 |
| MOYENNE | 11 | 0.0000098 | 0.0023 | 0.00019 | 0.0012 | 0.35 | 54 | 0.014 | 2.4 | 0.0078 | 0.0076 | 20 | 0.00093 | 0.03 | 0.00031 | 0.0025 | 0.0013 | 3.3 | 0.00006 | 0.24 | 0.025 | 0.00003 | 0.0015 | 0.025 | 0.003 |
| ÉCART TYPE | 12 | 0.0000095 | 0.0025 | 0.00029 | 0.0012 | 0.53 | 11 | 0.01 | 3.0 | 0.007 | 0.0015 | 3.7 | 0.0012 | 0.02 | 0.00045 | 0.0014 | 0.00054 | 0.36 | NC | 0.5 | 0.037 | 0.0000054 | 0.00048 | 0.017 | 0.0015 |
| 25eme CENTILE | 2.8 | 0.000003 | 0.00073 | 0.00002 | 0.00043 | 0.015 | 47 | 0.007 | 0.8 | 0.0021 | 0.007 | 17 | 0.00013 | 0.015 | 0.000033 | 0.0015 | 0.00086 | 3.0 | 0.00006 | 0.016 | 0.0011 | 0.000026 | 0.0012 | 0.014 | 0.002 |
| 75eme CENTILE | 15 | 0.000017 | 0.0032 | 0.00027 | 0.0015 | 0.54 | 56 | 0.019 | 2.2 | 0.011 | 0.0085 | 22 | 0.0013 | 0.046 | 0.00046 | 0.0033 | 0.0017 | 3.5 | 0.00006 | 0.1 | 0.037 | 0.000034 | 0.0018 | 0.034 | 0.0043 |
| **Dilution SGR** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19156-1797.00-1336 | 3.6 | 0.000004 | 0.00086 | 0.000012 | 0.0003 | 0.007 | 39 | 0.012 | 0.56 | 0.00081 | 0.0059 | 24 | 0.0001 | 0.006 | 0.00003 | 0.0019 | 0.00082 | 3.4 | < 0,00006 | 0.031 | 0.0007 | 0.000018 | 0.00093 | 0.033 | < 0,002 |
| X18127A-1428.00-0654 | 7.9 | < 0,000003 | 0.00062 | 0.000022 | 0.0007 | < 0,007 | 36 | 0.01 | 1.5 | 0.0016 | 0.0072 | 33 | 0.0002 | 0.016 | 0.00008 | 0.015 | 0.0016 | 5.6 | < 0,00006 | 0.19 | 0.00031 | 0.000016 | 0.00074 | 0.017 | < 0,002 |
| X19147A-1603.00-1593 | 18 | < 0,000003 | 0.00065 | 0.000025 | 0.0002 | 0.051 | 44 | 0.0065 | 2.8 | 0.0028 | 0.0097 | 28 | 0.0003 | 0.01 | 0.00004 | 0.0015 | 0.00049 | 3.9 | < 0,00006 | 1.6 | 0.0037 | 0.00002 | 0.00055 | 0.0092 | < 0,002 |
| Y165037EXT-1717.00-0076 | 4.0 | 0.000004 | 0.0014 | 0.000057 | 0.0004 | 0.064 | 42 | 0.005 | 0.76 | 0.0018 | 0.0072 | 26 | 0.0004 | 0.019 | 0.00005 | 0.0054 | 0.0012 | 2.9 | < 0,00006 | 0.032 | 0.005 | 0.000017 | 0.0007 | 0.033 | < 0,002 |
| X19149A-1999.00-2201 | 7.3 | < 0,000003 | 0.00085 | 0.000012 | 0.0002 | < 0,007 | 63 | 0.016 | 2.1 | 0.0021 | 0.0084 | 22 | 0.0001 | 0.012 | 0.00002 | 0.0013 | 0.00079 | 3.5 | < 0,00006 | 0.048 | 0.00083 | 0.000026 | 0.0011 | 0.015 | < 0,002 |
| X19156-1803.00-1343 | 13 | 0.000005 | 0.0011 | 0.000024 | 0.0003 | 0.008 | 58 | 0.012 | 2.4 | 0.0033 | 0.0063 | 24 | 0.0002 | 0.006 | 0.00001 | < 0,0009 | 0.00061 | 2.9 | < 0,00006 | 0.083 | 0.00091 | 0.000035 | 0.0013 | 0.0098 | < 0,002 |
| COMPTE | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| MINIMUM | 3.6 | < 0,000003 | 0.00062 | 0.000012 | 0.0002 | < 0,007 | 36 | 0.005 | 0.56 | 0.00081 | 0.0059 | 22 | 0.0001 | 0.006 | 0.00001 | < 0,0009 | 0.00049 | 2.9 | < 0,00006 | 0.031 | 0.00031 | 0.000016 | 0.00055 | 0.0092 | < 0,002 |
| MAXIMUM | 18 | 0.000005 | 0.0014 | 0.000057 | 0.0007 | 0.064 | 63 | 0.016 | 2.8 | 0.0033 | 0.0097 | 33 | 0.0004 | 0.019 | 0.00008 | 0.015 | 0.0016 | 5.6 | < 0,00006 | 1.6 | 0.005 | 0.000035 | 0.0013 | 0.033 | < 0,002 |
| MEDIANE | 7.6 | 0.0000035 | 0.00086 | 0.000023 | 0.0003 | 0.0075 | 43 | 0.011 | 1.8 | 0.002 | 0.0072 | 25 | 0.0002 | 0.011 | 0.000035 | 0.0017 | 0.00081 | 3.5 | NC | 0.065 | 0.00087 | 0.000019 | 0.00083 | 0.016 | NC |
| MOYENNE | 8.9 | 0.0000037 | 0.0009 | 0.000025 | 0.00035 | 0.024 | 47 | 0.01 | 1.7 | 0.0021 | 0.0075 | 26 | 0.00022 | 0.012 | 0.000038 | 0.0043 | 0.00092 | 3.7 | NC | 0.33 | 0.0019 | 0.000022 | 0.00088 | 0.02 | NC |
| ÉCART TYPE | 5.6 | 0.00000082 | 0.00028 | 0.000017 | 0.00019 | 0.026 | 11 | 0.004 | 0.91 | 0.00088 | 0.0014 | 4.0 | 0.00012 | 0.0053 | 0.000025 | 0.0053 | 0.00042 | 1.0 | NC | 0.62 | 0.0019 | 0.0000073 | 0.00028 | 0.011 | NC |
| 25eme CENTILE | 4.8 | 0.000003 | 0.0007 | 0.000015 | 0.00023 | 0.007 | 40 | 0.0074 | 0.95 | 0.0016 | 0.0065 | 24 | 0.00013 | 0.007 | 0.000023 | 0.0014 | 0.00066 | 3.0 | NC | 0.036 | 0.00073 | 0.000017 | 0.00071 | 0.011 | NC |
| 75eme CENTILE | 12 | 0.000004 | 0.001 | 0.000025 | 0.00038 | 0.04 | 54 | 0.012 | 2.3 | 0.0026 | 0.0081 | 27 | 0.00028 | 0.015 | 0.000048 | 0.0045 | 0.0011 | 3.8 | NC | 0.17 | 0.003 | 0.000025 | 0.001 | 0.029 | NC |
| **Stérile AGR** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19141AW-1557.75-0646 | 2.3 | < 0,000003 | 0.004 | 0.000009 | 0.0002 | 0.019 | 70 | 0.01 | 0.56 | 0.00072 | 0.0018 | 7.6 | < 0,0001 | 0.019 | 0.00002 | 0.0016 | 0.00055 | 3.8 | < 0,00006 | 0.026 | 0.0015 | 0.000051 | 0.00012 | 0.051 | < 0,002 |
| X19151-1671.00-1628 | 3.0 | < 0,000003 | 0.0036 | 0.00036 | 0.0011 | 0.56 | 34 | 0.0027 | 0.89 | 0.005 | 0.008 | 17 | 0.0013 | 0.045 | 0.00035 | 0.0039 | 0.00094 | 2.9 | < 0,00006 | 0.012 | 0.024 | 0.000024 | 0.0017 | 0.023 | < 0,002 |
| X19139-1738.00-1882 | 1.8 | 0.000017 | 0.0073 | 0.0010 | 0.0033 | 2.0 | 55 | 0.0067 | 0.8 | 0.02 | 0.0025 | 12 | 0.0033 | 0.084 | 0.0012 | 0.0054 | 0.001 | 4.7 | 0.00009 | 0.0083 | 0.097 | 0.000038 | 0.0014 | 0.039 | **0.11** |
| X19145-1736.00-1992 | 2.8 | < 0,000003 | 0.0036 | 0.00038 | 0.0012 | 0.65 | 50 | 0.0065 | 0.78 | 0.0082 | 0.0049 | 14 | 0.0018 | 0.048 | 0.00058 | 0.0012 | 0.0024 | 4.5 | 0.00007 | 0.027 | 0.055 | 0.000023 | 0.0013 | 0.035 | 0.002 |
| X18131-0777.00-0578 | 3.3 | 0.000006 | 0.0041 | 0.00017 | 0.0011 | 0.45 | 40 | 0.037 | 0.47 | 0.0061 | 0.0049 | 17 | 0.0008 | 0.038 | 0.00034 | 0.0083 | 0.001 | 4.6 | < 0,00006 | 0.016 | 0.026 | 0.000011 | 0.0031 | 0.051 | < 0,002 |
| Y155016EXT-1758.00-0804 | 3.8 | 0.000011 | 0.0056 | 0.00055 | 0.0017 | 0.91 | 51 | 0.0073 | 1.4 | 0.016 | 0.0086 | 18 | 0.0025 | 0.076 | 0.0005 | 0.0022 | 0.0012 | 3.6 | < 0,00006 | 0.023 | 0.058 | 0.000046 | 0.00087 | 0.03 | 0.003 |
| Y155021EXTA-1724.00-0795 | 4.2 | 0.000008 | 0.0067 | 0.00052 | 0.0011 | 1.1 | 43 | 0.011 | 1.4 | 0.014 | 0.01 | 21 | 0.0022 | 0.052 | 0.00062 | 0.0026 | 0.0011 | 3.7 | < 0,00006 | 0.043 | 0.069 | 0.000038 | 0.00096 | 0.026 | 0.004 |
| X19143-1265.10-1226 | 5.1 | < 0,000003 | 0.0015 | 0.000012 | 0.0002 | 0.018 | 58 | 0.018 | 1.0 | 0.0022 | 0.0036 | 15 | 0.0002 | 0.02 | 0.00006 | 0.0036 | 0.0007 | 3.7 | < 0,00006 | 0.039 | 0.0015 | 0.00002 | 0.00045 | 0.025 | < 0,002 |
| X19140-1518.00-1591 | 4.6 | 0.000003 | 0.0025 | 0.00015 | 0.0005 | 0.44 | 45 | 0.0082 | 1.3 | 0.0073 | 0.0061 | 20 | 0.0008 | 0.035 | 0.00037 | 0.0027 | 0.00065 | 3.2 | < 0,00006 | 0.036 | 0.022 | 0.000029 | 0.001 | 0.016 | < 0,002 |
| X19145WA-1677.00-0575 | 8.7 | < 0,000003 | 0.0018 | 0.000042 | 0.0003 | 0.1 | 64 | 0.021 | 1.4 | 0.0032 | 0.016 | 20 | 0.0003 | 0.022 | 0.00008 | 0.0012 | 0.0013 | 3.1 | < 0,00006 | 0.039 | 0.011 | 0.000011 | 0.0007 | 0.019 | < 0,002 |
| X19149AWB-1844.00-0656 | 4.0 | 0.000004 | 0.003 | 0.00025 | 0.0029 | 0.39 | 46 | 0.011 | 0.84 | 0.0054 | 0.019 | 17 | 0.0009 | 0.032 | 0.00039 | 0.0044 | 0.0012 | 2.7 | < 0,00006 | 0.019 | 0.022 | 0.000031 | 0.0022 | 0.028 | 0.002 |
| X18121-1189.00-0961 | 3.2 | 0.000017 | 0.0041 | 0.00033 | 0.0013 | 0.57 | 32 | 0.0071 | 0.86 | 0.0079 | 0.0055 | 21 | 0.0013 | 0.067 | 0.00057 | 0.0031 | 0.0012 | 3.3 | < 0,00006 | 0.017 | 0.033 | 0.000021 | 0.002 | 0.028 | 0.002 |
| X19136W-1478.00-0915 | 3.8 | 0.000005 | 0.0036 | 0.00023 | 0.0016 | 0.62 | 40 | 0.0087 | 0.68 | 0.0092 | 0.0048 | 14 | 0.0014 | 0.054 | 0.00067 | 0.0013 | 0.0013 | 3.8 | < 0,00006 | 0.019 | 0.039 | 0.000021 | 0.0017 | 0.031 | 0.002 |
| X18108AWC-1087.20-0196 | 4.6 | 0.000009 | 0.0031 | 0.000081 | 0.0005 | 0.16 | 65 | 0.011 | 0.8 | 0.0025 | 0.0046 | 18 | 0.0004 | 0.012 | 0.00042 | 0.0033 | 0.00091 | 2.6 | < 0,00006 | 0.029 | 0.0095 | 0.000026 | 0.0025 | 0.029 | < 0,002 |
| X18127A-1122.00-0299 | 6.4 | 0.00001 | 0.0028 | 0.00022 | 0.001 | 0.55 | 51 | 0.043 | 1.5 | 0.0075 | 0.01 | 19 | 0.0011 | 0.029 | 0.00034 | 0.0035 | 0.0007 | 4.6 | < 0,00006 | 0.039 | 0.036 | 0.000014 | 0.0022 | 0.016 | 0.002 |
| X18121-1231.00-1009 | 7.7 | 0.000012 | 0.0012 | 0.000049 | 0.0008 | 0.093 | 47 | 0.0058 | 1.7 | 0.0029 | 0.0066 | 16 | 0.0004 | 0.016 | 0.00023 | 0.0031 | 0.0011 | 2.7 | < 0,00006 | 0.045 | 0.0036 | 0.000023 | 0.0035 | 0.011 | < 0,002 |
| X19135-1719.00-1698 | 84 | < 0,000003 | 0.0004 | 0.000032 | 0.001 | < 0,007 | 73 | 0.025 | 5.4 | 0.0065 | 0.013 | 23 | 0.0002 | 0.003 | 0.00002 | 0.0023 | 0.0012 | 3.6 | < 0,00006 | 0.53 | 0.00044 | 0.000049 | 0.00067 | 0.0054 | 0.008 |
| X19150A-1326.00-1330 | 3.6 | 0.000008 | 0.0039 | 0.00022 | 0.0011 | 0.46 | 44 | 0.03 | 0.54 | 0.0086 | 0.0058 | 16 | 0.001 | 0.035 | 0.00025 | 0.0042 | 0.00087 | 3.1 | < 0,00006 | 0.014 | 0.037 | 0.000015 | 0.0034 | 0.05 | < 0,002 |
| Y165037EXT-1663.00-0009 | 3.9 | 0.00002 | 0.0059 | 0.00047 | 0.0017 | 0.75 | 40 | 0.0081 | 1.3 | 0.013 | 0.0099 | 22 | 0.0019 | 0.052 | 0.00071 | 0.0027 | 0.0011 | 4.1 | < 0,00006 | 0.026 | 0.053 | 0.000018 | 0.0018 | 0.024 | 0.003 |
| X19149A-1906.00-2084 | 5.8 | < 0,000003 | 0.00076 | 0.000013 | 0.0005 | 0.022 | 50 | 0.024 | 1.1 | 0.0015 | 0.0074 | 24 | 0.0002 | 0.029 | 0.00006 | 0.0021 | 0.00095 | 3.8 | < 0,00006 | 0.039 | 0.0021 | 0.000014 | 0.00079 | 0.023 | < 0,002 |
| X19148W-1824.00-0744 | 39 | 0.000003 | 0.00078 | 0.000044 | 0.0012 | 0.043 | 66 | 0.032 | 4.1 | 0.0035 | 0.013 | 18 | 0.0004 | 0.01 | 0.00008 | 0.0017 | 0.00057 | 3.2 | < 0,00006 | 0.19 | 0.0034 | 0.000033 | 0.00097 | 0.0061 | < 0,002 |
| X19147A-1466.00-1437 | 2.8 | < 0,000003 | 0.0046 | 0.00042 | 0.0009 | 0.84 | 37 | 0.0016 | 1.0 | 0.0095 | 0.0061 | 14 | 0.0019 | 0.045 | 0.00067 | 0.0035 | 0.0014 | 3.2 | < 0,00006 | 0.014 | 0.033 | 0.000022 | 0.0023 | 0.023 | 0.003 |
| COMPTE | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| MINIMUM | 1.8 | < 0,000003 | 0.0004 | 0.000009 | 0.0002 | < 0,007 | 32 | 0.0016 | 0.47 | 0.00072 | 0.0018 | 7.6 | < 0,0001 | 0.003 | 0.00002 | 0.0012 | 0.00055 | 2.6 | < 0,00006 | 0.0083 | 0.00044 | 0.000011 | 0.00012 | 0.0054 | < 0,002 |
| MAXIMUM | 84 | 0.00002 | 0.0073 | 0.0010 | 0.0033 | 2.0 | 73 | 0.043 | 5.4 | 0.02 | 0.019 | 24 | 0.0033 | 0.084 | 0.0012 | 0.0083 | 0.0024 | 4.7 | 0.00009 | 0.53 | 0.097 | 0.000051 | 0.0035 | 0.051 | 0.11 |
| MEDIANE | 4.0 | 0.0000045 | 0.0036 | 0.00022 | 0.0011 | 0.45 | 49 | 0.01 | 1.0 | 0.0069 | 0.0064 | 18 | 0.00095 | 0.035 | 0.00036 | 0.0029 | 0.0011 | 3.6 | 0.00006 | 0.027 | 0.025 | 0.000023 | 0.0016 | 0.025 | 0.002 |
| MOYENNE | 9.5 | 0.0000071 | 0.0034 | 0.00025 | 0.0011 | 0.49 | 50 | 0.015 | 1.3 | 0.0073 | 0.0078 | 17 | 0.0011 | 0.037 | 0.00039 | 0.0031 | 0.0011 | 3.6 | 0.000062 | 0.057 | 0.029 | 0.000026 | 0.0016 | 0.027 | 0.0073 |
| ÉCART TYPE | 18 | 0.0000053 | 0.0019 | 0.00024 | 0.00077 | 0.47 | 12 | 0.012 | 1.2 | 0.0049 | 0.0043 | 3.8 | 0.00087 | 0.021 | 0.00029 | 0.0016 | 0.00038 | 0.63 | 0.0000066 | 0.11 | 0.026 | 0.000012 | 0.00095 | 0.013 | 0.022 |
| 25eme CENTILE | 3.2 | 0.000003 | 0.002 | 0.000045 | 0.00058 | 0.095 | 41 | 0.0072 | 0.8 | 0.0032 | 0.0049 | 15 | 0.0004 | 0.021 | 0.00012 | 0.0021 | 0.00088 | 3.1 | 0.00006 | 0.018 | 0.0051 | 0.000019 | 0.00089 | 0.02 | 0.002 |
| 75eme CENTILE | 5.6 | 0.0000098 | 0.0041 | 0.00038 | 0.0013 | 0.64 | 58 | 0.023 | 1.4 | 0.009 | 0.01 | 20 | 0.0017 | 0.051 | 0.00058 | 0.0036 | 0.0012 | 3.8 | 0.00006 | 0.039 | 0.038 | 0.000033 | 0.0022 | 0.031 | 0.0028 |
| **Puits d'accès** | | | | | | | | | | | | | | | | | | | | | | | | | |
| X19139-0887.00-0918 | 4.5 | 0.000012 | 0.0065 | 0.00056 | 0.002 | 1.1 | 54 | 0.017 | 1.1 | 0.014 | 0.0069 | 16 | 0.0022 | 0.058 | 0.00044 | 0.0045 | 0.00044 | 3.7 | 0.00009 | 0.017 | 0.073 | 0.000028 | 0.0016 | 0.037 | 0.005 |
| X19140-0708.00-0706 | 5.1 | 0.000013 | 0.0035 | 0.00026 | 0.001 | 0.55 | 52 | 0.012 | 1.4 | 0.0058 | 0.044 | 17 | 0.0014 | 0.027 | 0.00045 | 0.0037 | 0.0011 | 3.6 | < 0,00006 | 0.03 | 0.029 | 0.000043 | 0.0035 | 0.02 | 0.002 |
| X19157-0933.00-0984 | 2.4 | 0.000015 | 0.015 | 0.0015 | 0.003 | 2.1 | 43 | 0.0063 | 1.7 | 0.025 | 0.0095 | 22 | 0.006 | 0.066 | 0.0016 | 0.0018 | 0.0012 | 4.7 | < 0,00006 | 0.016 | 0.14 | 0.000049 | 0.001 | 0.042 | 0.006 |
| X18127W-0773.00-0369 | 3.4 | 0.000003 | 0.0033 | 0.00026 | 0.001 | 0.57 | 47 | 0.023 | 0.62 | 0.007 | 0.0044 | 18 | 0.0011 | 0.039 | 0.00032 | 0.0028 | 0.0013 | 4.1 | < 0,00006 | 0.019 | 0.033 | 0.00003 | 0.0025 | 0.04 | < 0,002 |
| X19159-1392.00-1329 | 1.4 | 0.000015 | 0.012 | 0.0018 | 0.0052 | 2.3 | 39 | 0.013 | 1.4 | 0.027 | 0.0045 | 16 | 0.005 | 0.095 | 0.0017 | 0.0021 | 0.0011 | 4.6 | < 0,00006 | 0.0068 | 0.14 | 0.000039 | 0.0011 | 0.047 | 0.007 |
| X19148W-1752.00-0664 | 1.8 | 0.000034 | 0.014 | 0.0021 | 0.0061 | 2.6 | 46 | 0.016 | 1.5 | 0.036 | 0.0042 | 18 | 0.006 | 0.12 | 0.0015 | 0.0052 | 0.00096 | 7.0 | 0.0001 | 0.0084 | 0.17 | 0.000027 | 0.00075 | 0.064 | 0.007 |
| X19148-1583.00-1092 | 3.4 | 0.000005 | 0.0066 | 0.00067 | 0.0021 | 1.3 | 41 | 0.013 | 1.1 | 0.017 | 0.0092 | 19 | 0.0034 | 0.063 | 0.00079 | 0.0046 | 0.0011 | 4.8 | < 0,00006 | 0.024 | 0.075 | 0.000028 | 0.0011 | 0.031 | 0.004 |
| X19149AWB-1297.00-0122 | 6.4 | 0.000006 | 0.0031 | 0.00047 | 0.001 | 0.27 | 35 | 0.0036 | 1.7 | 0.0048 | 0.01 | 27 | 0.0011 | 0.034 | 0.00014 | < 0,0009 | 0.0011 | 4.0 | 0.00008 | 0.066 | 0.021 | 0.000023 | 0.00085 | 0.017 | < 0,002 |
| COMPTE | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |
| MINIMUM | 1.4 | 0.000003 | 0.0031 | 0.00026 | 0.001 | 0.27 | 35 | 0.0036 | 0.62 | 0.0048 | 0.0042 | 16 | 0.0011 | 0.027 | 0.00014 | < 0,0009 | 0.00044 | 3.6 | < 0,00006 | 0.0068 | 0.021 | 0.000023 | 0.00075 | 0.017 | < 0,002 |
| MAXIMUM | 6.4 | 0.000034 | 0.015 | 0.0021 | 0.0061 | 2.6 | 54 | 0.023 | 1.7 | 0.036 | 0.044 | 27 | 0.006 | 0.12 | 0.0017 | 0.0052 | 0.0013 | 7.0 | 0.0001 | 0.066 | 0.17 | 0.000049 | 0.0035 | 0.064 | 0.007 |
| MEDIANE | 3.4 | 0.000013 | 0.0065 | 0.00062 | 0.0021 | 1.2 | 44 | 0.013 | 1.4 | 0.015 | 0.0081 | 18 | 0.0028 | 0.061 | 0.00062 | 0.0033 | 0.0011 | 4.3 | 0.00006 | 0.018 | 0.074 | 0.000029 | 0.0011 | 0.038 | 0.0045 |
| MOYENNE | 3.6 | 0.000013 | 0.008 | 0.00095 | 0.0027 | 1.3 | 45 | 0.013 | 1.3 | 0.017 | 0.012 | 19 | 0.0033 | 0.063 | 0.00087 | 0.0032 | 0.001 | 4.6 | 0.000071 | 0.023 | 0.084 | 0.000033 | 0.0016 | 0.037 | 0.0044 |
| ÉCART TYPE | 1.7 | 0.0000097 | 0.0049 | 0.00073 | 0.002 | 0.88 | 6.4 | 0.006 | 0.37 | 0.011 | 0.013 | 3.8 | 0.0021 | 0.033 | 0.00063 | 0.0015 | 0.00026 | 1.1 | 0.000016 | 0.019 | 0.056 | 0.0000091 | 0.00098 | 0.015 | 0.0022 |
| 25eme CENTILE | 2.3 | 0.0000058 | 0.0035 | 0.00042 | 0.001 | 0.56 | 41 | 0.011 | 1.1 | 0.0067 | 0.0045 | 17 | 0.0013 | 0.038 | 0.00041 | 0.002 | 0.001 | 3.9 | 0.00006 | 0.014 | 0.032 | 0.000028 | 0.00098 | 0.028 | 0.002 |
| 75eme CENTILE | 4.7 | 0.000015 | 0.012 | 0.0015 | 0.0036 | 2.2 | 48 | 0.016 | 1.6 | 0.025 | 0.0097 | 19 | 0.0053 | 0.073 | 0.0015 | 0.0045 | 0.0011 | 4.8 | 0.000083 | 0.026 | 0.14 | 0.00004 | 0.0019 | 0.044 | 0.0063 |

Notes:
"-" - Données inexistantes
NC - Statistique non calculée
1 - RES: critère d'eau souterraine- r
Les critères applicables aux eaux so
en utilisant une dureté standard d

2 - EC: Critère d'eau souterraine- e
3 - Critère d'effluent final de la

**ANNEXE E**

# Résultats des tests cinétiques (tableaux et figures)

Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | pH | Acidité | Alcalinité | Conductivité | Solides dissous totaux | Bromure | Fluorure | Chlorure | Sulfate | Nitrite (as N) | Nitrate (as N) | Nitrate + Nitrite (as N) | Phosphore (réactif total) | Mercure | Argent | Aluminum | Arsenic | Baryum | Beryllium | Bore | Bismuth | Calcium | Cadmium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | no unit | mg/L as CaCO3 | mg/L as CaCO3 | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.05 | 2.0 | 2.0 | 2.0 | 30 | 0.3 | 0.06 | 0.2 | 0.2 | 0.03 | 0.06 | 0.06 | 0.03 | 0.00001 | 0.00005 | 0.001 | 0.0002 | 0.00002 | 0.000007 | 0.002 | 0.000007 | 0.01 | 0.000003 |
| | | | | | | | | | RES[2] | | | | | | | 4.0 | 860 | | 0.06 | 300 | | 1.0 | 0.0000013 | 0.00062 | | 0.34 | 0.6 | | 28 | | | 0.0011 |
| | | | | | | | | | EC[3] | | | | | | | 1.5 | 250 | | 1.0 | | | | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | | 5.0 | | | 0.005 |
| | | | | | | | | | Effluent final Dir. 019[4] | *6-9.5* | | | | | | | | | | | | | | | | *0.2* | | | | | | |
| Minerai AGR | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 768 | | 9.2 | < 2 | 28 | 94 | 74 | < 0.3 | < 0.06 | 2.6 | 18 | < 0.03 | < 0.06 | < 0.06 | 0.060 | < 0.00001 | < 0.00005 | 0.031 | 0.0008 | 0.0021 | < 0.000007 | 0.006 | < 0.000007 | 7.2 | 0.000003 |
| Minerai AGR | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 970 | | 8.4 | < 2 | 17 | 99 | 51 | < 0.3 | < 0.06 | 2.0 | 21 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.045 | 0.0006 | 0.0023 | < 0.000007 | 0.002 | < 0.000007 | 8.4 | < 0.000003 |
| Minerai AGR | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 976 | | 8.2 | < 2 | 13 | 91 | 37 | < 0.3 | < 0.06 | 1.6 | 22 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.031 | 0.0004 | 0.0028 | < 0.000007 | < 0.002 | < 0.000007 | 8.0 | 0.000003 |
| Minerai AGR | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 946 | | 8.7 | < 2 | 13 | 87 | 57 | < 0.3 | < 0.06 | 1.1 | 21 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.036 | 0.0003 | 0.0027 | < 0.000007 | < 0.002 | < 0.000007 | 8.3 | 0.000004 |
| Minerai AGR | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 898 | | 9.0 | < 2 | 12 | 84 | 54 | < 0.3 | < 0.06 | 0.7 | 23 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.032 | 0.0002 | 0.0018 | < 0.000007 | < 0.002 | < 0.000007 | 9.3 | 0.000005 |
| Minerai AGR | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 962 | | 7.3 | < 2 | 16 | 92 | 51 | < 0.3 | < 0.06 | 0.8 | 23 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.041 | 0.0003 | 0.0027 | < 0.000007 | < 0.002 | < 0.000007 | 9.2 | 0.000006 |
| Minerai AGR | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 938 | | 8.1 | < 2 | 10 | 81 | 46 | < 0.3 | < 0.06 | 0.6 | 19 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.036 | 0.0004 | 0.0021 | < 0.000007 | 0.013 | 0.000018 | 8.2 | 0.000007 |
| Minerai AGR | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 909 | | 8.5 | < 2 | 12 | 78 | 31 | < 0.3 | < 0.06 | 0.5 | 19 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | 0.0002 | 0.002 | < 0.000007 | < 0.002 | < 0.000007 | 8.0 | 0.000009 |
| Minerai AGR | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 925 | | 8.4 | < 2 | 11 | 70 | 43 | < 0.3 | < 0.06 | 0.5 | 17 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.031 | 0.0003 | 0.0014 | < 0.000007 | 0.002 | < 0.000007 | 7.8 | 0.000006 |
| Minerai AGR | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 927 | | 7.4 | < 2 | 10 | 71 | < 30 | < 0.3 | < 0.06 | 0.4 | 16 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | 0.0004 | 0.0018 | < 0.000007 | 0.004 | < 0.000007 | 6.9 | < 0.000003 |
| Minerai AGR | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 934 | | 7.3 | < 2 | 12 | 66 | 43 | < 0.3 | < 0.06 | 0.5 | 13 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.042 | 0.0002 | 0.0019 | < 0.000007 | < 0.002 | < 0.000007 | 6.6 | 0.000003 |
| Minerai AGR | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 921 | | 7.6 | < 2 | 10 | 62 | < 30 | < 0.3 | < 0.06 | 0.3 | 14 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | < 0.0002 | 0.0021 | < 0.000007 | < 0.002 | 0.000009 | 7.1 | 0.000004 |
| Minerai AGR | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 896 | | 7.4 | < 2 | 11 | 65 | < 30 | < 0.3 | < 0.06 | 0.2 | 16 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | 0.0004 | 0.002 | < 0.000007 | 0.003 | < 0.000007 | 7.9 | 0.000003 |
| Minerai AGR | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 908 | | 7.3 | < 2 | 12 | 56 | < 30 | < 0.3 | < 0.06 | 0.2 | 13 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.034 | 0.0002 | 0.0013 | < 0.000007 | < 0.002 | < 0.000007 | 6.8 | 0.000003 |
| Minerai AGR | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 895 | | 7.9 | < 2 | 10 | 59 | < 30 | < 0.3 | < 0.06 | < 0.2 | 13 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.043 | < 0.0002 | 0.0014 | < 0.000007 | 0.33 | < 0.000007 | 6.8 | < 0.000003 |
| Minerai AGR | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 895 | | 7.5 | < 2 | 12 | 64 | 43 | < 0.3 | < 0.06 | < 0.2 | 23 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.039 | < 0.0002 | 0.0014 | < 0.000007 | 0.004 | < 0.000007 | 7.7 | 0.000004 |
| Minerai AGR | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 889 | | 7.8 | < 2 | 10 | 54 | < 30 | < 0.3 | < 0.06 | 0.2 | 12 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.034 | < 0.0002 | 0.0011 | < 0.000007 | < 0.002 | < 0.000007 | 6.3 | 0.000027 |
| Minerai AGR | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 820 | | 8.2 | < 2 | 12 | 67 | 43 | < 0.3 | < 0.06 | < 0.2 | 18 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.046 | < 0.0002 | 0.0021 | < 0.000007 | < 0.002 | < 0.000007 | 8.8 | 0.000003 |
| Minerai AGR | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 816 | | 7.8 | < 2 | 12 | 57 | < 30 | < 0.3 | < 0.06 | < 0.2 | 13 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.048 | 0.0003 | 0.0017 | < 0.000007 | < 0.002 | < 0.000007 | 7.2 | 0.000007 |
| Minerai AGR | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 851 | | 7.6 | < 2 | 12 | 53 | < 30 | < 0.3 | < 0.06 | < 0.2 | 11 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.042 | 0.0003 | 0.0013 | < 0.000007 | < 0.002 | 0.000008 | 5.9 | 0.000006 |
| Minerai AGR | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 846 | | 8.5 | < 2 | 14 | 55 | < 30 | < 0.3 | < 0.06 | < 0.2 | 13 | < 0.03 | < 0.06 | < 0.06 | 0.050 | < 0.00001 | < 0.00005 | 0.054 | < 0.0002 | 0.0015 | < 0.000007 | < 0.002 | < 0.000007 | 7.2 | 0.000006 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | Cobalt | Chromium | Cuivre | Iron | Potassium | Lithium | Magnesium | Manganese | Molybdène | Sodium | Nickel | Plomb | Antimoine | Selenium | Strontium | Étain | Titane | Thallium | Uranium | Vanadium | Tungstène | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | **0.000004** | **0.00008** | **0.0002** | **0.007** | **0.003** | **0.0001** | **0.001** | **0.00001** | **0.00004** | **0.01** | **0.0001** | **0.00001** | **0.0009** | **0.00004** | **0.00002** | **0.00006** | **0.00005** | **0.000005** | **0.000002** | **0.00001** | **0.00002** | **0.002** |
| | | | | | | | | | RES[2] | **0.37** | **0.016** | **0.0073** | | | | | **2.3** | **29** | | **0.26** | **0.034** | **1.1** | **0.062** | | | | | **0.32** | | | **0.067** |
| | | | | | | | | | EC[3] | | 0.05 | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | 0.01 | 0.006 | 0.01 | | | | | 0.02 | | | 5.0 |
| | | | | | | | | | Effluent final Dir. 019[4] | | | *0.3* | *3.0* | | | | | | | *0.5* | *0.2* | | | | | | | | | | *0.5* |
| Minerai AGR | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 768 | | 0.000035 | < 0.00008 | 0.0004 | 0.007 | 9.9 | 0.0027 | 0.52 | 0.024 | 0.00028 | 3.5 | 0.0003 | 0.00003 | < 0.0009 | 0.00004 | 0.098 | 0.00058 | 0.0005 | < 0.000005 | 0.000031 | 0.00049 | 0.002 | < 0.002 |
| Minerai AGR | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 970 | | 0.000048 | < 0.00008 | 0.0009 | 0.031 | 8.5 | 0.0027 | 0.69 | 0.031 | 0.00032 | 3.4 | 0.0002 | 0.00002 | < 0.0009 | 0.00005 | 0.15 | 0.00082 | 0.00034 | 0.000007 | 0.00027 | 0.00054 | 0.0021 | < 0.002 |
| Minerai AGR | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 976 | | 0.000012 | < 0.00008 | < 0.0002 | < 0.007 | 7.0 | 0.0022 | 0.68 | 0.035 | 0.00015 | 2.6 | 0.0001 | 0.00003 | < 0.0009 | 0.00008 | 0.16 | 0.00029 | 0.00012 | 0.000007 | 0.0003 | 0.00051 | 0.0014 | < 0.002 |
| Minerai AGR | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 946 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 6.2 | 0.0022 | 0.72 | 0.036 | 0.00024 | 2.8 | 0.0002 | 0.00001 | < 0.0009 | 0.00007 | 0.16 | 0.00013 | 0.00019 | < 0.000005 | 0.00029 | 0.00047 | 0.0011 | < 0.002 |
| Minerai AGR | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 898 | | 0.000028 | < 0.00008 | < 0.0002 | < 0.007 | 4.4 | 0.0012 | 0.58 | 0.035 | 0.00095 | 2.0 | 0.0001 | < 0.00001 | < 0.0009 | 0.00006 | 0.21 | 0.00008 | 0.00013 | < 0.000005 | 0.00031 | 0.00046 | 0.00075 | < 0.002 |
| Minerai AGR | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 962 | | 0.000014 | < 0.00008 | 0.0004 | 0.007 | 6.4 | 0.0025 | 0.9 | 0.041 | 0.00032 | 2.7 | 0.0003 | 0.00001 | < 0.0009 | 0.00007 | 0.19 | 0.00013 | 0.00017 | 0.000005 | 0.00052 | 0.00067 | 0.001 | < 0.002 |
| Minerai AGR | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 938 | | 0.000013 | 0.00033 | < 0.0002 | < 0.007 | 5.1 | 0.0028 | 0.72 | 0.036 | 0.0012 | 2.5 | < 0.0001 | 0.00002 | < 0.0009 | 0.00028 | 0.16 | 0.00009 | 0.00012 | 0.000007 | 0.00045 | 0.00064 | 0.00041 | < 0.002 |
| Minerai AGR | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 909 | | 0.000028 | < 0.00008 | 0.0016 | < 0.007 | 4.0 | 0.0014 | 0.6 | 0.034 | 0.00018 | 1.6 | 0.0002 | 0.00002 | < 0.0009 | 0.00008 | 0.17 | 0.00008 | 0.00006 | < 0.000005 | 0.00041 | 0.0006 | 0.00072 | < 0.002 |
| Minerai AGR | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 925 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 4.0 | 0.002 | 0.61 | 0.034 | 0.00018 | 1.9 | 0.0003 | 0.00001 | < 0.0009 | 0.00005 | 0.16 | < 0.00006 | 0.00013 | < 0.000005 | 0.00037 | 0.00052 | 0.00067 | < 0.002 |
| Minerai AGR | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 927 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 3.9 | 0.0023 | 0.64 | 0.036 | 0.00054 | 1.5 | < 0.0001 | 0.00002 | < 0.0009 | 0.00006 | 0.14 | 0.00007 | < 0.00005 | 0.000005 | 0.00046 | 0.00057 | 0.00065 | < 0.002 |
| Minerai AGR | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 934 | | 0.000009 | < 0.00008 | < 0.0002 | < 0.007 | 4.3 | 0.0027 | 0.71 | 0.043 | 0.00035 | 1.6 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00006 | 0.1 | 0.00009 | 0.00011 | < 0.000005 | 0.0005 | 0.00071 | 0.00088 | < 0.002 |
| Minerai AGR | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 921 | | 0.000006 | < 0.00008 | 0.0004 | < 0.007 | 3.5 | 0.0014 | 0.58 | 0.037 | 0.00035 | 1.1 | < 0.0001 | 0.00002 | < 0.0009 | 0.00005 | 0.13 | 0.00007 | 0.00012 | < 0.000005 | 0.00045 | 0.00053 | 0.00086 | < 0.002 |
| Minerai AGR | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 896 | | 0.000009 | < 0.00008 | < 0.0002 | < 0.007 | 3.4 | 0.0016 | 0.54 | 0.034 | 0.00018 | 1.0 | < 0.0001 | 0.00001 | < 0.0009 | 0.00005 | 0.17 | < 0.00006 | 0.00012 | < 0.000005 | 0.00049 | 0.00063 | 0.0007 | < 0.002 |
| Minerai AGR | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 908 | | 0.000045 | < 0.00008 | 0.0008 | < 0.007 | 2.5 | 0.0013 | 0.43 | 0.035 | 0.00012 | 0.7 | < 0.0001 | 0.00001 | < 0.0009 | 0.00008 | 0.14 | 0.0001 | 0.00012 | < 0.000005 | 0.00046 | 0.00058 | 0.00074 | < 0.002 |
| Minerai AGR | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 895 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 2.6 | 0.0009 | 0.39 | 0.033 | 0.00016 | 0.9 | < 0.0001 | 0.00002 | < 0.0009 | < 0.00004 | 0.12 | 0.00008 | 0.00035 | < 0.000005 | 0.00044 | 0.00059 | 0.00072 | < 0.002 |
| Minerai AGR | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 895 | | 0.000005 | 0.0001 | < 0.0002 | < 0.007 | 3.3 | 0.0016 | 0.56 | 0.037 | 0.0002 | 1.0 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00005 | 0.12 | 0.00009 | 0.00014 | < 0.000005 | 0.00055 | 0.0007 | 0.00079 | < 0.002 |
| Minerai AGR | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 889 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 2.7 | 0.0039 | 0.51 | 0.033 | 0.00017 | 1.2 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00004 | 0.11 | 0.00016 | 0.00026 | < 0.000005 | 0.00041 | 0.00071 | 0.00072 | < 0.002 |
| Minerai AGR | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 820 | | 0.000005 | 0.00008 | < 0.0002 | < 0.007 | 3.7 | 0.0012 | 0.49 | 0.029 | 0.00032 | 0.99 | < 0.0001 | 0.00002 | < 0.0009 | < 0.00004 | 0.16 | 0.0001 | 0.00017 | < 0.000005 | 0.00047 | 0.0011 | 0.00066 | < 0.002 |
| Minerai AGR | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 816 | | 0.000009 | < 0.00008 | < 0.0002 | < 0.007 | 3.2 | 0.0012 | 0.42 | 0.027 | 0.00034 | 0.65 | 0.0001 | 0.00001 | < 0.0009 | < 0.00004 | 0.13 | 0.00008 | 0.00018 | < 0.000005 | 0.00038 | 0.0012 | 0.00064 | < 0.002 |
| Minerai AGR | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 851 | | 0.00002 | < 0.00008 | < 0.0002 | < 0.007 | 2.7 | 0.0011 | 0.43 | 0.028 | 0.00014 | 0.61 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00007 | 0.11 | < 0.00006 | 0.0002 | < 0.000005 | 0.00037 | 0.00094 | 0.00057 | < 0.002 |
| Minerai AGR | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 846 | | 0.000017 | < 0.00008 | 0.0004 | < 0.007 | 3.0 | 0.0015 | 0.54 | 0.033 | 0.00028 | 0.6 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00006 | 0.12 | < 0.00006 | 0.0003 | < 0.000005 | 0.00045 | 0.0011 | 0.0008 | < 0.002 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | pH | Acidité | Alcalinité | Conductivité | Solides dissous totaux | Bromure | Fluorure | Chlorure | Sulfate | Nitrite (as N) | Nitrate (as N) | Nitrate + Nitrite (as N) | Phosphore (réactif total) | Mercure | Argent | Aluminum | Arsenic | Baryum | Beryllium | Bore | Bismuth | Calcium | Cadmium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | no unit | mg/L as CaCO3 | mg/L as CaCO | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.05 | 2.0 | 2.0 | 2.0 | 30 | 0.3 | 0.06 | 0.2 | 0.2 | 0.03 | 0.06 | 0.06 | 0.03 | 0.00001 | 0.00005 | 0.001 | 0.0002 | 0.00002 | 0.000007 | 0.002 | 0.000007 | 0.01 | 0.000003 |
| | | | | | | | | | RES[2] | | | | | | | 4.0 | 860 | | 0.06 | 300 | | 1.0 | 0.0000013 | 0.00062 | | 0.34 | 0.6 | | 28 | | | 0.0011 |
| | | | | | | | | | EC[3] | | | | | | | 1.5 | 250 | | 1.0 | | | | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | | 5.0 | | | 0.005 |
| | | | | | | | | | Final Effluent Dir. 019[4] | *6-9.5* | | | | | | | | | | | | | | | | | *0.2* | | | | | |
| Minerai SGR | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 661 | | 8.6 | < 2 | 25 | 291 | 191 | < 0.3 | < 0.06 | 6.0 | 100 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.012 | 0.0006 | 0.0088 | < 0.000007 | 0.003 | < 0.000007 | 41 | 0.000005 |
| Minerai SGR | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 792 | | 8.1 | < 2 | 22 | 389 | 251 | < 0.3 | 0.14 | 3.0 | 150 | < 0.03 | < 0.06 | < 0.06 | 0.060 | < 0.00001 | 0.00018 | 0.02 | 0.0006 | 0.01 | < 0.000007 | 0.003 | < 0.000007 | 65 | < 0.000003 |
| Minerai SGR | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 794 | | 8.0 | < 2 | 14 | 317 | 200 | < 0.3 | 0.06 | 1.6 | 120 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.019 | 0.0003 | 0.008 | < 0.000007 | 0.007 | < 0.000007 | 48 | 0.000015 |
| Minerai SGR | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 802 | | 8.0 | < 2 | 13 | 241 | 163 | < 0.3 | < 0.06 | 0.7 | 89 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.025 | 0.0002 | 0.0053 | < 0.000007 | 0.004 | < 0.000007 | 36 | 0.000023 |
| Minerai SGR | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 773 | | 7.7 | < 2 | 11 | 181 | 103 | < 0.3 | < 0.06 | 0.3 | 61 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.026 | < 0.0002 | 0.0038 | < 0.000007 | 0.002 | < 0.000007 | 25 | 0.000013 |
| Minerai SGR | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 832 | | 7.5 | < 2 | 11 | 215 | 126 | < 0.3 | < 0.06 | 0.2 | 78 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.025 | < 0.0002 | 0.005 | < 0.000007 | < 0.002 | < 0.000007 | 36 | 0.000016 |
| Minerai SGR | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 788 | | 7.7 | < 2 | 14 | 167 | 97 | < 0.3 | < 0.06 | < 0.2 | 56 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.029 | 0.0002 | 0.0038 | < 0.000007 | 0.019 | 0.000 | 26 | 0.00001 |
| Minerai SGR | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 776 | | 7.4 | < 2 | 11 | 150 | 94 | < 0.3 | < 0.06 | < 0.2 | 50 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | < 0.0002 | 0.0028 | < 0.000007 | < 0.002 | < 0.000007 | 22 | 0.000011 |
| Minerai SGR | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 775 | | 7.7 | < 2 | 10 | 149 | 89 | < 0.3 | < 0.06 | < 0.2 | 51 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.036 | 0.0003 | 0.0031 | < 0.000007 | 0.005 | < 0.000007 | 24 | 0.000012 |
| Minerai SGR | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 762 | | 7.2 | < 2 | 11 | 141 | 66 | < 0.3 | < 0.06 | < 0.2 | 46 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.038 | 0.0002 | 0.0032 | < 0.000007 | 0.012 | < 0.000007 | 20 | 0.000012 |
| Minerai SGR | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 817 | | 7.4 | < 2 | 12 | 134 | 71 | < 0.3 | < 0.06 | < 0.2 | 40 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | < 0.0002 | 0.0034 | < 0.000007 | < 0.002 | < 0.000007 | 21 | 0.000015 |
| Minerai SGR | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 782 | | 7.7 | < 2 | 12 | 110 | 37 | < 0.3 | < 0.06 | < 0.2 | 34 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.039 | < 0.0002 | 0.0024 | < 0.000007 | 0.002 | < 0.000007 | 17 | 0.000009 |
| Minerai SGR | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 753 | | 7.3 | < 2 | 10 | 105 | 63 | < 0.3 | < 0.06 | < 0.2 | 34 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.044 | < 0.0002 | 0.0026 | < 0.000007 | 0.003 | 0.000 | 17 | 0.000013 |
| Minerai SGR | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 758 | | 7.2 | < 2 | 9 | 97 | 86 | < 0.3 | < 0.06 | < 0.2 | 30 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.051 | < 0.0002 | 0.0022 | < 0.000007 | < 0.002 | < 0.000007 | 15 | 0.000014 |
| Minerai SGR | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 749 | | 7.8 | < 2 | 12 | 92 | < 30 | < 0.3 | < 0.06 | < 0.2 | 27 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.04 | < 0.0002 | 0.0019 | < 0.000007 | 0.174 | < 0.000007 | 13 | 0.000009 |
| Minerai SGR | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 738 | | 7.5 | < 2 | 11 | 88 | 51 | < 0.3 | < 0.06 | < 0.2 | 23 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.043 | < 0.0002 | 0.0018 | < 0.000007 | 0.004 | < 0.000007 | 14 | 0.000018 |
| Minerai SGR | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 748 | | 7.5 | < 2 | 11 | 77 | < 30 | < 0.3 | < 0.06 | < 0.2 | 22 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.038 | < 0.0002 | 0.0017 | < 0.000007 | < 0.002 | < 0.000007 | 11 | 0.000012 |
| Minerai SGR | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 677 | | 7.7 | < 2 | 14 | 92 | 57 | < 0.3 | < 0.06 | < 0.2 | 27 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.042 | < 0.0002 | 0.0019 | < 0.000007 | 0.004 | < 0.000007 | 14 | 0.000007 |
| Minerai SGR | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 677 | | 7.4 | < 2 | 11 | 141 | 100 | < 0.3 | < 0.06 | < 0.2 | 22 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | 0.0001 | 0.043 | < 0.0002 | 0.0021 | < 0.000007 | < 0.002 | < 0.000007 | 12 | 0.000011 |
| Minerai SGR | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 698 | | 7.5 | < 2 | 12 | 80 | < 30 | < 0.3 | < 0.06 | < 0.2 | 20 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | 0.0001 | 0.038 | < 0.0002 | 0.0016 | < 0.000007 | < 0.002 | 0.000 | 11 | 0.00001 |
| Minerai SGR | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 714 | | 7.4 | < 2 | 9.0 | 75 | < 30 | < 0.3 | < 0.06 | < 0.2 | 20 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | **0.00001** | 0.00008 | 0.057 | < 0.0002 | 0.0017 | < 0.000007 | < 0.002 | < 0.000007 | 12 | 0.000006 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | Cobalt | Chromium | Cuivre | Iron | Potassium | Lithium | Magnesium | Manganese | Molybdène | Sodium | Nickel | Plomb | Antimoine | Selenium | Strontium | Étain | Titane | Thallium | Uranium | Vanadium | Tungstène | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.000004 | 0.00008 | 0.0002 | 0.007 | 0.003 | 0.0001 | 0.001 | 0.00001 | 0.00004 | 0.01 | 0.0001 | 0.00001 | 0.0009 | 0.00004 | 0.00002 | 0.00006 | 0.00005 | 0.000005 | 0.000002 | 0.00001 | 0.00002 | 0.002 |
| | | | | | | | | | RES[2] | 0.37 | 0.016 | 0.0073 | | | | | 2.3 | 29 | | 0.26 | 0.034 | 1.1 | 0.062 | | | | | | 0.32 | | | 0.067 |
| | | | | | | | | | EC[3] | | 0.05 | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | 0.01 | 0.006 | 0.01 | | | | | | 0.02 | | | 5.0 |
| | | | | | | | | | Final Effluent Dir. 019[4] | | | *0.3* | *3.0* | | | | | | | *0.5* | *0.2* | | | | | | | | | | *0.5* |
| Minerai SGR | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 661 | | 0.000029 | < 0.00008 | 0.0004 | < 0.007 | 14 | 0.0049 | 1.7 | 0.025 | 0.00055 | 7.1 | 0.0005 | 0.00015 | < 0.0009 | 0.0001 | 0.38 | 0.00062 | 0.00006 | < 0.000005 | 0.00007 | 0.00037 | 0.0021 | < 0.002 |
| Minerai SGR | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 792 | | 0.000078 | < 0.00008 | 0.0003 | 0.012 | 13 | 0.0061 | 2.6 | 0.049 | 0.00045 | 5.7 | 0.0006 | 0.00058 | 0.0011 | 0.00016 | 0.72 | 0.00037 | 0.00007 | 0.000009 | 0.0021 | 0.0004 | 0.0029 | < 0.002 |
| Minerai SGR | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 794 | | 0.000028 | < 0.00008 | 0.0004 | < 0.007 | 9.0 | 0.004 | 1.6 | 0.042 | 0.003 | 3.1 | 0.0003 | 0.00025 | < 0.0009 | 0.00012 | 0.59 | 0.00038 | 0.00013 | 0.000005 | 0.0021 | 0.00039 | 0.0022 | < 0.002 |
| Minerai SGR | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 802 | | 0.000025 | < 0.00008 | < 0.0002 | < 0.007 | 6.8 | 0.0031 | 1.3 | 0.04 | 0.00019 | 2.2 | 0.0004 | 0.00011 | < 0.0009 | 0.00009 | 0.44 | 0.00014 | < 0.00005 | < 0.000005 | 0.0017 | 0.00038 | 0.0014 | < 0.002 |
| Minerai SGR | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 773 | | 0.000049 | < 0.00008 | < 0.0002 | < 0.007 | 4.2 | 0.0014 | 0.8 | 0.035 | 0.0017 | 1.6 | 0.0002 | 0.00007 | < 0.0009 | 0.00008 | 0.3 | 0.00012 | 0.00006 | < 0.000005 | 0.0011 | 0.00029 | 0.00089 | < 0.002 |
| Minerai SGR | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 832 | | 0.000041 | < 0.00008 | 0.0004 | < 0.007 | 5.5 | 0.0023 | 1.09 | 0.049 | 0.0009 | 1.5 | 0.0004 | 0.00006 | < 0.0009 | 0.00009 | 0.42 | 0.00012 | < 0.00005 | 0.000 | 0.0021 | 0.00036 | 0.00123 | < 0.002 |
| Minerai SGR | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 788 | | 0.000029 | < 0.00008 | < 0.0002 | < 0.007 | 4.1 | 0.0023 | 0.68 | 0.041 | 0.0003 | 1.0 | < 0.0001 | 0.00004 | < 0.0009 | 0.00012 | 0.31 | 0.00009 | < 0.00005 | 0.000 | 0.0013 | 0.00033 | 0.00048 | < 0.002 |
| Minerai SGR | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 776 | | 0.000068 | < 0.00008 | 0.0023 | < 0.007 | 3.2 | 0.0011 | 0.46 | 0.036 | 0.0002 | 0.7 | 0.0003 | 0.00004 | < 0.0009 | 0.00008 | 0.27 | 0.00007 | < 0.00005 | 0.000 | 0.0008 | 0.00033 | 0.00072 | < 0.002 |
| Minerai SGR | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 775 | | 0.000009 | < 0.00008 | < 0.0002 | < 0.007 | 3.4 | 0.0017 | 0.53 | 0.037 | 0.0004 | 1.5 | 0.0003 | 0.00004 | < 0.0009 | 0.00006 | 0.27 | 0.00007 | 0.00005 | 0.000 | 0.0009 | 0.00033 | 0.00066 | < 0.002 |
| Minerai SGR | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 762 | | 0.000011 | < 0.00008 | < 0.0002 | < 0.007 | 2.8 | 0.0014 | 0.44 | 0.037 | 0.0002 | 0.6 | < 0.0001 | 0.00003 | < 0.0009 | 0.00004 | 0.22 | 0.00008 | < 0.00005 | 0.000 | 0.0008 | 0.00032 | 0.00061 | < 0.002 |
| Minerai SGR | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 817 | | 0.000017 | < 0.00008 | < 0.0002 | < 0.007 | 3.2 | 0.0018 | 0.53 | 0.046 | 0.0002 | 0.5 | < 0.0001 | 0.00003 | < 0.0009 | 0.00006 | 0.24 | 0.00008 | 0.00007 | 0.000 | 0.0018 | 0.00034 | 0.00103 | < 0.002 |
| Minerai SGR | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 782 | | 0.000014 | < 0.00008 | < 0.0002 | < 0.007 | 2.9 | 0.0008 | 0.36 | 0.037 | 0.0019 | 0.6 | < 0.0001 | 0.00003 | < 0.0009 | 0.00004 | 0.17 | 0.00006 | 0.00008 | < 0.000005 | 0.0009 | 0.0003 | 0.00078 | < 0.002 |
| Minerai SGR | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 753 | | 0.000007 | < 0.00008 | < 0.0002 | < 0.007 | 2.4 | 0.0008 | 0.28 | 0.033 | 0.0002 | 0.3 | < 0.0001 | 0.00005 | < 0.0009 | < 0.00004 | 0.18 | < 0.00006 | 0.00006 | < 0.000005 | 0.0006 | 0.00038 | 0.00071 | < 0.002 |
| Minerai SGR | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 758 | | 0.000035 | < 0.00008 | 0.0006 | < 0.007 | 2.1 | 0.0008 | 0.25 | 0.034 | 0.0005 | 0.3 | < 0.0001 | 0.00004 | < 0.0009 | < 0.00004 | 0.16 | < 0.00006 | 0.00007 | < 0.000005 | 0.0006 | 0.00036 | 0.00076 | < 0.002 |
| Minerai SGR | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 749 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 1.9 | 0.0004 | 0.21 | 0.03 | 0.0002 | 0.5 | < 0.0001 | 0.00003 | < 0.0009 | < 0.00004 | 0.12 | 0.00006 | 0.00015 | < 0.000005 | 0.0005 | 0.00034 | 0.0007 | < 0.002 |
| Minerai SGR | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 738 | | 0.000011 | 0.0001 | < 0.0002 | < 0.007 | 2.2 | 0.0008 | 0.24 | 0.039 | 0.0002 | 0.3 | < 0.0001 | 0.00003 | < 0.0009 | < 0.00004 | 0.12 | < 0.00006 | 0.00007 | < 0.000005 | 0.0005 | 0.00037 | 0.00076 | < 0.002 |
| Minerai SGR | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 748 | | 0.000005 | < 0.00008 | < 0.0002 | 0.020 | 1.7 | 0.0033 | 0.2 | 0.03 | 0.0005 | 0.5 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00004 | 0.1 | 0.00008 | 0.00006 | < 0.000005 | 0.0004 | 0.00035 | 0.00067 | < 0.002 |
| Minerai SGR | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 677 | | 0.000038 | < 0.00008 | < 0.0002 | < 0.007 | 2.6 | 0.0005 | 0.19 | 0.032 | 0.0008 | 0.8 | < 0.0001 | 0.00003 | < 0.0009 | 0.00007 | 0.12 | < 0.00006 | < 0.00005 | < 0.000005 | 0.0003 | 0.00038 | 0.00048 | < 0.002 |
| Minerai SGR | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 677 | | 0.000006 | < 0.00008 | < 0.0002 | < 0.007 | 2.0 | 0.0005 | 0.17 | 0.031 | 0.0001 | 0.2 | < 0.0001 | 0.00001 | < 0.0009 | < 0.00004 | 0.11 | < 0.00006 | < 0.00005 | < 0.000005 | 0.0003 | 0.00042 | 0.00049 | < 0.002 |
| Minerai SGR | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 698 | | 0.000021 | < 0.00008 | 0.0003 | < 0.007 | 1.9 | 0.0006 | 0.19 | 0.031 | 0.0001 | 0.2 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00007 | 0.1 | < 0.00006 | < 0.00005 | < 0.000005 | 0.0003 | 0.00037 | 0.00057 | < 0.002 |
| Minerai SGR | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 714 | | 0.00012 | < 0.00008 | 0.0002 | < 0.007 | 2.0 | 0.0007 | 0.21 | 0.038 | 0.0002 | 0.12 | 0.0002 | < 0.00001 | < 0.0009 | < 0.00004 | 0.1 | < 0.00006 | 0.00011 | < 0.000005 | 0.00026 | 0.00045 | 0.00074 | < 0.002 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

East Malartic Sector
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | pH | Acidité | Alcalinité | Conductivité | Solides dissous totaux | Bromure | Fluorure | Chlorure | Sulfate | Nitrite (as N) | Nitrate (as N) | Nitrate + Nitrite (as N) | Phosphore (réactif total) | Mercure | Argent | Aluminum | Arsenic | Baryum | Beryllium | Bore | Bismuth | Calcium | Cadmium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | no unit | mg/L as CaCO3 | mg/L as CaCO3 | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.05 | 2.0 | 2.0 | 2.0 | 30 | 0.3 | 0.06 | 0.2 | 0.2 | 0.03 | 0.06 | 0.06 | 0.03 | 0.00001 | 0.00005 | 0.001 | 0.0002 | 0.00002 | 0.000007 | 0.002 | 0.000007 | 0.01 | 0.000003 |
| | | | | | | | | | RES[2] | | | | | | | 4.0 | 860 | | 0.06 | 300 | | 1.0 | 0.0000013 | 0.00062 | | 0.34 | 0.6 | | 28 | | | 0.0011 |
| | | | | | | | | | EC[3] | | | | | | | 1.5 | 250 | | 1.0 | | | | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | | 5.0 | | | 0.005 |
| | | | | | | | | | Final Effluent Dir. 019[4] | *6-9.5* | | | | | | | | | | | | | | | | *0.2* | | | | | | |
| Minerai SGR+/SGR++ | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 779 | | 8.9 | < 2 | 32 | 234 | 157 | < 0.3 | 0.08 | 29 | 58 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.034 | 0.0012 | 0.009 | < 0.000007 | 0.004 | 0.000023 | 19 | < 0.000003 |
| Minerai SGR+/SGR++ | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 966 | | 8.5 | < 2 | 22 | 129 | 89 | < 0.3 | < 0.06 | 3.7 | 27 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.032 | 0.0011 | 0.004 | < 0.000007 | 0.006 | < 0.000007 | 12 | < 0.000003 |
| Minerai SGR+/SGR++ | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 975 | | 8.7 | < 2 | 16 | 75 | 34 | < 0.3 | < 0.06 | 0.9 | 15 | < 0.03 | < 0.06 | < 0.06 | 0.070 | < 0.00001 | < 0.00005 | 0.036 | 0.0003 | 0.0016 | < 0.000007 | 0.007 | < 0.000007 | 4.7 | 0.000005 |
| Minerai SGR+/SGR++ | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 967 | | 8.7 | < 2 | 27 | 82 | 54 | < 0.3 | < 0.06 | 0.7 | 16 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.059 | 0.0005 | 0.0024 | < 0.000007 | 0.004 | < 0.000007 | 9.4 | < 0.000003 |
| Minerai SGR+/SGR++ | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 935 | | 7.6 | < 2 | 20 | 79 | 49 | < 0.3 | < 0.06 | 0.3 | 14 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.05 | 0.0003 | 0.002 | < 0.000007 | 0.015 | < 0.000007 | 8.3 | 0.000012 |
| Minerai SGR+/SGR++ | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 965 | | 8.0 | < 2 | 15 | 82 | 49 | < 0.3 | < 0.06 | 0.2 | 17 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.053 | 0.0004 | 0.003 | < 0.000007 | < 0.002 | < 0.000007 | 10.0 | 0.000007 |
| Minerai SGR+/SGR++ | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 950 | | 8.3 | < 2 | 14 | 76 | 43 | < 0.3 | < 0.06 | < 0.2 | 15 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.054 | 0.0003 | 0.0023 | 0.000007 | 0.011 | 0.000014 | 8.7 | 0.000003 |
| Minerai SGR+/SGR++ | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 931 | | 8.6 | < 2 | 14 | 70 | 37 | < 0.3 | < 0.06 | < 0.2 | 15 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.048 | 0.0003 | 0.002 | < 0.000007 | < 0.002 | 0.00001 | 8.5 | 0.00001 |
| Minerai SGR+/SGR++ | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 933 | | 8.4 | < 2 | 12 | 65 | 40 | < 0.3 | < 0.06 | < 0.2 | 14 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.053 | 0.0004 | 0.002 | < 0.000007 | 0.003 | < 0.000007 | 8.7 | 0.000005 |
| Minerai SGR+/SGR++ | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 948 | | 7.5 | < 2 | 14 | 65 | < 30 | < 0.3 | < 0.06 | < 0.2 | 14 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.056 | 0.0003 | 0.0016 | < 0.000007 | 0.022 | < 0.000007 | 8.0 | < 0.000003 |
| Minerai SGR+/SGR++ | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 975 | | 7.4 | < 2 | 14 | 72 | 43 | < 0.3 | < 0.06 | < 0.2 | 15 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.044 | 0.0004 | 0.0024 | < 0.000007 | < 0.002 | < 0.000007 | 9.9 | 0.000005 |
| Minerai SGR+/SGR++ | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 924 | | 8.1 | < 2 | 14 | 62 | < 30 | < 0.3 | < 0.06 | < 0.2 | 12 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.052 | 0.0003 | 0.0019 | < 0.000007 | < 0.002 | 0.00001 | 8.4 | 0.000005 |
| Minerai SGR+/SGR++ | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 901 | | 7.6 | < 2 | 12 | 65 | 34 | < 0.3 | < 0.06 | < 0.2 | 14 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.05 | 0.0004 | 0.0018 | < 0.000007 | 0.006 | < 0.000007 | 8.7 | 0.000008 |
| Minerai SGR+/SGR++ | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 919 | | 7.7 | < 2 | 14 | 56 | 31 | < 0.3 | < 0.06 | < 0.2 | 11 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | **0.00001** | < 0.00005 | 0.055 | 0.0002 | 0.0014 | < 0.000007 | < 0.002 | < 0.000007 | 7.4 | 0.000004 |
| Minerai SGR+/SGR++ | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 934 | | 7.7 | < 2 | 14 | 58 | < 30 | < 0.3 | < 0.06 | < 0.2 | 11 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.052 | 0.0002 | 0.0016 | < 0.000007 | 0.1 | < 0.000007 | 7.2 | 0.000005 |
| Minerai SGR+/SGR++ | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 901 | | 7.7 | < 2 | 13 | 65 | 43 | < 0.3 | < 0.06 | < 0.2 | 13 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.068 | 0.0002 | 0.0016 | < 0.000007 | 0.003 | < 0.000007 | 9.3 | 0.000004 |
| Minerai SGR+/SGR++ | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 896 | | 7.9 | < 2 | 12 | 57 | < 30 | < 0.3 | < 0.06 | < 0.2 | 12 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.052 | 0.0002 | 0.0013 | < 0.000007 | < 0.002 | < 0.000007 | 7.5 | < 0.000003 |
| Minerai SGR+/SGR++ | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 864 | | 7.6 | < 2 | 12 | 64 | 40 | < 0.3 | < 0.06 | < 0.2 | 15 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.057 | 0.0002 | 0.0016 | < 0.000007 | < 0.002 | < 0.000007 | 9.1 | 0.000003 |
| Minerai SGR+/SGR++ | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 841 | | 7.4 | < 2 | 10 | 57 | < 30 | < 0.3 | < 0.06 | < 0.2 | 12 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.054 | 0.0002 | 0.0015 | < 0.000007 | < 0.002 | < 0.000007 | 7.7 | 0.000004 |
| Minerai SGR+/SGR++ | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 870 | | 7.5 | < 2 | 10 | 53 | < 30 | < 0.3 | < 0.06 | < 0.2 | 11 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.045 | 0.0003 | 0.0013 | < 0.000007 | < 0.002 | 0.00001 | 6.9 | 0.000005 |
| Minerai SGR+/SGR++ | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 877 | | 7.7 | < 2 | 13 | 50 | 31 | < 0.3 | < 0.06 | < 0.2 | 10 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.065 | < 0.0002 | 0.0014 | < 0.000007 | < 0.002 | < 0.000007 | 7.7 | 0.000011 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

East Malartic Sector
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | Cobalt | Chromium | Cuivre | Iron | Potassium | Lithium | Magnesium | Manganese | Molybdène | Sodium | Nickel | Plomb | Antimoine | Selenium | Strontium | Étain | Titane | Thallium | Uranium | Vanadium | Tungstène | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.000004 | 0.00008 | 0.0002 | 0.007 | 0.003 | 0.0001 | 0.001 | 0.00001 | 0.00004 | 0.01 | 0.0001 | 0.00001 | 0.0009 | 0.00004 | 0.00002 | 0.00006 | 0.00005 | 0.000005 | 0.000002 | 0.00001 | 0.00002 | 0.002 |
| | | | | | | | | | RES[2] | 0.37 | 0.016 | 0.0073 | | | | | 2.3 | 29 | | 0.26 | 0.034 | 1.1 | 0.062 | | | | | 0.32 | | | 0.067 |
| | | | | | | | | | EC[3] | | 0.05 | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | 0.01 | 0.006 | 0.01 | | | | | 0.02 | | | 5.0 |
| | | | | | | | | | Final Effluent Dir. 019[4] | | | 0.3 | 3.0 | | | | | | | 0.5 | 0.2 | | | | | | | | | 0.5 |
| Minerai SGR+/SGR++ | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 779 | | 0.000026 | < 0.00008 | 0.0005 | < 0.007 | 14 | 0.0067 | 2.4 | 0.012 | 0.0016 | 14 | 0.0004 | 0.00004 | 0.0009 | 0.00027 | 0.35 | 0.00074 | 0.00017 | < 0.000005 | 0.00011 | 0.00055 | 0.0038 | < 0.002 |
| Minerai SGR+/SGR++ | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 966 | | 0.000025 | < 0.00008 | < 0.0002 | < 0.007 | 7.2 | 0.0046 | 1.5 | 0.02 | 0.0023 | 5.5 | 0.0003 | 0.00005 | 0.0018 | 0.00025 | 0.18 | 0.0002 | 0.00021 | 0.000006 | 0.00051 | 0.00035 | 0.0047 | < 0.002 |
| Minerai SGR+/SGR++ | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 975 | | 0.000018 | < 0.00008 | 0.0007 | 0.008 | 5.9 | 0.0017 | 0.36 | 0.024 | 0.00093 | 4.7 | 0.0004 | 0.00007 | < 0.0009 | 0.00022 | 0.028 | 0.00019 | 0.00057 | < 0.000005 | 0.00052 | 0.00035 | 0.0016 | < 0.002 |
| Minerai SGR+/SGR++ | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 967 | | 0.000009 | < 0.00008 | < 0.0002 | < 0.007 | 3.7 | 0.002 | 0.87 | 0.022 | 0.00086 | 1.9 | 0.0002 | 0.00004 | < 0.0009 | 0.00013 | 0.095 | 0.00008 | 0.00018 | < 0.000005 | 0.00053 | 0.00034 | 0.0018 | < 0.002 |
| Minerai SGR+/SGR++ | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 935 | | 0.000043 | < 0.00008 | < 0.0002 | < 0.007 | 2.7 | 0.0012 | 0.65 | 0.024 | 0.0015 | 2.0 | < 0.0001 | 0.00004 | < 0.0009 | 0.00014 | 0.083 | 0.00018 | 0.00014 | < 0.000005 | 0.00047 | 0.00029 | 0.001 | < 0.002 |
| Minerai SGR+/SGR++ | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 965 | | 0.000021 | < 0.00008 | 0.0003 | < 0.007 | 3.3 | 0.0016 | 0.89 | 0.028 | 0.0011 | 1.5 | 0.0003 | 0.00006 | < 0.0009 | 0.0001 | 0.099 | 0.00009 | 0.00028 | < 0.000005 | 0.00077 | 0.00032 | 0.0014 | < 0.002 |
| Minerai SGR+/SGR++ | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 950 | | 0.000023 | < 0.00008 | < 0.0002 | 0.013 | 2.7 | 0.0016 | 0.66 | 0.025 | 0.001 | 1.0 | < 0.0001 | 0.00004 | < 0.0009 | 0.00018 | 0.079 | 0.00007 | 0.00017 | < 0.000005 | 0.0007 | 0.00027 | 0.00061 | < 0.002 |
| Minerai SGR+/SGR++ | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 931 | | 0.000012 | < 0.00008 | 0.0005 | < 0.007 | 2.3 | 0.0007 | 0.58 | 0.025 | 0.00053 | 0.78 | 0.0002 | 0.00005 | < 0.0009 | 0.0001 | 0.075 | 0.00007 | 0.00021 | < 0.000005 | 0.00057 | 0.00028 | 0.00092 | < 0.002 |
| Minerai SGR+/SGR++ | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 933 | | 0.000006 | < 0.00008 | < 0.0002 | 0.01 | 2.2 | 0.0012 | 0.55 | 0.025 | 0.00047 | 1.3 | 0.0002 | 0.00004 | < 0.0009 | 0.00007 | 0.073 | < 0.00006 | 0.00021 | < 0.000005 | 0.00052 | 0.00027 | 0.00068 | < 0.002 |
| Minerai SGR+/SGR++ | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 948 | | 0.000006 | < 0.00008 | < 0.0002 | < 0.007 | 2.0 | 0.0011 | 0.53 | 0.027 | 0.00032 | 0.66 | < 0.0001 | 0.00007 | < 0.0009 | 0.00006 | 0.063 | 0.00014 | 0.00011 | < 0.000005 | 0.00059 | 0.0003 | 0.00063 | < 0.002 |
| Minerai SGR+/SGR++ | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 975 | | 0.00002 | < 0.00008 | < 0.0002 | < 0.007 | 2.4 | 0.0015 | 0.69 | 0.032 | 0.0026 | 0.71 | < 0.0001 | 0.00008 | < 0.0009 | 0.0001 | 0.073 | < 0.00006 | 0.00012 | < 0.000005 | 0.0014 | 0.00028 | 0.0014 | < 0.002 |
| Minerai SGR+/SGR++ | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 924 | | 0.000013 | < 0.00008 | 0.0004 | < 0.007 | 2.1 | 0.0007 | 0.49 | 0.029 | 0.0005 | 0.52 | < 0.0001 | 0.00005 | < 0.0009 | 0.00009 | 0.054 | < 0.00006 | 0.00014 | < 0.000005 | 0.00061 | 0.00028 | 0.00096 | < 0.002 |
| Minerai SGR+/SGR++ | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 901 | | 0.000005 | < 0.00008 | < 0.0002 | < 0.007 | 2.0 | 0.0009 | 0.48 | 0.027 | 0.00068 | 0.53 | < 0.0001 | 0.00008 | < 0.0009 | 0.00009 | 0.062 | < 0.00006 | 0.00019 | < 0.000005 | 0.00066 | 0.00032 | 0.0011 | < 0.002 |
| Minerai SGR+/SGR++ | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 919 | | 0.000051 | < 0.00008 | 0.0007 | < 0.007 | 1.6 | 0.0007 | 0.4 | 0.028 | 0.00035 | 0.37 | 0.0001 | 0.00012 | < 0.0009 | 0.00007 | 0.053 | < 0.00006 | 0.00031 | < 0.000005 | 0.0006 | 0.00028 | 0.00094 | < 0.002 |
| Minerai SGR+/SGR++ | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 934 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 1.5 | 0.0004 | 0.37 | 0.025 | 0.00042 | 0.47 | < 0.0001 | 0.00004 | < 0.0009 | 0.00008 | 0.046 | 0.00007 | 0.00022 | < 0.000005 | 0.00073 | 0.00027 | 0.00095 | < 0.002 |
| Minerai SGR+/SGR++ | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 901 | | 0.000011 | < 0.00008 | < 0.0002 | < 0.007 | 2.1 | 0.0008 | 0.43 | 0.029 | 0.00054 | 0.44 | < 0.0001 | 0.00005 | < 0.0009 | 0.00007 | 0.05 | < 0.00006 | 0.00019 | < 0.000005 | 0.00057 | 0.00038 | 0.00089 | < 0.002 |
| Minerai SGR+/SGR++ | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 896 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 1.5 | 0.0034 | 0.37 | 0.026 | 0.00028 | 0.8 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00007 | 0.043 | < 0.00006 | 0.00015 | < 0.000005 | 0.00049 | 0.00033 | 0.00072 | < 0.002 |
| Minerai SGR+/SGR++ | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 864 | | 0.000019 | < 0.00008 | < 0.0002 | < 0.007 | 2.1 | 0.0005 | 0.37 | 0.028 | 0.00034 | 0.43 | < 0.0001 | 0.00005 | < 0.0009 | 0.00006 | 0.05 | < 0.00006 | 0.00014 | < 0.000005 | 0.00058 | 0.00039 | 0.00081 | < 0.002 |
| Minerai SGR+/SGR++ | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 841 | | 0.000014 | 0.00013 | < 0.0002 | < 0.007 | 1.6 | 0.0005 | 0.34 | 0.027 | 0.00031 | 0.28 | 0.0002 | 0.00005 | < 0.0009 | < 0.00004 | 0.045 | < 0.00006 | 0.0002 | < 0.000005 | 0.00051 | 0.00036 | 0.00063 | < 0.002 |
| Minerai SGR+/SGR++ | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 870 | | 0.000012 | < 0.00008 | < 0.0002 | < 0.007 | 1.4 | 0.0005 | 0.3 | 0.027 | 0.0003 | 0.26 | < 0.0001 | 0.00003 | < 0.0009 | 0.00008 | 0.04 | < 0.00006 | 0.00016 | < 0.000005 | 0.00045 | 0.00031 | 0.00067 | < 0.002 |
| Minerai SGR+/SGR++ | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 877 | | 0.000036 | 0.00009 | < 0.0002 | < 0.007 | 1.5 | 0.0006 | 0.31 | 0.031 | 0.00064 | 0.14 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00005 | 0.042 | < 0.00006 | 0.00018 | < 0.000005 | 0.00047 | 0.00036 | 0.00088 | < 0.002 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | pH | Acidité | Alcalinité | Conductivité | Solides dissous totaux | Bromure | Fluorure | Chlorure | Sulfate | Nitrite (as N) | Nitrate (as N) | Nitrate + Nitrite (as N) | Phosphore (réactif total) | Mercure | Argent | Aluminum | Arsenic | Baryum | Beryllium | Bore | Bismuth | Calcium | Cadmium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | no unit | mg/L as CaCO3 | mg/L as CaCO3 | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.05 | 2.0 | 2.0 | 2.0 | 30 | 0.3 | 0.06 | 0.2 | 0.2 | 0.03 | 0.06 | 0.06 | 0.03 | 0.00001 | 0.00005 | 0.001 | 0.0002 | 0.00002 | 0.000007 | 0.002 | 0.000007 | 0.01 | 0.000003 |
| | | | | | | | | | RES[2] | | | | | | | 4.0 | 860 | | 0.06 | 300 | | 1.0 | 0.0000013 | 0.00062 | | 0.34 | 0.6 | | 28 | | | 0.0011 |
| | | | | | | | | | EC[3] | | | | | | | 1.5 | 250 | | 1.0 | | | | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | | 5.0 | | | 0.005 |
| | | | | | | | | | Final Effluent Dir, 0194 | *6-9.5* | | | | | | | | | | | | | | | | *0.2* | | | | | | |
| Dilution | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 794 | | 9.2 | < 2 | 27 | 56 | 46 | < 0.3 | < 0.06 | 0.7 | 5.6 | < 0.03 | < 0.06 | < 0.06 | 0.170 | < 0.00001 | < 0.00005 | 0.054 | 0.0004 | 0.0013 | < 0.000007 | 0.002 | < 0.000007 | 4.4 | 0.000004 |
| Dilution | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 966 | | 8.7 | < 2 | 16 | 83 | 49 | < 0.3 | < 0.06 | 1.2 | 16 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.045 | 0.0005 | 0.0017 | < 0.000007 | 0.003 | < 0.000007 | 5.0 | < 0.000003 |
| Dilution | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 963 | | 8.5 | < 2 | 16 | 91 | 40 | < 0.3 | < 0.06 | 1.5 | 20 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | 0.00009 | 0.035 | 0.0006 | 0.0028 | < 0.000007 | 0.002 | < 0.000007 | 9.3 | 0.000005 |
| Dilution | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 983 | | 8.5 | < 2 | 21 | 62 | 46 | < 0.3 | < 0.06 | 0.6 | 12 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | 0.0003 | 0.0025 | < 0.000007 | < 0.002 | < 0.000007 | 4.2 | 0.000006 |
| Dilution | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 948 | | 8.8 | < 2 | 11 | 44 | < 30 | < 0.3 | < 0.06 | 0.2 | 6.6 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.046 | 0.0002 | 0.001 | < 0.000007 | 0.002 | < 0.000007 | 3.7 | 0.000005 |
| Dilution | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 974 | | 7.5 | < 2 | 11 | 56 | 34 | < 0.3 | < 0.06 | 0.3 | 11 | < 0.03 | < 0.06 | < 0.06 | 0.080 | < 0.00001 | < 0.00005 | 0.048 | 0.0003 | 0.0014 | < 0.000007 | < 0.002 | < 0.000007 | 4.5 | 0.000009 |
| Dilution | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 962 | | 7.3 | < 2 | 7.0 | 41 | < 30 | < 0.3 | < 0.06 | < 0.2 | 7.6 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.04 | < 0.0002 | 0.0011 | < 0.000007 | 0.02 | < 0.000007 | 3.5 | 0.000005 |
| Dilution | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 936 | | 7.8 | < 2 | 9.0 | 41 | 31 | < 0.3 | < 0.06 | < 0.2 | 8.0 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.044 | < 0.0002 | 0.0013 | < 0.000007 | < 0.002 | < 0.000007 | 3.8 | 0.000005 |
| Dilution | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 934 | | 7.8 | < 2 | 13 | 44 | 34 | < 0.3 | < 0.06 | < 0.2 | 9.3 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.039 | 0.0003 | 0.0014 | < 0.000007 | 0.004 | < 0.000007 | 4.2 | < 0.000003 |
| Dilution | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 944 | | 7.2 | < 2 | 7.0 | 38 | < 30 | < 0.3 | 0.15 | < 0.2 | 8.3 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.038 | < 0.0002 | 0.00088 | < 0.000007 | 0.033 | < 0.000007 | 3.5 | 0.000005 |
| Dilution | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 952 | | 7.4 | < 2 | 10 | 46 | < 30 | < 0.3 | < 0.06 | < 0.2 | 7.6 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.043 | < 0.0002 | 0.0012 | < 0.000007 | < 0.002 | < 0.000007 | 4.4 | 0.000004 |
| Dilution | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 902 | | 7.4 | < 2 | 3.0 | 35 | < 30 | < 0.3 | < 0.06 | < 0.2 | 7.0 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | **0.00001** | < 0.00005 | 0.087 | 0.0002 | 0.0016 | < 0.000007 | < 0.002 | < 0.000007 | 3.8 | 0.000006 |
| Dilution | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 901 | | 7.2 | < 2 | 9.0 | 32 | < 30 | < 0.3 | < 0.06 | < 0.2 | 6.2 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.046 | 0.0002 | 0.00096 | < 0.000007 | 0.002 | < 0.000007 | 3.6 | 0.000003 |
| Dilution | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 928 | | 7.4 | < 2 | 10 | 35 | < 30 | < 0.3 | < 0.06 | < 0.2 | 6.5 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.061 | < 0.0002 | 0.0012 | < 0.000007 | < 0.002 | < 0.000007 | 4.4 | 0.000004 |
| Dilution | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 912 | | 7.5 | < 2 | 8.0 | 34 | < 30 | < 0.3 | < 0.06 | < 0.2 | 6.4 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.049 | < 0.0002 | 0.00099 | < 0.000007 | 0.19 | < 0.000007 | 3.6 | < 0.000003 |
| Dilution | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 915 | | 7.4 | < 2 | 9.0 | 39 | < 30 | < 0.3 | < 0.06 | < 0.2 | 6.5 | < 0.03 | < 0.06 | < 0.06 | 0.050 | < 0.00001 | < 0.00005 | 0.06 | 0.0002 | 0.001 | < 0.000007 | 0.004 | < 0.000007 | 4.6 | 0.000005 |
| Dilution | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 896 | | 7.4 | < 2 | 7.0 | 30 | < 30 | < 0.3 | < 0.06 | < 0.2 | 5.9 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.044 | < 0.0002 | 0.00089 | < 0.000007 | < 0.002 | < 0.000007 | 3.3 | 0.000003 |
| Dilution | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 833 | | 7.5 | < 2 | 10 | 42 | < 30 | < 0.3 | 0.12 | < 0.2 | 7.6 | < 0.03 | < 0.06 | < 0.06 | 0.060 | < 0.00001 | < 0.00005 | 0.07 | 0.0002 | 0.00095 | < 0.000007 | < 0.002 | < 0.000007 | 5.2 | < 0.000003 |
| Dilution | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 825 | | 7.4 | < 2 | 9.0 | 30 | < 30 | < 0.3 | < 0.06 | < 0.2 | 4.4 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.063 | 0.0002 | 0.00083 | < 0.000007 | < 0.002 | < 0.000007 | 3.7 | 0.000005 |
| Dilution | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 870 | | 7.3 | < 2 | 9.0 | 30 | < 30 | < 0.3 | < 0.06 | < 0.2 | 4.0 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.047 | 0.0003 | 0.00069 | < 0.000007 | < 0.002 | 0.000011 | 3.1 | 0.000004 |
| Dilution | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 855 | | 7.5 | < 2 | 9.0 | 29 | < 30 | < 0.3 | < 0.06 | < 0.2 | 5.1 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.067 | < 0.0002 | 0.001 | < 0.000007 | < 0.002 | < 0.000007 | 4.1 | 0.000004 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du Guide d'intervention - Protection des sols et réabilitation des terrains contaminés, MELCC, 2019, Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3,
3 - EC: Critère d'eau souterraine- eau de consommation du Guide d'intervention - Protection des sols et réabilitation des terrains contaminés, MELCC,2019,
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | Cobalt | Chromium | Cuivre | Iron | Potassium | Lithium | Magnesium | Manganese | Molybdène | Sodium | Nickel | Plomb | Antimoine | Selenium | Strontium | Étain | Titane | Thallium | Uranium | Vanadium | Tungstène | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.000004 | 0.00008 | 0.0002 | 0.007 | 0.003 | 0.0001 | 0.001 | 0.00001 | 0.00004 | 0.01 | 0.0001 | 0.00001 | 0.0009 | 0.00004 | 0.00002 | 0.00006 | 0.00005 | 0.000005 | 0.000002 | 0.00001 | 0.00002 | 0.002 |
| | | | | | | | | | RES[2] | 0.37 | 0.016 | 0.0073 | | | | | 2.3 | 29 | | 0.26 | 0.034 | 1.1 | 0.062 | | | | | 0.32 | | | 0.067 |
| | | | | | | | | | EC[3] | | 0.05 | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | 0.01 | 0.006 | 0.01 | | | | | 0.02 | | | 5.0 |
| | | | | | | | | | Final Effluent Dir, 0194 | | | *0.3* | *3.0* | | | | | | | *0.5* | *0.2* | | | | | | | | | | *0.5* |
| Dilution | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 794 | | 0.000025 | 0.00009 | 0.0005 | 0.016 | 4.4 | 0.0009 | 0.17 | 0.01 | 0.00051 | 2.9 | 0.0003 | 0.00004 | < 0.0009 | 0.00009 | 0.018 | 0.00076 | 0.0012 | < 0.000005 | 0.000021 | 0.00048 | 0.00087 | < 0.002 |
| Dilution | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 966 | | 0.000025 | 0.00011 | < 0.0002 | 0.013 | 6.6 | 0.0018 | 0.36 | 0.022 | 0.00055 | 5.6 | 0.0006 | 0.00008 | < 0.0009 | 0.00024 | 0.03 | 0.00024 | 0.00086 | 0.000007 | 0.00046 | 0.0004 | 0.0024 | < 0.002 |
| Dilution | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 963 | | 0.000021 | < 0.00008 | < 0.0002 | < 0.007 | 4.8 | 0.0023 | 1.0 | 0.024 | 0.0011 | 2.8 | 0.0002 | 0.00004 | 0.0011 | 0.00014 | 0.12 | 0.00011 | 0.0002 | < 0.000005 | 0.0005 | 0.0003 | 0.0023 | < 0.002 |
| Dilution | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 983 | | 0.000008 | < 0.00008 | < 0.0002 | < 0.007 | 5.3 | 0.0016 | 0.38 | 0.024 | 0.0006 | 4.1 | 0.0004 | 0.00005 | < 0.0009 | 0.00019 | 0.025 | 0.00011 | 0.00044 | 0.00001 | 0.00067 | 0.00036 | 0.0011 | < 0.002 |
| Dilution | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 948 | | 0.000018 | 0.0001 | < 0.0002 | 0.008 | 3.0 | 0.0006 | 0.22 | 0.022 | 0.00023 | 2.9 | < 0.0001 | 0.00003 | < 0.0009 | 0.00011 | 0.018 | 0.00009 | 0.00053 | < 0.000005 | 0.00025 | 0.00036 | 0.00046 | < 0.002 |
| Dilution | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 974 | | 0.00002 | < 0.00008 | 0.0006 | 0.013 | 4.5 | 0.0016 | 0.38 | 0.027 | 0.00087 | 3.2 | 0.0003 | 0.00004 | < 0.0009 | 0.00017 | 0.025 | 0.00012 | 0.00088 | < 0.000005 | 0.00068 | 0.00044 | 0.00072 | < 0.002 |
| Dilution | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 962 | | 0.000004 | < 0.00008 | < 0.0002 | 0.01 | 3.2 | 0.0015 | 0.27 | 0.02 | 0.00024 | 1.8 | < 0.0001 | 0.00003 | < 0.0009 | 0.00017 | 0.019 | 0.00007 | 0.00051 | < 0.000005 | 0.00046 | 0.00035 | < 0.00002 | < 0.002 |
| Dilution | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 936 | | 0.000022 | < 0.00008 | 0.0015 | 0.01 | 2.6 | 0.0007 | 0.24 | 0.022 | 0.00014 | 1.5 | 0.0002 | 0.00004 | < 0.0009 | 0.00012 | 0.02 | 0.00008 | 0.00061 | < 0.000005 | 0.00036 | 0.00039 | 0.00036 | < 0.002 |
| Dilution | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 934 | | < 0.000004 | < 0.00008 | < 0.0002 | 0.007 | 2.9 | 0.0013 | 0.31 | 0.022 | 0.00047 | 2.4 | 0.0002 | 0.00003 | < 0.0009 | 0.00013 | 0.027 | 0.00008 | 0.00049 | < 0.000005 | 0.00045 | 0.00035 | 0.00029 | < 0.002 |
| Dilution | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 944 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 2.3 | 0.0012 | 0.27 | 0.02 | 0.00009 | 1.4 | < 0.0001 | 0.00007 | < 0.0009 | 0.00011 | 0.019 | 0.0002 | 0.00029 | < 0.000005 | 0.00046 | 0.00036 | 0.00021 | < 0.002 |
| Dilution | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 952 | | 0.000009 | < 0.00008 | 0.0028 | < 0.007 | 2.8 | 0.0015 | 0.32 | 0.026 | 0.00016 | 1.4 | < 0.0001 | 0.00003 | < 0.0009 | 0.00012 | 0.019 | 0.00007 | 0.00036 | 0.000005 | 0.00077 | 0.00041 | 0.00034 | < 0.002 |
| Dilution | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 902 | | 0.000021 | 0.00013 | 0.0005 | 0.027 | 2.4 | 0.0009 | 0.28 | 0.022 | 0.00019 | 1.1 | < 0.0001 | 0.00005 | < 0.0009 | 0.00009 | 0.016 | < 0.00006 | 0.0027 | < 0.000005 | 0.00052 | 0.00042 | 0.00032 | < 0.002 |
| Dilution | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 901 | | 0.000008 | < 0.00008 | 0.0009 | 0.008 | 1.8 | 0.0008 | 0.21 | 0.017 | 0.00012 | 0.7 | < 0.0001 | 0.00002 | < 0.0009 | 0.00009 | 0.018 | < 0.00006 | 0.00052 | < 0.000005 | 0.00052 | 0.00041 | 0.00018 | < 0.002 |
| Dilution | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 928 | | 0.000072 | < 0.00008 | < 0.0002 | 0.01 | 2.0 | 0.0008 | 0.24 | 0.024 | 0.00016 | 0.76 | < 0.0001 | 0.00003 | < 0.0009 | 0.00012 | 0.02 | < 0.00006 | 0.00085 | < 0.000005 | 0.00043 | 0.00042 | 0.00019 | < 0.002 |
| Dilution | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 912 | | < 0.000004 | < 0.00008 | < 0.0002 | 0.008 | 1.7 | 0.0004 | 0.2 | 0.017 | 0.00033 | 0.81 | < 0.0001 | 0.00003 | < 0.0009 | 0.00008 | 0.017 | 0.00009 | 0.00061 | < 0.000005 | 0.00047 | 0.00038 | 0.00019 | < 0.002 |
| Dilution | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 915 | | 0.000004 | 0.00012 | < 0.0002 | 0.008 | 2.1 | 0.0009 | 0.26 | 0.022 | 0.00021 | 0.83 | < 0.0001 | 0.00002 | < 0.0009 | 0.0001 | 0.017 | 0.00008 | 0.00045 | < 0.000005 | 0.00052 | 0.00048 | 0.00029 | < 0.002 |
| Dilution | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 896 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 1.5 | 0.0037 | 0.22 | 0.015 | 0.00031 | 1.1 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00009 | 0.015 | < 0.00006 | 0.00047 | < 0.000005 | 0.00051 | 0.00044 | 0.00028 | < 0.002 |
| Dilution | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 833 | | 0.000005 | < 0.00008 | < 0.0002 | 0.007 | 2.4 | 0.0006 | 0.25 | 0.019 | 0.00009 | 0.61 | < 0.0001 | 0.00003 | < 0.0009 | 0.0001 | 0.02 | < 0.00006 | 0.00057 | < 0.000005 | 0.00053 | 0.00063 | 0.00015 | < 0.002 |
| Dilution | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 825 | | 0.000007 | 0.00011 | < 0.0002 | 0.007 | 1.7 | 0.0006 | 0.2 | 0.016 | 0.00007 | 0.36 | < 0.0001 | < 0.00001 | < 0.0009 | < 0.00004 | 0.015 | < 0.00006 | 0.00066 | < 0.000005 | 0.00051 | 0.0007 | 0.00016 | < 0.002 |
| Dilution | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 870 | | 0.000024 | < 0.00008 | < 0.0002 | 0.013 | 1.4 | 0.0006 | 0.18 | 0.016 | 0.00005 | 0.45 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00011 | 0.014 | 0.0003 | 0.00037 | < 0.000005 | 0.00054 | 0.00058 | 0.00004 | < 0.002 |
| Dilution | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 855 | | 0.000015 | < 0.00008 | 0.0003 | 0.009 | 1.6 | 0.0008 | 0.22 | 0.019 | 0.0002 | 0.39 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00009 | 0.017 | < 0.00006 | 0.00049 | < 0.000005 | 0.00063 | 0.00067 | 0.00023 | < 0.002 |

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3 - EC: Critère d'eau souterraine- eau de consommation du Guide d'intervention - Protection des sols et réabilitation des terrains contaminés, MELCC,2019,
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | pH | Acidité | Alcalinité | Conductivité | Solides dissous totaux | Bromure | Fluorure | Chlorure | Sulfate | Nitrite (as N) | Nitrate (as N) | Nitrate + Nitrite (as N) | Phosphore (réactif total) | Mercure | Argent | Aluminum | Arsenic | Baryum | Beryllium | Bore | Bismuth | Calcium | Cadmium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | no unit | mg/L as CaCO3 | mg/L as CaCO3 | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.05 | 2.0 | 2.0 | 2.0 | 30 | 0.3 | 0.06 | 0.2 | 0.2 | 0.03 | 0.06 | 0.06 | 0.03 | 0.00001 | 0.00005 | 0.001 | 0.0002 | 0.00002 | 0.000007 | 0.002 | 0.000007 | 0.01 | 0.000003 |
| | | | | | | | | | RES[2] | | | | | | | 4.0 | 860 | | 0.06 | 300 | | 1.0 | 0.0000013 | 0.00062 | | 0.34 | 0.6 | | 28 | | | 0.0011 |
| | | | | | | | | | EC[3] | | | | | | | 1.5 | 250 | | 1.0 | | | | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | | 5.0 | | | 0.005 |
| | | | | | | | | | Final Effluent Dir. 019[4] | *6-9.5* | | | | | | | | | | | | | | | | *0.2* | | | | | | |
| Roche#1 AGR Stérile | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 782 | | 8.7 | < 2 | 17 | 74 | 83 | < 0.3 | 0.07 | 2.3 | 9.6 | < 0.03 | < 0.06 | < 0.06 | 0.260 | < 0.00001 | < 0.00005 | 0.072 | 0.0018 | 0.0044 | < 0.000007 | 0.002 | < 0.000007 | 2.7 | 0.000003 |
| Roche#1 AGR Stérile | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 961 | | 7.4 | < 2 | 14 | 47 | 51 | < 0.3 | < 0.06 | 0.9 | 4.7 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.05 | 0.0039 | 0.0036 | < 0.000007 | 0.002 | < 0.000007 | 1.9 | < 0.000003 |
| Roche#1 AGR Stérile | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 940 | | 7.5 | < 2 | 11 | 39 | < 30 | < 0.3 | < 0.06 | 0.5 | 5.1 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.046 | 0.0034 | 0.0037 | < 0.000007 | < 0.002 | < 0.000007 | 1.9 | < 0.000003 |
| Roche#1 AGR Stérile | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 962 | | 7.3 | < 2 | 9.0 | 38 | 40 | < 0.3 | < 0.06 | 0.3 | 6.7 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.044 | 0.0028 | 0.0041 | < 0.000007 | < 0.002 | < 0.000007 | 1.8 | 0.000004 |
| Roche#1 AGR Stérile | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 928 | | 6.9 | < 2 | 5.0 | 38 | < 30 | < 0.3 | < 0.06 | < 0.2 | 6.6 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.046 | 0.0023 | 0.0041 | < 0.000007 | 0.002 | < 0.000007 | 1.7 | < 0.000003 |
| Roche#1 AGR Stérile | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 960 | | 7.2 | < 2 | 6.0 | 34 | < 30 | < 0.3 | < 0.06 | < 0.2 | 6.1 | < 0.03 | < 0.06 | < 0.06 | 0.050 | < 0.00001 | < 0.00005 | 0.045 | 0.0026 | 0.0044 | < 0.000007 | < 0.002 | < 0.000007 | 2.1 | < 0.000003 |
| Roche#1 AGR Stérile | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 945 | | 7.2 | < 2 | 7.0 | 31 | < 30 | < 0.3 | < 0.06 | < 0.2 | 5.1 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.042 | 0.0022 | 0.0041 | < 0.000007 | 0.013 | 0.000015 | 2.0 | < 0.000003 |
| Roche#1 AGR Stérile | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 936 | | 7.2 | < 2 | 7.0 | 27 | < 30 | < 0.3 | < 0.06 | < 0.2 | 4.9 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.035 | 0.0022 | 0.0038 | < 0.000007 | < 0.002 | < 0.000007 | 1.8 | 0.000003 |
| Roche#1 AGR Stérile | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 931 | | 7.2 | < 2 | 9.0 | 28 | < 30 | < 0.3 | < 0.06 | < 0.2 | 5.0 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.032 | 0.002 | 0.0043 | < 0.000007 | 0.007 | < 0.000007 | 2.2 | < 0.000003 |
| Roche#1 AGR Stérile | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 921 | | 7.0 | < 2 | 7.0 | 24 | < 30 | < 0.3 | < 0.06 | < 0.2 | 3.9 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.036 | 0.0018 | 0.0042 | < 0.000007 | 0.027 | < 0.000007 | 1.8 | < 0.000003 |
| Roche#1 AGR Stérile | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 973 | | 7.1 | < 2 | 7.0 | 29 | 40 | < 0.3 | < 0.06 | < 0.2 | 3.6 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.034 | 0.0024 | 0.0049 | < 0.000007 | < 0.002 | < 0.000007 | 2.2 | < 0.000003 |
| Roche#1 AGR Stérile | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 912 | | 7.1 | < 2 | 6.0 | 22 | < 30 | < 0.3 | < 0.06 | < 0.2 | 3.2 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | 0.0016 | 0.0045 | < 0.000007 | 0.003 | < 0.000007 | 2.0 | 0.00001 |
| Roche#1 AGR Stérile | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 902 | | 7.0 | < 2 | 6.0 | 20 | < 30 | < 0.3 | < 0.06 | < 0.2 | 3.4 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.037 | 0.0019 | 0.0038 | < 0.000007 | 0.003 | < 0.000007 | 1.9 | 0.000003 |
| Roche#1 AGR Stérile | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 911 | | 6.9 | < 2 | 6.0 | 19 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.8 | < 0.03 | < 0.06 | <0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.036 | 0.0016 | 0.0046 | < 0.000007 | < 0.002 | < 0.000007 | 1.7 | < 0.000003 |
| Roche#1 AGR Stérile | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 912 | | 7.1 | < 2 | 6.0 | 22 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.9 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.035 | 0.0015 | 0.0041 | < 0.000007 | 0.18 | < 0.000007 | 1.6 | 0.000003 |
| Roche#1 AGR Stérile | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 907 | | 7.0 | < 2 | 5.0 | 21 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.7 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.039 | 0.0016 | 0.0041 | < 0.000007 | 0.003 | < 0.000007 | 1.8 | < 0.000003 |
| Roche#1 AGR Stérile | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 921 | | 7.0 | < 2 | 5.0 | 17 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.5 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.032 | 0.0014 | 0.0035 | < 0.000007 | < 0.002 | < 0.000007 | 1.5 | < 0.000003 |
| Roche#1 AGR Stérile | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 831 | | 7.2 | < 2 | 6.0 | 21 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.8 | < 0.03 | < 0.06 | < 0.06 | 0.060 | < 0.00001 | < 0.00005 | 0.05 | 0.0017 | 0.0037 | < 0.000007 | < 0.002 | < 0.000007 | 1.8 | < 0.000003 |
| Roche#1 AGR Stérile | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 842 | | 7.0 | < 2 | 4.0 | 20 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.1 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.045 | 0.0016 | 0.0031 | < 0.000007 | < 0.002 | < 0.000007 | 1.5 | 0.000004 |
| Roche#1 AGR Stérile | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 865 | | 6.8 | < 2 | 4.0 | 17 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.2 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | 0.0015 | 0.0037 | < 0.000007 | < 0.002 | < 0.000007 | 1.4 | < 0.000003 |
| Roche#1 AGR Stérile | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 868 | | 6.9 | < 2 | 5.0 | 15 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.3 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.043 | 0.0013 | 0.004 | < 0.000007 | < 0.002 | < 0.000007 | 1.7 | 0.000003 |

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3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | Cobalt | Chromium | Cuivre | Iron | Potassium | Lithium | Magnesium | Manganese | Molybdène | Sodium | Nickel | Plomb | Antimoine | Selenium | Strontium | Étain | Titane | Thallium | Uranium | Vanadium | Tungstène | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.000004 | 0.00008 | 0.0002 | 0.007 | 0.003 | 0.0001 | 0.001 | 0.00001 | 0.00004 | 0.01 | 0.0001 | 0.00001 | 0.0009 | 0.00004 | 0.00002 | 0.00006 | 0.00005 | 0.000005 | 0.000002 | 0.00001 | 0.00002 | 0.002 |
| | | | | | | | | | RES[2] | 0.37 | 0.016 | 0.0073 | | | | | 2.3 | 29 | | 0.26 | 0.034 | 1.1 | 0.062 | | | | | 0.32 | | | 0.067 |
| | | | | | | | | | EC[3] | | 0.05 | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | 0.01 | 0.006 | 0.01 | | | | | 0.02 | | | 5.0 |
| | | | | | | | | | Final Effluent Dir. 019[4] | | | *0.3* | *3.0* | | | | | | | *0.5* | *0.2* | | | | | | | | | | *0.5* |
| Roche#1 AGR Stérile | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 782 | | 0.000032 | 0.00015 | 0.0004 | 0.021 | 6.5 | 0.0027 | 0.27 | 0.0053 | 0.00029 | 7.2 | 0.0004 | 0.00004 | < 0.0009 | 0.00024 | 0.02 | 0.00032 | 0.0016 | < 0.000005 | 0.000045 | 0.00066 | 0.0013 | < 0.002 |
| Roche#1 AGR Stérile | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 961 | | 0.000043 | 0.0001 | 0.0003 | 0.014 | 5.2 | 0.002 | 0.26 | 0.0079 | 0.00029 | 4.4 | 0.0006 | 0.00003 | 0.0011 | 0.00022 | 0.016 | 0.0002 | 0.00062 | < 0.000005 | 0.00026 | 0.00054 | 0.0012 | < 0.002 |
| Roche#1 AGR Stérile | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 940 | | 0.00005 | 0.00036 | 0.0013 | 0.009 | 5.2 | 0.0019 | 0.3 | 0.009 | 0.00026 | 3.4 | 0.0005 | 0.00004 | 0.001 | 0.00016 | 0.016 | 0.00015 | 0.0006 | < 0.000005 | 0.00037 | 0.00051 | 0.00079 | < 0.002 |
| Roche#1 AGR Stérile | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 962 | | 0.00004 | < 0.00008 | < 0.0002 | 0.008 | 4.0 | 0.0016 | 0.33 | 0.0078 | 0.00011 | 2.7 | 0.0004 | 0.00001 | < 0.0009 | 0.00013 | 0.015 | 0.00011 | 0.00042 | < 0.000005 | 0.00057 | 0.00044 | 0.00048 | < 0.002 |
| Roche#1 AGR Stérile | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 928 | | 0.000075 | 0.00017 | < 0.0002 | 0.012 | 3.8 | 0.0011 | 0.33 | 0.0074 | 0.00026 | 2.7 | 0.0004 | 0.00003 | < 0.0009 | 0.00014 | 0.017 | 0.00015 | 0.00076 | < 0.000005 | 0.00086 | 0.00047 | 0.00031 | < 0.002 |
| Roche#1 AGR Stérile | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 960 | | 0.000054 | < 0.00008 | 0.0005 | 0.011 | 3.9 | 0.0016 | 0.4 | 0.0092 | 0.00045 | 1.8 | 0.0004 | 0.00003 | < 0.0009 | 0.00016 | 0.018 | 0.00012 | 0.00061 | < 0.000005 | 0.001 | 0.00049 | 0.00027 | < 0.002 |
| Roche#1 AGR Stérile | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 945 | | 0.000033 | < 0.00008 | < 0.0002 | 0.008 | 3.6 | 0.0016 | 0.36 | 0.0079 | 0.00016 | 1.2 | 0.0002 | 0.00003 | < 0.0009 | 0.00021 | 0.016 | 0.00012 | 0.00037 | < 0.000005 | 0.0011 | 0.00043 | < 0.00002 | < 0.002 |
| Roche#1 AGR Stérile | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 936 | | 0.000052 | < 0.00008 | 0.0014 | 0.007 | 2.9 | 0.0009 | 0.32 | 0.0073 | 0.00007 | 0.94 | 0.0003 | 0.00003 | < 0.0009 | 0.00014 | 0.016 | 0.00009 | 0.00034 | < 0.000005 | 0.0012 | 0.00043 | 0.0002 | < 0.002 |
| Roche#1 AGR Stérile | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 931 | | 0.00003 | < 0.00008 | < 0.0002 | < 0.007 | 3.0 | 0.0015 | 0.39 | 0.0072 | 0.0012 | 2.4 | 0.0002 | 0.00002 | < 0.0009 | 0.0001 | 0.025 | < 0.00006 | 0.00028 | < 0.000005 | 0.0012 | 0.00043 | 0.00014 | 0.002 |
| Roche#1 AGR Stérile | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 921 | | 0.000044 | < 0.00008 | < 0.0002 | < 0.007 | 2.6 | 0.0013 | 0.32 | 0.0078 | 0.00007 | 0.62 | < 0.0001 | 0.00004 | < 0.0009 | 0.00009 | 0.014 | 0.00021 | 0.00029 | < 0.000005 | 0.0013 | 0.00039 | 0.00009 | < 0.002 |
| Roche#1 AGR Stérile | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 973 | | 0.000044 | < 0.00008 | < 0.0002 | < 0.007 | 2.9 | 0.0015 | 0.39 | 0.009 | 0.0007 | 0.53 | < 0.0001 | 0.00002 | < 0.0009 | 0.0001 | 0.017 | 0.00008 | 0.00022 | < 0.000005 | 0.0022 | 0.00051 | 0.00031 | < 0.002 |
| Roche#1 AGR Stérile | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 912 | | 0.000035 | < 0.00008 | 0.0002 | < 0.007 | 2.6 | 0.0008 | 0.33 | 0.0075 | 0.011 | 0.7 | < 0.0001 | 0.00003 | < 0.0009 | 0.0001 | 0.016 | 0.00007 | 0.00029 | < 0.000005 | 0.0017 | 0.00039 | 0.00016 | < 0.002 |
| Roche#1 AGR Stérile | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 902 | | 0.000046 | < 0.00008 | < 0.0002 | 0.015 | 2.4 | 0.001 | 0.31 | 0.0064 | 0.00031 | 0.39 | < 0.0001 | 0.00003 | < 0.0009 | 0.00008 | 0.013 | < 0.00006 | 0.00038 | < 0.000005 | 0.002 | 0.00048 | 0.00008 | < 0.002 |
| Roche#1 AGR Stérile | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 911 | | 0.000055 | < 0.00008 | < 0.0002 | < 0.007 | 1.8 | 0.0008 | 0.27 | 0.0072 | 0.00014 | 0.27 | < 0.0001 | 0.00001 | < 0.0009 | 0.00008 | 0.012 | < 0.00006 | 0.00039 | < 0.000005 | 0.002 | 0.00037 | 0.00008 | < 0.002 |
| Roche#1 AGR Stérile | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 912 | | 0.000005 | < 0.00008 | 0.0004 | 0.007 | 1.7 | 0.0004 | 0.25 | 0.0061 | 0.00086 | 0.42 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00007 | 0.011 | 0.00011 | 0.00042 | < 0.000005 | 0.002 | 0.00042 | 0.00009 | < 0.002 |
| Roche#1 AGR Stérile | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 907 | | 0.000028 | 0.00013 | < 0.0002 | 0.01 | 2.0 | 0.0008 | 0.28 | 0.0066 | 0.0003 | 0.32 | 0.0001 | 0.00002 | < 0.0009 | 0.00007 | 0.01 | < 0.00006 | 0.00033 | < 0.000005 | 0.002 | 0.00047 | 0.00008 | < 0.002 |
| Roche#1 AGR Stérile | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 921 | | 0.000024 | < 0.00008 | 0.0005 | 0.014 | 1.5 | 0.0033 | 0.23 | 0.0058 | 0.00007 | 0.44 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00007 | 0.009 | < 0.00006 | 0.00022 | < 0.000005 | 0.0019 | 0.00041 | 0.00005 | < 0.002 |
| Roche#1 AGR Stérile | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 831 | | 0.000034 | < 0.00008 | < 0.0002 | 0.008 | 2.2 | 0.0005 | 0.23 | 0.0061 | 0.00006 | 0.26 | < 0.0001 | 0.00006 | < 0.0009 | 0.00008 | 0.0097 | < 0.00006 | 0.00065 | < 0.000005 | 0.0017 | 0.00055 | 0.00005 | < 0.002 |
| Roche#1 AGR Stérile | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 842 | | 0.000055 | 0.00016 | 0.0002 | < 0.007 | 1.6 | 0.0005 | 0.21 | 0.0056 | 0.00004 | 0.17 | 0.0002 | < 0.00001 | < 0.0009 | < 0.00004 | 0.0081 | < 0.00006 | 0.00048 | < 0.000005 | 0.0015 | 0.00056 | 0.00008 | < 0.002 |
| Roche#1 AGR Stérile | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 865 | | 0.000031 | < 0.00008 | 0.0003 | < 0.007 | 1.4 | 0.0005 | 0.2 | 0.0059 | 0.00013 | 0.17 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00007 | 0.0087 | < 0.00006 | 0.00029 | < 0.000005 | 0.0017 | 0.00049 | < 0.00002 | < 0.002 |
| Roche#1 AGR Stérile | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 868 | | 0.00004 | 0.00009 | 0.0004 | 0.007 | 1.6 | 0.0006 | 0.22 | 0.0066 | 0.00009 | 0.07 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00004 | 0.012 | < 0.00006 | 0.00043 | < 0.000005 | 0.0016 | 0.00052 | 0.00006 | < 0.002 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

Zone East Gouldie
Mine Canadian Malartic

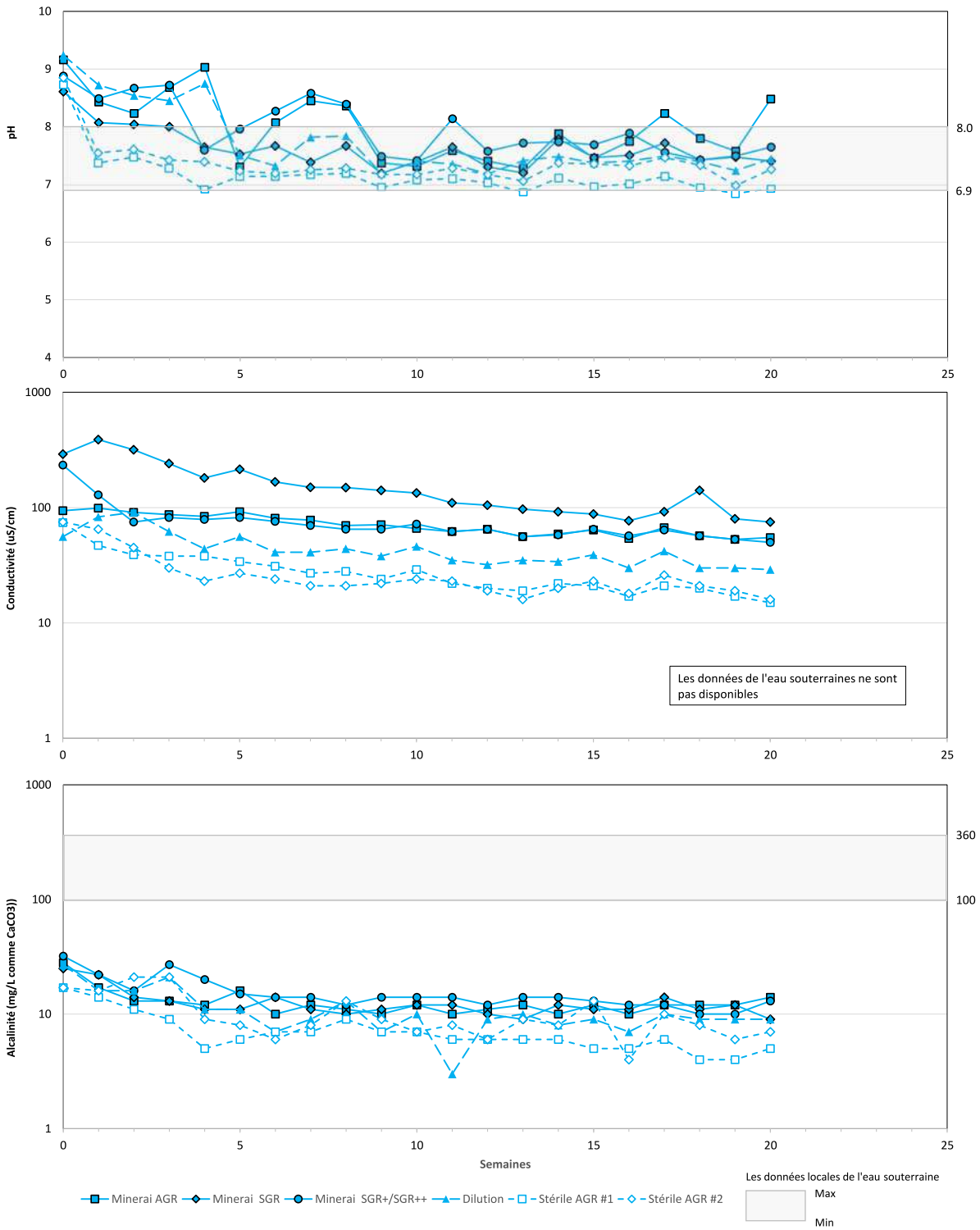
| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | pH | Acidité | Alcalinité | Conductivité | Solides dissous totaux | Bromure | Fluorure | Chlorure | Sulfate | Nitrite (as N) | Nitrate (as N) | Nitrate + Nitrite (as N) | Phosphore (réactif total) | Mercure | Argent | Aluminum | Arsenic | Baryum | Beryllium | Bore | Bismuth | Calcium | Cadmium |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | no unit | mg/L as CaCO3 | mg/L as CaCO3 | uS/cm | mg/L | mg/L | mg/L | mg/L | mg/L | as N mg/L | as N mg/L | as N mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.05 | 2.0 | 2.0 | 2.0 | 30 | 0.3 | 0.06 | 0.2 | 0.2 | 0.03 | 0.06 | 0.06 | 0.03 | 0.00001 | 0.00005 | 0.001 | 0.0002 | 0.00002 | 0.000007 | 0.002 | 0.000007 | 0.01 | 0.000003 |
| | | | | | | | | | RES[2] | | | | | | | 4.0 | 860 | | 0.06 | 300 | | 1.0 | 0.0000013 | 0.00062 | | 0.34 | 0.6 | | 28 | | | 0.0011 |
| | | | | | | | | | EC[3] | | | | | | | 1.5 | 250 | | 1.0 | | | | 0.001 | 0.1 | 0.1 | 0.0003 | 1.0 | | 5.0 | | | 0.005 |
| | | | | | | | | | Final Effluent Dir. 019[4] | *6-9.5* | | | | | | | | | | | | | | | | *0.2* | | | | | |
| Roche#2 AGR Stérile | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 755 | | 8.9 | < 2 | 17 | 75 | 74 | < 0.3 | < 0.06 | 3.2 | 11 | < 0.03 | < 0.06 | < 0.06 | 0.140 | < 0.00001 | < 0.00005 | 0.1 | 0.0003 | 0.0022 | < 0.000007 | < 0.002 | < 0.000007 | 3.9 | 0.000005 |
| Roche#2 AGR Stérile | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 966 | | 7.6 | < 2 | 16 | 65 | 46 | < 0.3 | < 0.06 | 2.6 | 9.6 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.045 | 0.0002 | 0.0022 | < 0.000007 | 0.003 | < 0.000007 | 3.3 | < 0.000003 |
| Roche#2 AGR Stérile | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 978 | | 7.6 | < 2 | 21 | 45 | < 30 | < 0.3 | < 0.06 | 1.4 | 6.0 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.035 | < 0.0002 | 0.0016 | < 0.000007 | 0.007 | < 0.000007 | 2.7 | 0.000005 |
| Roche#2 AGR Stérile | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 968 | | 7.4 | < 2 | 21 | 30 | 31 | < 0.3 | < 0.06 | 0.8 | 4.0 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | < 0.0002 | 0.001 | < 0.000007 | < 0.002 | < 0.000007 | 2.0 | 0.000003 |
| Roche#2 AGR Stérile | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 909 | | 7.4 | < 2 | 9.0 | 23 | < 30 | < 0.3 | < 0.06 | 0.4 | 3.4 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.035 | < 0.0002 | 0.00083 | < 0.000007 | 0.003 | < 0.000007 | 1.5 | < 0.000003 |
| Roche#2 AGR Stérile | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 946 | | 7.2 | < 2 | 8.0 | 27 | < 30 | < 0.3 | < 0.06 | 0.4 | 3.0 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.046 | 0.0003 | 0.0012 | < 0.000007 | 0.003 | < 0.000007 | 2.6 | 0.000005 |
| Roche#2 AGR Stérile | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 957 | | 7.2 | < 2 | 6.0 | 24 | < 30 | < 0.3 | < 0.06 | 0.3 | 2.5 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.037 | < 0.0002 | 0.001 | < 0.000007 | 0.026 | < 0.000007 | 1.9 | < 0.000003 |
| Roche#2 AGR Stérile | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 933 | | 7.3 | < 2 | 8.0 | 21 | < 30 | < 0.3 | < 0.06 | 0.2 | 2.3 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.033 | < 0.0002 | 0.0013 | < 0.000007 | < 0.002 | < 0.000007 | 1.7 | < 0.000003 |
| Roche#2 AGR Stérile | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 932 | | 7.3 | < 2 | 13 | 21 | < 30 | < 0.3 | < 0.06 | 0.2 | 2.2 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.031 | 0.0002 | 0.0011 | < 0.000007 | 0.004 | < 0.000007 | 1.9 | 0.000004 |
| Roche#2 AGR Stérile | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 929 | | 7.2 | < 2 | 9.0 | 22 | < 30 | < 0.3 | < 0.06 | < 0.2 | 2.2 | < 0.03 | < 0.06 | < 0.06 | 0.030 | < 0.00001 | < 0.00005 | 0.043 | 0.0004 | 0.0011 | < 0.000007 | 0.003 | < 0.000007 | 2.0 | < 0.000003 |
| Roche#2 AGR Stérile | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 966 | | 7.2 | < 2 | 7.0 | 24 | < 30 | < 0.3 | < 0.06 | < 0.2 | 1.8 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.037 | < 0.0002 | 0.0011 | < 0.000007 | < 0.002 | < 0.000007 | 2.0 | < 0.000003 |
| Roche#2 AGR Stérile | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 917 | | 7.3 | < 2 | 8.0 | 23 | < 30 | < 0.3 | < 0.06 | < 0.2 | 1.4 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.038 | < 0.0002 | 0.0012 | < 0.000007 | < 0.002 | < 0.000007 | 2.0 | 0.000004 |
| Roche#2 AGR Stérile | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 887 | | 7.2 | < 2 | 6.0 | 19 | < 30 | < 0.3 | < 0.06 | < 0.2 | 1.3 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.044 | < 0.0002 | 0.00082 | < 0.000007 | 0.003 | 0.000008 | 2.0 | < 0.000003 |
| Roche#2 AGR Stérile | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 907 | | 7.1 | < 2 | 9.0 | 16 | < 30 | < 0.3 | < 0.06 | < 0.2 | 1.1 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.041 | < 0.0002 | 0.00087 | < 0.000007 | < 0.002 | < 0.000007 | 1.8 | 0.000006 |
| Roche#2 AGR Stérile | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 898 | | 7.4 | < 2 | 8.0 | 20 | < 30 | < 0.3 | < 0.06 | < 0.2 | 1.2 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.046 | < 0.0002 | 0.0013 | < 0.000007 | 0.22 | < 0.000007 | 1.8 | < 0.000003 |
| Roche#2 AGR Stérile | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 892 | | 7.4 | < 2 | 13 | 23 | < 30 | < 0.3 | < 0.06 | < 0.2 | 1.1 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.058 | < 0.0002 | 0.0012 | < 0.000007 | 0.005 | < 0.000007 | 2.5 | < 0.000003 |
| Roche#2 AGR Stérile | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 902 | | 7.3 | < 2 | 4.0 | 18 | < 30 | < 0.3 | < 0.06 | 0.4 | 1.0 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.038 | < 0.0002 | 0.00094 | < 0.000007 | < 0.002 | < 0.000007 | 1.7 | < 0.000003 |
| Roche#2 AGR Stérile | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 838 | | 7.5 | < 2 | 10 | 26 | < 30 | < 0.3 | 0.1 | < 0.2 | 2.0 | < 0.03 | < 0.06 | < 0.06 | 0.040 | < 0.00001 | < 0.00005 | 0.07 | < 0.0002 | 0.0015 | < 0.000007 | 0.006 | < 0.000007 | 2.8 | 0.000004 |
| Roche#2 AGR Stérile | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 823 | | 7.3 | < 2 | 8.0 | 21 | < 30 | < 0.3 | < 0.06 | < 0.2 | 0.8 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.058 | 0.0002 | 0.0008 | < 0.000007 | 0.003 | < 0.000007 | 2.0 | 0.000003 |
| Roche#2 AGR Stérile | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 867 | | 7.0 | < 2 | 6.0 | 19 | < 30 | < 0.3 | < 0.06 | < 0.2 | 0.8 | < 0.03 | < 0.06 | < 0.06 | < 0.03 | < 0.00001 | < 0.00005 | 0.042 | 0.0002 | 0.00073 | < 0.000007 | < 0.002 | < 0.000007 | 1.8 | < 0.000003 |
| Roche#2 AGR Stérile | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 845 | | 7.3 | < 2 | 7.0 | 16 | < 30 | < 0.3 | < 0.06 | < 0.2 | 0.8 | < 0.03 | < 0.06 | < 0.06 | 0.050 | < 0.00001 | < 0.00005 | 0.056 | < 0.0002 | 0.00081 | < 0.000007 | < 0.002 | < 0.000007 | 2.1 | 0.000004 |

1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012

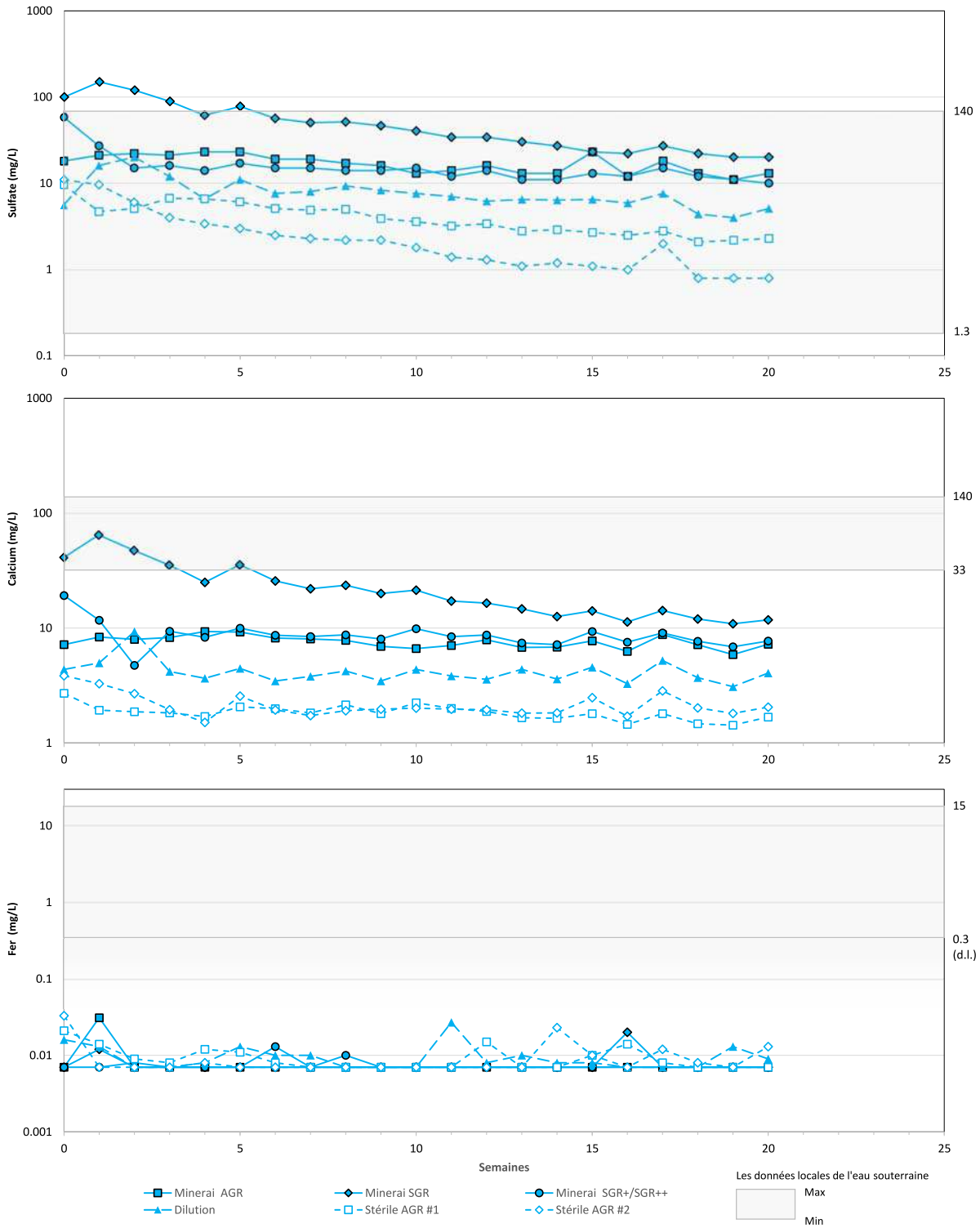
Zone East Gouldie
Mine Canadian Malartic

| ID de l'échantillon | PV | Evénement | Type d'Essai | Poids de l'essai | LIMS | Date/heure de l'échantillon | Semaine | Volume de lixiviats de la cellule d'humidité | | Cobalt | Chromium | Cuivre | Iron | Potassium | Lithium | Magnesium | Manganese | Molybdène | Sodium | Nickel | Plomb | Antimoine | Selenium | Strontium | Étain | Titane | Thallium | Uranium | Vanadium | Tungstène | Zinc |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| | | | | kg | | | | mL | LDM[1] | 0.000004 | 0.00008 | 0.0002 | 0.007 | 0.003 | 0.0001 | 0.001 | 0.00001 | 0.00004 | 0.01 | 0.0001 | 0.00001 | 0.0009 | 0.00004 | 0.00002 | 0.00006 | 0.00005 | 0.000005 | 0.000002 | 0.00001 | 0.00002 | 0.002 |
| | | | | | | | | | RES[2] | 0.37 | 0.016 | 0.0073 | | | | | 2.3 | 29 | | 0.26 | 0.034 | 1.1 | 0.062 | | | | | 0.32 | | | 0.067 |
| | | | | | | | | | EC[3] | | 0.05 | 1.0 | | | | | 0.05 | 0.04 | 200 | 0.07 | 0.01 | 0.006 | 0.01 | | | | | 0.02 | | | 5.0 |
| | | | | | | | | | Final Effluent Dir. 019[4] | | | *0.3* | *3.0* | | | | | | | *0.5* | *0.2* | | | | | | | | | | *0.5* |
| Roche#2 AGR Stérile | PV1 | 1 | HCT | 1 | CA10146-SEP20 | 2020-09-15 | 0 | 755 | | 0.000029 | 0.00017 | 0.0008 | 0.033 | 7.0 | 0.0022 | 0.48 | 0.028 | 0.00046 | 4.4 | 0.0002 | 0.00008 | < 0.0009 | 0.00038 | 0.018 | 0.00042 | 0.0026 | < 0.000005 | 0.000087 | 0.00063 | 0.00014 | < 0.002 |
| Roche#2 AGR Stérile | PV2 | 2 | HCT | 1 | CA10224-SEP20 | 2020-09-22 | 1 | 966 | | 0.000015 | < 0.00008 | 0.0005 | < 0.007 | 6.8 | 0.0025 | 0.46 | 0.026 | 0.00053 | 4.2 | 0.0001 | 0.00002 | < 0.0009 | 0.00037 | 0.017 | 0.00022 | 0.00047 | < 0.000005 | 0.00036 | 0.00053 | 0.00044 | < 0.002 |
| Roche#2 AGR Stérile | PV3 | 3 | HCT | 1 | CA10307-SEP20 | 2020-09-29 | 2 | 978 | | 0.000005 | < 0.00008 | 0.0002 | < 0.007 | 4.6 | 0.0016 | 0.32 | 0.022 | 0.0015 | 2.5 | < 0.0001 | 0.00001 | < 0.0009 | 0.00018 | 0.012 | 0.0001 | 0.00042 | < 0.000005 | 0.00024 | 0.00036 | 0.00025 | < 0.002 |
| Roche#2 AGR Stérile | PV4 | 4 | HCT | 1 | CA10015-OCT20 | 2020-10-06 | 3 | 968 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 3.1 | 0.0011 | 0.23 | 0.018 | 0.00039 | 1.7 | 0.0002 | 0.00002 | < 0.0009 | 0.00018 | 0.0085 | 0.00009 | 0.00029 | < 0.000005 | 0.00021 | 0.00031 | 0.00019 | < 0.002 |
| Roche#2 AGR Stérile | PV5 | 5 | HCT | 1 | CA10126-OCT20 | 2020-10-13 | 4 | 909 | | 0.000039 | < 0.00008 | 0.0002 | 0.008 | 2.1 | 0.0005 | 0.16 | 0.014 | 0.0031 | 1.6 | < 0.0001 | 0.00002 | < 0.0009 | 0.00015 | 0.0071 | 0.00008 | 0.00053 | < 0.000005 | 0.00016 | 0.00029 | 0.00012 | < 0.002 |
| Roche#2 AGR Stérile | PV6 | 6 | HCT | 1 | CA10189-OCT20 | 2020-10-20 | 5 | 946 | | 0.000023 | < 0.00008 | 0.0005 | 0.007 | 2.7 | 0.0009 | 0.22 | 0.03 | 0.0013 | 1.4 | 0.0002 | 0.00003 | < 0.0009 | 0.00017 | 0.009 | 0.00012 | 0.00057 | < 0.000005 | 0.00023 | 0.00038 | 0.00013 | < 0.002 |
| Roche#2 AGR Stérile | PV7 | 7 | HCT | 1 | CA10248-OCT20 | 2020-10-27 | 6 | 957 | | < 0.000004 | 0.00013 | < 0.0002 | 0.007 | 2.4 | 0.0012 | 0.17 | 0.022 | 0.00041 | 1.2 | < 0.0001 | 0.00002 | < 0.0009 | 0.00023 | 0.0067 | 0.0001 | 0.00036 | < 0.000005 | 0.00019 | 0.00038 | < 0.00002 | < 0.002 |
| Roche#2 AGR Stérile | PV8 | 8 | HCT | 1 | CA10014-NOV20 | 2020-11-03 | 7 | 933 | | 0.000011 | < 0.00008 | 0.0004 | < 0.007 | 1.8 | 0.0005 | 0.15 | 0.019 | 0.00015 | 0.88 | 0.0002 | 0.00003 | < 0.0009 | 0.00014 | 0.029 | 0.00009 | 0.00027 | < 0.000005 | 0.00022 | 0.00032 | 0.00015 | < 0.002 |
| Roche#2 AGR Stérile | PV9 | 9 | HCT | 1 | CA10072-NOV20 | 2020-11-10 | 8 | 932 | | 0.000005 | < 0.00008 | 0.0003 | < 0.007 | 2.1 | 0.001 | 0.19 | 0.019 | 0.00055 | 2.1 | 0.0001 | 0.00002 | < 0.0009 | 0.00012 | 0.014 | 0.00006 | 0.00018 | < 0.000005 | 0.00023 | 0.00032 | 0.00013 | < 0.002 |
| Roche#2 AGR Stérile | PV10 | 10 | HCT | 1 | CA10119-NOV20 | 2020-11-17 | 9 | 929 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 2.0 | 0.0008 | 0.17 | 0.022 | 0.00062 | 0.93 | < 0.0001 | 0.00001 | < 0.0009 | 0.00009 | 0.0065 | 0.00007 | 0.0002 | < 0.000005 | 0.00025 | 0.00039 | 0.00012 | < 0.002 |
| Roche#2 AGR Stérile | PV11 | 11 | HCT | 1 | CA10157-NOV20 | 2020-11-24 | 10 | 966 | | 0.000007 | < 0.00008 | < 0.0002 | < 0.007 | 2.1 | 0.001 | 0.17 | 0.024 | 0.00026 | 0.78 | < 0.0001 | 0.00001 | < 0.0009 | 0.00012 | 0.0065 | 0.00009 | 0.00026 | < 0.000005 | 0.00034 | 0.0004 | 0.00014 | < 0.002 |
| Roche#2 AGR Stérile | PV12 | 12 | HCT | 1 | CA10013-DEC20 | 2020-12-01 | 11 | 917 | | 0.000089 | < 0.00008 | 0.0002 | < 0.007 | 1.9 | 0.0004 | 0.17 | 0.019 | 0.00076 | 0.8 | < 0.0001 | 0.00003 | < 0.0009 | 0.00011 | 0.0056 | 0.00008 | 0.00035 | < 0.000005 | 0.00031 | 0.00035 | 0.0002 | < 0.002 |
| Roche#2 AGR Stérile | PV13 | 13 | HCT | 1 | CA10064-DEC20 | 2020-12-08 | 12 | 887 | | < 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 1.8 | 0.0007 | 0.18 | 0.019 | 0.00019 | 0.56 | < 0.0001 | 0.00002 | < 0.0009 | 0.00007 | 0.0064 | < 0.00006 | 0.00044 | < 0.000005 | 0.0004 | 0.00047 | 0.0001 | 0.004 |
| Roche#2 AGR Stérile | PV14 | 14 | HCT | 1 | CA10156-DEC20 | 2020-12-15 | 13 | 907 | | 0.000028 | < 0.00008 | < 0.0002 | < 0.007 | 1.5 | 0.0006 | 0.17 | 0.019 | 0.00081 | 0.45 | < 0.0001 | 0.00003 | < 0.0009 | 0.00008 | 0.0064 | 0.00008 | 0.00038 | < 0.000005 | 0.0004 | 0.00038 | 0.00011 | < 0.002 |
| Roche#2 AGR Stérile | PV15 | 15 | HCT | 1 | CA10179-DEC20 | 2020-12-22 | 14 | 898 | | 0.00001 | < 0.00008 | < 0.0002 | 0.023 | 1.6 | 0.0003 | 0.16 | 0.017 | 0.0002 | 0.6 | 0.0003 | 0.00002 | < 0.0009 | 0.00008 | 0.0058 | 0.00012 | 0.00043 | < 0.000005 | 0.00044 | 0.0004 | 0.00013 | < 0.002 |
| Roche#2 AGR Stérile | PV16 | 16 | HCT | 1 | CA14194-JAN21 | 2020-12-29 | 15 | 892 | | 0.00001 | 0.00015 | 0.0002 | 0.01 | 2.0 | 0.0007 | 0.2 | 0.023 | 0.0002 | 0.52 | < 0.0001 | 0.00002 | < 0.0009 | 0.00006 | 0.0064 | 0.0001 | 0.00065 | < 0.000005 | 0.0005 | 0.00052 | 0.00014 | < 0.002 |
| Roche#2 AGR Stérile | PV17 | 17 | HCT | 1 | CA10011-JAN21 | 2021-01-05 | 16 | 902 | | 0.000004 | < 0.00008 | < 0.0002 | < 0.007 | 1.3 | 0.003 | 0.16 | 0.014 | 0.00011 | 0.95 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00007 | 0.0052 | 0.00007 | 0.00037 | < 0.000005 | 0.00049 | 0.00045 | 0.00008 | < 0.002 |
| Roche#2 AGR Stérile | PV18 | 18 | HCT | 1 | CA10058-JAN21 | 2021-01-12 | 17 | 838 | | 0.000025 | < 0.00008 | < 0.0002 | 0.012 | 2.6 | 0.0006 | 0.25 | 0.019 | 0.0011 | 1.5 | < 0.0001 | 0.00003 | < 0.0009 | 0.00013 | 0.011 | 0.0001 | 0.00098 | < 0.000005 | 0.0009 | 0.00068 | 0.00014 | < 0.002 |
| Roche#2 AGR Stérile | PV19 | 19 | HCT | 1 | CA10134-JAN21 | 2021-01-19 | 18 | 823 | | 0.000015 | 0.00011 | < 0.0002 | 0.008 | 1.7 | 0.0006 | 0.19 | 0.015 | 0.00034 | 0.27 | 0.0001 | < 0.00001 | < 0.0009 | < 0.00004 | 0.0062 | 0.00008 | 0.00051 | < 0.000005 | 0.00062 | 0.0007 | 0.00009 | 0.002 |
| Roche#2 AGR Stérile | PV20 | 20 | HCT | 1 | CA10199-JAN21 | 2021-01-26 | 19 | 867 | | 0.000037 | < 0.00008 | < 0.0002 | < 0.007 | 1.4 | 0.0005 | 0.17 | 0.013 | 0.00014 | 0.25 | < 0.0001 | < 0.00001 | < 0.0009 | 0.00009 | 0.0061 | < 0.00006 | 0.00026 | < 0.000005 | 0.00067 | 0.00055 | < 0.00002 | < 0.002 |
| Roche#2 AGR Stérile | PV21 | 21 | HCT | 1 | CA10010-FEB21 | 2021-02-02 | 20 | 845 | | 0.000026 | < 0.00008 | 0.0003 | 0.013 | 1.5 | 0.0007 | 0.19 | 0.014 | 0.00039 | 0.13 | < 0.0001 | < 0.00001 | < 0.0009 | < 0.00004 | 0.0065 | < 0.00006 | 0.00039 | < 0.000005 | 0.00077 | 0.00065 | 0.00007 | < 0.002 |

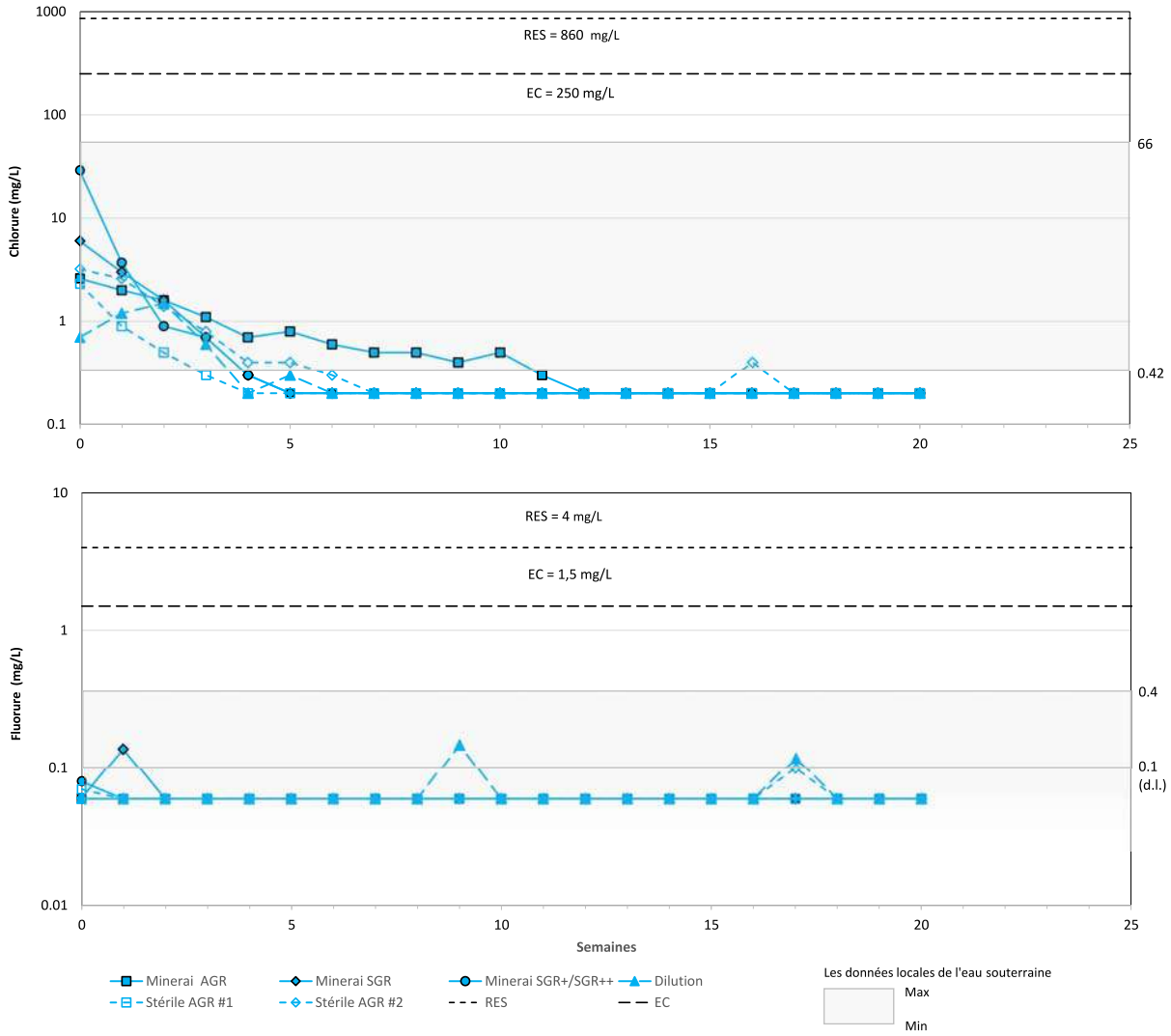
1- LDM: Limite de détection de la méthode utilisée
2 - RES: critère d'eau souterraine- résurgence dans les eaux de surface du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC, 2019. Ces critères varient en fonction de la dureté du milieu récepteur pour notamment le baryum, le cadmium, le chrome (3+), le cuivre, le manganèse, le nickel, le plomb, l'uranium et le zinc, et sont calculés en utilisant une dureté standard de 50 mg/L sous forme de CaCO3.
3 - EC: Critère d'eau souterraine- eau de consommation du *Guide d'intervention - Protection des sols et réabilitation des terrains contaminés* . MELCC,2019.
4 - Tableau 1 de l'annexe 2 de la directive 019 sur l'industrie minière, MELCC,2012



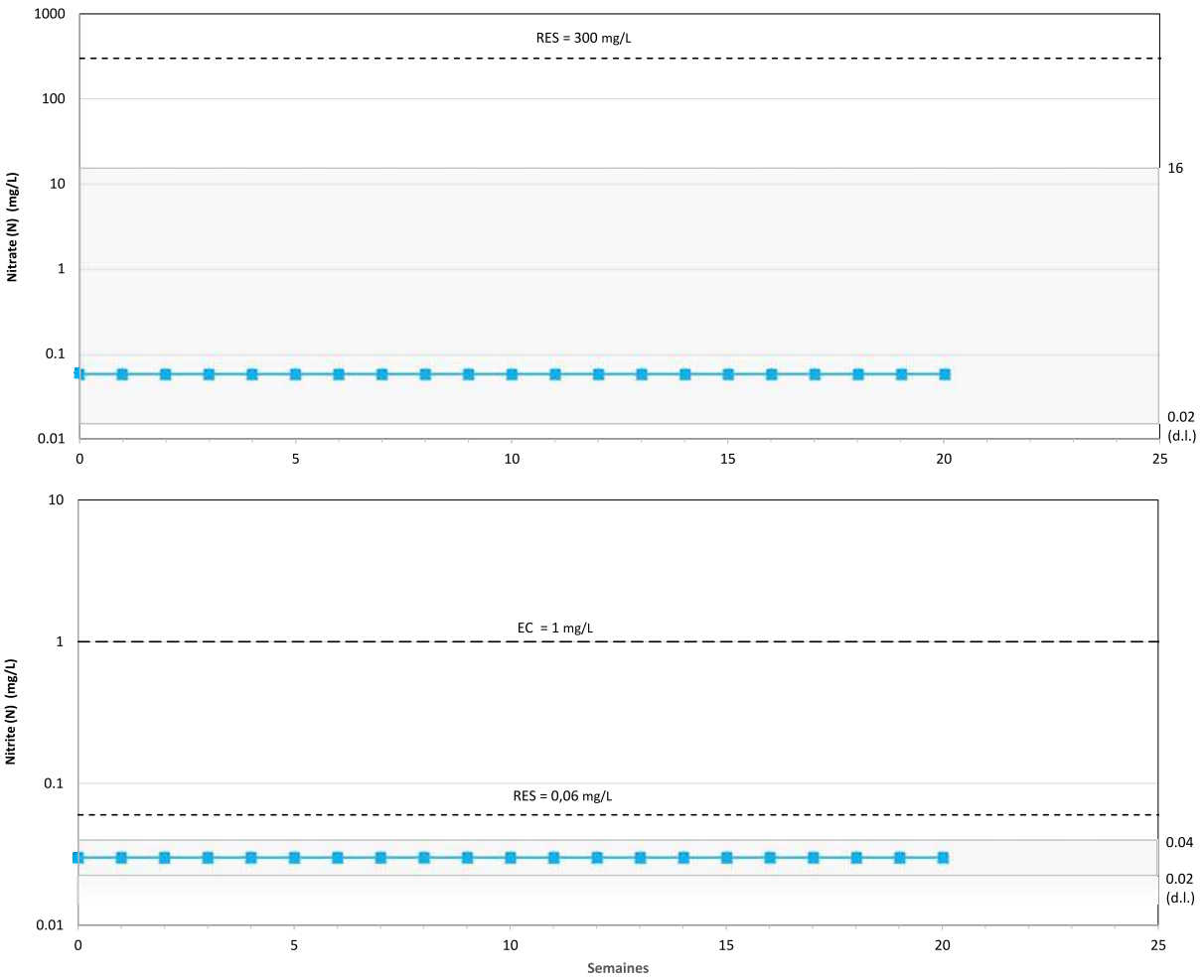

| | | | |
|---|---|---|---|
| **Notes:**<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL | **Composition du roc:**<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | **pH**<br>**Conductivité**<br>**Alcalinité** | **Test des cellules d'humidité**<br>**Concentrations (mg/L)**<br>**Zone d'East Gouldie** |
| | | Dessiné AT; DATE Feb-21<br>Vérifié VBJ; JOB NO 19115345<br>Révisé VBJ; PHASE 61118 | **Mine Canadian Malartic** — GOLDER<br>**Annexe FIGURE E- 1** |



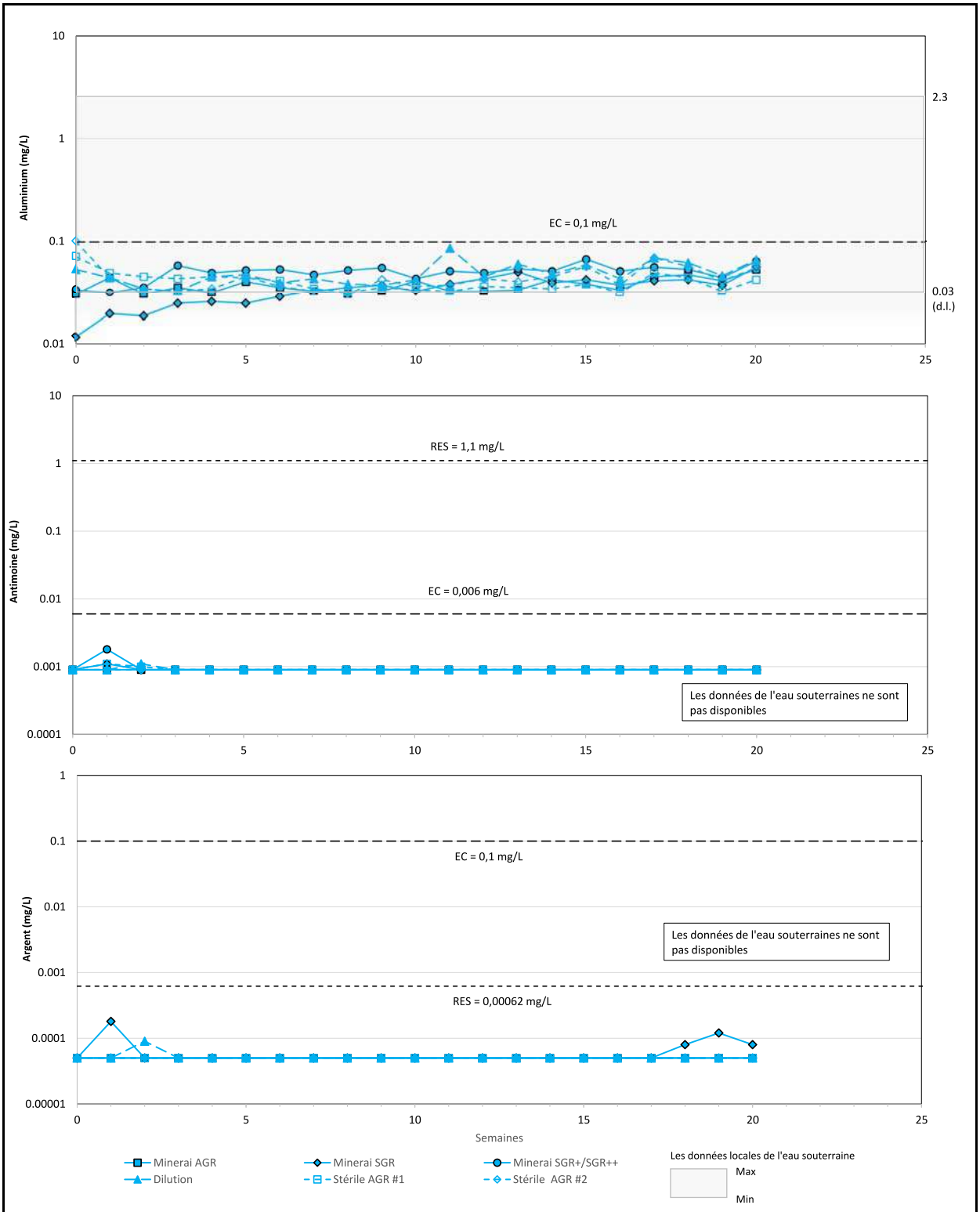

| | | | |
|---|---|---|---|
| Notes:<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL | Composition du roc:<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | **Sulfate**<br>**Calcium**<br>**Fer**<br>Dessiné AT · DATE Feb-21<br>Vérifié VBJ · JOB NO 19115345<br>Révisé VBJ · PHASE 61118 | **Test des cellules d'humidité**<br>**Concentrations (mg/L)**<br>**Zone d'East Gouldie**<br>**Mine Canadian Malartic** · GOLDER<br>**Annexe FIGURE E- 2** |



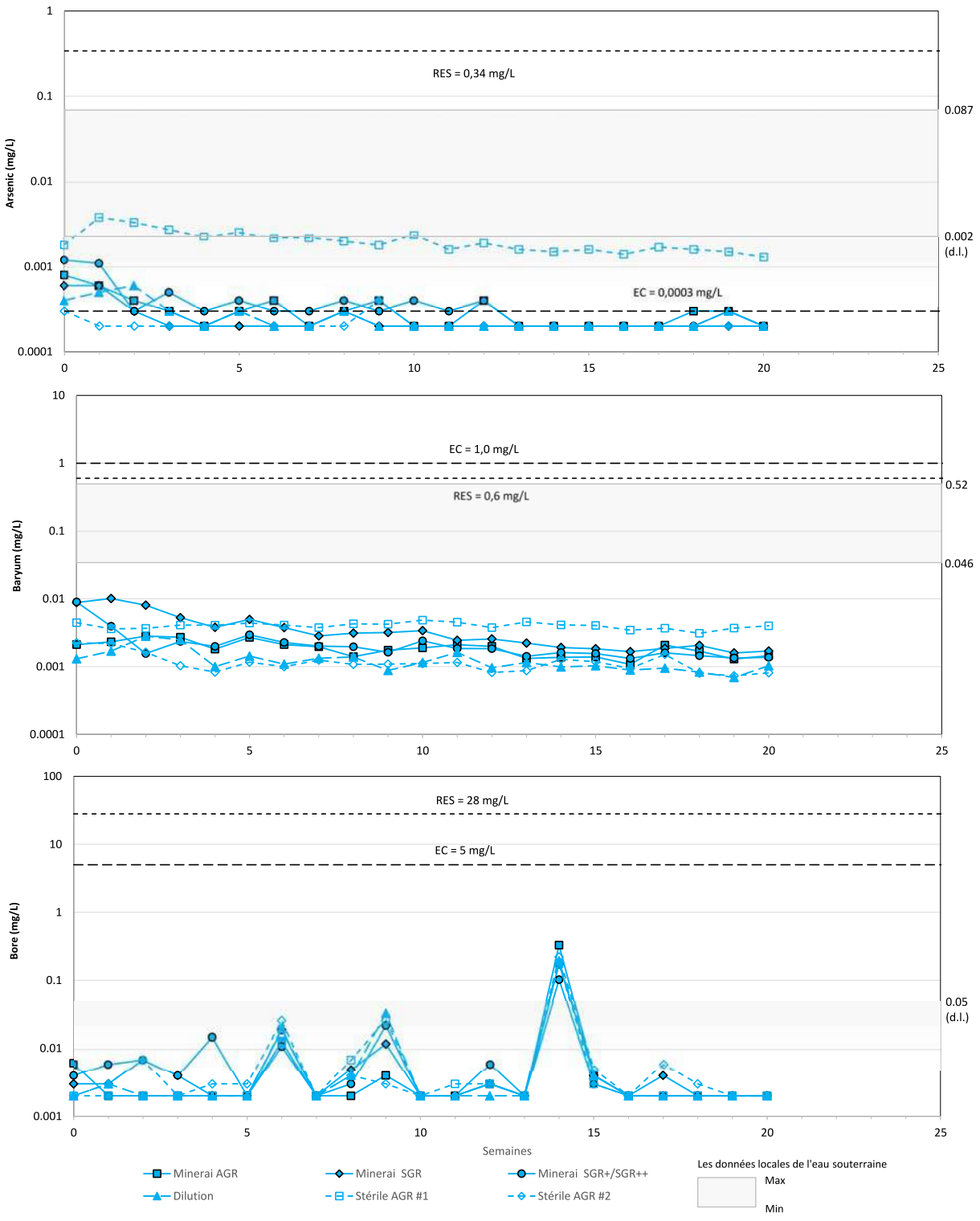

| | | | |
|---|---|---|---|
| Notes:<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>-le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour le fluorure et est calculé en utilisant une dureté inférieur à 120 mg/L sous forme de CaCO3. | Composition du roc:<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | **Chlorure**<br>**Fluorure**<br>Dessiné AT DATE Feb-21<br>Vérifié VBJ JOB NO 19115345<br>Révisé VBJ PHASE 61118 | **Test des cellules d'humidité**<br>**Concentrations (mg/L)**<br>**Zone d'East Gouldie**<br>**Mine Canadian Malartic**<br>GOLDER<br>**Annexe FIGURE E- 3** |



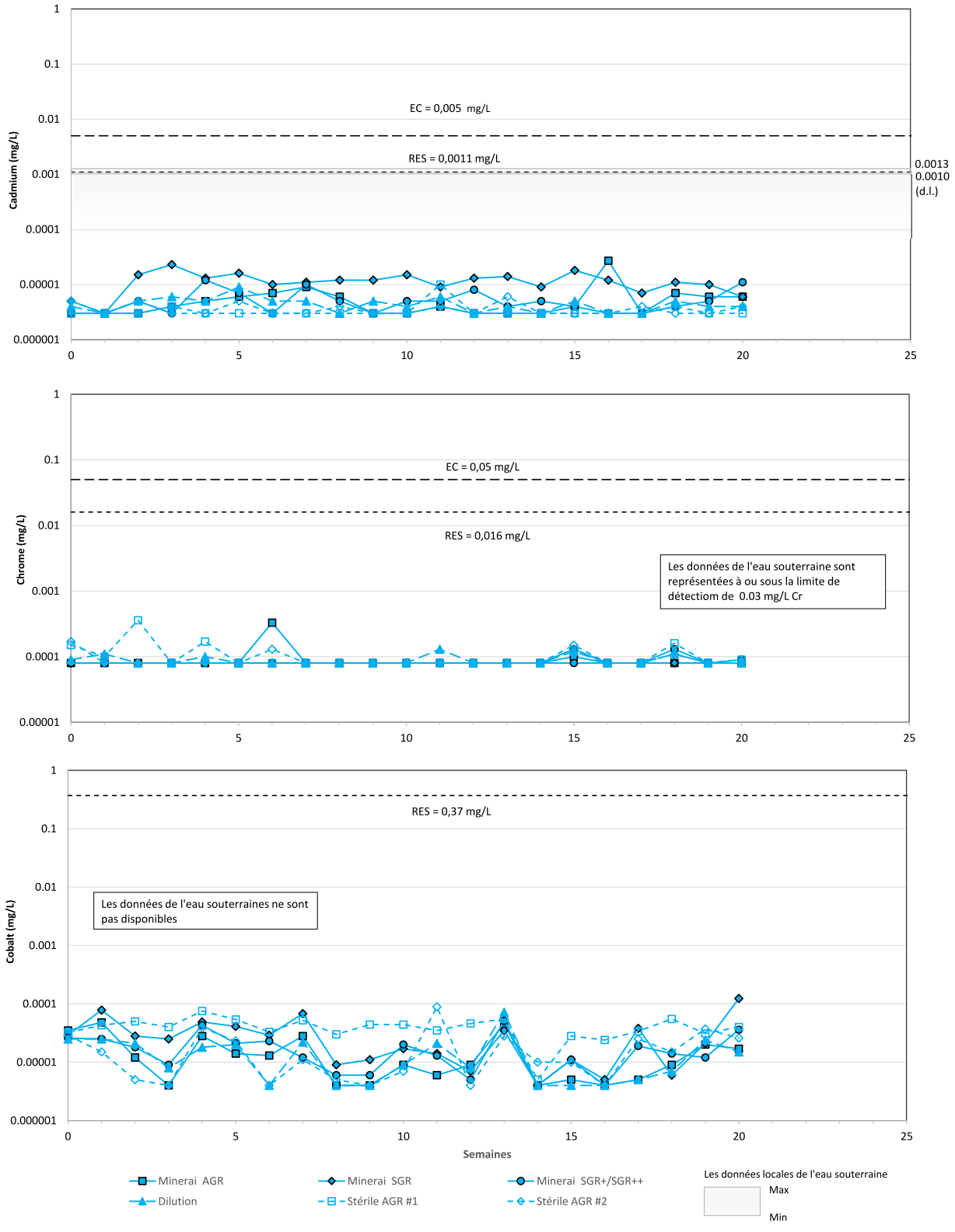

| | | | |
|---|---|---|---|
| Notes:<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>- Le critère RES du Nitrite est basé sur des concentration en chlorure à effet aigu < 2mg/L et à effet chronique variant de 4 à 6 mg/L. | Composition du roc:<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | **Nitrate**<br>**Nitrite**<br>Dessiné AT DATE Feb-21<br>Vérifié VBJ JOB NO 19115345<br>Révisé VBJ PHASE 61118 | **Test des cellules d'humidité**<br>**Concentrations (mg/L)**<br>**Zone d'East Gouldie**<br>**Mine Canadian Malartic** GOLDER<br>**Annexe FIGURE E- 4** |



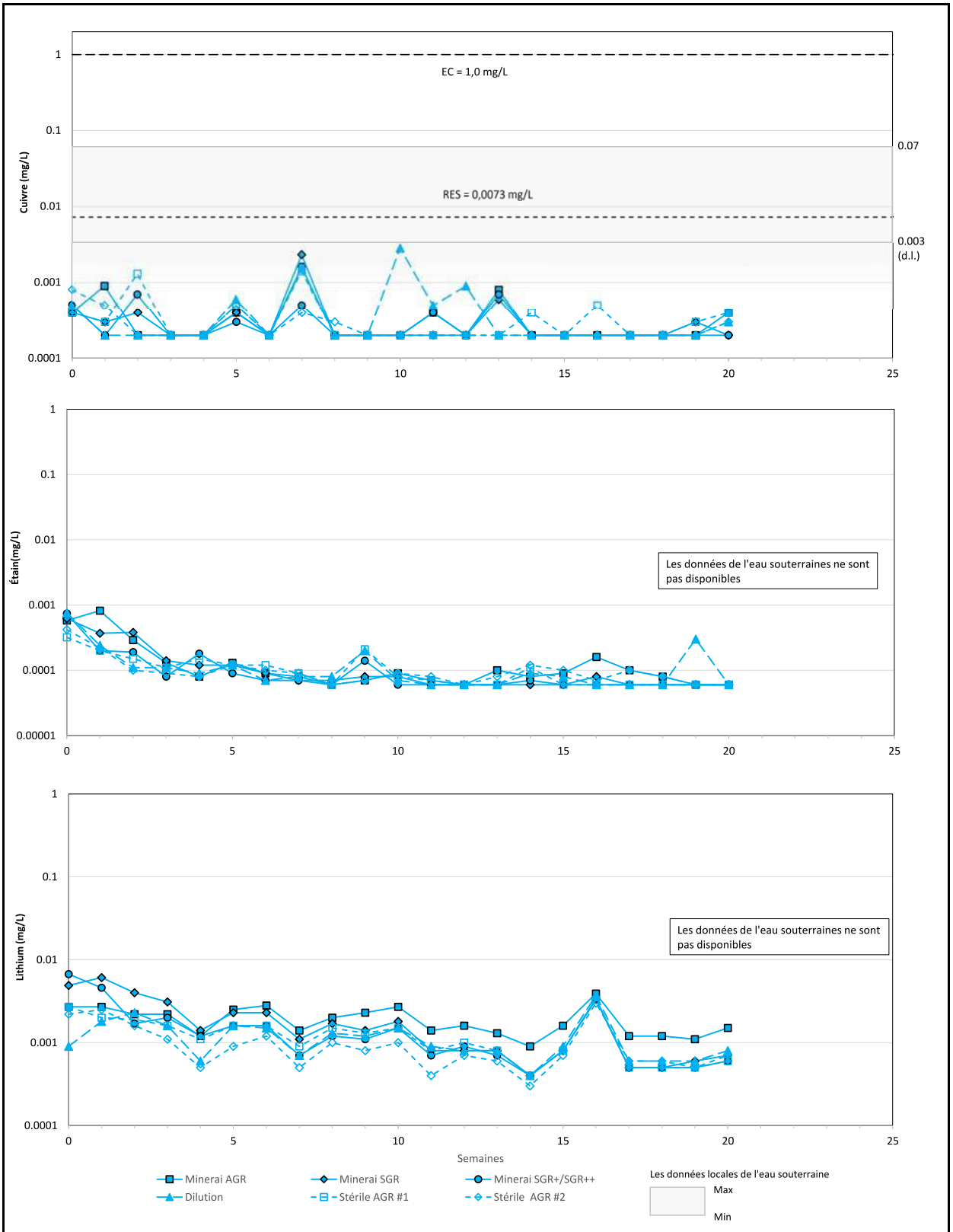

| Notes: | Composition du roc: | Alumnium<br>Antimoine<br>Argent | | | Test des cellules d'humidité<br>Concentrations (mg/L)<br>Zone d'East Gouldie |
|---|---|---|---|---|---|
| Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>- Le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour l'argent et est calculé en utilisant une dureté de 50mg/L sous forme de CaCO3. | Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | Dessiné AT | DATE Feb-21 | Mine Canadian Malartic | GOLDER |
| | | Vérifié VBJ | JOB NO 19115345 | | |
| | | Révisé VBJ | PHASE 61118 | Annexe FIGURE E- 5 | |



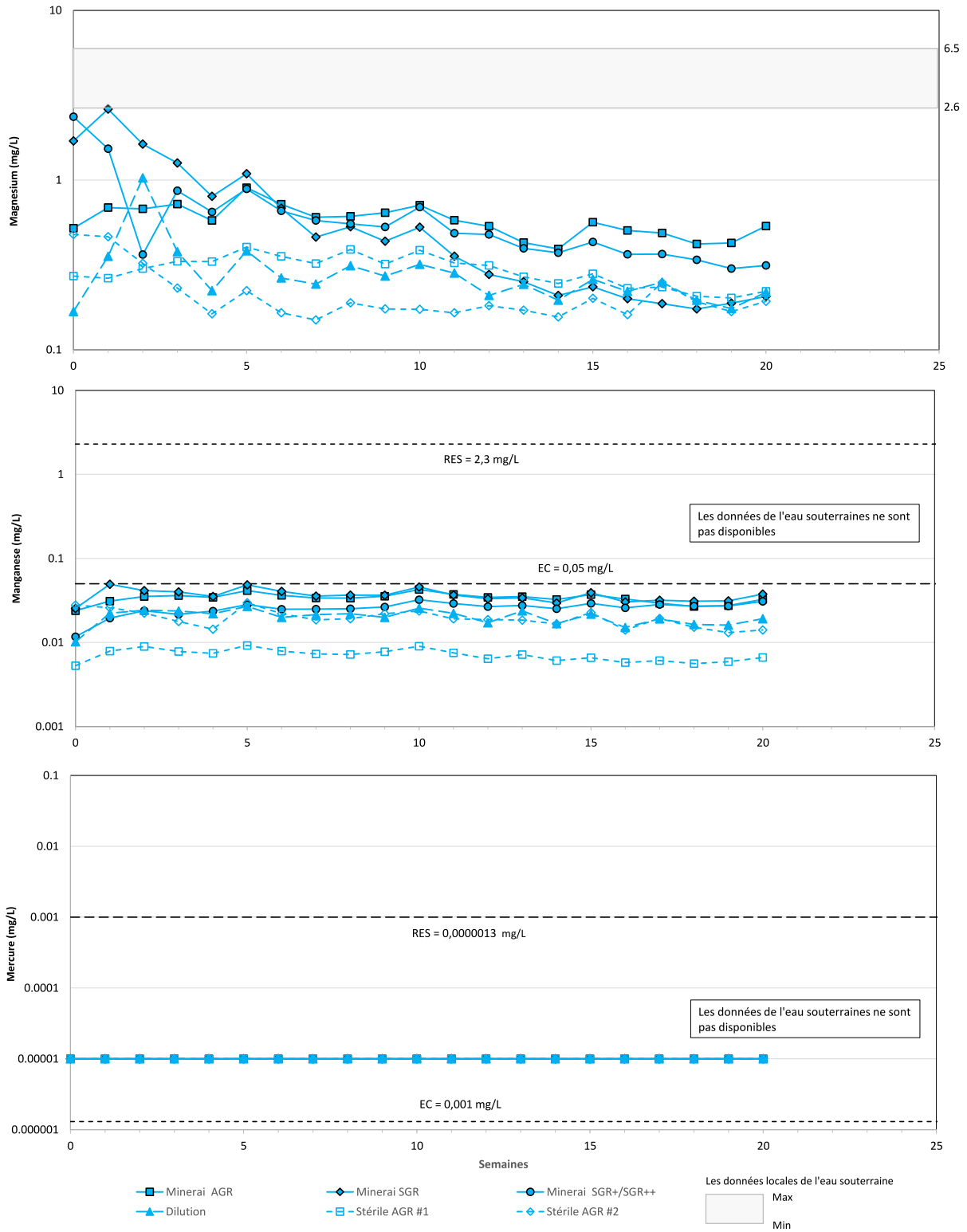

| | | | |
|---|---|---|---|
| Notes:<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>- Le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour le barium et est calculé en utilisant une dureté de 50mg/L sous forme de CaCO3. | Composition du roc:<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | Arsenic<br>Baryum<br>Bore<br>Dessiné AT DATE Feb-21<br>Vérifié VBJ JOB NO 19115345<br>Révisé VBJ PHASE 61118 | Test des cellules d'humidité<br>Concentrations (mg/L)<br>Zone d'East Gouldie<br>Mine Canadian Malartic<br>GOLDER<br>Annexe FIGURE E- 6 |



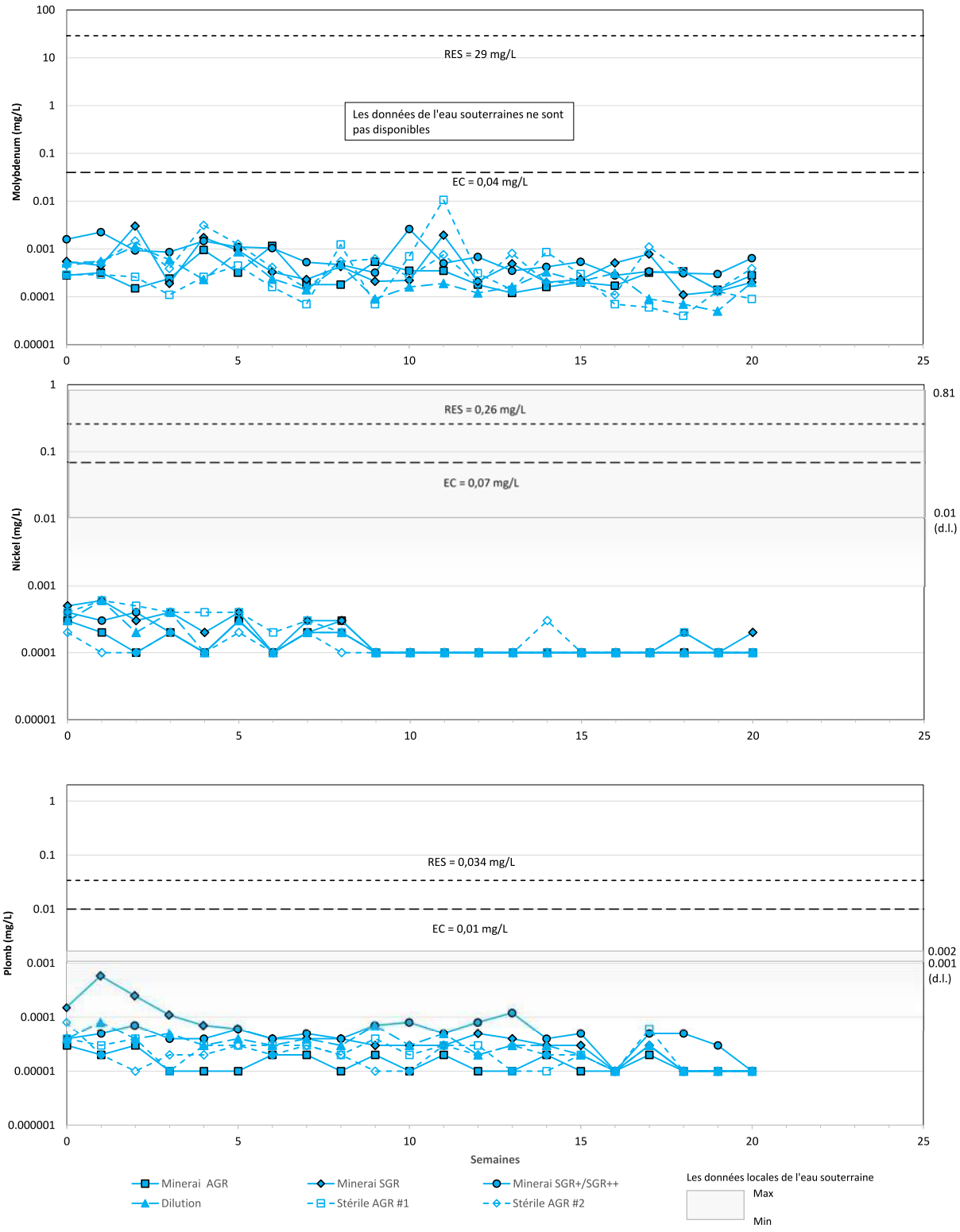

| Notes: | Composition du roc: | Cadmium<br>Chrome<br>Cobalt | Test des cellules d'humidité<br>Concentrations (mg/L)<br>Zone d'East Gouldie |
|---|---|---|---|
| Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>- Le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour le cadmium et est calculé en utilisant une dureté de 50mg/L sous forme de CaCO3. Le critère Cr représente celui du Cr VI. | Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | Dessiné AT DATE Feb-21<br>Vérifié VBJ JOB NO 19115345<br>Révisé VBJ PHASE 61118 | Mine Canadian Malartic<br>GOLDER<br>Annexe FIGURE E- 7 |



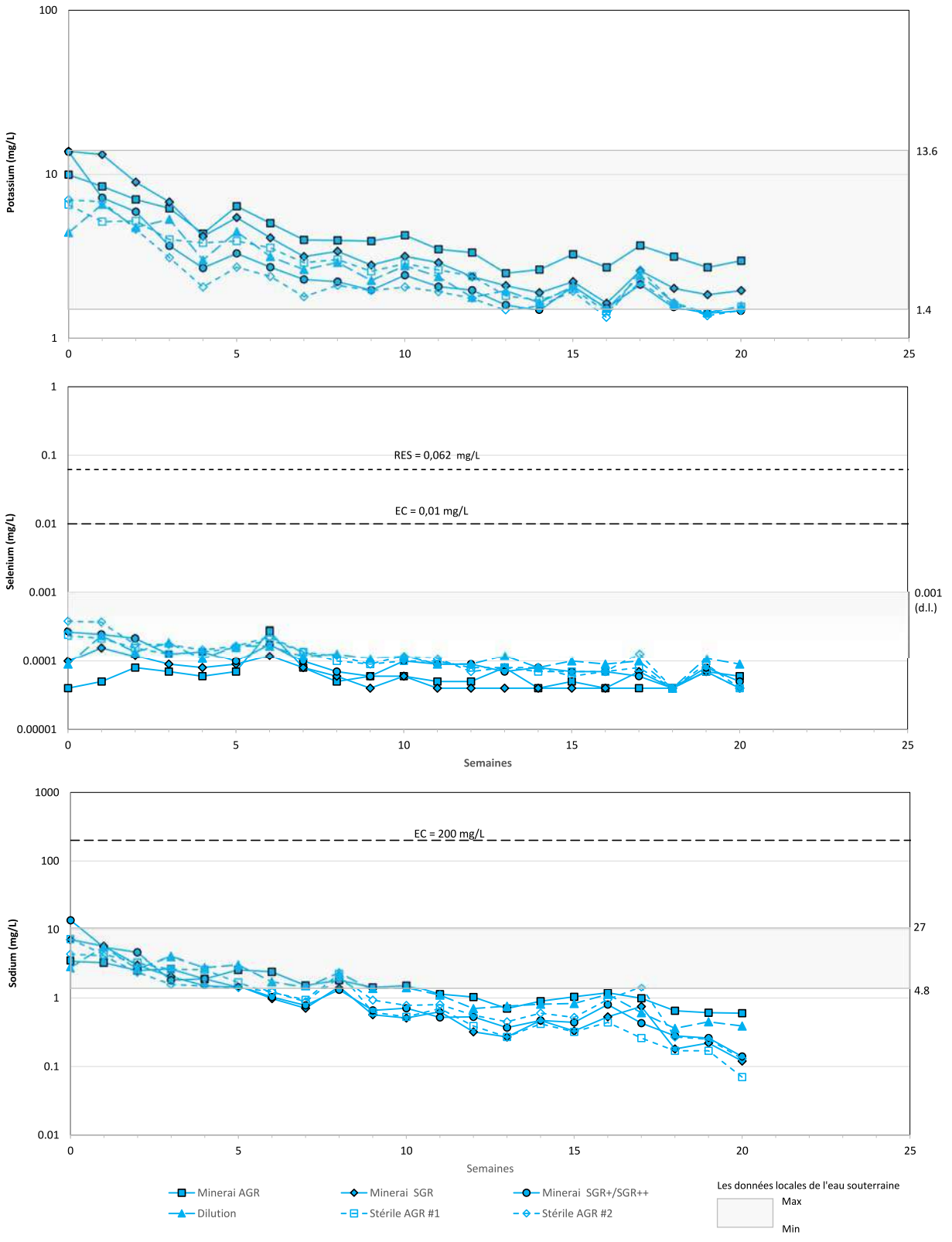

| | | | |
|---|---|---|---|
| **Notes:**<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>- Le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour le cuivre et est calculé en utilisant une dureté de 50mg/L sous forme de CaCO3. | **Composition du roc:**<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | **Cuivre**<br>**Étain**<br>**Lithium**<br>Dessiné AT DATE Feb-21<br>Vérifié VBJ JOB NO 19115345<br>Révisé VBJ PHASE 61118 | **Test des cellules d'humidité**<br>**Concentrations (mg/L)**<br>**Zone d'East Gouldie**<br>**Mine Canadian Malartic**<br>GOLDER<br>**Annexe FIGURE E- 8** |




| | | | |
|---|---|---|---|
| Notes:<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>- Le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour le manganese et est calculé en utilisant une dureté de 50mg/L sous forme de CaCO3. | Composition du roc:<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | **Magnesium<br>Manganese<br>Mercure**<br>Dessiné AT DATE Feb-21<br>Vérifié VBJ JOB NO 19115345<br>Révisé VBJ PHASE 61118 | **Test des cellules d'humidité<br>Concentrations (mg/L)<br>Zone d'East Gouldie**<br>**Mine Canadian Malartic**<br>GOLDER<br>**Annexe FIGURE E- 9** |




| | | | |
|---|---|---|---|
| Notes:<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL<br>- Le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour le nickel et le plomb et est calculé en utilisant une dureté de 50mg/L sous forme de CaCO3. | Composition du roc:<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br>Dilution: 75% AGR, 25% SGR | **Molybdenum<br>Nickel<br>Plomb**<br>Dessiné AT DATE Feb-21<br>Vérifié VBJ JOB NO 19115345<br>Révisé VBJ PHASE 61118 | **Test des cellules d'humidité<br>Concentrations (mg/L)<br>Zone d'East Gouldie**<br>Mine Canadian Malartic<br>GOLDER<br>Annexe FIGURE E- 10 |




Notes:
Valeurs < LDL sont représentées en tant que la valeur de la LDL

Composition du roc:
Minerai SGR+/SGR++: 80% SGR+, 20% SGR++

Dilution: 75% AGR, 25% SGR

**Potassium**
**Selenium**
**Sodium**

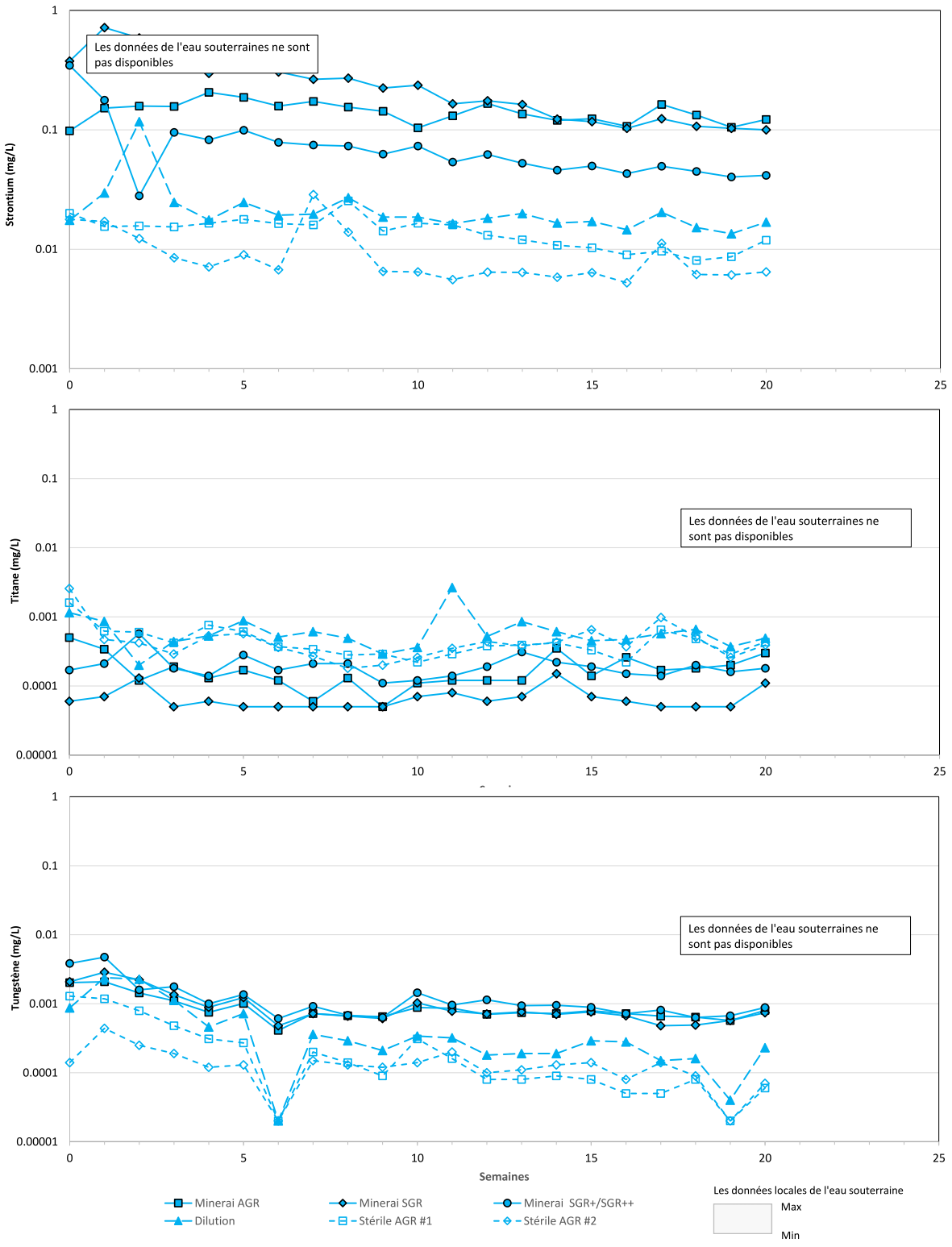
| | | | |
|---|---|---|---|
| Dessiné | AT | DATE | Feb-21 |
| Vérifié | VBJ | JOB NO | 19115345 |
| Révisé | VBJ | PHASE | 61118 |

**Test des cellules d'humidité**
**Concentrations (mg/L)**
**Zone d'East Gouldie**

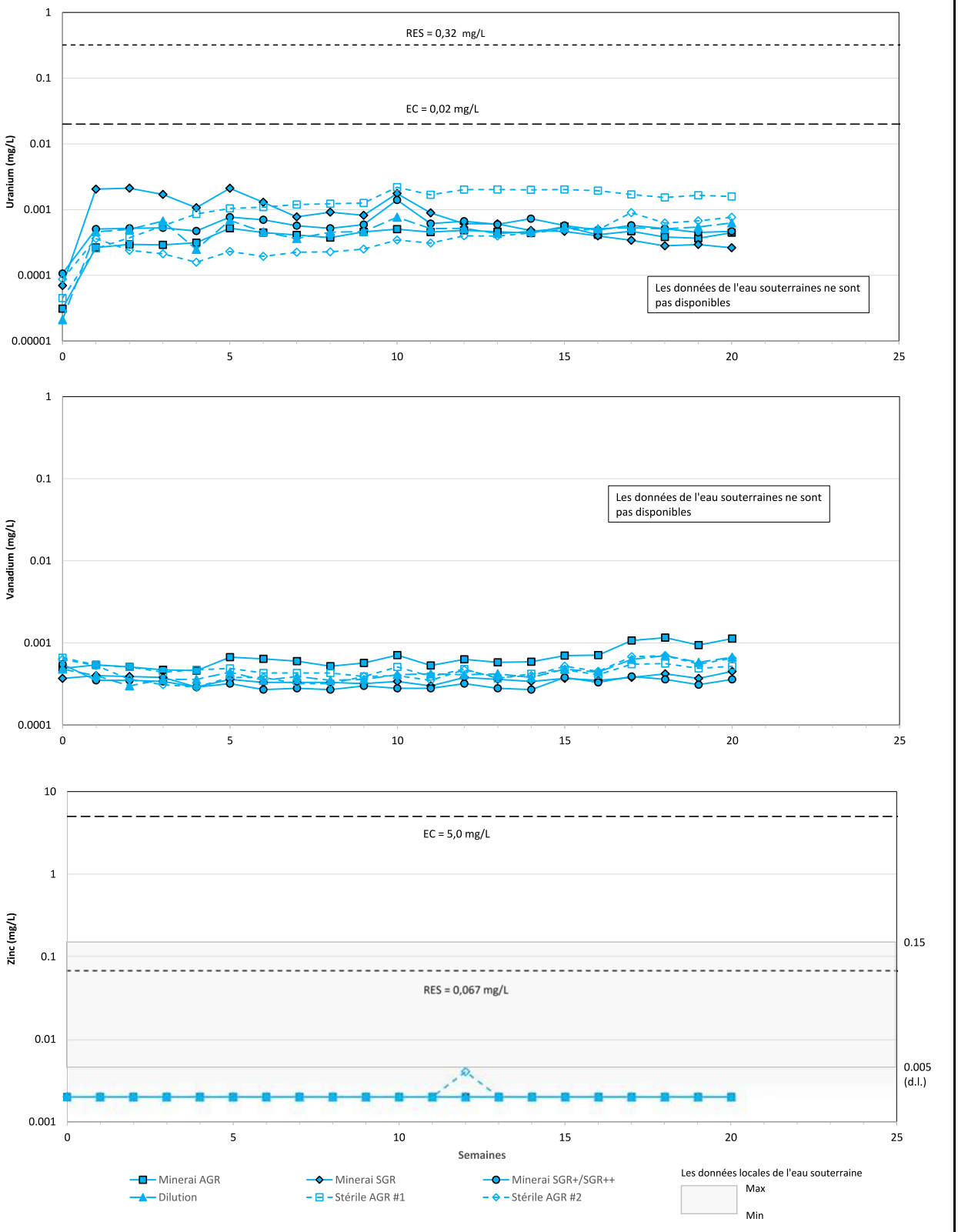
**Mine Canadian Malartic**

GOLDER

**Annexe FIGURE E- 11**




| | | | |
|---|---|---|---|
| Notes:<br>Valeurs < LDL sont représentées en tant que la valeur de la LDL | Composition du roc:<br>Minerai SGR+/SGR++: 80% SGR+, 20% SGR++<br><br>Dilution: 75% AGR, 25% SGR | **Strontium**<br>**Titane**<br>**Tungstène** | **Test des cellules d'humidité**<br>**Concentrations (mg/L)**<br>**Zone d'East Gouldie** |
| | | Dessiné AT · DATE Feb-21<br>Vérifié VBJ · JOB NO 19115345<br>Révisé VBJ · PHASE 61118 | **Mine Canadian Malartic** · GOLDER<br>**Annexe FIGURE E- 12** |




Notes:
Valeurs < LDL sont représentées en tant que la valeur de la LDL

- Le critère RES applicables aux eaux souterraines dépend de la dureté du milieu récepteur pour le zinc et est calculé en utilisant une dureté de 50mg/L et entre 20 et 100 mg/L pour l'uranium sous forme de CaCO3.

Composition du roc:
Minerai SGR+/SGR++: 80% SGR+, 20% SGR++
Dilution: 75% AGR, 25% SGR

**Uranium**
**Vanadium**
**Zinc**

| | | | |
|---|---|---|---|
| Dessiné | AT | DATE | Feb-21 |
| Vérifié | VBJ | JOB NO | 19115345 |
| Révisé | VBJ | PHASE | 61118 |

**Test des cellules d'humidité**
**Concentrations (mg/L)**
**Zone d'East Gouldie**

**Mine Canadian Malartic**

GOLDER

**Annexe FIGURE E- 13**

**ANNEXE F**

# Certificats analytiques

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Hum Cells**

**Project :** PO#ODS-91998

10-February-2021

**Date Rec. :** 02 February 2021
**LR Report:** **CA10010-FEB21**
**Reference:** Wk#20

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#20 | 6: VO19211753R 046 42 Wk#20 | 7: VO19185519R 043 45 Wk#20 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#20 | 9: EastGouldie_ Dilution_HCT Wk#20 | 10: VO19249690R 009 78 Wk#20 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 02-Feb-21 | 02-Feb-21 | 02-Feb-21 | 02-Feb-21 | 02-Feb-21 | 02-Feb-21 |
| HumCell Leachate Vol [mL] | 02-Feb-21 | 11:15 | 845 | 846 | 714 | 877 | 855 | 868 |
| pH [No unit] | 04-Feb-21 | 13:46 | 7.27 | 8.48 | 7.41 | 7.65 | 7.45 | 6.93 |
| Acidity [mg/L as CaCO3] | 03-Feb-21 | 13:11 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 03-Feb-21 | 13:11 | 7 | 14 | 9 | 13 | 9 | 5 |
| Conductivity [uS/cm] | 03-Feb-21 | 13:11 | 16 | 55 | 75 | 50 | 29 | 15 |
| TDS [mg/L] | 03-Feb-21 | 15:15 | < 30 | < 30 | < 30 | 31 | < 30 | < 30 |
| F [mg/L] | 03-Feb-21 | 13:44 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 09-Feb-21 | 09:22 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 09-Feb-21 | 09:22 | 0.8 | 13 | 20 | 10 | 5.1 | 2.3 |
| Br [mg/L] | 10-Feb-21 | 09:05 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 10-Feb-21 | 09:05 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 10-Feb-21 | 09:05 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 10-Feb-21 | 09:05 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 03-Feb-21 | 08:13 | 0.05 | 0.05 | < 0.03 | < 0.03 | 0.04 | < 0.03 |

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Phone: 705-652-2000 FAX: 705-652-6365



| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#20 | 6: VO19211753R 046 42 Wk#20 | 7: VO19185519R 043 45 Wk#20 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#20 | 9: EastGouldie_ Dilution_HCT Wk#20 | 10: VO19249690R 009 78 Wk#20 |
|---|---|---|---|---|---|---|---|---|
| Hg [mg/L] | 04-Feb-21 | 15:43 | < 0.00001 | < 0.00001 | 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 08-Feb-21 | 11:39 | < 0.00005 | < 0.00005 | 0.00008 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 08-Feb-21 | 11:39 | 0.056 | 0.054 | 0.057 | 0.065 | 0.067 | 0.043 |
| As [mg/L] | 08-Feb-21 | 11:39 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0013 |
| Ba [mg/L] | 08-Feb-21 | 11:39 | 0.00081 | 0.00145 | 0.00170 | 0.00137 | 0.00103 | 0.00399 |
| Be [mg/L] | 08-Feb-21 | 11:39 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 08-Feb-21 | 11:39 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 08-Feb-21 | 11:39 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 08-Feb-21 | 11:39 | 2.05 | 7.24 | 11.8 | 7.71 | 4.06 | 1.68 |
| Cd [mg/L] | 08-Feb-21 | 11:39 | 0.000004 | 0.000006 | 0.000006 | 0.000011 | 0.000004 | 0.000003 |
| Co [mg/L] | 08-Feb-21 | 11:39 | 0.000026 | 0.000017 | 0.000123 | 0.000036 | 0.000015 | 0.000040 |
| Cr [mg/L] | 08-Feb-21 | 11:39 | < 0.00008 | < 0.00008 | < 0.00008 | 0.00009 | < 0.00008 | 0.00009 |
| Cu [mg/L] | 08-Feb-21 | 11:39 | 0.0003 | 0.0004 | 0.0002 | < 0.0002 | 0.0003 | 0.0004 |
| Fe [mg/L] | 08-Feb-21 | 11:39 | 0.013 | < 0.007 | < 0.007 | < 0.007 | 0.009 | 0.007 |
| K [mg/L] | 08-Feb-21 | 11:39 | 1.48 | 2.99 | 1.97 | 1.47 | 1.59 | 1.57 |
| Li [mg/L] | 08-Feb-21 | 11:39 | 0.0007 | 0.0015 | 0.0007 | 0.0006 | 0.0008 | 0.0006 |
| Mg [mg/L] | 08-Feb-21 | 11:39 | 0.193 | 0.536 | 0.206 | 0.314 | 0.218 | 0.221 |
| Mn [mg/L] | 08-Feb-21 | 11:39 | 0.0141 | 0.0326 | 0.0377 | 0.0309 | 0.0192 | 0.00663 |
| Mo [mg/L] | 08-Feb-21 | 11:39 | 0.00039 | 0.00028 | 0.00020 | 0.00064 | 0.00020 | 0.00009 |
| Na [mg/L] | 08-Feb-21 | 11:39 | 0.13 | 0.60 | 0.12 | 0.14 | 0.39 | 0.07 |
| Ni [mg/L] | 08-Feb-21 | 11:39 | < 0.0001 | < 0.0001 | 0.0002 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 08-Feb-21 | 11:39 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Sb [mg/L] | 08-Feb-21 | 11:39 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 08-Feb-21 | 11:39 | < 0.00004 | 0.00006 | < 0.00004 | 0.00005 | 0.00009 | 0.00004 |
| Si [mg/L] | 08-Feb-21 | 11:39 | 0.25 | 0.31 | 0.34 | 0.34 | 0.33 | 0.32 |
| Sr [mg/L] | 08-Feb-21 | 11:39 | 0.00647 | 0.122 | 0.100 | 0.0416 | 0.0169 | 0.0119 |
| Sn [mg/L] | 08-Feb-21 | 11:39 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Th [mg/L] | 08-Feb-21 | 11:39 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

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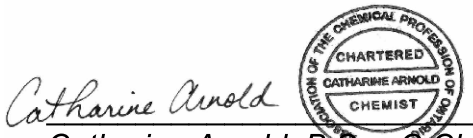
|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 08-Feb-21 | 11:39 | 0.00039 | 0.00030 | 0.00011 | 0.00018 | 0.00049 | 0.00043 |
| Tl [mg/L] | 08-Feb-21 | 11:39 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 08-Feb-21 | 11:39 | 0.000765 | 0.000445 | 0.000262 | 0.000467 | 0.000626 | 0.00158 |
| V [mg/L] | 08-Feb-21 | 11:39 | 0.00065 | 0.00113 | 0.00045 | 0.00036 | 0.00067 | 0.00052 |
| W [mg/L] | 08-Feb-21 | 11:39 | 0.00007 | 0.00080 | 0.00074 | 0.00088 | 0.00023 | 0.00006 |
| Zn [mg/L] | 08-Feb-21 | 11:39 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10010-FEB21**

# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Acidity - QCBatchID: EWL0027-FEB21* | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | < 2 | | | ND | 20 | 98 | 90 | 110 | NA | | |
| *Alkalinity - QCBatchID: EWL0027-FEB21* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | ND | 20 | 94 | 80 | 120 | NA | | |
| *Anions by IC - QCBatchID: DIO0090-FEB21* | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 99 | 80 | 120 | 94 | 75 | 125 |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | ND | 20 | 103 | 80 | 120 | 104 | 75 | 125 |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 97 | 80 | 120 | 102 | 75 | 125 |
| *Anions by IC - QCBatchID: DIO0094-FEB21* | | | | | | | | | | | | | |
| Chloride | 0.2 | mg/L | <0.2 | | | ND | 20 | 97 | 80 | 120 | 100 | 75 | 125 |
| Sulphate | 0.2 | mg/L | <0.2 | | | 0 | 20 | 97 | 80 | 120 | NV | 75 | 125 |
| *Conductivity - QCBatchID: EWL0027-FEB21* | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 1 | 20 | 100 | 90 | 110 | NA | | |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0041-FEB21* | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 101 | 90 | 110 | 96 | 75 | 125 |
| *Inorganics-General - QCBatchID: EHG0005-FEB21* | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 81 | 80 | 120 | 76 | 70 | 130 |
| *Metals - QCBatchID: EMS0017-FEB21* | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | 19 | 20 | 107 | 90 | 110 | 101 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0017-FEB21* | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 2 | 20 | 102 | 90 | 110 | 119 | 70 | 130 |
| Antimony | 0.0009 | mg/L | <0.0009 | | | ND | 20 | 102 | 90 | 110 | 118 | 70 | 130 |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | 6 | 20 | 107 | 90 | 110 | 100 | 70 | 130 |
| Barium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 100 | 90 | 110 | 101 | 70 | 130 |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 102 | 90 | 110 | 102 | 70 | 130 |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 93 | 90 | 110 | 91 | 70 | 130 |
| Boron | 0.002 | mg/L | <0.002 | | | 16 | 20 | 105 | 90 | 110 | 107 | 70 | 130 |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | 15 | 20 | 106 | 90 | 110 | 106 | 70 | 130 |
| Calcium | 0.01 | mg/L | <0.01 | | | 2 | 20 | 105 | 90 | 110 | 100 | 70 | 130 |
| Chromium | 0.00008 | mg/L | <0.00008 | | | 6 | 20 | 105 | 90 | 110 | 100 | 70 | 130 |
| Copper | 0.0002 | mg/L | <0.0002 | | | 2 | 20 | 105 | 90 | 110 | 104 | 70 | 130 |
| Iron | 0.007 | mg/L | <0.007 | | | 2 | 20 | 106 | 90 | 110 | NV | 70 | 130 |
| Lead | 0.00001 | mg/L | <0.00001 | | | 1 | 20 | 102 | 90 | 110 | 98 | 70 | 130 |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 3 | 20 | 106 | 90 | 110 | 104 | 70 | 130 |
| Magnesium | 0.001 | mg/L | <0.001 | | | 0 | 20 | 108 | 90 | 110 | 102 | 70 | 130 |

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10010-FEB21**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 1 | 20 | 107 | 90 | 110 | 105 | 70 | 130 |
| Molybdenum | 0.00004 | mg/L | <0.00004 | | | 3 | 20 | 107 | 90 | 110 | 104 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | 8 | 20 | 106 | 90 | 110 | 106 | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.009 | | | 2 | 20 | 109 | 90 | 110 | 102 | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | ND | 20 | 104 | 90 | 110 | 113 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 0 | 20 | 109 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 108 | 90 | 110 | 99 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 1 | 20 | 102 | 90 | 110 | 100 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 0 | 20 | 102 | 90 | 110 | 102 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | ND | 20 | 104 | 90 | 110 | 106 | 70 | 130 |
| Thorium | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 98 | 90 | 110 | NV | 70 | 130 |
| Tin | 0.00006 | mg/L | <0.00006 | | | ND | 20 | 104 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | 1 | 20 | 105 | 90 | 110 | NV | 70 | 130 |
| Tungsten | 0.00002 | mg/L | 7.4e-005 | | | ND | 20 | 107 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 18 | 20 | 93 | 90 | 110 | 93 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | 1e-005 | | | 2 | 20 | 105 | 90 | 110 | 103 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | 2 | 20 | 104 | 90 | 110 | 108 | 70 | 130 |
| *pH - QCBatchID: EWL0027-FEB21* | | | | | | | | | | | | | |
| pH | 0.05 | No unit | NA | | | 0 | | 101 | | | NA | | |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0024-FEB21* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | 2 | 10 | 97 | 90 | 110 | 112 | 75 | 125 |
| *Solids Analysis - QCBatchID: EWL0023-FEB21* | | | | | | | | | | | | | |
| Total Dissolved Solids | 30 | mg/L | <30 | | | 6 | 20 | 97 | 90 | 110 | NA | | |

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Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

15-January-2021

**Date Rec. :** 05 January 2021
**LR Report:** **CA10011-JAN21**
**Reference:** Wk#16

**Copy:** #1

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#16 | 6: VO19211753R0 46 42 Wk#16 | 7: VO19185519R0 43 45 Wk#16 | 8: EastGouldie_OreSGR+/++_HCT Wk#16 | 9: EastGouldie_Dilution_HCT Wk#16 | 10: VO19249690R0 09 78 Wk#16 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 05-Jan-21 | 05-Jan-21 | 05-Jan-21 | 05-Jan-21 | 05-Jan-21 | 05-Jan-21 |
| HumCell Leachate Vol [mL] | 07-Jan-21 | 11:29 | 902 | 889 | 748 | 896 | 896 | 921 |
| pH [No unit] | 07-Jan-21 | 14:47 | 7.33 | 7.75 | 7.51 | 7.89 | 7.41 | 7.02 |
| Acidity [mg/L as CaCO3] | 06-Jan-21 | 11:20 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 06-Jan-21 | 11:20 | 4 | 10 | 11 | 12 | 7 | 5 |
| Conductivity [uS/cm] | 06-Jan-21 | 11:20 | 18 | 54 | 77 | 57 | 30 | 17 |
| TDS [mg/L] | 08-Jan-21 | 11:14 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| F [mg/L] | 06-Jan-21 | 09:05 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 08-Jan-21 | 16:37 | 0.4 | 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 08-Jan-21 | 16:37 | 1.0 | 12 | 22 | 12 | 5.9 | 2.5 |
| Br [mg/L] | 06-Jan-21 | 11:23 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 06-Jan-21 | 11:23 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 06-Jan-21 | 11:23 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 06-Jan-21 | 11:23 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 06-Jan-21 | 13:45 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Hg [mg/L] | 06-Jan-21 | 16:55 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 08-Jan-21 | 15:26 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 08-Jan-21 | 15:26 | 0.038 | 0.034 | 0.038 | 0.052 | 0.044 | 0.032 |
| As [mg/L] | 08-Jan-21 | 15:26 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002 | < 0.0002 | 0.0014 |
| Ba [mg/L] | 08-Jan-21 | 15:26 | 0.00094 | 0.00108 | 0.00166 | 0.00132 | 0.00089 | 0.00346 |
| Be [mg/L] | 08-Jan-21 | 15:26 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 08-Jan-21 | 15:26 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 08-Jan-21 | 15:26 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 08-Jan-21 | 15:26 | 1.71 | 6.26 | 11.3 | 7.54 | 3.28 | 1.45 |
| Cd [mg/L] | 08-Jan-21 | 15:26 | < 0.000003 | 0.000027 | 0.000012 | < 0.000003 | 0.000003 | < 0.000003 |
| Co [mg/L] | 08-Jan-21 | 15:26 | 0.000004 | < 0.000004 | 0.000005 | < 0.000004 | < 0.000004 | 0.000024 |
| Cr [mg/L] | 08-Jan-21 | 15:26 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 08-Jan-21 | 15:26 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0005 |
| Fe [mg/L] | 08-Jan-21 | 15:26 | < 0.007 | < 0.007 | 0.020 | < 0.007 | < 0.007 | 0.014 |
| K [mg/L] | 08-Jan-21 | 15:26 | 1.34 | 2.72 | 1.65 | 1.54 | 1.52 | 1.46 |
| Li [mg/L] | 08-Jan-21 | 15:26 | 0.0030 | 0.0039 | 0.0033 | 0.0034 | 0.0037 | 0.0033 |
| Mg [mg/L] | 08-Jan-21 | 15:26 | 0.161 | 0.505 | 0.200 | 0.365 | 0.221 | 0.230 |
| Mn [mg/L] | 08-Jan-21 | 15:26 | 0.0141 | 0.0330 | 0.0303 | 0.0258 | 0.0151 | 0.00577 |
| Mo [mg/L] | 08-Jan-21 | 15:26 | 0.00011 | 0.00017 | 0.00051 | 0.00028 | 0.00031 | 0.00007 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10011-JAN21**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#16 | 6: VO19211753R0 46 42 Wk#16 | 7: VO19185519R0 43 45 Wk#16 | 8: EastGouldie_OrEsGR+/++_HCT Wk#16 | 9: EastGouldie_Dilution_HCT Wk#16 | 10: VO19249690R0 09 78 Wk#16 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 08-Jan-21 | 15:26 | 0.95 | 1.19 | 0.53 | 0.80 | 1.13 | 0.44 |
| Ni [mg/L] | 08-Jan-21 | 15:26 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 08-Jan-21 | 15:26 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Sb [mg/L] | 08-Jan-21 | 15:26 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 08-Jan-21 | 15:26 | 0.00007 | 0.00004 | 0.00004 | 0.00007 | 0.00009 | 0.00007 |
| Si [mg/L] | 08-Jan-21 | 15:26 | 0.24 | 0.27 | 0.35 | 0.40 | 0.30 | 0.32 |
| Sr [mg/L] | 08-Jan-21 | 15:26 | 0.00524 | 0.107 | 0.103 | 0.0430 | 0.0146 | 0.0090 |
| Sn [mg/L] | 08-Jan-21 | 15:26 | 0.00007 | 0.00016 | 0.00008 | < 0.00006 | < 0.00006 | < 0.00006 |
| Th [mg/L] | 08-Jan-21 | 15:26 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 08-Jan-21 | 15:26 | 0.00037 | 0.00026 | 0.00006 | 0.00015 | 0.00047 | 0.00022 |
| Tl [mg/L] | 08-Jan-21 | 15:26 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 08-Jan-21 | 15:26 | 0.000490 | 0.000414 | 0.000397 | 0.000488 | 0.000511 | 0.00194 |
| V [mg/L] | 08-Jan-21 | 15:26 | 0.00045 | 0.00071 | 0.00035 | 0.00033 | 0.00044 | 0.00041 |
| W [mg/L] | 08-Jan-21 | 15:26 | 0.00008 | 0.00072 | 0.00067 | 0.00072 | 0.00028 | 0.00005 |
| Zn [mg/L] | 08-Jan-21 | 15:26 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10011-JAN21**

# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | | |
| | | | | | | | % | | Low | High | | Low | High | |
| *Acidity - QCBatchID: EWL0020-JAN21* | | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | 2 | | | 0 | 20 | 94 | 90 | 110 | NA | | | |
| *Alkalinity - QCBatchID: EWL0020-JAN21* | | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | ND | 20 | 98 | 80 | 120 | NA | | | |
| *Anions by IC - QCBatchID: DIO0025-JAN21* | | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 100 | 80 | 120 | 96 | 75 | 125 | |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | ND | 20 | 101 | 80 | 120 | 102 | 75 | 125 | |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 98 | 80 | 120 | 104 | 75 | 125 | |
| *Anions by IC - QCBatchID: DIO0057-JAN21* | | | | | | | | | | | | | | |
| Chloride | 0.2 | mg/L | <0.2 | | | ND | 20 | 95 | 80 | 120 | 101 | 75 | 125 | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 4 | 20 | 96 | 80 | 120 | 91 | 75 | 125 | |
| *Conductivity - QCBatchID: EWL0020-JAN21* | | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 1 | 20 | 100 | 90 | 110 | NA | | | |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0026-JAN21* | | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 98 | 90 | 110 | 95 | 75 | 125 | |
| *Inorganics-General - QCBatchID: EHG0005-JAN21* | | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 100 | 80 | 120 | 100 | 70 | 130 | |
| *Metals - QCBatchID: EMS0027-JAN21* | | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | 4 | 20 | 100 | 90 | 110 | 86 | 70 | 130 | |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0027-JAN21* | | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 3 | 20 | 96 | 90 | 110 | 117 | 70 | 130 | |
| Antimony | 0.0009 | mg/L | <0.0009 | | | ND | 20 | 100 | 90 | 110 | 119 | 70 | 130 | |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | 3 | 20 | 100 | 90 | 110 | 91 | 70 | 130 | |
| Barium | 0.00002 | mg/L | <0.00002 | | | 2 | 20 | 98 | 90 | 110 | 103 | 70 | 130 | |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | 5 | 20 | 99 | 90 | 110 | 89 | 70 | 130 | |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | 5 | 20 | 94 | 90 | 110 | 107 | 70 | 130 | |
| Boron | 0.002 | mg/L | <0.002 | | | 1 | 20 | 107 | 90 | 110 | 89 | 70 | 130 | |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | 15 | 20 | 100 | 90 | 110 | 93 | 70 | 130 | |
| Calcium | 0.01 | mg/L | <0.01 | | | 1 | 20 | 107 | 90 | 110 | 94 | 70 | 130 | |
| Chromium | 0.00008 | mg/L | <0.00008 | | | 13 | 20 | 99 | 90 | 110 | 96 | 70 | 130 | |
| Copper | 0.0002 | mg/L | <0.0002 | | | 2 | 20 | 101 | 90 | 110 | 110 | 70 | 130 | |
| Iron | 0.007 | mg/L | <0.007 | | | 2 | 20 | 110 | 90 | 110 | NV | 70 | 130 | |
| Lead | 0.00001 | mg/L | <0.00001 | | | 3 | 20 | 91 | 90 | 110 | 95 | 70 | 130 | |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 5 | 20 | 98 | 90 | 110 | 78 | 70 | 130 | |
| Magnesium | 0.001 | mg/L | <0.001 | | | 2 | 20 | 109 | 90 | 110 | 102 | 70 | 130 | |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10011-JAN21**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 1 | 20 | 100 | 90 | 110 | 97 | 70 | 130 |
| Molybdenum | 0.00004 | mg/L | <0.00004 | | | 3 | 20 | 102 | 90 | 110 | 89 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 103 | 90 | 110 | 82 | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.009 | | | 1 | 20 | 101 | 90 | 110 | 71 | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | ND | 20 | 94 | 90 | 110 | 93 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 1 | 20 | 104 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 101 | 90 | 110 | 84 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 0 | 20 | 107 | 90 | 110 | 109 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 96 | 90 | 110 | 98 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | ND | 20 | 92 | 90 | 110 | 106 | 70 | 130 |
| Thorium | 0.0001 | mg/L | <0.0001 | | | 8 | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Tin | 0.00006 | mg/L | <0.00006 | | | 14 | 20 | 98 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | 7 | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Tungsten | 0.00002 | mg/L | <0.00002 | | | 15 | 20 | 92 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 1 | 20 | 91 | 90 | 110 | 94 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | 0 | 20 | 99 | 90 | 110 | 87 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | 2 | 20 | 100 | 90 | 110 | 100 | 70 | 130 |
| *pH - QCBatchID: EWL0020-JAN21* | | | | | | | | | | | | | |
| pH | 0.05 | No unit | NA | | | 0 | | 99 | | | NA | | |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0033-JAN21* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | ND | 10 | 98 | 90 | 110 | NV | 75 | 125 |
| *Solids Analysis - QCBatchID: EWL0016-JAN21* | | | | | | | | | | | | | |
| Total Dissolved Solids | 30 | mg/L | <30 | | | 0 | 20 | 101 | 90 | 110 | NA | | |
| *Solids Analysis - QCBatchID: EWL0058-JAN21* | | | | | | | | | | | | | |
| Total Dissolved Solids | 30 | mg/L | <30 | | | ND | 20 | 102 | 90 | 110 | NA | | |

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**Hum Cells**

**Project :** PO#ODS-91998

17-December-2020

**Date Rec. :** 01 December 2020
**LR Report:** **CA10013-DEC20**
**Reference:** Wk#11

**Copy:** #1

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#11 | 6: VO19211753R0 46 42 Wk#11 | 7: VO19185519R0 43 45 Wk#11 | 8: EastGouldie_OreSGR+/++_HCT Wk#11 | 9: EastGouldie_Dilution_HCT Wk#11 | 10: VO19249690R0 09 78 Wk#11 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 01-Dec-20 | 01-Dec-20 | 01-Dec-20 | 01-Dec-20 | 01-Dec-20 | 01-Dec-20 |
| HumCell Leachate Vol [mL] | 02-Dec-20 | 11:27 | 917 | 921 | 782 | 924 | 902 | 912 |
| pH [No unit] | 02-Dec-20 | 12:52 | 7.29 | 7.59 | 7.65 | 8.14 | 7.36 | 7.11 |
| Acidity [mg/L as CaCO3] | 02-Dec-20 | 12:52 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 02-Dec-20 | 12:52 | 8 | 10 | 12 | 14 | 3 | 6 |
| Conductivity [uS/cm] | 02-Dec-20 | 12:52 | 23 | 62 | 110 | 62 | 35 | 22 |
| TDS [mg/L] | 02-Dec-20 | 14:05 | < 30 | < 30 | 37 | < 30 | < 30 | < 30 |
| F [mg/L] | 03-Dec-20 | 08:43 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 09-Dec-20 | 15:20 | < 0.2 | 0.3 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 09-Dec-20 | 15:20 | 1.4 | 14 | 34 | 12 | 7.0 | 3.2 |
| Br [mg/L] | 08-Dec-20 | 13:10 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 08-Dec-20 | 13:10 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 08-Dec-20 | 13:10 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 08-Dec-20 | 13:10 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 03-Dec-20 | 13:05 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Hg [mg/L] | 03-Dec-20 | 13:09 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00001 | < 0.00001 |
| Ag [mg/L] | 07-Dec-20 | 15:04 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 07-Dec-20 | 15:04 | 0.038 | 0.033 | 0.039 | 0.052 | 0.087 | 0.033 |
| As [mg/L] | 07-Dec-20 | 15:04 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0003 | 0.0002 | 0.0016 |
| Ba [mg/L] | 07-Dec-20 | 15:04 | 0.00115 | 0.00210 | 0.00244 | 0.00185 | 0.00162 | 0.00453 |
| Be [mg/L] | 07-Dec-20 | 15:04 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 07-Dec-20 | 15:04 | < 0.002 | < 0.002 | 0.002 | < 0.002 | < 0.002 | 0.003 |
| Bi [mg/L] | 07-Dec-20 | 15:04 | < 0.000007 | 0.000009 | < 0.000007 | 0.000010 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 07-Dec-20 | 15:04 | 1.97 | 7.06 | 17.2 | 8.43 | 3.83 | 2.00 |
| Cd [mg/L] | 07-Dec-20 | 15:04 | 0.000004 | 0.000004 | 0.000009 | 0.000005 | 0.000006 | 0.000010 |
| Co [mg/L] | 07-Dec-20 | 15:04 | 0.000089 | 0.000006 | 0.000014 | 0.000013 | 0.000021 | 0.000035 |
| Cr [mg/L] | 07-Dec-20 | 15:04 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | 0.00013 | < 0.00008 |
| Cu [mg/L] | 07-Dec-20 | 15:04 | 0.0002 | 0.0004 | < 0.0002 | 0.0004 | 0.0005 | 0.0002 |
| Fe [mg/L] | 07-Dec-20 | 15:04 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | 0.027 | < 0.007 |
| K [mg/L] | 07-Dec-20 | 15:04 | 1.94 | 3.51 | 2.91 | 2.08 | 2.39 | 2.63 |
| Li [mg/L] | 07-Dec-20 | 15:04 | 0.0004 | 0.0014 | 0.0008 | 0.0007 | 0.0009 | 0.0008 |
| Mg [mg/L] | 07-Dec-20 | 15:04 | 0.165 | 0.580 | 0.356 | 0.486 | 0.283 | 0.325 |
| Mn [mg/L] | 07-Dec-20 | 15:04 | 0.0191 | 0.0374 | 0.0368 | 0.0291 | 0.0222 | 0.00752 |
| Mo [mg/L] | 07-Dec-20 | 15:04 | 0.00076 | 0.00035 | 0.00194 | 0.00050 | 0.00019 | 0.0106 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10013-DEC20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#11 | 6: VO19211753R0 46 42 Wk#11 | 7: VO19185519R0 43 45 Wk#11 | 8: EastGouldie_OrEsGR+/++_HCT Wk#11 | 9: EastGouldie_Dilution_HCT Wk#11 | 10: VO19249690R0 09 78 Wk#11 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 07-Dec-20 | 15:04 | 0.80 | 1.14 | 0.63 | 0.52 | 1.10 | 0.70 |
| Ni [mg/L] | 07-Dec-20 | 15:04 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 07-Dec-20 | 15:04 | 0.00003 | 0.00002 | 0.00003 | 0.00005 | 0.00005 | 0.00003 |
| Sb [mg/L] | 07-Dec-20 | 15:04 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 07-Dec-20 | 15:04 | 0.00011 | 0.00005 | 0.00004 | 0.00009 | 0.00009 | 0.00010 |
| Si [mg/L] | 07-Dec-20 | 15:04 | 0.25 | 0.26 | 0.45 | 0.41 | 0.40 | 0.44 |
| Sr [mg/L] | 07-Dec-20 | 15:04 | 0.00557 | 0.131 | 0.165 | 0.0537 | 0.0164 | 0.0160 |
| Sn [mg/L] | 07-Dec-20 | 15:04 | 0.00008 | 0.00007 | 0.00006 | < 0.00006 | < 0.00006 | 0.00007 |
| Th [mg/L] | 07-Dec-20 | 15:04 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 07-Dec-20 | 15:04 | 0.00035 | 0.00012 | 0.00008 | 0.00014 | 0.00265 | 0.00029 |
| Tl [mg/L] | 07-Dec-20 | 15:04 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 07-Dec-20 | 15:04 | 0.000310 | 0.000454 | 0.000891 | 0.000610 | 0.000515 | 0.00168 |
| V [mg/L] | 07-Dec-20 | 15:04 | 0.00035 | 0.00053 | 0.00030 | 0.00028 | 0.00042 | 0.00039 |
| W [mg/L] | 07-Dec-20 | 15:04 | 0.00020 | 0.00086 | 0.00078 | 0.00096 | 0.00032 | 0.00016 |
| Zn [mg/L] | 07-Dec-20 | 15:04 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

16-November-2020

**Date Rec. :** 03 November 2020
**LR Report:** **CA10014-NOV20**
**Reference:** Wk#7

**Copy:** #1

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#7 | 6: VO19211753R0 46 42 Wk#7 | 7: VO19185519R0 43 45 Wk#7 | 8: EastGouldie_OreSGR+/++_HCT Wk#7 | 9: EastGouldie_Dilution_HCT Wk#7 | 10: VO19249690R0 09 78 Wk#7 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 03-Nov-20 | 03-Nov-20 | 03-Nov-20 | 03-Nov-20 | 03-Nov-20 | 03-Nov-20 |
| HumCell Leachate Vol [mL] | 03-Nov-20 | 12:10 | 933 | 909 | 776 | 931 | 936 | 936 |
| pH [No unit] | 04-Nov-20 | 16:14 | 7.26 | 8.45 | 7.39 | 8.58 | 7.82 | 7.18 |
| Acidity [mg/L as CaCO3] | 04-Nov-20 | 16:14 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 04-Nov-20 | 16:14 | 8 | 12 | 11 | 14 | 9 | 7 |
| Conductivity [uS/cm] | 04-Nov-20 | 16:14 | 21 | 78 | 150 | 70 | 41 | 27 |
| TDS [mg/L] | 05-Nov-20 | 11:03 | < 30 | 31 | 94 | 37 | 31 | < 30 |
| F [mg/L] | 04-Nov-20 | 11:16 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 13-Nov-20 | 11:08 | 0.2 | 0.5 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 13-Nov-20 | 11:08 | 2.3 | 19 | 50 | 15 | 8.0 | 4.9 |
| Br [mg/L] | 10-Nov-20 | 12:42 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 10-Nov-20 | 12:42 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 10-Nov-20 | 12:42 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 10-Nov-20 | 12:42 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 05-Nov-20 | 17:02 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Hg [mg/L] | 05-Nov-20 | 13:47 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 06-Nov-20 | 15:46 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 06-Nov-20 | 15:46 | 0.033 | 0.033 | 0.033 | 0.048 | 0.044 | 0.035 |
| As [mg/L] | 06-Nov-20 | 15:46 | < 0.0002 | 0.0002 | < 0.0002 | 0.0003 | < 0.0002 | 0.0022 |
| Ba [mg/L] | 06-Nov-20 | 15:46 | 0.00125 | 0.00196 | 0.00284 | 0.00201 | 0.00133 | 0.00376 |
| Be [mg/L] | 06-Nov-20 | 15:46 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 06-Nov-20 | 15:46 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 06-Nov-20 | 15:46 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000010 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 06-Nov-20 | 15:46 | 1.73 | 8.03 | 22.0 | 8.45 | 3.80 | 1.83 |
| Cd [mg/L] | 06-Nov-20 | 15:46 | < 0.000003 | 0.000009 | 0.000011 | 0.000010 | 0.000005 | 0.000003 |
| Co [mg/L] | 06-Nov-20 | 15:46 | 0.000011 | 0.000028 | 0.000068 | 0.000012 | 0.000022 | 0.000052 |
| Cr [mg/L] | 06-Nov-20 | 15:46 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 06-Nov-20 | 15:46 | 0.0004 | 0.0016 | 0.0023 | 0.0005 | 0.0015 | 0.0014 |
| Fe [mg/L] | 06-Nov-20 | 15:46 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | 0.010 | 0.007 |
| K [mg/L] | 06-Nov-20 | 15:46 | 1.81 | 4.00 | 3.17 | 2.30 | 2.64 | 2.91 |
| Li [mg/L] | 06-Nov-20 | 15:46 | 0.0005 | 0.0014 | 0.0011 | 0.0007 | 0.0007 | 0.0009 |
| Mg [mg/L] | 06-Nov-20 | 15:46 | 0.150 | 0.604 | 0.461 | 0.578 | 0.244 | 0.322 |
| Mn [mg/L] | 06-Nov-20 | 15:46 | 0.0186 | 0.0339 | 0.0356 | 0.0250 | 0.0215 | 0.00730 |
| Mo [mg/L] | 06-Nov-20 | 15:46 | 0.00015 | 0.00018 | 0.00023 | 0.00053 | 0.00014 | 0.00007 |

OnLine LIMS

0002322096



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Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10014-NOV20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#7 | 6: VO19211753R0 46 42 Wk#7 | 7: VO19185519R0 43 45 Wk#7 | 8: EastGouldie_OrEastGouldie_Dil eSGR+/++_HCT Wk#7 | 9: ution_HCT Wk#7 | 10: VO19249690R0 09 78 Wk#7 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 06-Nov-20 | 15:46 | 0.88 | 1.60 | 0.71 | 0.78 | 1.51 | 0.94 |
| Ni [mg/L] | 06-Nov-20 | 15:46 | 0.0002 | 0.0002 | 0.0003 | 0.0002 | 0.0002 | 0.0003 |
| Pb [mg/L] | 06-Nov-20 | 15:46 | 0.00003 | 0.00002 | 0.00004 | 0.00005 | 0.00004 | 0.00003 |
| Sb [mg/L] | 06-Nov-20 | 15:46 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 06-Nov-20 | 15:46 | 0.00014 | 0.00008 | 0.00008 | 0.00010 | 0.00012 | 0.00014 |
| Si [mg/L] | 06-Nov-20 | 15:46 | 0.16 | 0.22 | 0.36 | 0.33 | 0.26 | 0.34 |
| Sr [mg/L] | 06-Nov-20 | 15:46 | 0.0287 | 0.173 | 0.265 | 0.0747 | 0.0197 | 0.0160 |
| Sn [mg/L] | 06-Nov-20 | 15:46 | 0.00009 | 0.00008 | 0.00007 | 0.00007 | 0.00008 | 0.00009 |
| Th [mg/L] | 06-Nov-20 | 15:46 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 06-Nov-20 | 15:46 | 0.00027 | 0.00006 | < 0.00005 | 0.00021 | 0.00061 | 0.00034 |
| Tl [mg/L] | 06-Nov-20 | 15:46 | < 0.000005 | < 0.000005 | 0.000006 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 06-Nov-20 | 15:46 | 0.000224 | 0.000410 | 0.000776 | 0.000569 | 0.000364 | 0.00119 |
| V [mg/L] | 06-Nov-20 | 15:46 | 0.00032 | 0.00060 | 0.00033 | 0.00028 | 0.00039 | 0.00043 |
| W [mg/L] | 06-Nov-20 | 15:46 | 0.00015 | 0.00072 | 0.00072 | 0.00092 | 0.00036 | 0.00020 |
| Zn [mg/L] | 06-Nov-20 | 15:46 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
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OnLine LIMS

0002322096



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27-October-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 06 October 2020
**LR Report:** **CA10015-OCT20**
**Reference:** Wk#3

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#3 | 6: VO19211753R0 46 42 Wk#3 | 7: VO19185519R0 43 45 Wk#3 | 8: EastGouldie_OreSGR+/++_HCT Wk#3 | 9: EastGouldie_Dilution_HCT Wk#3 | 10: VO19249690R0 09 78 Wk#3 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 06-Oct-20 | 06-Oct-20 | 06-Oct-20 | 06-Oct-20 | 06-Oct-20 | 06-Oct-20 |
| HumCell Leachate Vol [mL] | 07-Oct-20 | 10:25 | 968 | 946 | 802 | 967 | 983 | 962 |
| pH [No unit] | 08-Oct-20 | 16:39 | 7.43 | 8.68 | 8.00 | 8.72 | 8.45 | 7.29 |
| Acidity [mg/L as CaCO3] | 08-Oct-20 | 16:39 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 08-Oct-20 | 16:39 | 21 | 13 | 13 | 27 | 21 | 9 |
| Conductivity [uS/cm] | 08-Oct-20 | 16:39 | 30 | 87 | 241 | 82 | 62 | 38 |
| TDS [mg/L] | 08-Oct-20 | 14:13 | 31 | 57 | 163 | 54 | 46 | 40 |
| F [mg/L] | 07-Oct-20 | 10:17 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 27-Oct-20 | 11:51 | 0.8 | 1.1 | 0.7 | 0.7 | 0.6 | 0.3 |
| SO4 [mg/L] | 27-Oct-20 | 11:51 | 4.0 | 21 | 89 | 16 | 12 | 6.7 |
| Br [mg/L] | 13-Oct-20 | 14:37 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 13-Oct-20 | 14:37 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 13-Oct-20 | 14:37 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 21-Oct-20 | 14:52 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 07-Oct-20 | 08:44 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Hg [mg/L] | 07-Oct-20 | 14:14 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 09-Oct-20 | 11:46 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 09-Oct-20 | 11:46 | 0.033 | 0.036 | 0.025 | 0.059 | 0.033 | 0.044 |
| As [mg/L] | 09-Oct-20 | 11:46 | < 0.0002 | 0.0003 | 0.0002 | 0.0005 | 0.0003 | 0.0028 |
| Ba [mg/L] | 09-Oct-20 | 11:46 | 0.00103 | 0.00272 | 0.00528 | 0.00235 | 0.00248 | 0.00409 |
| Be [mg/L] | 09-Oct-20 | 11:46 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 09-Oct-20 | 11:46 | < 0.002 | < 0.002 | 0.004 | 0.004 | < 0.002 | < 0.002 |
| Bi [mg/L] | 09-Oct-20 | 11:46 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 09-Oct-20 | 11:46 | 1.95 | 8.26 | 35.6 | 9.39 | 4.19 | 1.83 |
| Cd [mg/L] | 09-Oct-20 | 11:46 | 0.000003 | 0.000004 | 0.000023 | < 0.000003 | 0.000006 | 0.000004 |
| Co [mg/L] | 09-Oct-20 | 11:46 | < 0.000004 | < 0.000004 | 0.000025 | 0.000009 | 0.000008 | 0.000040 |
| Cr [mg/L] | 09-Oct-20 | 11:46 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 09-Oct-20 | 11:46 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 09-Oct-20 | 11:46 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | 0.008 |
| K [mg/L] | 09-Oct-20 | 11:46 | 3.12 | 6.22 | 6.79 | 3.68 | 5.33 | 4.02 |
| Li [mg/L] | 09-Oct-20 | 11:46 | 0.0011 | 0.0022 | 0.0031 | 0.0020 | 0.0016 | 0.0016 |
| Mg [mg/L] | 09-Oct-20 | 11:46 | 0.231 | 0.722 | 1.26 | 0.866 | 0.378 | 0.332 |
| Mn [mg/L] | 09-Oct-20 | 11:46 | 0.0178 | 0.0361 | 0.0400 | 0.0216 | 0.0237 | 0.00783 |
| Mo [mg/L] | 09-Oct-20 | 11:46 | 0.00039 | 0.00024 | 0.00019 | 0.00086 | 0.00060 | 0.00011 |

OnLine LIMS

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Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA10015-OCT20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#3 | 6: VO19211753R0 46 42 Wk#3 | 7: VO19185519R0 43 45 Wk#3 | 8: EastGouldie_OrEastGouldie_Di eSGR+/++_HCT Wk#3 | 9: lution_HCT Wk#3 | 10: VO19249690R0 09 78 Wk#3 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 09-Oct-20 | 11:46 | 1.66 | 2.76 | 2.15 | 1.90 | 4.13 | 2.72 |
| Ni [mg/L] | 09-Oct-20 | 11:46 | 0.0002 | 0.0002 | 0.0004 | 0.0002 | 0.0004 | 0.0004 |
| Pb [mg/L] | 09-Oct-20 | 11:46 | 0.00002 | 0.00001 | 0.00011 | 0.00004 | 0.00005 | 0.00001 |
| Sb [mg/L] | 09-Oct-20 | 11:46 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 09-Oct-20 | 11:46 | 0.00018 | 0.00007 | 0.00009 | 0.00013 | 0.00019 | 0.00013 |
| Si [mg/L] | 09-Oct-20 | 11:46 | 0.20 | 0.29 | 0.67 | 0.55 | 0.39 | 0.43 |
| Sr [mg/L] | 09-Oct-20 | 11:46 | 0.00850 | 0.157 | 0.444 | 0.0952 | 0.0247 | 0.0154 |
| Sn [mg/L] | 09-Oct-20 | 11:46 | 0.00009 | 0.00013 | 0.00014 | 0.00008 | 0.00011 | 0.00011 |
| Th [mg/L] | 09-Oct-20 | 11:46 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 09-Oct-20 | 11:46 | 0.00029 | 0.00019 | < 0.00005 | 0.00018 | 0.00044 | 0.00042 |
| Tl [mg/L] | 09-Oct-20 | 11:46 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000010 | < 0.000005 |
| U [mg/L] | 09-Oct-20 | 11:46 | 0.000212 | 0.000290 | 0.00170 | 0.000527 | 0.000667 | 0.000566 |
| V [mg/L] | 09-Oct-20 | 11:46 | 0.00031 | 0.00047 | 0.00038 | 0.00034 | 0.00036 | 0.00044 |
| W [mg/L] | 09-Oct-20 | 11:46 | 0.00019 | 0.00110 | 0.00135 | 0.00177 | 0.00112 | 0.00048 |
| Zn [mg/L] | 09-Oct-20 | 11:46 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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**Hum Cells**

**Project :** PO#ODS-91998

20-January-2021

**Date Rec. :** 12 January 2021
**LR Report:** **CA10058-JAN21**
**Reference:** Wk#17

**Copy:** #1

**Canadian Malartic GP**
Attn : Francois Bergeron

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Malartic, QC
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Fax:

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#17 | 6: VO19211753R0 46 42 Wk#17 | 7: VO19185519R0 43 45 Wk#17 | 8: EastGouldie_OreSGR+/++_HCT Wk#17 | 9: EastGouldie_Dilution_HCT Wk#17 | 10: VO19249690R0 09 78 Wk#17 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 12-Jan-21 | 12-Jan-21 | 12-Jan-21 | 12-Jan-21 | 12-Jan-21 | 12-Jan-21 |
| HumCell Leachate Vol [mL] | 13-Jan-21 | 09:29 | 838 | 820 | 677 | 864 | 833 | 831 |
| pH [No unit] | 14-Jan-21 | 14:45 | 7.47 | 8.23 | 7.72 | 7.56 | 7.50 | 7.15 |
| Acidity [mg/L as CaCO3] | 13-Jan-21 | 11:22 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 13-Jan-21 | 11:23 | 10 | 12 | 14 | 12 | 10 | 6 |
| Conductivity [uS/cm] | 13-Jan-21 | 11:23 | 26 | 67 | 92 | 64 | 42 | 21 |
| TDS [mg/L] | 13-Jan-21 | 14:13 | < 30 | 43 | 57 | 40 | < 30 | < 30 |
| F [mg/L] | 13-Jan-21 | 13:18 | 0.10 | < 0.06 | < 0.06 | < 0.06 | 0.12 | < 0.06 |
| Cl [mg/L] | 18-Jan-21 | 09:38 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 18-Jan-21 | 09:38 | 2.0 | 18 | 27 | 15 | 7.6 | 2.8 |
| Br [mg/L] | 14-Jan-21 | 16:55 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 14-Jan-21 | 16:55 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 14-Jan-21 | 16:55 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 14-Jan-21 | 16:55 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 13-Jan-21 | 13:47 | 0.04 | 0.03 | 0.04 | 0.04 | 0.06 | 0.06 |
| Hg [mg/L] | 14-Jan-21 | 08:52 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 18-Jan-21 | 15:24 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 18-Jan-21 | 15:24 | 0.070 | 0.046 | 0.042 | 0.057 | 0.070 | 0.050 |
| As [mg/L] | 18-Jan-21 | 15:24 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002 | 0.0002 | 0.0017 |
| Ba [mg/L] | 18-Jan-21 | 15:24 | 0.00151 | 0.00208 | 0.00186 | 0.00160 | 0.00095 | 0.00369 |
| Be [mg/L] | 18-Jan-21 | 15:24 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 18-Jan-21 | 15:24 | 0.006 | < 0.002 | 0.004 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 18-Jan-21 | 15:24 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 18-Jan-21 | 15:24 | 2.84 | 8.78 | 14.2 | 9.06 | 5.22 | 1.80 |
| Cd [mg/L] | 18-Jan-21 | 15:24 | 0.000004 | 0.000003 | 0.000007 | 0.000003 | < 0.000003 | < 0.000003 |
| Co [mg/L] | 18-Jan-21 | 15:24 | 0.000025 | 0.000005 | 0.000038 | 0.000019 | 0.000005 | 0.000034 |
| Cr [mg/L] | 18-Jan-21 | 15:25 | < 0.00008 | 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 18-Jan-21 | 15:25 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 18-Jan-21 | 15:25 | 0.012 | < 0.007 | < 0.007 | < 0.007 | 0.007 | 0.008 |
| K [mg/L] | 18-Jan-21 | 15:25 | 2.62 | 3.70 | 2.60 | 2.14 | 2.43 | 2.22 |
| Li [mg/L] | 18-Jan-21 | 15:25 | 0.0006 | 0.0012 | 0.0005 | 0.0005 | 0.0006 | 0.0005 |
| Mg [mg/L] | 18-Jan-21 | 15:25 | 0.249 | 0.488 | 0.187 | 0.366 | 0.250 | 0.234 |
| Mn [mg/L] | 18-Jan-21 | 15:25 | 0.0193 | 0.0293 | 0.0318 | 0.0283 | 0.0191 | 0.0061 |
| Mo [mg/L] | 18-Jan-21 | 15:25 | 0.00110 | 0.00032 | 0.00078 | 0.00034 | 0.00009 | 0.00006 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10058-JAN21**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#17 | 6: VO19211753R0 46 42 Wk#17 | 7: VO19185519R0 43 45 Wk#17 | 8: EastGouldie_OrEsGR+/++_HCT Wk#17 | 9: EastGouldie_Dilution_HCT Wk#17 | 10: VO19249690R0 09 78 Wk#17 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 18-Jan-21 | 15:25 | 1.45 | 0.99 | 0.75 | 0.43 | 0.61 | 0.26 |
| Ni [mg/L] | 18-Jan-21 | 15:25 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 18-Jan-21 | 15:25 | 0.00003 | 0.00002 | 0.00003 | 0.00005 | 0.00003 | 0.00006 |
| Sb [mg/L] | 18-Jan-21 | 15:25 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 18-Jan-21 | 15:25 | 0.00013 | < 0.00004 | 0.00007 | 0.00006 | 0.00010 | 0.00008 |
| Si [mg/L] | 18-Jan-21 | 15:25 | 0.40 | 0.37 | 0.35 | 0.43 | 0.41 | 0.41 |
| Sr [mg/L] | 18-Jan-21 | 15:25 | 0.0112 | 0.163 | 0.124 | 0.0495 | 0.0204 | 0.00965 |
| Sn [mg/L] | 18-Jan-21 | 15:25 | 0.00010 | 0.00010 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Th [mg/L] | 18-Jan-21 | 15:25 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 18-Jan-21 | 15:25 | 0.00098 | 0.00017 | < 0.00005 | 0.00014 | 0.00057 | 0.00065 |
| Tl [mg/L] | 18-Jan-21 | 15:25 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 18-Jan-21 | 15:25 | 0.000899 | 0.000468 | 0.000341 | 0.000575 | 0.000529 | 0.001700 |
| V [mg/L] | 18-Jan-21 | 15:25 | 0.00068 | 0.00107 | 0.00038 | 0.00039 | 0.00063 | 0.00055 |
| W [mg/L] | 18-Jan-21 | 15:25 | 0.00014 | 0.00066 | 0.00048 | 0.00081 | 0.00015 | 0.00005 |
| Zn [mg/L] | 18-Jan-21 | 15:25 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD — ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10058-JAN21**

# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | | |
| | | | | | | | % | | Low | High | | Low | High | |
| *Acidity - QCBatchID: EWL0132-JAN21* | | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | 2 | | | 0 | 20 | 98 | 90 | 110 | NA | | | |
| *Alkalinity - QCBatchID: EWL0132-JAN21* | | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | ND | 20 | 99 | 80 | 120 | NA | | | |
| *Anions by IC - QCBatchID: DIO0133-JAN21* | | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 99 | 80 | 120 | 99 | 75 | 125 | |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | ND | 20 | 101 | 80 | 120 | 102 | 75 | 125 | |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 98 | 80 | 120 | 96 | 75 | 125 | |
| *Anions by IC - QCBatchID: DIO0160-JAN21* | | | | | | | | | | | | | | |
| Chloride | 0.2 | mg/L | <0.2 | | | ND | 20 | 96 | 80 | 120 | 97 | 75 | 125 | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 0 | 20 | 92 | 80 | 120 | 98 | 75 | 125 | |
| *Anions by IC - QCBatchID: DIO0193-JAN21* | | | | | | | | | | | | | | |
| Chloride | 0.2 | mg/L | <0.2 | | | ND | 20 | 96 | 80 | 120 | 94 | 75 | 125 | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 0 | 20 | 97 | 80 | 120 | 86 | 75 | 125 | |
| *Conductivity - QCBatchID: EWL0132-JAN21* | | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 1 | 20 | 100 | 90 | 110 | NA | | | |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0139-JAN21* | | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | 0 | 10 | 96 | 90 | 110 | 97 | 75 | 125 | |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0148-JAN21* | | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | 0 | 10 | 96 | 90 | 110 | 89 | 75 | 125 | |
| *Inorganics-General - QCBatchID: EHG0012-JAN21* | | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 83 | 80 | 120 | 91 | 70 | 130 | |
| *Metals - QCBatchID: EMS0066-JAN21* | | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | 0 | 20 | 92 | 90 | 110 | 98 | 70 | 130 | |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0066-JAN21* | | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 1 | 20 | 92 | 90 | 110 | 89 | 70 | 130 | |
| Antimony | 0.0009 | mg/L | <0.0009 | | | ND | 20 | 97 | 90 | 110 | 97 | 70 | 130 | |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | ND | 20 | 91 | 90 | 110 | 97 | 70 | 130 | |
| Barium | 0.00002 | mg/L | <0.00002 | | | 3 | 20 | 91 | 90 | 110 | 98 | 70 | 130 | |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 90 | 90 | 110 | 96 | 70 | 130 | |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 90 | 90 | 110 | 74 | 70 | 130 | |
| Boron | 0.002 | mg/L | <0.002 | | | 3 | 20 | 96 | 90 | 110 | 100 | 70 | 130 | |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | 12 | 20 | 90 | 90 | 110 | 92 | 70 | 130 | |
| Calcium | 0.01 | mg/L | <0.01 | | | 0 | 20 | 106 | 90 | 110 | 101 | 70 | 130 | |
| Chromium | 0.00008 | mg/L | <0.00008 | | | 9 | 20 | 91 | 90 | 110 | 90 | 70 | 130 | |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10058-JAN21**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Copper | 0.0002 | mg/L | <0.0002 | | | 0 | 20 | 90 | 90 | 110 | 91 | 70 | 130 |
| Iron | 0.007 | mg/L | <0.007 | | | ND | 20 | 106 | 90 | 110 | NV | 70 | 130 |
| Lead | 0.00001 | mg/L | 1e-005 | | | ND | 20 | 93 | 90 | 110 | 92 | 70 | 130 |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 2 | 20 | 96 | 90 | 110 | 112 | 70 | 130 |
| Magnesium | 0.001 | mg/L | <0.001 | | | 0 | 20 | 104 | 90 | 110 | 96 | 70 | 130 |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 2 | 20 | 90 | 90 | 110 | 94 | 70 | 130 |
| Molybdenum | 0.00004 | mg/L | <0.00004 | | | 6 | 20 | 96 | 90 | 110 | 92 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | 13 | 20 | 91 | 90 | 110 | 100 | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.009 | | | 0 | 20 | 108 | 90 | 110 | 106 | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | 12 | 20 | 93 | 90 | 110 | 101 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 4 | 20 | 109 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 90 | 90 | 110 | 86 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 2 | 20 | 106 | 90 | 110 | 94 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 91 | 90 | 110 | 94 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | ND | 20 | 94 | 90 | 110 | 98 | 70 | 130 |
| Thorium | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 98 | 90 | 110 | NV | 70 | 130 |
| Tin | 0.00006 | mg/L | <0.00006 | | | 2 | 20 | 93 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | 19 | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Tungsten | 0.00002 | mg/L | <0.00002 | | | ND | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 11 | 20 | 94 | 90 | 110 | 96 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | 12 | 20 | 90 | 90 | 110 | 92 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | 1 | 20 | 98 | 90 | 110 | 97 | 70 | 130 |
| *pH - QCBatchID: EWL0132-JAN21* | | | | | | | | | | | | | |
| pH | 0.05 | No unit | NA | | | 0 | | 100 | | | NA | | |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0102-JAN21* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | 5 | 10 | 101 | 90 | 110 | 93 | 75 | 125 |
| *Solids Analysis - QCBatchID: EWL0125-JAN21* | | | | | | | | | | | | | |
| Total Dissolved Solids | 30 | mg/L | <30 | | | 3 | 20 | 98 | 90 | 110 | NA | | |

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**Hum Cells**

**Project :** PO#ODS-91998

18-December-2020

**Date Rec. :** 08 December 2020
**LR Report:** **CA10064-DEC20**
**Reference:** Wk#12

**Copy:** #1

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#12 | 6: VO19211753R0 46 42 Wk#12 | 7: VO19185519R0 43 45 Wk#12 | 8: EastGouldie_OreSGR+/++_HCT Wk#12 | 9: EastGouldie_Dilution_HCT Wk#12 | 10: VO19249690R0 09 78 Wk#12 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 08-Dec-20 | 08-Dec-20 | 08-Dec-20 | 08-Dec-20 | 08-Dec-20 | 08-Dec-20 |
| HumCell Leachate Vol [mL] | 09-Dec-20 | 09:25 | 887 | 896 | 753 | 901 | 901 | 902 |
| pH [No unit] | 10-Dec-20 | 10:10 | 7.18 | 7.41 | 7.31 | 7.58 | 7.19 | 7.04 |
| Acidity [mg/L as CaCO3] | 14-Dec-20 | 14:04 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 11-Dec-20 | 14:00 | 6 | 11 | 10 | 12 | 9 | 6 |
| Conductivity [uS/cm] | 10-Dec-20 | 10:10 | 19 | 65 | 105 | 65 | 32 | 20 |
| TDS [mg/L] | 10-Dec-20 | 12:49 | < 30 | < 30 | 63 | 34 | < 30 | < 30 |
| F [mg/L] | 09-Dec-20 | 07:54 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 15-Dec-20 | 10:01 | < 0.2 | 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 16-Dec-20 | 09:16 | 1.3 | 16 | 34 | 14 | 6.2 | 3.4 |
| Br [mg/L] | 14-Dec-20 | 16:10 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 14-Dec-20 | 16:10 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 14-Dec-20 | 16:10 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 14-Dec-20 | 16:10 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 08-Dec-20 | 15:20 | 0.04 | < 0.03 | < 0.03 | 0.04 | 0.04 | < 0.03 |
| Hg [mg/L] | 10-Dec-20 | 10:46 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 14-Dec-20 | 13:04 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 14-Dec-20 | 13:04 | 0.044 | 0.033 | 0.044 | 0.050 | 0.046 | 0.037 |
| As [mg/L] | 14-Dec-20 | 13:04 | < 0.0002 | 0.0004 | < 0.0002 | 0.0004 | 0.0002 | 0.0019 |
| Ba [mg/L] | 14-Dec-20 | 13:04 | 0.00082 | 0.00199 | 0.00256 | 0.00184 | 0.00096 | 0.00376 |
| Be [mg/L] | 14-Dec-20 | 13:04 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 14-Dec-20 | 13:04 | 0.003 | 0.003 | 0.003 | 0.006 | 0.002 | 0.003 |
| Bi [mg/L] | 14-Dec-20 | 13:04 | 0.000008 | < 0.000007 | 0.000008 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 14-Dec-20 | 13:04 | 1.95 | 7.89 | 16.5 | 8.70 | 3.58 | 1.88 |
| Cd [mg/L] | 14-Dec-20 | 13:04 | < 0.000003 | 0.000003 | 0.000013 | 0.000008 | 0.000003 | 0.000003 |
| Co [mg/L] | 14-Dec-20 | 13:04 | < 0.000004 | 0.000009 | 0.000007 | 0.000005 | 0.000008 | 0.000046 |
| Cr [mg/L] | 14-Dec-20 | 13:04 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 14-Dec-20 | 13:04 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0009 | < 0.0002 |
| Fe [mg/L] | 14-Dec-20 | 13:04 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | 0.008 | 0.015 |
| K [mg/L] | 14-Dec-20 | 13:04 | 1.77 | 3.35 | 2.39 | 1.98 | 1.79 | 2.41 |
| Li [mg/L] | 14-Dec-20 | 13:04 | 0.0007 | 0.0016 | 0.0008 | 0.0009 | 0.0008 | 0.0010 |
| Mg [mg/L] | 14-Dec-20 | 13:04 | 0.182 | 0.535 | 0.278 | 0.478 | 0.209 | 0.314 |
| Mn [mg/L] | 14-Dec-20 | 13:04 | 0.0187 | 0.0344 | 0.0332 | 0.0267 | 0.0172 | 0.00642 |
| Mo [mg/L] | 14-Dec-20 | 13:04 | 0.00019 | 0.00018 | 0.00021 | 0.00068 | 0.00012 | 0.00031 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10064-DEC20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#12 | 6: VO19211753R0 46 42 Wk#12 | 7: VO19185519R0 43 45 Wk#12 | 8: EastGouldie_OrEsGR+/++_HCT Wk#12 | 9: EastGouldie_Dilution_HCT Wk#12 | 10: VO19249690R0 09 78 Wk#12 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 14-Dec-20 | 13:04 | 0.56 | 1.03 | 0.32 | 0.53 | 0.70 | 0.39 |
| Ni [mg/L] | 14-Dec-20 | 13:04 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 14-Dec-20 | 13:04 | 0.00002 | 0.00001 | 0.00005 | 0.00008 | 0.00002 | 0.00003 |
| Sb [mg/L] | 14-Dec-20 | 13:04 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 14-Dec-20 | 13:04 | 0.00007 | 0.00005 | < 0.00004 | 0.00009 | 0.00009 | 0.00008 |
| Si [mg/L] | 14-Dec-20 | 13:04 | 0.25 | 0.28 | 0.39 | 0.42 | 0.28 | 0.39 |
| Sr [mg/L] | 14-Dec-20 | 13:04 | 0.00643 | 0.166 | 0.175 | 0.0621 | 0.0182 | 0.0131 |
| Sn [mg/L] | 14-Dec-20 | 13:04 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Th [mg/L] | 14-Dec-20 | 13:04 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 14-Dec-20 | 13:04 | 0.00044 | 0.00012 | 0.00006 | 0.00019 | 0.00052 | 0.00038 |
| Tl [mg/L] | 14-Dec-20 | 13:04 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 14-Dec-20 | 13:04 | 0.000399 | 0.000485 | 0.000610 | 0.000664 | 0.000519 | 0.00201 |
| V [mg/L] | 14-Dec-20 | 13:04 | 0.00047 | 0.00063 | 0.00038 | 0.00032 | 0.00041 | 0.00048 |
| W [mg/L] | 14-Dec-20 | 13:04 | 0.00010 | 0.00070 | 0.00071 | 0.00114 | 0.00018 | 0.00008 |
| Zn [mg/L] | 14-Dec-20 | 13:04 | 0.004 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

24-November-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 10 November 2020
**LR Report:** **CA10072-NOV20**
**Reference:** Wk#8

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#8 | 6: VO19211753R0 46 42 Wk#8 | 7: VO19185519R0 43 45 Wk#8 | 8: EastGouldie_OreSGR+/++_HCT Wk#8 | 9: EastGouldie_Dilution_HCT Wk#8 | 10: VO19249690R0 09 78 Wk#8 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 10-Nov-20 | 10-Nov-20 | 10-Nov-20 | 10-Nov-20 | 10-Nov-20 | 10-Nov-20 |
| HumCell Leachate Vol [mL] | 11-Nov-20 | 08:41 | 932 | 925 | 775 | 933 | 934 | 931 |
| pH [No unit] | 11-Nov-20 | 16:01 | 7.29 | 8.36 | 7.67 | 8.39 | 7.84 | 7.20 |
| Acidity [mg/L as CaCO3] | 11-Nov-20 | 16:01 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 11-Nov-20 | 16:01 | 13 | 11 | 10 | 12 | 13 | 9 |
| Conductivity [uS/cm] | 11-Nov-20 | 16:01 | 21 | 70 | 149 | 65 | 44 | 28 |
| TDS [mg/L] | 13-Nov-20 | 10:24 | < 30 | 43 | 89 | 40 | 34 | < 30 |
| F [mg/L] | 11-Nov-20 | 09:52 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 24-Nov-20 | 15:09 | 0.2 | 0.5 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 24-Nov-20 | 15:09 | 2.2 | 17 | 51 | 14 | 9.3 | 5.0 |
| Br [mg/L] | 17-Nov-20 | 16:01 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 17-Nov-20 | 16:01 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 17-Nov-20 | 16:01 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 17-Nov-20 | 16:01 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 11-Nov-20 | 11:25 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Hg [mg/L] | 12-Nov-20 | 11:29 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 18-Nov-20 | 14:39 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 18-Nov-20 | 14:39 | 0.031 | 0.031 | 0.036 | 0.053 | 0.039 | 0.032 |
| As [mg/L] | 18-Nov-20 | 14:39 | 0.0002 | 0.0003 | 0.0003 | 0.0004 | 0.0003 | 0.0020 |
| Ba [mg/L] | 18-Nov-20 | 14:39 | 0.00108 | 0.00140 | 0.00311 | 0.00196 | 0.00139 | 0.00427 |
| Be [mg/L] | 18-Nov-20 | 14:39 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 18-Nov-20 | 14:39 | 0.004 | 0.002 | 0.005 | 0.003 | 0.004 | 0.007 |
| Bi [mg/L] | 18-Nov-20 | 14:39 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 18-Nov-20 | 14:39 | 1.91 | 7.82 | 23.6 | 8.73 | 4.23 | 2.15 |
| Cd [mg/L] | 18-Nov-20 | 14:39 | 0.000004 | 0.000006 | 0.000012 | 0.000005 | < 0.000003 | < 0.000003 |
| Co [mg/L] | 18-Nov-20 | 14:39 | 0.000005 | < 0.000004 | 0.000009 | 0.000006 | < 0.000004 | 0.000030 |
| Cr [mg/L] | 18-Nov-20 | 14:39 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 18-Nov-20 | 14:39 | 0.0003 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 18-Nov-20 | 14:39 | < 0.007 | < 0.007 | < 0.007 | 0.010 | 0.007 | < 0.007 |
| K [mg/L] | 18-Nov-20 | 14:39 | 2.12 | 3.97 | 3.41 | 2.23 | 2.92 | 3.04 |
| Li [mg/L] | 18-Nov-20 | 14:40 | 0.0010 | 0.0020 | 0.0017 | 0.0012 | 0.0013 | 0.0015 |
| Mg [mg/L] | 18-Nov-20 | 14:40 | 0.189 | 0.611 | 0.531 | 0.552 | 0.313 | 0.390 |
| Mn [mg/L] | 18-Nov-20 | 14:40 | 0.0192 | 0.0338 | 0.0366 | 0.0252 | 0.0220 | 0.00721 |
| Mo [mg/L] | 18-Nov-20 | 14:40 | 0.00055 | 0.00018 | 0.00043 | 0.00047 | 0.00047 | 0.00124 |

OnLine LIMS

0002331120



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Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10072-NOV20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R035 16 Wk#8 | 6: VO19211753R046 42 Wk#8 | 7: VO19185519R043 45 Wk#8 | 8: EastGouldie_OreSGR+/++_HCT Wk#8 | 9: EastGouldie_Dilution_HCT Wk#8 | 10: VO19249690R009 78 Wk#8 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 18-Nov-20 | 14:40 | 2.10 | 1.91 | 1.46 | 1.32 | 2.44 | 2.35 |
| Ni [mg/L] | 18-Nov-20 | 14:40 | 0.0001 | 0.0003 | 0.0003 | 0.0002 | 0.0002 | 0.0002 |
| Pb [mg/L] | 18-Nov-20 | 14:40 | 0.00002 | 0.00001 | 0.00004 | 0.00004 | 0.00003 | 0.00002 |
| Sb [mg/L] | 18-Nov-20 | 14:40 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 18-Nov-20 | 14:40 | 0.00012 | 0.00005 | 0.00006 | 0.00007 | 0.00013 | 0.00010 |
| Si [mg/L] | 18-Nov-20 | 14:40 | 0.23 | 0.25 | 0.48 | 0.42 | 0.30 | 0.43 |
| Sr [mg/L] | 18-Nov-20 | 14:40 | 0.0139 | 0.155 | 0.271 | 0.0732 | 0.0270 | 0.0254 |
| Sn [mg/L] | 18-Nov-20 | 14:40 | 0.00006 | < 0.00006 | 0.00007 | < 0.00006 | 0.00008 | < 0.00006 |
| Th [mg/L] | 18-Nov-20 | 14:40 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 18-Nov-20 | 14:40 | 0.00018 | 0.00013 | 0.00005 | 0.00021 | 0.00049 | 0.00028 |
| Tl [mg/L] | 18-Nov-20 | 14:40 | < 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 18-Nov-20 | 14:40 | 0.000227 | 0.000374 | 0.000913 | 0.000519 | 0.000453 | 0.00123 |
| V [mg/L] | 18-Nov-20 | 14:40 | 0.00032 | 0.00052 | 0.00033 | 0.00027 | 0.00035 | 0.00043 |
| W [mg/L] | 18-Nov-20 | 14:40 | 0.00013 | 0.00067 | 0.00066 | 0.00068 | 0.00029 | 0.00014 |
| Zn [mg/L] | 18-Nov-20 | 14:40 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.002 |

Catharine Arnold

*Catharine Arnold, B.Sc., C.Chem*
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OnLine LIMS

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**Canadian Malartic GP**
Attn : Francois Bergeron

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J0Y 1Z0, Canada

Phone:
Fax:

**Hum Cells**

**Project :** PO#ODS-91998

03-December-2020

**Date Rec. :** 17 November 2020
**LR Report:** **CA10119-NOV20**
**Reference:** Wk# 9

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# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#9 | 6: VO19211753R 046 42 Wk#9 | 7: VO19185519R 043 45 Wk#9 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#9 | 9: EastGouldie_ Dilution_HCT Wk#9 | 10: VO19249690R 009 78 Wk#9 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 17-Nov-20 | 17-Nov-20 | 17-Nov-20 | 17-Nov-20 | 17-Nov-20 | 17-Nov-20 |
| HumCell Leachate Vol [mL] | 18-Nov-20 | 12:48 | 929 | 927 | 762 | 948 | 944 | 921 |
| pH [No unit] | 23-Nov-20 | 11:42 | 7.18 | 7.38 | 7.20 | 7.49 | 7.20 | 6.96 |
| Acidity [mg/L as CaCO3] | 20-Nov-20 | 09:56 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 20-Nov-20 | 09:56 | 9 | 10 | 11 | 14 | 7 | 7 |
| Conductivity [uS/cm] | 20-Nov-20 | 09:56 | 22 | 71 | 141 | 65 | 38 | 24 |
| TDS [mg/L] | 19-Nov-20 | 10:10 | < 30 | < 30 | 66 | < 30 | < 30 | < 30 |
| F [mg/L] | 19-Nov-20 | 08:55 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | 0.15 | < 0.06 |
| Cl [mg/L] | 01-Dec-20 | 15:34 | < 0.2 | 0.4 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 01-Dec-20 | 15:34 | 2.2 | 16 | 46 | 14 | 8.3 | 3.9 |
| Br [mg/L] | 23-Nov-20 | 13:07 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 23-Nov-20 | 13:07 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 23-Nov-20 | 13:07 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 23-Nov-20 | 13:07 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 18-Nov-20 | 15:07 | 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 0.03 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10119-NOV20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#9 | 6: VO19211753R 046 42 Wk#9 | 7: VO19185519R 043 45 Wk#9 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#9 | 9: EastGouldie_ Dilution_HCT Wk#9 | 10: VO19249690R 009 78 Wk#9 |
|---|---|---|---|---|---|---|---|---|
| Hg [mg/L] | 19-Nov-20 | 11:55 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 20-Nov-20 | 13:22 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 20-Nov-20 | 13:22 | 0.043 | 0.033 | 0.038 | 0.056 | 0.038 | 0.036 |
| As [mg/L] | 20-Nov-20 | 13:22 | 0.0004 | 0.0004 | 0.0002 | 0.0003 | < 0.0002 | 0.0018 |
| Ba [mg/L] | 20-Nov-20 | 13:22 | 0.00109 | 0.00175 | 0.00319 | 0.00163 | 0.00088 | 0.00423 |
| Be [mg/L] | 20-Nov-20 | 13:22 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 20-Nov-20 | 13:22 | 0.003 | 0.004 | 0.012 | 0.022 | 0.033 | 0.027 |
| Bi [mg/L] | 20-Nov-20 | 13:22 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 20-Nov-20 | 13:22 | 1.97 | 6.92 | 20.0 | 8.03 | 3.46 | 1.80 |
| Cd [mg/L] | 20-Nov-20 | 13:22 | < 0.000003 | < 0.000003 | 0.000012 | < 0.000003 | 0.000005 | < 0.000003 |
| Co [mg/L] | 20-Nov-20 | 13:22 | < 0.000004 | < 0.000004 | 0.000011 | 0.000006 | < 0.000004 | 0.000044 |
| Cr [mg/L] | 20-Nov-20 | 13:22 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 20-Nov-20 | 13:22 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 20-Nov-20 | 13:22 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 |
| K [mg/L] | 20-Nov-20 | 13:22 | 1.97 | 3.93 | 2.81 | 1.98 | 2.27 | 2.58 |
| Li [mg/L] | 20-Nov-20 | 13:22 | 0.0008 | 0.0023 | 0.0014 | 0.0011 | 0.0012 | 0.0013 |
| Mg [mg/L] | 20-Nov-20 | 13:22 | 0.174 | 0.642 | 0.436 | 0.529 | 0.272 | 0.320 |
| Mn [mg/L] | 20-Nov-20 | 13:22 | 0.0220 | 0.0355 | 0.0365 | 0.0265 | 0.0199 | 0.00777 |
| Mo [mg/L] | 20-Nov-20 | 13:22 | 0.00062 | 0.00054 | 0.00021 | 0.00032 | 0.00009 | 0.00007 |
| Na [mg/L] | 20-Nov-20 | 13:22 | 0.93 | 1.50 | 0.57 | 0.66 | 1.38 | 0.62 |
| Ni [mg/L] | 20-Nov-20 | 13:22 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 20-Nov-20 | 13:22 | 0.00001 | 0.00002 | 0.00003 | 0.00007 | 0.00007 | 0.00004 |
| Sb [mg/L] | 20-Nov-20 | 13:22 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 20-Nov-20 | 13:22 | 0.00009 | 0.00006 | 0.00004 | 0.00006 | 0.00011 | 0.00009 |
| Si [mg/L] | 20-Nov-20 | 13:22 | 0.22 | 0.25 | 0.43 | 0.38 | 0.28 | 0.40 |
| Sr [mg/L] | 20-Nov-20 | 13:22 | 0.00652 | 0.143 | 0.224 | 0.0626 | 0.0186 | 0.0142 |
| Sn [mg/L] | 20-Nov-20 | 13:22 | 0.00007 | 0.00007 | 0.00008 | 0.00014 | 0.00020 | 0.00021 |
| Th [mg/L] | 20-Nov-20 | 13:22 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10119-NOV20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#9 | 6: VO19211753R 046 42 Wk#9 | 7: VO19185519R 043 45 Wk#9 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#9 | 9: EastGouldie_ Dilution_HCT Wk#9 | 10: VO19249690R 009 78 Wk#9 |
|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 20-Nov-20 | 13:22 | 0.00020 | < 0.00005 | < 0.00005 | 0.00011 | 0.00029 | 0.00029 |
| Tl [mg/L] | 20-Nov-20 | 13:22 | < 0.000005 | 0.000005 | 0.000006 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 20-Nov-20 | 13:22 | 0.000251 | 0.000459 | 0.000818 | 0.000590 | 0.000462 | 0.00126 |
| V [mg/L] | 20-Nov-20 | 13:22 | 0.00039 | 0.00057 | 0.00032 | 0.00030 | 0.00036 | 0.00039 |
| W [mg/L] | 20-Nov-20 | 13:22 | 0.00012 | 0.00065 | 0.00061 | 0.00063 | 0.00021 | 0.00009 |
| Zn [mg/L] | 20-Nov-20 | 13:22 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Hum Cells**

**Project :** PO#ODS-91998

30-October-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 13 October 2020
**LR Report:** **CA10126-OCT20**
**Reference:** Wk#4 - PO# ODS-91998

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# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#4 | 6: VO19211753R0 46 42 Wk#4 | 7: VO19185519R0 43 45 Wk#4 | 8: EastGouldie_OreSGR+/++_HCT Wk#4 | 9: EastGouldie_Dilution_HCT Wk#4 | 10: VO19249690R0 09 78 Wk#4 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 13-Oct-20 | 13-Oct-20 | 13-Oct-20 | 13-Oct-20 | 13-Oct-20 | 13-Oct-20 |
| HumCell Leachate Vol [mL] | 14-Oct-20 | 16:17 | 909 | 898 | 773 | 935 | 948 | 928 |
| pH [No unit] | 19-Oct-20 | 10:27 | 7.40 | 9.03 | 7.65 | 7.60 | 8.75 | 6.92 |
| Acidity [mg/L as CaCO3] | 14-Oct-20 | 16:22 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 20-Oct-20 | 15:16 | 9 | 12 | 11 | 20 | 11 | 5 |
| Conductivity [uS/cm] | 16-Oct-20 | 13:55 | 23 | 84 | 181 | 79 | 44 | 38 |
| TDS [mg/L] | 16-Oct-20 | 10:02 | < 30 | 54 | 103 | 49 | < 30 | < 30 |
| F [mg/L] | 14-Oct-20 | 09:10 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 30-Oct-20 | 10:36 | 0.4 | 0.7 | 0.3 | 0.3 | 0.2 | < 0.2 |
| SO4 [mg/L] | 30-Oct-20 | 10:36 | 3.4 | 23 | 61 | 14 | 6.6 | 6.6 |
| Br [mg/L] | 21-Oct-20 | 07:44 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 21-Oct-20 | 07:44 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 21-Oct-20 | 07:44 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 21-Oct-20 | 07:44 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 14-Oct-20 | 17:21 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Hg [mg/L] | 15-Oct-20 | 16:08 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 20-Oct-20 | 15:18 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 20-Oct-20 | 15:18 | 0.035 | 0.032 | 0.026 | 0.050 | 0.046 | 0.046 |
| As [mg/L] | 20-Oct-20 | 15:18 | < 0.0002 | 0.0002 | < 0.0002 | 0.0003 | 0.0002 | 0.0023 |
| Ba [mg/L] | 20-Oct-20 | 15:18 | 0.00083 | 0.00181 | 0.00380 | 0.00199 | 0.00100 | 0.00408 |
| Be [mg/L] | 20-Oct-20 | 15:18 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 20-Oct-20 | 15:18 | 0.003 | < 0.002 | 0.002 | 0.015 | 0.002 | 0.002 |
| Bi [mg/L] | 20-Oct-20 | 15:18 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 20-Oct-20 | 15:18 | 1.51 | 9.33 | 25.0 | 8.31 | 3.66 | 1.70 |
| Cd [mg/L] | 20-Oct-20 | 15:18 | < 0.000003 | 0.000005 | 0.000013 | 0.000012 | 0.000005 | < 0.000003 |
| Co [mg/L] | 20-Oct-20 | 15:18 | 0.000039 | 0.000028 | 0.000049 | 0.000043 | 0.000018 | 0.000075 |
| Cr [mg/L] | 20-Oct-20 | 15:18 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | 0.00010 | 0.00017 |
| Cu [mg/L] | 20-Oct-20 | 15:18 | 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 20-Oct-20 | 15:18 | 0.008 | < 0.007 | < 0.007 | < 0.007 | 0.008 | 0.012 |
| K [mg/L] | 20-Oct-20 | 15:18 | 2.07 | 4.36 | 4.21 | 2.70 | 3.02 | 3.84 |
| Li [mg/L] | 20-Oct-20 | 15:18 | 0.0005 | 0.0012 | 0.0014 | 0.0012 | 0.0006 | 0.0011 |
| Mg [mg/L] | 20-Oct-20 | 15:18 | 0.163 | 0.578 | 0.802 | 0.649 | 0.223 | 0.331 |
| Mn [mg/L] | 20-Oct-20 | 15:18 | 0.0144 | 0.0345 | 0.0353 | 0.0236 | 0.0220 | 0.00743 |
| Mo [mg/L] | 22-Oct-20 | 12:07 | 0.00313 | 0.00095 | 0.00173 | 0.00147 | 0.00023 | 0.00026 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10126-OCT20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#4 | 6: VO19211753R0 46 42 Wk#4 | 7: VO19185519R0 43 45 Wk#4 | 8: EastGouldie_OrEastGouldie_Dil eSGR+/++_HCT Wk#4 | 9: ution_HCT Wk#4 | 10: VO19249690R0 09 78 Wk#4 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 20-Oct-20 | 15:18 | 1.57 | 1.98 | 1.59 | 2.00 | 2.87 | 2.69 |
| Ni [mg/L] | 20-Oct-20 | 15:18 | < 0.0001 | 0.0001 | 0.0002 | < 0.0001 | < 0.0001 | 0.0004 |
| Pb [mg/L] | 20-Oct-20 | 15:18 | 0.00002 | < 0.00001 | 0.00007 | 0.00004 | 0.00003 | 0.00003 |
| Sb [mg/L] | 20-Oct-20 | 15:18 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 20-Oct-20 | 15:18 | 0.00015 | 0.00006 | 0.00008 | 0.00014 | 0.00011 | 0.00014 |
| Si [mg/L] | 20-Oct-20 | 15:18 | 0.14 | 0.20 | 0.37 | 0.35 | 0.25 | 0.35 |
| Sr [mg/L] | 20-Oct-20 | 15:19 | 0.00713 | 0.206 | 0.297 | 0.0825 | 0.0176 | 0.0165 |
| Sn [mg/L] | 20-Oct-20 | 15:19 | 0.00008 | 0.00008 | 0.00012 | 0.00018 | 0.00009 | 0.00015 |
| Th [mg/L] | 20-Oct-20 | 15:19 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 20-Oct-20 | 15:19 | 0.00053 | 0.00013 | 0.00006 | 0.00014 | 0.00053 | 0.00076 |
| Tl [mg/L] | 20-Oct-20 | 15:19 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 20-Oct-20 | 15:19 | 0.000158 | 0.000313 | 0.001070 | 0.000472 | 0.000248 | 0.000857 |
| V [mg/L] | 20-Oct-20 | 15:19 | 0.00029 | 0.00046 | 0.00029 | 0.00029 | 0.00036 | 0.00047 |
| W [mg/L] | 20-Oct-20 | 15:19 | 0.00012 | 0.00075 | 0.00089 | 0.00100 | 0.00046 | 0.00031 |
| Zn [mg/L] | 20-Oct-20 | 15:19 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

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*Project Specialist,*
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**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Hum Cells**

**Project :** PO#ODS-91998

29-January-2021

**Date Rec. :** 19 January 2021
**LR Report:** **CA10134-JAN21**
**Reference:** Wk#18

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#18 | 6: VO19211753R 046 42 Wk#18 | 7: VO19185519R 043 45 Wk#18 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#18 | 9: EastGouldie_ Dilution_HCT Wk#18 | 10: VO19249690R 009 78 Wk#18 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 19-Jan-21 | 19-Jan-21 | 19-Jan-21 | 19-Jan-21 | 19-Jan-21 | 19-Jan-21 |
| HumCell Leachate Vol [mL] | 20-Jan-21 | 11:14 | 823 | 816 | 677 | 841 | 825 | 842 |
| pH [No unit] | 21-Jan-21 | 08:07 | 7.34 | 7.80 | 7.43 | 7.43 | 7.40 | 6.95 |
| Acidity [mg/L as CaCO3] | 21-Jan-21 | 08:07 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 21-Jan-21 | 08:07 | 8 | 12 | 11 | 10 | 9 | 4 |
| Conductivity [uS/cm] | 21-Jan-21 | 08:07 | 21 | 57 | 141 | 57 | 30 | 20 |
| TDS [mg/L] | 22-Jan-21 | 08:08 | < 30 | < 30 | 100 | < 30 | < 30 | < 30 |
| F [mg/L] | 19-Jan-21 | 15:05 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 26-Jan-21 | 14:53 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 26-Jan-21 | 14:53 | 0.8 | 13 | 22 | 12 | 4.4 | 2.1 |
| Br [mg/L] | 25-Jan-21 | 16:34 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 25-Jan-21 | 16:34 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 25-Jan-21 | 16:34 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 25-Jan-21 | 16:34 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 20-Jan-21 | 10:40 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 0.04 | < 0.03 |

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| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#18 | 6: VO19211753R 046 42 Wk#18 | 7: VO19185519R 043 45 Wk#18 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#18 | 9: EastGouldie_ Dilution_HCT Wk#18 | 10: VO19249690R 009 78 Wk#18 |
|---|---|---|---|---|---|---|---|---|
| Hg [mg/L] | 21-Jan-21 | 14:36 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 26-Jan-21 | 16:25 | < 0.00005 | < 0.00005 | 0.00008 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 26-Jan-21 | 16:25 | 0.058 | 0.048 | 0.043 | 0.054 | 0.063 | 0.045 |
| As [mg/L] | 26-Jan-21 | 16:25 | 0.0002 | 0.0003 | < 0.0002 | 0.0002 | 0.0002 | 0.0016 |
| Ba [mg/L] | 26-Jan-21 | 16:25 | 0.00080 | 0.00169 | 0.00206 | 0.00145 | 0.00083 | 0.00310 |
| Be [mg/L] | 26-Jan-21 | 16:25 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 26-Jan-21 | 16:25 | 0.003 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 26-Jan-21 | 16:25 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 26-Jan-21 | 16:25 | 2.02 | 7.16 | 12.0 | 7.68 | 3.70 | 1.47 |
| Cd [mg/L] | 26-Jan-21 | 16:25 | 0.000003 | 0.000007 | 0.000011 | 0.000004 | 0.000005 | 0.000004 |
| Co [mg/L] | 26-Jan-21 | 16:25 | 0.000015 | 0.000009 | 0.000006 | 0.000014 | 0.000007 | 0.000055 |
| Cr [mg/L] | 26-Jan-21 | 16:25 | 0.00011 | < 0.00008 | < 0.00008 | 0.00013 | 0.00011 | 0.00016 |
| Cu [mg/L] | 26-Jan-21 | 16:25 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002 |
| Fe [mg/L] | 26-Jan-21 | 16:25 | 0.008 | < 0.007 | < 0.007 | < 0.007 | 0.007 | < 0.007 |
| K [mg/L] | 26-Jan-21 | 16:25 | 1.66 | 3.16 | 2.03 | 1.55 | 1.66 | 1.60 |
| Li [mg/L] | 26-Jan-21 | 16:25 | 0.0006 | 0.0012 | 0.0005 | 0.0005 | 0.0006 | 0.0005 |
| Mg [mg/L] | 26-Jan-21 | 16:25 | 0.192 | 0.420 | 0.174 | 0.339 | 0.196 | 0.207 |
| Mn [mg/L] | 26-Jan-21 | 16:25 | 0.0152 | 0.0268 | 0.031 | 0.0271 | 0.0164 | 0.00561 |
| Mo [mg/L] | 26-Jan-21 | 16:25 | 0.00034 | 0.00034 | 0.00011 | 0.00031 | 0.00007 | 0.00004 |
| Na [mg/L] | 26-Jan-21 | 16:25 | 0.27 | 0.65 | 0.18 | 0.28 | 0.36 | 0.17 |
| Ni [mg/L] | 26-Jan-21 | 16:25 | 0.0001 | 0.0001 | < 0.0001 | 0.0002 | < 0.0001 | 0.0002 |
| Pb [mg/L] | 26-Jan-21 | 16:25 | < 0.00001 | 0.00001 | 0.00001 | 0.00005 | < 0.00001 | < 0.00001 |
| Sb [mg/L] | 26-Jan-21 | 16:25 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 26-Jan-21 | 16:25 | < 0.00004 | < 0.00004 | < 0.00004 | < 0.00004 | < 0.00004 | < 0.00004 |
| Si [mg/L] | 26-Jan-21 | 16:25 | 0.25 | 0.31 | 0.28 | 0.30 | 0.31 | 0.29 |
| Sr [mg/L] | 26-Jan-21 | 16:25 | 0.00615 | 0.133 | 0.107 | 0.0448 | 0.0152 | 0.00807 |
| Sn [mg/L] | 26-Jan-21 | 16:25 | 0.00008 | 0.00008 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Th [mg/L] | 26-Jan-21 | 16:25 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

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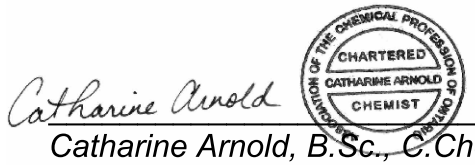
|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 26-Jan-21 | 16:25 | 0.00051 | 0.00018 | < 0.00005 | 0.00020 | 0.00066 | 0.00048 |
| Tl [mg/L] | 26-Jan-21 | 16:25 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 26-Jan-21 | 16:25 | 0.000623 | 0.000383 | 0.000281 | 0.000513 | 0.000510 | 0.00153 |
| V [mg/L] | 26-Jan-21 | 16:25 | 0.00070 | 0.00116 | 0.00042 | 0.00036 | 0.00070 | 0.00056 |
| W [mg/L] | 26-Jan-21 | 16:25 | 0.00009 | 0.00064 | 0.00049 | 0.00063 | 0.00016 | 0.00008 |
| Zn [mg/L] | 26-Jan-21 | 16:25 | 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10134-JAN21**

# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | | |
| | | | | | | | % | | Low | High | | Low | High | |
| *Acidity - QCBatchID: EWL0239-JAN21* | | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | 2 | | | 8 | 20 | 110 | 90 | 110 | NA | | | |
| *Alkalinity - QCBatchID: EWL0239-JAN21* | | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | ND | 20 | 109 | 80 | 120 | NA | | | |
| *Anions by IC - QCBatchID: DIO0276-JAN21* | | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 93 | 80 | 120 | 83 | 75 | 125 | |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | ND | 20 | 103 | 80 | 120 | 98 | 75 | 125 | |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 93 | 80 | 120 | 99 | 75 | 125 | |
| *Anions by IC - QCBatchID: DIO0294-JAN21* | | | | | | | | | | | | | | |
| Chloride | 0.2 | mg/L | <0.2 | | | ND | 20 | 93 | 80 | 120 | 87 | 75 | 125 | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 1 | 20 | 98 | 80 | 120 | 93 | 75 | 125 | |
| *Conductivity - QCBatchID: EWL0239-JAN21* | | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 5 | 20 | 100 | 90 | 110 | NA | | | |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0236-JAN21* | | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 99 | 90 | 110 | 80 | 75 | 125 | |
| *Inorganics-General - QCBatchID: EHG0020-JAN21* | | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 101 | 80 | 120 | 99 | 70 | 130 | |
| *Metals - QCBatchID: EMS0093-JAN21* | | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | 12 | 20 | 94 | 90 | 110 | 95 | 70 | 130 | |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0093-JAN21* | | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 4 | 20 | 94 | 90 | 110 | 103 | 70 | 130 | |
| Antimony | 0.0009 | mg/L | <0.0009 | | | ND | 20 | 98 | 90 | 110 | 103 | 70 | 130 | |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | 3 | 20 | 98 | 90 | 110 | 93 | 70 | 130 | |
| Barium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 100 | 90 | 110 | 98 | 70 | 130 | |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 93 | 90 | 110 | 96 | 70 | 130 | |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 92 | 90 | 110 | 85 | 70 | 130 | |
| Boron | 0.002 | mg/L | <0.002 | | | 3 | 20 | 92 | 90 | 110 | 103 | 70 | 130 | |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | 2 | 20 | 94 | 90 | 110 | 94 | 70 | 130 | |
| Calcium | 0.01 | mg/L | <0.01 | | | 1 | 20 | 99 | 90 | 110 | 94 | 70 | 130 | |
| Chromium | 0.00008 | mg/L | <0.00008 | | | 5 | 20 | 94 | 90 | 110 | 105 | 70 | 130 | |
| Copper | 0.0002 | mg/L | <0.0002 | | | 1 | 20 | 94 | 90 | 110 | 98 | 70 | 130 | |
| Iron | 0.007 | mg/L | <0.007 | | | 15 | 20 | 95 | 90 | 110 | NV | 70 | 130 | |
| Lead | 0.00001 | mg/L | <0.00001 | | | ND | 20 | 96 | 90 | 110 | 98 | 70 | 130 | |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 1 | 20 | 99 | 90 | 110 | 129 | 70 | 130 | |
| Magnesium | 0.001 | mg/L | <0.001 | | | 3 | 20 | 102 | 90 | 110 | 95 | 70 | 130 | |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10134-JAN21**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 6 | 20 | 94 | 90 | 110 | 96 | 70 | 130 |
| Molybdenum | 0.00004 | mg/L | <0.00004 | | | 6 | 20 | 92 | 90 | 110 | 95 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | 13 | 20 | 95 | 90 | 110 | 103 | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.009 | | | 0 | 20 | 108 | 90 | 110 | 93 | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | 5 | 20 | 96 | 90 | 110 | 97 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 0 | 20 | 98 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 96 | 90 | 110 | 85 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 2 | 20 | 97 | 90 | 110 | 95 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 92 | 90 | 110 | 94 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | 2 | 20 | 97 | 90 | 110 | 97 | 70 | 130 |
| Thorium | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 96 | 90 | 110 | NV | 70 | 130 |
| Tin | 0.00006 | mg/L | <0.00006 | | | ND | 20 | 94 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | 16 | 20 | 96 | 90 | 110 | NV | 70 | 130 |
| Tungsten | 0.00002 | mg/L | <0.00002 | | | 19 | 20 | 93 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 6 | 20 | 94 | 90 | 110 | 91 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | 2 | 20 | 95 | 90 | 110 | 101 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | 1 | 20 | 100 | 90 | 110 | 111 | 70 | 130 |
| *pH - QCBatchID: EWL0239-JAN21* | | | | | | | | | | | | | |
| pH | 0.05 | No unit | NA | | | 0 | | 100 | | | NA | | |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0158-JAN21* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | ND | 10 | 110 | 90 | 110 | 75 | 75 | 125 |
| *Solids Analysis - QCBatchID: EWL0234-JAN21* | | | | | | | | | | | | | |
| Total Dissolved Solids | 30 | mg/L | <30 | | | 1 | 20 | 102 | 90 | 110 | NA | | |
| *Solids Analysis - QCBatchID: EWL0258-JAN21* | | | | | | | | | | | | | |
| Total Dissolved Solids | 30 | mg/L | <30 | | | ND | 20 | 101 | 90 | 110 | NA | | |

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25-September-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 15 September 2020
**LR Report:** **CA10146-SEP20**
**Reference:** Wk#0

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#0 | 6: VO19211753R0 46 42 Wk#0 | 7: VO19185519R0 43 45 Wk#0 | 8: EastGouldie_OreSGR+/++_HCT Wk#0 | 9: EastGouldie_Dilution_HCT Wk#0 | 10: VO19249690R0 09 78 Wk#0 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 15-Sep-20 | 15-Sep-20 | 15-Sep-20 | 15-Sep-20 | 15-Sep-20 | 15-Sep-20 |
| HumCell Leachate Vol [mL] | 16-Sep-20 | 09:17 | 755 | 768 | 661 | 779 | 794 | 782 |
| pH [No unit] | 18-Sep-20 | 08:48 | 8.85 | 9.16 | 8.61 | 8.88 | 9.24 | 8.73 |
| Acidity [mg/L as CaCO3] | 18-Sep-20 | 08:48 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 18-Sep-20 | 08:48 | 17 | 28 | 25 | 32 | 27 | 17 |
| Conductivity [uS/cm] | 18-Sep-20 | 08:48 | 75 | 94 | 291 | 234 | 56 | 74 |
| TDS [mg/L] | 21-Sep-20 | 17:05 | 74 | 74 | 191 | 157 | 46 | 83 |
| F [mg/L] | 16-Sep-20 | 10:38 | < 0.06 | < 0.06 | < 0.06 | 0.08 | < 0.06 | 0.07 |
| Cl [mg/L] | 24-Sep-20 | 14:24 | 3.2 | 2.6 | 6.0 | 29 | 0.7 | 2.3 |
| SO4 [mg/L] | 24-Sep-20 | 14:24 | 11 | 18 | 100 | 58 | 5.6 | 9.6 |
| Br [mg/L] | 21-Sep-20 | 16:20 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 21-Sep-20 | 16:20 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 21-Sep-20 | 16:20 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 21-Sep-20 | 16:20 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 16-Sep-20 | 16:42 | 0.14 | 0.06 | 0.04 | 0.04 | 0.17 | 0.26 |
| Hg [mg/L] | 17-Sep-20 | 14:08 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 21-Sep-20 | 14:54 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 21-Sep-20 | 14:54 | 0.101 | 0.031 | 0.012 | 0.034 | 0.054 | 0.072 |
| As [mg/L] | 21-Sep-20 | 14:54 | 0.0003 | 0.0008 | 0.0006 | 0.0012 | 0.0004 | 0.0018 |
| Ba [mg/L] | 21-Sep-20 | 14:54 | 0.00224 | 0.00211 | 0.00880 | 0.00899 | 0.00130 | 0.00444 |
| Be [mg/L] | 21-Sep-20 | 14:54 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 21-Sep-20 | 14:54 | < 0.002 | 0.006 | 0.003 | 0.004 | 0.002 | 0.002 |
| Bi [mg/L] | 21-Sep-20 | 14:54 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000023 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 21-Sep-20 | 14:54 | 3.85 | 7.18 | 41.3 | 19.2 | 4.36 | 2.71 |
| Cd [mg/L] | 21-Sep-20 | 14:54 | 0.000005 | 0.000003 | 0.000005 | < 0.000003 | 0.000004 | 0.000003 |
| Co [mg/L] | 21-Sep-20 | 14:54 | 0.000029 | 0.000035 | 0.000029 | 0.000026 | 0.000025 | 0.000032 |
| Cr [mg/L] | 21-Sep-20 | 14:54 | 0.00017 | < 0.00008 | < 0.00008 | < 0.00008 | 0.00009 | 0.00015 |
| Cu [mg/L] | 21-Sep-20 | 14:54 | 0.0008 | 0.0004 | 0.0004 | 0.0005 | 0.0005 | 0.0004 |
| Fe [mg/L] | 21-Sep-20 | 14:54 | 0.033 | 0.007 | < 0.007 | < 0.007 | 0.016 | 0.021 |
| K [mg/L] | 21-Sep-20 | 14:54 | 7.00 | 9.94 | 13.8 | 13.7 | 4.43 | 6.53 |
| Li [mg/L] | 21-Sep-20 | 14:54 | 0.0022 | 0.0027 | 0.0049 | 0.0067 | 0.0009 | 0.0027 |
| Mg [mg/L] | 21-Sep-20 | 14:54 | 0.478 | 0.520 | 1.70 | 2.36 | 0.168 | 0.272 |
| Mn [mg/L] | 21-Sep-20 | 14:54 | 0.0279 | 0.0239 | 0.0254 | 0.0117 | 0.0102 | 0.00529 |
| Mo [mg/L] | 21-Sep-20 | 14:54 | 0.00046 | 0.00028 | 0.00055 | 0.00160 | 0.00051 | 0.00029 |

OnLine LIMS

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**LR Report :** **CA10146-SEP20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#0 | 6: VO19211753R0 46 42 Wk#0 | 7: VO19185519R0 43 45 Wk#0 | 8: EastGouldie_OrEastGouldie_Di eSGR+/++_HCT Wk#0 | 9: lution_HCT Wk#0 | 10: VO19249690R0 09 78 Wk#0 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 21-Sep-20 | 14:54 | 4.39 | 3.53 | 7.10 | 13.6 | 2.87 | 7.24 |
| Ni [mg/L] | 21-Sep-20 | 14:54 | 0.0002 | 0.0003 | 0.0005 | 0.0004 | 0.0003 | 0.0004 |
| Pb [mg/L] | 21-Sep-20 | 14:54 | 0.00008 | 0.00003 | 0.00015 | 0.00004 | 0.00004 | 0.00004 |
| Sb [mg/L] | 21-Sep-20 | 14:54 | < 0.0009 | < 0.0009 | < 0.0009 | 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 21-Sep-20 | 14:54 | 0.00038 | 0.00004 | 0.00010 | 0.00027 | 0.00009 | 0.00024 |
| Si [mg/L] | 21-Sep-20 | 14:54 | 0.40 | 0.33 | 0.85 | 0.68 | 0.46 | 0.59 |
| Sr [mg/L] | 21-Sep-20 | 14:54 | 0.0178 | 0.0980 | 0.376 | 0.346 | 0.0175 | 0.0200 |
| Sn [mg/L] | 21-Sep-20 | 14:54 | 0.00042 | 0.00058 | 0.00062 | 0.00074 | 0.00076 | 0.00032 |
| Th [mg/L] | 21-Sep-20 | 14:54 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 |
| Ti [mg/L] | 21-Sep-20 | 14:54 | 0.00257 | 0.00050 | 0.00006 | 0.00017 | 0.00115 | 0.00160 |
| Tl [mg/L] | 21-Sep-20 | 14:54 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 21-Sep-20 | 14:54 | 0.000087 | 0.000031 | 0.000070 | 0.000106 | 0.000021 | 0.000045 |
| V [mg/L] | 21-Sep-20 | 14:54 | 0.00063 | 0.00049 | 0.00037 | 0.00055 | 0.00048 | 0.00066 |
| W [mg/L] | 21-Sep-20 | 14:54 | 0.00014 | 0.00202 | 0.00208 | 0.00384 | 0.00087 | 0.00129 |
| Zn [mg/L] | 21-Sep-20 | 14:54 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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**Hum Cells**

**Project :** PO#ODS-91998

29-December-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 15 December 2020
**LR Report:** **CA10156-DEC20**
**Reference:** Wk#13

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk# | 6: VO19211753R0 46 42 Wk# | 7: VO19185519R0 43 45 Wk# | 8: EastGouldie_OreSGR+/++_HCT Wk# | 9: EastGouldie_Dilution_HCT Wk# | 10: VO19249690R0 09 78 Wk# |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 15-Dec-20 | 15-Dec-20 | 15-Dec-20 | 15-Dec-20 | 15-Dec-20 | 15-Dec-20 |
| HumCell Leachate Vol [mL] | 16-Dec-20 | 10:54 | 907 | 908 | 758 | 919 | 928 | 911 |
| pH [No unit] | 16-Dec-20 | 13:54 | 7.07 | 7.29 | 7.21 | 7.72 | 7.42 | 6.87 |
| Acidity [mg/L as CaCO3] | 16-Dec-20 | 13:54 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 17-Dec-20 | 14:22 | 9 | 12 | 9 | 14 | 10 | 6 |
| Conductivity [uS/cm] | 16-Dec-20 | 13:54 | 16 | 56 | 97 | 56 | 35 | 19 |
| TDS [mg/L] | 16-Dec-20 | 15:06 | < 30 | < 30 | 86 | 31 | < 30 | < 30 |
| F [mg/L] | 16-Dec-20 | 09:14 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 22-Dec-20 | 11:29 | < 0.2 | 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 22-Dec-20 | 11:29 | 1.1 | 13 | 30 | 11 | 6.5 | 2.8 |
| Br [mg/L] | 21-Dec-20 | 13:21 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 22-Dec-20 | 14:46 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 21-Dec-20 | 13:21 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 22-Dec-20 | 14:46 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | <0.06 |
| Tot.Reactive P [mg/L] | 16-Dec-20 | 14:19 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 0.04 | < 0.03 |
| Hg [mg/L] | 18-Dec-20 | 10:39 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 22-Dec-20 | 09:26 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 22-Dec-20 | 09:26 | 0.041 | 0.034 | 0.051 | 0.055 | 0.061 | 0.036 |
| As [mg/L] | 22-Dec-20 | 09:26 | < 0.0002 | 0.0002 | < 0.0002 | 0.0002 | < 0.0002 | 0.0016 |
| Ba [mg/L] | 22-Dec-20 | 09:26 | 0.00087 | 0.00132 | 0.00222 | 0.00142 | 0.00115 | 0.00456 |
| Be [mg/L] | 22-Dec-20 | 09:26 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 22-Dec-20 | 09:26 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 22-Dec-20 | 09:26 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 22-Dec-20 | 09:26 | 1.82 | 6.79 | 14.7 | 7.43 | 4.37 | 1.66 |
| Cd [mg/L] | 22-Dec-20 | 09:26 | 0.000006 | 0.000003 | 0.000014 | 0.000004 | 0.000004 | < 0.000003 |
| Co [mg/L] | 22-Dec-20 | 09:26 | 0.000028 | 0.000045 | 0.000035 | 0.000051 | 0.000072 | 0.000055 |
| Cr [mg/L] | 22-Dec-20 | 09:26 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 22-Dec-20 | 09:26 | < 0.0002 | 0.0008 | 0.0006 | 0.0007 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 22-Dec-20 | 09:26 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | 0.010 | < 0.007 |
| K [mg/L] | 22-Dec-20 | 09:26 | 1.49 | 2.51 | 2.11 | 1.61 | 1.97 | 1.83 |
| Li [mg/L] | 22-Dec-20 | 09:26 | 0.0006 | 0.0013 | 0.0008 | 0.0007 | 0.0008 | 0.0008 |
| Mg [mg/L] | 22-Dec-20 | 09:26 | 0.171 | 0.428 | 0.252 | 0.396 | 0.243 | 0.269 |
| Mn [mg/L] | 22-Dec-20 | 09:26 | 0.0185 | 0.0352 | 0.0340 | 0.0276 | 0.0238 | 0.00717 |
| Mo [mg/L] | 22-Dec-20 | 09:26 | 0.00081 | 0.00012 | 0.00049 | 0.00035 | 0.00016 | 0.00014 |

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Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10156-DEC20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk# | 6: VO19211753R0 46 42 Wk# | 7: VO19185519R0 43 45 Wk# | 8: EastGouldie_OrEastGouldie_Di eSGR+/++_HCT Wk# | 9: lution_HCT Wk# | 10: VO19249690R0 09 78 Wk# |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 22-Dec-20 | 09:26 | 0.45 | 0.70 | 0.27 | 0.37 | 0.76 | 0.27 |
| Ni [mg/L] | 22-Dec-20 | 09:26 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 22-Dec-20 | 09:26 | 0.00003 | 0.00001 | 0.00004 | 0.00012 | 0.00003 | 0.00001 |
| Sb [mg/L] | 22-Dec-20 | 09:26 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 22-Dec-20 | 09:26 | 0.00008 | 0.00008 | < 0.00004 | 0.00007 | 0.00012 | 0.00008 |
| Si [mg/L] | 22-Dec-20 | 09:26 | 0.24 | 0.27 | 0.40 | 0.36 | 0.34 | 0.38 |
| Sr [mg/L] | 22-Dec-20 | 09:26 | 0.0064 | 0.136 | 0.163 | 0.0525 | 0.0199 | 0.0120 |
| Sn [mg/L] | 22-Dec-20 | 09:26 | 0.00008 | 0.00010 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Th [mg/L] | 22-Dec-20 | 09:26 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 22-Dec-20 | 09:26 | 0.00038 | 0.00012 | 0.00007 | 0.00031 | 0.00085 | 0.00039 |
| Tl [mg/L] | 22-Dec-20 | 09:26 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 22-Dec-20 | 09:26 | 0.000395 | 0.000460 | 0.000606 | 0.000596 | 0.000433 | 0.00202 |
| V [mg/L] | 22-Dec-20 | 09:26 | 0.00038 | 0.00058 | 0.00036 | 0.00028 | 0.00042 | 0.00037 |
| W [mg/L] | 22-Dec-20 | 09:26 | 0.00011 | 0.00074 | 0.00076 | 0.00094 | 0.00019 | 0.00008 |
| Zn [mg/L] | 22-Dec-20 | 09:26 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Hum Cells**

**Project :** PO#ODS-91998

03-December-2020

**Date Rec. :** 24 November 2020
**LR Report:** **CA10157-NOV20**
**Reference:** Wk#10 - PO#ODS-91998

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# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#10 | 6: VO19211753R 046 42 Wk#10 | 7: VO19185519R 043 45 Wk#10 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#10 | 9: EastGouldie_ Dilution_HCT Wk#10 | 10: VO19249690R 009 78 Wk#10 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 24-Nov-20 | 24-Nov-20 | 24-Nov-20 | 24-Nov-20 | 24-Nov-20 | 24-Nov-20 |
| HumCell Leachate Vol [mL] | 25-Nov-20 | 11:18 | 966 | 934 | 817 | 975 | 952 | 973 |
| pH [No unit] | 26-Nov-20 | 15:59 | 7.18 | 7.32 | 7.40 | 7.42 | 7.41 | 7.09 |
| Acidity [mg/L as CaCO3] | 26-Nov-20 | 15:59 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 26-Nov-20 | 15:59 | 7 | 12 | 12 | 14 | 10 | 7 |
| Conductivity [uS/cm] | 26-Nov-20 | 15:59 | 24 | 66 | 134 | 72 | 46 | 29 |
| TDS [mg/L] | 25-Nov-20 | 14:24 | < 30 | 43 | 71 | 43 | < 30 | 40 |
| F [mg/L] | 25-Nov-20 | 07:46 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 02-Dec-20 | 16:27 | < 0.2 | 0.5 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 02-Dec-20 | 16:27 | 1.8 | 13 | 40 | 15 | 7.6 | 3.6 |
| Br [mg/L] | 02-Dec-20 | 13:09 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 02-Dec-20 | 13:09 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 02-Dec-20 | 13:09 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 02-Dec-20 | 13:09 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 25-Nov-20 | 14:54 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 0.03 | < 0.03 |

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0002339313

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10157-NOV20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#10 | 6: VO19211753R 046 42 Wk#10 | 7: VO19185519R 043 45 Wk#10 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#10 | 9: EastGouldie_ Dilution_HCT Wk#10 | 10: VO19249690R 009 78 Wk#10 |
|---|---|---|---|---|---|---|---|---|
| Hg [mg/L] | 26-Nov-20 | 09:23 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 02-Dec-20 | 17:02 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 02-Dec-20 | 17:02 | 0.037 | 0.042 | 0.033 | 0.044 | 0.043 | 0.034 |
| As [mg/L] | 02-Dec-20 | 17:02 | < 0.0002 | 0.0002 | < 0.0002 | 0.0004 | < 0.0002 | 0.0024 |
| Ba [mg/L] | 02-Dec-20 | 17:02 | 0.00111 | 0.00189 | 0.00339 | 0.00240 | 0.00115 | 0.00485 |
| Be [mg/L] | 02-Dec-20 | 17:02 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 02-Dec-20 | 17:02 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 02-Dec-20 | 17:02 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 02-Dec-20 | 17:02 | 2.01 | 6.63 | 21.4 | 9.88 | 4.36 | 2.24 |
| Cd [mg/L] | 02-Dec-20 | 17:02 | < 0.000003 | 0.000003 | 0.000015 | 0.000005 | 0.000004 | < 0.000003 |
| Co [mg/L] | 02-Dec-20 | 17:02 | 0.000007 | 0.000009 | 0.000017 | 0.000020 | 0.000009 | 0.000044 |
| Cr [mg/L] | 02-Dec-20 | 17:02 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 02-Dec-20 | 17:02 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0028 | < 0.0002 |
| Fe [mg/L] | 02-Dec-20 | 17:02 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 |
| K [mg/L] | 02-Dec-20 | 17:02 | 2.07 | 4.27 | 3.18 | 2.44 | 2.79 | 2.87 |
| Li [mg/L] | 02-Dec-20 | 17:02 | 0.0010 | 0.0027 | 0.0018 | 0.0015 | 0.0015 | 0.0015 |
| Mg [mg/L] | 02-Dec-20 | 17:02 | 0.173 | 0.711 | 0.527 | 0.693 | 0.319 | 0.386 |
| Mn [mg/L] | 02-Dec-20 | 17:02 | 0.0237 | 0.0427 | 0.0458 | 0.0323 | 0.0257 | 0.00903 |
| Mo [mg/L] | 02-Dec-20 | 17:02 | 0.00026 | 0.00035 | 0.00022 | 0.00261 | 0.00016 | 0.00070 |
| Na [mg/L] | 02-Dec-20 | 17:02 | 0.78 | 1.59 | 0.51 | 0.71 | 1.41 | 0.53 |
| Ni [mg/L] | 02-Dec-20 | 17:02 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 02-Dec-20 | 17:02 | 0.00001 | < 0.00001 | 0.00003 | 0.00008 | 0.00003 | 0.00002 |
| Sb [mg/L] | 02-Dec-20 | 17:02 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 02-Dec-20 | 17:02 | 0.00012 | 0.00006 | 0.00006 | 0.00010 | 0.00012 | 0.00010 |
| Si [mg/L] | 02-Dec-20 | 17:02 | 0.28 | 0.32 | 0.56 | 0.48 | 0.34 | 0.50 |
| Sr [mg/L] | 02-Dec-20 | 17:02 | 0.00647 | 0.104 | 0.236 | 0.0732 | 0.0186 | 0.0165 |
| Sn [mg/L] | 02-Dec-20 | 17:02 | 0.00009 | 0.00009 | 0.00008 | < 0.00006 | 0.00007 | 0.00008 |
| Th [mg/L] | 02-Dec-20 | 17:02 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

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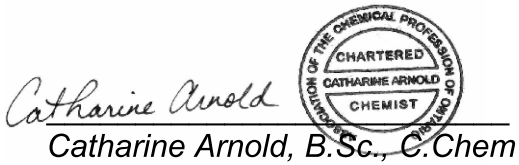
**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10157-NOV20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#10 | 6: VO19211753R 046 42 Wk#10 | 7: VO19185519R 043 45 Wk#10 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#10 | 9: EastGouldie_ Dilution_HCT Wk#10 | 10: VO19249690R 009 78 Wk#10 |
|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 02-Dec-20 | 17:02 | 0.00026 | 0.00011 | 0.00007 | 0.00012 | 0.00036 | 0.00022 |
| Tl [mg/L] | 02-Dec-20 | 17:02 | < 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | 0.000005 | < 0.000005 |
| U [mg/L] | 02-Dec-20 | 17:02 | 0.000344 | 0.000504 | 0.00176 | 0.00140 | 0.000765 | 0.00219 |
| V [mg/L] | 02-Dec-20 | 17:02 | 0.00040 | 0.00071 | 0.00034 | 0.00028 | 0.00041 | 0.00051 |
| W [mg/L] | 02-Dec-20 | 17:02 | 0.00014 | 0.00088 | 0.00103 | 0.00144 | 0.00034 | 0.00031 |
| Zn [mg/L] | 02-Dec-20 | 17:02 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Hum Cells**

**Project :** PO#ODS-91998

11-January-2021

**Date Rec. :** 22 December 2020
**LR Report:** **CA10179-DEC20**
**Reference:** Wk#14

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#14 | 6: VO19211753R 046 42 Wk#14 | 7: VO19185519R 043 45 Wk#14 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#14 | 9: EastGouldie_ Dilution_HCT Wk#14 | 10: VO19249690R 009 78 Wk#14 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 22-Dec-20 | 22-Dec-20 | 22-Dec-20 | 22-Dec-20 | 22-Dec-20 | 22-Dec-20 |
| HumCell Leachate Vol [mL] | 23-Dec-20 | 09:28 | 898 | 895 | 749 | 934 | 912 | 912 |
| pH [No unit] | 30-Dec-20 | 08:53 | 7.38 | 7.88 | 7.79 | 7.74 | 7.49 | 7.12 |
| Acidity [mg/L as CaCO3] | 24-Dec-20 | 09:24 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 24-Dec-20 | 09:24 | 8 | 10 | 12 | 14 | 8 | 6 |
| Conductivity [uS/cm] | 24-Dec-20 | 09:24 | 20 | 59 | 92 | 58 | 34 | 22 |
| TDS [mg/L] | 24-Dec-20 | 10:17 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| F [mg/L] | 29-Dec-20 | 13:30 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 30-Dec-20 | 12:16 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 31-Dec-20 | 12:02 | 1.2 | 13 | 27 | 11 | 6.4 | 2.9 |
| Br [mg/L] | 30-Dec-20 | 12:48 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 30-Dec-20 | 12:48 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 30-Dec-20 | 12:48 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 30-Dec-20 | 12:48 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 23-Dec-20 | 12:56 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |

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| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#14 | 6: VO19211753R 046 42 Wk#14 | 7: VO19185519R 043 45 Wk#14 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#14 | 9: EastGouldie_ Dilution_HCT Wk#14 | 10: VO19249690R 009 78 Wk#14 |
|---|---|---|---|---|---|---|---|---|
| Hg [mg/L] | 23-Dec-20 | 09:18 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 30-Dec-20 | 16:27 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 30-Dec-20 | 16:27 | 0.046 | 0.043 | 0.040 | 0.052 | 0.049 | 0.035 |
| As [mg/L] | 30-Dec-20 | 16:27 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002 | < 0.0002 | 0.0015 |
| Ba [mg/L] | 30-Dec-20 | 16:27 | 0.00128 | 0.00137 | 0.00191 | 0.00161 | 0.00099 | 0.00412 |
| Be [mg/L] | 30-Dec-20 | 16:27 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 30-Dec-20 | 16:27 | 0.220 | 0.328 | 0.174 | 0.102 | 0.193 | 0.177 |
| Bi [mg/L] | 30-Dec-20 | 16:27 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 30-Dec-20 | 16:27 | 1.83 | 6.83 | 12.6 | 7.18 | 3.60 | 1.64 |
| Cd [mg/L] | 30-Dec-20 | 16:27 | < 0.000003 | < 0.000003 | 0.000009 | 0.000005 | < 0.000003 | 0.000003 |
| Co [mg/L] | 30-Dec-20 | 16:27 | 0.000010 | < 0.000004 | < 0.000004 | < 0.000004 | < 0.000004 | 0.000005 |
| Cr [mg/L] | 30-Dec-20 | 16:27 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 30-Dec-20 | 16:27 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0004 |
| Fe [mg/L] | 30-Dec-20 | 16:27 | 0.023 | < 0.007 | < 0.007 | < 0.007 | 0.008 | 0.007 |
| K [mg/L] | 30-Dec-20 | 16:27 | 1.59 | 2.64 | 1.91 | 1.49 | 1.66 | 1.72 |
| Li [mg/L] | 30-Dec-20 | 16:27 | 0.0003 | 0.0009 | 0.0004 | 0.0004 | 0.0004 | 0.0004 |
| Mg [mg/L] | 30-Dec-20 | 16:27 | 0.156 | 0.393 | 0.209 | 0.373 | 0.196 | 0.246 |
| Mn [mg/L] | 30-Dec-20 | 16:27 | 0.0166 | 0.0325 | 0.0295 | 0.0252 | 0.0168 | 0.0061 |
| Mo [mg/L] | 30-Dec-20 | 16:27 | 0.00020 | 0.00016 | 0.00020 | 0.00042 | 0.00033 | 0.00086 |
| Na [mg/L] | 30-Dec-20 | 16:27 | 0.60 | 0.90 | 0.47 | 0.47 | 0.81 | 0.42 |
| Ni [mg/L] | 30-Dec-20 | 16:27 | 0.0003 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 30-Dec-20 | 16:27 | 0.00002 | 0.00002 | 0.00003 | 0.00004 | 0.00003 | < 0.00001 |
| Sb [mg/L] | 30-Dec-20 | 16:27 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 30-Dec-20 | 16:27 | 0.00008 | < 0.00004 | < 0.00004 | 0.00008 | 0.00008 | 0.00007 |
| Si [mg/L] | 30-Dec-20 | 16:27 | 0.20 | 0.25 | 0.30 | 0.27 | 0.23 | 0.31 |
| Sr [mg/L] | 30-Dec-20 | 16:27 | 0.00584 | 0.120 | 0.123 | 0.0460 | 0.0166 | 0.0108 |
| Sn [mg/L] | 30-Dec-20 | 16:27 | 0.00012 | 0.00008 | 0.00006 | 0.00007 | 0.00009 | 0.00011 |
| Th [mg/L] | 30-Dec-20 | 16:27 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

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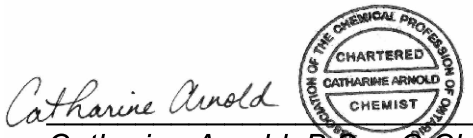
Phone: 705-652-2000 FAX: 705-652-6365

**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10179-DEC20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#14 | 6: VO19211753R 046 42 Wk#14 | 7: VO19185519R 043 45 Wk#14 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#14 | 9: EastGouldie_ Dilution_HCT Wk#14 | 10: VO19249690R 009 78 Wk#14 |
|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 30-Dec-20 | 16:27 | 0.00043 | 0.00035 | 0.00015 | 0.00022 | 0.00061 | 0.00042 |
| Tl [mg/L] | 30-Dec-20 | 16:27 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 30-Dec-20 | 16:27 | 0.000442 | 0.000439 | 0.000481 | 0.000726 | 0.000465 | 0.00200 |
| V [mg/L] | 30-Dec-20 | 16:27 | 0.00040 | 0.00059 | 0.00034 | 0.00027 | 0.00038 | 0.00042 |
| W [mg/L] | 30-Dec-20 | 16:27 | 0.00013 | 0.00072 | 0.00070 | 0.00095 | 0.00019 | 0.00009 |
| Zn [mg/L] | 30-Dec-20 | 16:27 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Hum Cells**

**Project :** PO#ODS-91998

10-November-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 20 October 2020
**LR Report:** **CA10189-OCT20**
**Reference:** Wk#5

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#5 | 6: VO19211753R0 46 42 Wk#5 | 7: VO19185519R0 43 45 Wk#5 | 8: EastGouldie_OreSGR+/++_HCT Wk#5 | 9: EastGouldie_Dilution_HCT Wk#5 | 10: VO19249690R0 09 78 Wk#5 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 20-Oct-20 | 20-Oct-20 | 20-Oct-20 | 20-Oct-20 | 20-Oct-20 | 20-Oct-20 |
| HumCell Leachate Vol [mL] | 20-Oct-20 | 10:14 | 946 | 962 | 832 | 965 | 974 | 960 |
| pH [No unit] | 27-Oct-20 | 15:40 | 7.24 | 7.31 | 7.53 | 7.96 | 7.51 | 7.15 |
| Acidity [mg/L as CaCO3] | 21-Oct-20 | 18:17 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 21-Oct-20 | 18:17 | 8 | 16 | 11 | 15 | 11 | 6 |
| Conductivity [uS/cm] | 21-Oct-20 | 18:17 | 27 | 92 | 215 | 82 | 56 | 34 |
| TDS [mg/L] | 21-Oct-20 | 17:06 | < 30 | 51 | 126 | 49 | 34 | < 30 |
| F [mg/L] | 20-Oct-20 | 15:26 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 09-Nov-20 | 10:13 | 0.4 | 0.8 | 0.2 | 0.2 | 0.3 | < 0.2 |
| SO4 [mg/L] | 09-Nov-20 | 10:13 | 3.0 | 23 | 78 | 17 | 11 | 6.1 |
| Br [mg/L] | 27-Oct-20 | 13:35 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 27-Oct-20 | 13:35 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 27-Oct-20 | 13:35 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 27-Oct-20 | 13:35 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 21-Oct-20 | 11:39 | 0.03 | < 0.03 | < 0.03 | 0.04 | 0.08 | 0.05 |
| Hg [mg/L] | 21-Oct-20 | 11:05 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 23-Oct-20 | 13:08 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 23-Oct-20 | 13:08 | 0.046 | 0.041 | 0.025 | 0.053 | 0.048 | 0.045 |
| As [mg/L] | 23-Oct-20 | 13:08 | 0.0003 | 0.0003 | < 0.0002 | 0.0004 | 0.0003 | 0.0026 |
| Ba [mg/L] | 23-Oct-20 | 13:08 | 0.00116 | 0.00269 | 0.00496 | 0.00295 | 0.00143 | 0.00438 |
| Be [mg/L] | 23-Oct-20 | 13:08 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 23-Oct-20 | 13:08 | 0.003 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 23-Oct-20 | 13:08 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 23-Oct-20 | 13:08 | 2.56 | 9.24 | 35.8 | 9.97 | 4.46 | 2.06 |
| Cd [mg/L] | 23-Oct-20 | 13:08 | 0.000005 | 0.000006 | 0.000016 | 0.000007 | 0.000009 | < 0.000003 |
| Co [mg/L] | 23-Oct-20 | 13:08 | 0.000023 | 0.000014 | 0.000041 | 0.000021 | 0.000020 | 0.000054 |
| Cr [mg/L] | 23-Oct-20 | 13:08 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 23-Oct-20 | 13:08 | 0.0005 | 0.0004 | 0.0004 | 0.0003 | 0.0006 | 0.0005 |
| Fe [mg/L] | 23-Oct-20 | 13:08 | 0.007 | 0.007 | < 0.007 | < 0.007 | 0.013 | 0.011 |
| K [mg/L] | 23-Oct-20 | 13:08 | 2.73 | 6.40 | 5.46 | 3.31 | 4.48 | 3.94 |
| Li [mg/L] | 23-Oct-20 | 13:08 | 0.0009 | 0.0025 | 0.0023 | 0.0016 | 0.0016 | 0.0016 |
| Mg [mg/L] | 23-Oct-20 | 13:08 | 0.223 | 0.902 | 1.09 | 0.888 | 0.383 | 0.403 |
| Mn [mg/L] | 23-Oct-20 | 13:08 | 0.0297 | 0.0414 | 0.0485 | 0.0282 | 0.0269 | 0.00923 |
| Mo [mg/L] | 23-Oct-20 | 13:08 | 0.00126 | 0.00032 | 0.00094 | 0.00110 | 0.00087 | 0.00045 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10189-OCT20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#5 | 6: VO19211753R0 46 42 Wk#5 | 7: VO19185519R0 43 45 Wk#5 | 8: EastGouldie_OrEastGouldie_Di eSGR+/++_HCT Wk#5 | 9: lution_HCT Wk#5 | 10: VO19249690R0 09 78 Wk#5 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 23-Oct-20 | 13:08 | 1.42 | 2.68 | 1.50 | 1.51 | 3.15 | 1.77 |
| Ni [mg/L] | 23-Oct-20 | 13:08 | 0.0002 | 0.0003 | 0.0004 | 0.0003 | 0.0003 | 0.0004 |
| Pb [mg/L] | 23-Oct-20 | 13:08 | 0.00003 | 0.00001 | 0.00006 | 0.00006 | 0.00004 | 0.00003 |
| Sb [mg/L] | 23-Oct-20 | 13:08 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 23-Oct-20 | 13:08 | 0.00017 | 0.00007 | 0.00009 | 0.00010 | 0.00017 | 0.00016 |
| Si [mg/L] | 23-Oct-20 | 13:08 | 0.25 | 0.30 | 0.60 | 0.48 | 0.39 | 0.44 |
| Sr [mg/L] | 23-Oct-20 | 13:08 | 0.00901 | 0.187 | 0.419 | 0.0992 | 0.0247 | 0.0178 |
| Sn [mg/L] | 23-Oct-20 | 13:08 | 0.00012 | 0.00013 | 0.00012 | 0.00009 | 0.00012 | 0.00012 |
| Th [mg/L] | 23-Oct-20 | 13:08 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 23-Oct-20 | 13:08 | 0.00057 | 0.00017 | < 0.00005 | 0.00028 | 0.00088 | 0.00061 |
| Tl [mg/L] | 23-Oct-20 | 13:08 | < 0.000005 | 0.000005 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 23-Oct-20 | 13:08 | 0.000230 | 0.000520 | 0.00211 | 0.000769 | 0.000684 | 0.00104 |
| V [mg/L] | 23-Oct-20 | 13:08 | 0.00038 | 0.00067 | 0.00036 | 0.00032 | 0.00044 | 0.00049 |
| W [mg/L] | 23-Oct-20 | 13:08 | 0.00013 | 0.00101 | 0.00123 | 0.00136 | 0.00072 | 0.00027 |
| Zn [mg/L] | 23-Oct-20 | 13:08 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

CHARTERED CHEMIST CATHARINE ARNOLD

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Hum Cells**

**Project :** PO#ODS-91998

08-February-2021

**Date Rec. :** 26 January 2021
**LR Report:** **CA10199-JAN21**
**Reference:** Wk#19

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#19 | 6: VO19211753R 046 42 Wk#19 | 7: VO19185519R 043 45 Wk#19 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#19 | 9: EastGouldie_ Dilution_HCT Wk#19 | 10: VO19249690R 009 78 Wk#19 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 26-Jan-21 | 26-Jan-21 | 26-Jan-21 | 26-Jan-21 | 26-Jan-21 | 26-Jan-21 |
| HumCell Leachate Vol [mL] | 26-Jan-21 | 15:20 | 867 | 851 | 698 | 870 | 870 | 865 |
| pH [No unit] | 28-Jan-21 | 08:25 | 6.99 | 7.58 | 7.48 | 7.50 | 7.25 | 6.84 |
| Acidity [mg/L as CaCO3] | 28-Jan-21 | 08:25 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 28-Jan-21 | 08:25 | 6 | 12 | 12 | 10 | 9 | 4 |
| Conductivity [uS/cm] | 28-Jan-21 | 08:25 | 19 | 53 | 80 | 53 | 30 | 17 |
| TDS [mg/L] | 28-Jan-21 | 14:23 | < 30 | < 30 | < 30 | < 30 | < 30 | < 30 |
| F [mg/L] | 26-Jan-21 | 14:33 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 29-Jan-21 | 10:17 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 29-Jan-21 | 10:17 | 0.8 | 11 | 20 | 11 | 4.0 | 2.2 |
| Br [mg/L] | 29-Jan-21 | 16:10 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 29-Jan-21 | 16:10 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 29-Jan-21 | 16:10 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 29-Jan-21 | 16:10 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 26-Jan-21 | 15:56 | < 0.03 | 0.04 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |

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| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#19 | 6: VO19211753R 046 42 Wk#19 | 7: VO19185519R 043 45 Wk#19 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#19 | 9: EastGouldie_ Dilution_HCT Wk#19 | 10: VO19249690R 009 78 Wk#19 |
|---|---|---|---|---|---|---|---|---|
| Hg [mg/L] | 26-Jan-21 | 17:29 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 04-Feb-21 | 12:49 | < 0.00005 | < 0.00005 | 0.00012 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 04-Feb-21 | 12:49 | 0.042 | 0.042 | 0.038 | 0.045 | 0.047 | 0.033 |
| As [mg/L] | 04-Feb-21 | 12:49 | 0.0002 | 0.0003 | < 0.0002 | 0.0003 | 0.0003 | 0.0015 |
| Ba [mg/L] | 04-Feb-21 | 12:49 | 0.00073 | 0.00129 | 0.00159 | 0.00134 | 0.00069 | 0.00370 |
| Be [mg/L] | 04-Feb-21 | 12:49 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 04-Feb-21 | 12:49 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bi [mg/L] | 04-Feb-21 | 12:49 | < 0.000007 | 0.000008 | 0.000019 | 0.000010 | 0.000011 | < 0.000007 |
| Ca [mg/L] | 04-Feb-21 | 12:49 | 1.81 | 5.88 | 10.9 | 6.87 | 3.09 | 1.43 |
| Cd [mg/L] | 04-Feb-21 | 12:49 | < 0.000003 | 0.000006 | 0.000010 | 0.000005 | 0.000004 | < 0.000003 |
| Co [mg/L] | 04-Feb-21 | 12:49 | 0.000037 | 0.000020 | 0.000021 | 0.000012 | 0.000024 | 0.000031 |
| Cr [mg/L] | 04-Feb-21 | 12:49 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 04-Feb-21 | 12:49 | < 0.0002 | < 0.0002 | 0.0003 | < 0.0002 | < 0.0002 | 0.0003 |
| Fe [mg/L] | 04-Feb-21 | 12:49 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | 0.013 | < 0.007 |
| K [mg/L] | 04-Feb-21 | 12:49 | 1.37 | 2.72 | 1.86 | 1.42 | 1.43 | 1.42 |
| Li [mg/L] | 04-Feb-21 | 12:49 | 0.0005 | 0.0011 | 0.0006 | 0.0005 | 0.0006 | 0.0005 |
| Mg [mg/L] | 04-Feb-21 | 12:49 | 0.168 | 0.426 | 0.188 | 0.301 | 0.175 | 0.202 |
| Mn [mg/L] | 04-Feb-21 | 12:49 | 0.0131 | 0.0275 | 0.0313 | 0.0272 | 0.0161 | 0.0059 |
| Mo [mg/L] | 04-Feb-21 | 12:49 | 0.00014 | 0.00014 | 0.00013 | 0.00030 | 0.00005 | 0.00013 |
| Na [mg/L] | 04-Feb-21 | 12:49 | 0.25 | 0.61 | 0.22 | 0.26 | 0.45 | 0.17 |
| Ni [mg/L] | 04-Feb-21 | 12:49 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 04-Feb-21 | 12:49 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00003 | < 0.00001 | < 0.00001 |
| Sb [mg/L] | 04-Feb-21 | 12:49 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 04-Feb-21 | 12:49 | 0.00009 | 0.00007 | 0.00007 | 0.00008 | 0.00011 | 0.00007 |
| Si [mg/L] | 04-Feb-21 | 12:49 | 0.20 | 0.24 | 0.25 | 0.26 | 0.23 | 0.24 |
| Sr [mg/L] | 04-Feb-21 | 12:49 | 0.00610 | 0.105 | 0.103 | 0.0403 | 0.0135 | 0.00865 |
| Sn [mg/L] | 04-Feb-21 | 12:49 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00030 | < 0.00006 |
| Th [mg/L] | 04-Feb-21 | 12:49 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

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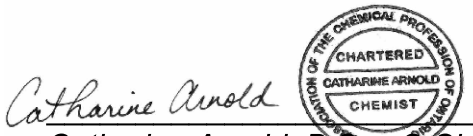
**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10199-JAN21**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#19 | 6: VO19211753R 046 42 Wk#19 | 7: VO19185519R 043 45 Wk#19 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#19 | 9: EastGouldie_ Dilution_HCT Wk#19 | 10: VO19249690R 009 78 Wk#19 |
|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 04-Feb-21 | 12:49 | 0.00026 | 0.00020 | < 0.00005 | 0.00016 | 0.00037 | 0.00029 |
| Tl [mg/L] | 04-Feb-21 | 12:49 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 04-Feb-21 | 12:49 | 0.000673 | 0.000366 | 0.000294 | 0.000449 | 0.000543 | 0.00165 |
| V [mg/L] | 04-Feb-21 | 12:49 | 0.00055 | 0.00094 | 0.00037 | 0.00031 | 0.00058 | 0.00049 |
| W [mg/L] | 04-Feb-21 | 12:49 | < 0.00002 | 0.00057 | 0.00057 | 0.00067 | 0.00004 | < 0.00002 |
| Zn [mg/L] | 04-Feb-21 | 12:49 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10199-JAN21**

# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | | |
| | | | | | | | % | | Low | High | | Low | High | |
| *Acidity - QCBatchID: EWL0355-JAN21* | | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | 3 | | | ND | 20 | 120 | 90 | 110 | NA | | | |
| *Alkalinity - QCBatchID: EWL0355-JAN21* | | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 2 | 20 | 100 | 80 | 120 | NA | | | |
| *Anions by IC - QCBatchID: DIO0347-JAN21* | | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 99 | 80 | 120 | 101 | 75 | 125 | |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | ND | 20 | 103 | 80 | 120 | 102 | 75 | 125 | |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 98 | 80 | 120 | 100 | 75 | 125 | |
| *Anions by IC - QCBatchID: DIO0348-JAN21* | | | | | | | | | | | | | | |
| Chloride | 0.2 | mg/L | <0.2 | | | ND | 20 | 94 | 80 | 120 | 100 | 75 | 125 | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 1 | 20 | 98 | 80 | 120 | 96 | 75 | 125 | |
| *Conductivity - QCBatchID: EWL0355-JAN21* | | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 1 | 20 | 98 | 90 | 110 | NA | | | |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0354-JAN21* | | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 100 | 90 | 110 | 100 | 75 | 125 | |
| *Inorganics-General - QCBatchID: EHG0027-JAN21* | | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 113 | 80 | 120 | 125 | 70 | 130 | |
| *Metals - QCBatchID: EMS0130-JAN21* | | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | 5 | 20 | 96 | 90 | 110 | 97 | 70 | 130 | |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0130-JAN21* | | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 5 | 20 | 97 | 90 | 110 | 103 | 70 | 130 | |
| Antimony | 0.0009 | mg/L | <0.0009 | | | 5 | 20 | 101 | 90 | 110 | 119 | 70 | 130 | |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | 4 | 20 | 97 | 90 | 110 | 98 | 70 | 130 | |
| Barium | 0.00002 | mg/L | <0.00002 | | | 4 | 20 | 102 | 90 | 110 | 99 | 70 | 130 | |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 94 | 90 | 110 | 94 | 70 | 130 | |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | 0 | 20 | 90 | 90 | 110 | 92 | 70 | 130 | |
| Boron | 0.002 | mg/L | <0.002 | | | 6 | 20 | 95 | 90 | 110 | 97 | 70 | 130 | |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | 2 | 20 | 97 | 90 | 110 | 94 | 70 | 130 | |
| Calcium | 0.01 | mg/L | <0.01 | | | 5 | 20 | 99 | 90 | 110 | 96 | 70 | 130 | |
| Chromium | 0.00008 | mg/L | <0.00008 | | | 0 | 20 | 94 | 90 | 110 | 89 | 70 | 130 | |
| Copper | 0.0002 | mg/L | <0.0002 | | | 4 | 20 | 98 | 90 | 110 | 103 | 70 | 130 | |
| Iron | 0.007 | mg/L | <0.007 | | | 9 | 20 | 99 | 90 | 110 | NV | 70 | 130 | |
| Lead | 0.00001 | mg/L | <0.00001 | | | ND | 20 | 94 | 90 | 110 | 96 | 70 | 130 | |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 2 | 20 | 97 | 90 | 110 | 94 | 70 | 130 | |
| Magnesium | 0.001 | mg/L | <0.001 | | | 5 | 20 | 104 | 90 | 110 | 96 | 70 | 130 | |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10199-JAN21**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 7 | 20 | 97 | 90 | 110 | 99 | 70 | 130 |
| Molybdenum | 0.00004 | mg/L | <0.00004 | | | 5 | 20 | 94 | 90 | 110 | 101 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 95 | 90 | 110 | 102 | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.009 | | | 4 | 20 | 108 | 90 | 110 | 90 | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | 1 | 20 | 98 | 90 | 110 | 114 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 4 | 20 | 104 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 99 | 90 | 110 | 96 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 5 | 20 | 99 | 90 | 110 | 95 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 4 | 20 | 97 | 90 | 110 | 99 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | 18 | 20 | 96 | 90 | 110 | 99 | 70 | 130 |
| Thorium | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 100 | 90 | 110 | NV | 70 | 130 |
| Tin | 0.00006 | mg/L | <0.00006 | | | 8 | 20 | 92 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | 18 | 20 | 96 | 90 | 110 | NV | 70 | 130 |
| Tungsten | 0.00002 | mg/L | <0.00002 | | | 4 | 20 | 94 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 6 | 20 | 91 | 90 | 110 | 90 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | 5 | 20 | 96 | 90 | 110 | 103 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | ND | 20 | 98 | 90 | 110 | 120 | 70 | 130 |
| *pH - QCBatchID: EWL0355-JAN21* | | | | | | | | | | | | | |
| pH | 0.05 | No unit | NA | | | 0 | | 100 | | | NA | | |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0221-JAN21* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | 9 | 10 | 101 | 90 | 110 | 90 | 75 | 125 |
| *Solids Analysis - QCBatchID: EWL0365-JAN21* | | | | | | | | | | | | | |
| Total Dissolved Solids | 30 | mg/L | <30 | | | 2 | 20 | 99 | 90 | 110 | NA | | |

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Phone: 705-652-2000 FAX: 705-652-6365

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Hum Cells**

**Project :** PO#ODS-91998

08-January-2021

**Date Rec. :** 29 December 2020
**LR Report:** **CA10207-DEC20**
**Reference:** Wk#15

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#15 | 6: VO19211753R 046 42 Wk#15 | 7: VO19185519R 043 45 Wk#15 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#15 | 9: EastGouldie_ Dilution_HCT Wk#15 | 10: VO19249690R 009 78 Wk#15 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 |
| HumCell Leachate Vol [mL] | 30-Dec-20 | 15:47 | 892 | 895 | 738 | 901 | 915 | 907 |
| pH [No unit] | 30-Dec-20 | 10:09 | 7.36 | 7.46 | 7.47 | 7.69 | 7.38 | 6.97 |
| Acidity [mg/L as CaCO3] | 30-Dec-20 | 10:09 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 30-Dec-20 | 10:09 | 13 | 12 | 11 | 13 | 9 | 5 |
| Conductivity [uS/cm] | 30-Dec-20 | 10:09 | 23 | 64 | 88 | 65 | 39 | 21 |
| TDS [mg/L] | 30-Dec-20 | 13:57 | < 30 | 43 | 51 | 43 | < 30 | < 30 |
| F [mg/L] | 30-Dec-20 | 11:17 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 04-Jan-21 | 12:41 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 04-Jan-21 | 12:41 | 1.1 | 23 | 23 | 13 | 6.5 | 2.7 |
| Br [mg/L] | 04-Jan-21 | 12:19 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 04-Jan-21 | 12:19 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 04-Jan-21 | 12:19 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 04-Jan-21 | 12:19 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 30-Dec-20 | 15:14 | < 0.03 | < 0.03 | < 0.03 | 0.03 | 0.05 | < 0.03 |

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Phone: 705-652-2000 FAX: 705-652-6365



| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#15 | 6: VO19211753R 046 42 Wk#15 | 7: VO19185519R 043 45 Wk#15 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#15 | 9: EastGouldie_ Dilution_HCT Wk#15 | 10: VO19249690R 009 78 Wk#15 |
|---|---|---|---|---|---|---|---|---|
| Hg [mg/L] | 04-Jan-21 | 17:08 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 08-Jan-21 | 09:58 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 08-Jan-21 | 09:58 | 0.019 | 0.010 | 0.050 | 0.065 | 0.033 | 0.036 |
| As [mg/L] | 08-Jan-21 | 09:58 | 0.0033 | 0.0050 | 0.0009 | 0.0002 | 0.0009 | 0.0017 |
| Ba [mg/L] | 08-Jan-21 | 09:58 | 0.0839 | 0.0833 | 0.00174 | 0.00161 | 0.00191 | 0.00407 |
| Be [mg/L] | 08-Jan-21 | 09:58 | 0.000010 | 0.000190 | < 0.000007 | 0.000021 | < 0.000007 | 0.000024 |
| B [mg/L] | 08-Jan-21 | 09:58 | 0.053 | 0.090 | 0.021 | < 0.002 | 0.020 | < 0.002 |
| Bi [mg/L] | 08-Jan-21 | 09:58 | < 0.000007 | 0.000010 | < 0.000007 | 0.000008 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 08-Jan-21 | 09:58 | 93.8 | 347 | 2.53 | 8.91 | 6.92 | 1.76 |
| Cd [mg/L] | 08-Jan-21 | 09:58 | 0.000300 | 0.000110 | 0.000010 | 0.000004 | 0.000030 | < 0.000003 |
| Co [mg/L] | 08-Jan-21 | 09:58 | 0.000500 | 0.000760 | 0.000030 | 0.000006 | 0.000020 | 0.000026 |
| Cr [mg/L] | 08-Jan-21 | 09:58 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 08-Jan-21 | 09:58 | 0.0014 | 0.0018 | 0.0004 | < 0.0002 | 0.0004 | 0.0004 |
| Fe [mg/L] | 08-Jan-21 | 09:58 | 0.010 | 0.010 | 0.010 | 0.007 | 0.010 | 0.015 |
| K [mg/L] | 08-Jan-21 | 09:58 | 16.1 | 7.72 | 1.91 | 1.99 | 2.95 | 2.00 |
| Li [mg/L] | 08-Jan-21 | 09:58 | 0.0046 | 0.0079 | 0.0023 | 0.0009 | 0.0032 | 0.0011 |
| Mg [mg/L] | 08-Jan-21 | 09:58 | 19.2 | 42.6 | 0.250 | 0.405 | 0.510 | 0.262 |
| Mn [mg/L] | 08-Jan-21 | 09:58 | 0.0906 | 1.37 | 0.0236 | 0.0291 | 0.0364 | 0.00653 |
| Mo [mg/L] | 08-Jan-21 | 09:58 | 0.296 | 0.102 | 0.00734 | 0.00071 | 0.00308 | 0.00173 |
| Na [mg/L] | 08-Jan-21 | 09:58 | 8.27 | 28.7 | 2.84 | 0.17 | 3.20 | 0.34 |
| Ni [mg/L] | 08-Jan-21 | 09:58 | 0.0004 | 0.0043 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Pb [mg/L] | 08-Jan-21 | 09:58 | 0.00030 | 0.00040 | 0.00037 | 0.00006 | 0.00031 | 0.00002 |
| Sb [mg/L] | 08-Jan-21 | 09:58 | 0.0013 | 0.0021 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 08-Jan-21 | 09:58 | 0.00103 | < 0.00004 | 0.00006 | 0.00010 | 0.00004 | 0.00008 |
| Si [mg/L] | 08-Jan-21 | 09:58 | 2.91 | 8.84 | 0.42 | 0.46 | 0.41 | 0.42 |
| Sr [mg/L] | 08-Jan-21 | 09:58 | 16.8 | 12.0 | 0.0328 | 0.0524 | 0.146 | 0.0120 |
| Sn [mg/L] | 08-Jan-21 | 09:58 | 0.00022 | 0.00021 | 0.00017 | < 0.00006 | 0.00013 | 0.00006 |
| Th [mg/L] | 08-Jan-21 | 09:58 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |

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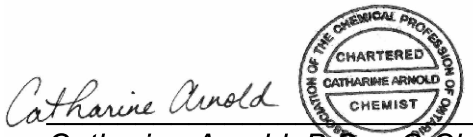
**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10207-DEC20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R 035 16 Wk#15 | 6: VO19211753R 046 42 Wk#15 | 7: VO19185519R 043 45 Wk#15 | 8: EastGouldie_ OreSGR+/++_ HCT Wk#15 | 9: EastGouldie_ Dilution_HCT Wk#15 | 10: VO19249690R 009 78 Wk#15 |
|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 08-Jan-21 | 09:58 | 0.00012 | 0.00009 | 0.00078 | 0.00030 | 0.00024 | 0.00031 |
| Tl [mg/L] | 08-Jan-21 | 09:58 | 0.000327 | 0.000218 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000006 |
| U [mg/L] | 08-Jan-21 | 09:58 | 0.00408 | 0.000940 | 0.000570 | 0.000582 | 0.000580 | 0.00213 |
| V [mg/L] | 08-Jan-21 | 09:58 | 0.00469 | 0.00099 | 0.00032 | 0.00034 | 0.00057 | 0.00047 |
| W [mg/L] | 08-Jan-21 | 09:58 | 0.00200 | 0.00197 | 0.00140 | 0.00086 | 0.00209 | 0.00008 |
| Zn [mg/L] | 08-Jan-21 | 09:58 | 0.007 | 0.013 | 0.004 | < 0.002 | 0.005 | < 0.002 |




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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30-September-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier, Malartic
Canada, J0Y 1Z0
Phone: , Fax:

**Date Rec. :** 22 September 2020
**LR Report:** **CA10224-SEP20**
**Reference:** Wk#1

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#1 | 6: VO19211753R0 46 42 Wk#1 | 7: VO19185519R0 43 45 Wk#1 | 8: EastGouldie_OreSGR+/++_HCT Wk#1 | 9: EastGouldie_Dilution_HCT Wk#1 | 10: VO19249690R0 09 78 Wk#1 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 22-Sep-20 | 22-Sep-20 | 22-Sep-20 | 22-Sep-20 | 22-Sep-20 | 22-Sep-20 |
| HumCell Leachate Vol [mL] | 23-Sep-20 | 09:36 | 966 | 970 | 792 | 966 | 966 | 961 |
| pH [No unit] | 24-Sep-20 | 15:29 | 7.55 | 8.43 | 8.07 | 8.49 | 8.72 | 7.38 |
| Acidity [mg/L as CaCO3] | 24-Sep-20 | 15:29 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 24-Sep-20 | 15:29 | 16 | 17 | 22 | 22 | 16 | 14 |
| Conductivity [uS/cm] | 24-Sep-20 | 15:29 | 65 | 99 | 389 | 129 | 83 | 47 |
| TDS [mg/L] | 25-Sep-20 | 10:49 | 46 | 51 | 251 | 89 | 49 | 51 |
| F [mg/L] | 23-Sep-20 | 15:25 | < 0.06 | < 0.06 | 0.14 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 30-Sep-20 | 12:32 | 2.6 | 2.0 | 3.0 | 3.7 | 1.2 | 0.9 |
| SO4 [mg/L] | 30-Sep-20 | 12:32 | 9.6 | 21 | 150 | 27 | 16 | 4.7 |
| Br [mg/L] | 29-Sep-20 | 11:30 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 29-Sep-20 | 11:30 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 29-Sep-20 | 11:30 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 29-Sep-20 | 11:30 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 23-Sep-20 | 14:37 | < 0.03 | < 0.03 | 0.06 | 0.03 | 0.04 | < 0.03 |
| Hg [mg/L] | 23-Sep-20 | 15:08 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 25-Sep-20 | 12:39 | < 0.00005 | < 0.00005 | 0.00018 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 25-Sep-20 | 12:39 | 0.045 | 0.045 | 0.020 | 0.032 | 0.045 | 0.050 |
| As [mg/L] | 25-Sep-20 | 12:39 | 0.0002 | 0.0006 | 0.0006 | 0.0011 | 0.0005 | 0.0039 |
| Ba [mg/L] | 25-Sep-20 | 12:39 | 0.00219 | 0.00232 | 0.0101 | 0.00395 | 0.00169 | 0.00361 |
| Be [mg/L] | 25-Sep-20 | 12:39 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 25-Sep-20 | 12:39 | 0.003 | 0.002 | 0.003 | 0.006 | 0.003 | 0.002 |
| Bi [mg/L] | 25-Sep-20 | 12:39 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 25-Sep-20 | 12:39 | 3.28 | 8.36 | 65.0 | 11.7 | 4.97 | 1.93 |
| Cd [mg/L] | 25-Sep-20 | 12:39 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 |
| Co [mg/L] | 25-Sep-20 | 12:39 | 0.000015 | 0.000048 | 0.000078 | 0.000025 | 0.000025 | 0.000043 |
| Cr [mg/L] | 25-Sep-20 | 12:39 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | 0.00011 | 0.00010 |
| Cu [mg/L] | 25-Sep-20 | 12:39 | 0.0005 | 0.0009 | 0.0003 | < 0.0002 | < 0.0002 | 0.0003 |
| Fe [mg/L] | 25-Sep-20 | 12:39 | < 0.007 | 0.031 | 0.012 | < 0.007 | 0.013 | 0.014 |
| K [mg/L] | 25-Sep-20 | 12:39 | 6.82 | 8.45 | 13.2 | 7.21 | 6.58 | 5.16 |
| Li [mg/L] | 25-Sep-20 | 12:39 | 0.0025 | 0.0027 | 0.0061 | 0.0046 | 0.0018 | 0.0020 |
| Mg [mg/L] | 25-Sep-20 | 12:39 | 0.464 | 0.688 | 2.62 | 1.53 | 0.355 | 0.264 |
| Mn [mg/L] | 25-Sep-20 | 12:39 | 0.0259 | 0.0311 | 0.0493 | 0.0195 | 0.0223 | 0.0079 |
| Mo [mg/L] | 25-Sep-20 | 12:39 | 0.00053 | 0.00032 | 0.00045 | 0.00225 | 0.00055 | 0.00029 |

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**LR Report :** **CA10224-SEP20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#1 | 6: VO19211753R0 46 42 Wk#1 | 7: VO19185519R0 43 45 Wk#1 | 8: EastGouldie_OrEastGouldie_Di eSGR+/++_HCT Wk#1 | 9: lution_HCT Wk#1 | 10: VO19249690R0 09 78 Wk#1 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 25-Sep-20 | 12:39 | 4.20 | 3.39 | 5.74 | 5.52 | 5.56 | 4.38 |
| Ni [mg/L] | 25-Sep-20 | 12:39 | 0.0001 | 0.0002 | 0.0006 | 0.0003 | 0.0006 | 0.0006 |
| Pb [mg/L] | 25-Sep-20 | 12:39 | 0.00002 | 0.00002 | 0.00058 | 0.00005 | 0.00008 | 0.00003 |
| Sb [mg/L] | 25-Sep-20 | 12:39 | < 0.0009 | < 0.0009 | 0.0011 | 0.0018 | < 0.0009 | 0.0011 |
| Se [mg/L] | 25-Sep-20 | 12:39 | 0.00037 | 0.00005 | 0.00016 | 0.00025 | 0.00024 | 0.00022 |
| Si [mg/L] | 25-Sep-20 | 12:39 | 0.36 | 0.31 | 0.93 | 0.75 | 0.46 | 0.43 |
| Sr [mg/L] | 25-Sep-20 | 12:39 | 0.0171 | 0.152 | 0.717 | 0.177 | 0.0296 | 0.0155 |
| Sn [mg/L] | 25-Sep-20 | 12:39 | 0.00022 | 0.00082 | 0.00037 | 0.00020 | 0.00024 | 0.00020 |
| Th [mg/L] | 25-Sep-20 | 12:39 | 0.0002 | 0.0035 | 0.0011 | < 0.0001 | 0.0003 | 0.0004 |
| Ti [mg/L] | 25-Sep-20 | 12:39 | 0.00047 | 0.00034 | 0.00007 | 0.00021 | 0.00086 | 0.00062 |
| Tl [mg/L] | 25-Sep-20 | 12:39 | < 0.000005 | 0.000007 | 0.000009 | 0.000006 | 0.000007 | < 0.000005 |
| U [mg/L] | 25-Sep-20 | 12:39 | 0.000362 | 0.000265 | 0.002051 | 0.000505 | 0.000459 | 0.000256 |
| V [mg/L] | 25-Sep-20 | 12:39 | 0.00053 | 0.00054 | 0.00040 | 0.00035 | 0.00040 | 0.00054 |
| W [mg/L] | 25-Sep-20 | 12:39 | 0.00044 | 0.00208 | 0.00286 | 0.00473 | 0.00239 | 0.00118 |
| Zn [mg/L] | 25-Sep-20 | 12:39 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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**Hum Cells**

**Project :** PO#ODS-91998

16-November-2020

**Date Rec. :** 27 October 2020
**LR Report:** **CA10248-OCT20**
**Reference:** Wk#6

**Copy:** #1

**Canadian Malartic GP**
Attn : Francois Bergeron

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J0Y 1Z0, Canada

Phone:
Fax:

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#6 | 6: VO19211753R0 46 42 Wk#6 | 7: VO19185519R0 43 45 Wk#6 | 8: EastGouldie_OreSGR+/++_HCT Wk#6 | 9: EastGouldie_Dilution_HCT Wk#6 | 10: VO19249690R0 09 78 Wk#6 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 27-Oct-20 | 27-Oct-20 | 27-Oct-20 | 27-Oct-20 | 27-Oct-20 | 27-Oct-20 |
| HumCell Leachate Vol [mL] | 27-Oct-20 | 12:17 | 957 | 938 | 788 | 950 | 962 | 945 |
| pH [No unit] | 30-Oct-20 | 09:21 | 7.20 | 8.07 | 7.67 | 8.27 | 7.33 | 7.15 |
| Acidity [mg/L as CaCO3] | 30-Oct-20 | 09:21 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 30-Oct-20 | 09:21 | 6 | 10 | 14 | 14 | 7 | 7 |
| Conductivity [uS/cm] | 30-Oct-20 | 09:21 | 24 | 81 | 167 | 76 | 41 | 31 |
| TDS [mg/L] | 02-Nov-20 | 19:22 | < 30 | 46 | 97 | 43 | < 30 | < 30 |
| F [mg/L] | 28-Oct-20 | 09:20 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 12-Nov-20 | 09:18 | 0.3 | 0.6 | < 0.2 | < 0.2 | < 0.2 | < 0.2 |
| SO4 [mg/L] | 09-Nov-20 | 16:05 | 2.5 | 19 | 56 | 15 | 7.6 | 5.1 |
| Br [mg/L] | 03-Nov-20 | 10:01 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 03-Nov-20 | 10:01 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 03-Nov-20 | 10:01 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 03-Nov-20 | 10:01 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 30-Oct-20 | 10:50 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Hg [mg/L] | 29-Oct-20 | 12:39 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 29-Oct-20 | 13:10 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 29-Oct-20 | 13:10 | 0.037 | 0.036 | 0.029 | 0.054 | 0.040 | 0.042 |
| As [mg/L] | 29-Oct-20 | 13:10 | < 0.0002 | 0.0004 | 0.0002 | 0.0003 | < 0.0002 | 0.0022 |
| Ba [mg/L] | 29-Oct-20 | 13:10 | 0.00100 | 0.00211 | 0.00376 | 0.00227 | 0.00109 | 0.00410 |
| Be [mg/L] | 29-Oct-20 | 13:10 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 30-Oct-20 | 12:33 | 0.026 | 0.013 | 0.019 | 0.011 | 0.020 | 0.013 |
| Bi [mg/L] | 29-Oct-20 | 13:10 | < 0.000007 | 0.000018 | 0.000011 | 0.000014 | < 0.000007 | 0.000015 |
| Ca [mg/L] | 29-Oct-20 | 13:10 | 1.94 | 8.18 | 25.7 | 8.66 | 3.46 | 1.99 |
| Cd [mg/L] | 29-Oct-20 | 13:10 | < 0.000003 | 0.000007 | 0.000010 | 0.000003 | 0.000005 | < 0.000003 |
| Co [mg/L] | 29-Oct-20 | 13:10 | < 0.000004 | 0.000013 | 0.000029 | 0.000023 | 0.000004 | 0.000033 |
| Cr [mg/L] | 29-Oct-20 | 13:10 | 0.00013 | 0.00033 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 |
| Cu [mg/L] | 29-Oct-20 | 13:10 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 29-Oct-20 | 13:10 | 0.007 | < 0.007 | < 0.007 | 0.013 | 0.010 | 0.008 |
| K [mg/L] | 29-Oct-20 | 13:10 | 2.40 | 5.05 | 4.12 | 2.73 | 3.17 | 3.58 |
| Li [mg/L] | 29-Oct-20 | 13:10 | 0.0012 | 0.0028 | 0.0023 | 0.0016 | 0.0015 | 0.0016 |
| Mg [mg/L] | 29-Oct-20 | 13:10 | 0.165 | 0.720 | 0.682 | 0.659 | 0.265 | 0.355 |
| Mn [mg/L] | 29-Oct-20 | 13:10 | 0.0220 | 0.0364 | 0.0406 | 0.0249 | 0.0199 | 0.00791 |
| Mo [mg/L] | 29-Oct-20 | 13:10 | 0.00041 | 0.00116 | 0.00033 | 0.00104 | 0.00024 | 0.00016 |

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**Hum Cells**

**Project :** PO#ODS-91998

**LR Report :** **CA10248-OCT20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#6 | 6: VO19211753R0 46 42 Wk#6 | 7: VO19185519R0 43 45 Wk#6 | 8: EastGouldie_OrEastGouldie_Di eSGR+/++_HCT Wk#6 | 9: lution_HCT Wk#6 | 10: VO19249690R0 09 78 Wk#6 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 29-Oct-20 | 13:10 | 1.23 | 2.51 | 0.98 | 1.03 | 1.81 | 1.21 |
| Ni [mg/L] | 29-Oct-20 | 13:10 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0002 |
| Pb [mg/L] | 29-Oct-20 | 13:10 | 0.00002 | 0.00002 | 0.00004 | 0.00004 | 0.00003 | 0.00003 |
| Sb [mg/L] | 29-Oct-20 | 13:10 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 29-Oct-20 | 13:10 | 0.00023 | 0.00028 | 0.00012 | 0.00018 | 0.00017 | 0.00021 |
| Si [mg/L] | 29-Oct-20 | 13:10 | 0.20 | 0.24 | 0.47 | 0.41 | 0.28 | 0.42 |
| Sr [mg/L] | 29-Oct-20 | 13:10 | 0.00674 | 0.158 | 0.305 | 0.0786 | 0.0193 | 0.0164 |
| Sn [mg/L] | 29-Oct-20 | 13:10 | 0.00010 | 0.00009 | 0.00009 | 0.00007 | 0.00007 | 0.00012 |
| Th [mg/L] | 29-Oct-20 | 13:10 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0002 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 29-Oct-20 | 13:10 | 0.00036 | 0.00012 | < 0.00005 | 0.00017 | 0.00051 | 0.00037 |
| Tl [mg/L] | 29-Oct-20 | 13:10 | < 0.000005 | 0.000007 | 0.000006 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 29-Oct-20 | 13:10 | 0.000194 | 0.000447 | 0.00129 | 0.000699 | 0.000459 | 0.00109 |
| V [mg/L] | 29-Oct-20 | 13:10 | 0.00038 | 0.00064 | 0.00033 | 0.00027 | 0.00035 | 0.00043 |
| W [mg/L] | 29-Oct-20 | 13:10 | < 0.00002 | 0.00041 | 0.00048 | 0.00061 | < 0.00002 | < 0.00002 |
| Zn [mg/L] | 29-Oct-20 | 13:10 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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20-October-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 29 September 2020
**LR Report:** **CA10307-SEP20**
**Reference:** Wk#2

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#2 | 6: VO19211753R0 46 42 Wk#2 | 7: VO19185519R0 43 45 Wk#2 | 8: EastGouldie_OreSGR+/++_HCT Wk#2 | 9: EastGouldie_Dilution_HCT Wk#2 | 10: VO19249690R0 09 78 Wk#2 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 29-Sep-20 | 29-Sep-20 | 29-Sep-20 | 29-Sep-20 | 29-Sep-20 | 29-Sep-20 |
| HumCell Leachate Vol [mL] | 29-Sep-20 | 14:19 | 978 | 976 | 794 | 975 | 963 | 940 |
| pH [No unit] | 01-Oct-20 | 14:43 | 7.61 | 8.23 | 8.04 | 8.67 | 8.54 | 7.48 |
| Acidity [mg/L as CaCO3] | 01-Oct-20 | 14:43 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Alkalinity [mg/L as CaCO3] | 01-Oct-20 | 14:43 | 21 | 13 | 14 | 16 | 16 | 11 |
| Conductivity [uS/cm] | 01-Oct-20 | 14:43 | 45 | 91 | 317 | 75 | 91 | 39 |
| TDS [mg/L] | 01-Oct-20 | 13:45 | < 30 | 37 | 200 | 34 | 40 | < 30 |
| F [mg/L] | 30-Sep-20 | 09:43 | < 0.06 | < 0.06 | 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Cl [mg/L] | 20-Oct-20 | 12:07 | 1.4 | 1.6 | 1.6 | 0.9 | 1.5 | 0.5 |
| SO4 [mg/L] | 15-Oct-20 | 15:20 | 6.0 | 22 | 120 | 15 | 20 | 5.1 |
| Br [mg/L] | 05-Oct-20 | 15:34 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO2 [as N mg/L] | 05-Oct-20 | 15:34 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| NO3 [as N mg/L] | 05-Oct-20 | 15:34 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| NO2+NO3 [as N mg/L] | 05-Oct-20 | 15:34 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Tot.Reactive P [mg/L] | 01-Oct-20 | 08:53 | 0.03 | 0.03 | 0.03 | 0.07 | 0.03 | 0.04 |
| Hg [mg/L] | 01-Oct-20 | 11:35 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 06-Oct-20 | 15:43 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | 0.00009 | < 0.00005 |
| Al [mg/L] | 06-Oct-20 | 15:43 | 0.035 | 0.031 | 0.019 | 0.036 | 0.035 | 0.046 |
| As [mg/L] | 06-Oct-20 | 15:43 | < 0.0002 | 0.0004 | 0.0003 | 0.0003 | 0.0006 | 0.0034 |
| Ba [mg/L] | 06-Oct-20 | 15:43 | 0.00163 | 0.00282 | 0.00804 | 0.00156 | 0.00281 | 0.00366 |
| Be [mg/L] | 06-Oct-20 | 15:43 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 06-Oct-20 | 15:43 | 0.007 | < 0.002 | 0.007 | 0.007 | 0.002 | < 0.002 |
| Bi [mg/L] | 06-Oct-20 | 15:43 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 06-Oct-20 | 15:43 | 2.69 | 7.97 | 47.7 | 4.74 | 9.33 | 1.87 |
| Cd [mg/L] | 06-Oct-20 | 15:43 | 0.000005 | 0.000003 | 0.000015 | 0.000005 | 0.000005 | < 0.000003 |
| Co [mg/L] | 06-Oct-20 | 15:43 | 0.000005 | 0.000012 | 0.000028 | 0.000018 | 0.000021 | 0.000050 |
| Cr [mg/L] | 06-Oct-20 | 15:43 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | 0.00036 |
| Cu [mg/L] | 06-Oct-20 | 15:43 | 0.0002 | < 0.0002 | 0.0004 | 0.0007 | < 0.0002 | 0.0013 |
| Fe [mg/L] | 06-Oct-20 | 15:43 | < 0.007 | < 0.007 | < 0.007 | 0.008 | < 0.007 | 0.009 |
| K [mg/L] | 06-Oct-20 | 15:43 | 4.64 | 7.04 | 8.96 | 5.93 | 4.77 | 5.22 |
| Li [mg/L] | 06-Oct-20 | 15:43 | 0.0016 | 0.0022 | 0.0040 | 0.0017 | 0.0023 | 0.0019 |
| Mg [mg/L] | 06-Oct-20 | 15:43 | 0.323 | 0.677 | 1.63 | 0.364 | 1.03 | 0.301 |
| Mn [mg/L] | 06-Oct-20 | 15:43 | 0.0224 | 0.0353 | 0.0415 | 0.0239 | 0.0242 | 0.00898 |
| Mo [mg/L] | 06-Oct-20 | 15:43 | 0.00147 | 0.00015 | 0.00301 | 0.00093 | 0.00113 | 0.00026 |

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**LR Report :** **CA10307-SEP20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R035 16 Wk#2 | 6: VO19211753R046 42 Wk#2 | 7: VO19185519R043 45 Wk#2 | 8: EastGouldie_OreSGR+/++_HCT Wk#2 | 9: EastGouldie_Dilution_HCT Wk#2 | 10: VO19249690R009 78 Wk#2 |
|---|---|---|---|---|---|---|---|---|
| Na [mg/L] | 06-Oct-20 | 15:43 | 2.48 | 2.62 | 3.13 | 4.68 | 2.75 | 3.35 |
| Ni [mg/L] | 06-Oct-20 | 15:43 | < 0.0001 | 0.0001 | 0.0003 | 0.0004 | 0.0002 | 0.0005 |
| Pb [mg/L] | 06-Oct-20 | 15:43 | 0.00001 | 0.00003 | 0.00025 | 0.00007 | 0.00004 | 0.00004 |
| Sb [mg/L] | 06-Oct-20 | 15:43 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | 0.0011 | 0.0010 |
| Se [mg/L] | 06-Oct-20 | 15:43 | 0.00018 | 0.00008 | 0.00012 | 0.00022 | 0.00014 | 0.00016 |
| Si [mg/L] | 06-Oct-20 | 15:43 | 0.29 | 0.27 | 0.85 | 0.44 | 0.50 | 0.43 |
| Sr [mg/L] | 06-Oct-20 | 15:43 | 0.0123 | 0.158 | 0.587 | 0.0280 | 0.117 | 0.0157 |
| Sn [mg/L] | 06-Oct-20 | 15:43 | 0.00010 | 0.00029 | 0.00038 | 0.00019 | 0.00011 | 0.00015 |
| Th [mg/L] | 06-Oct-20 | 15:43 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 06-Oct-20 | 15:43 | 0.00042 | 0.00012 | 0.00013 | 0.00057 | 0.00020 | 0.00060 |
| Tl [mg/L] | 06-Oct-20 | 15:43 | < 0.000005 | 0.000007 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 06-Oct-20 | 15:43 | 0.000240 | 0.000296 | 0.00212 | 0.000519 | 0.000501 | 0.000372 |
| V [mg/L] | 06-Oct-20 | 15:43 | 0.00036 | 0.00051 | 0.00039 | 0.00035 | 0.00030 | 0.00051 |
| W [mg/L] | 06-Oct-20 | 15:43 | 0.00025 | 0.00143 | 0.00222 | 0.00159 | 0.00227 | 0.00079 |
| Zn [mg/L] | 06-Oct-20 | 15:43 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

Catharine Arnold

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**Hum Cells**

20-January-2021

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier, Malartic
Canada, J0Y 1Z0
Phone: , Fax:

**Date Rec. :** 11 January 2021
**LR Report:** **CA14194-JAN21**
**Reference:** Wk#15

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R035 16 Wk#15 | 6: VO19211753R046 42 Wk#15 | 7: VO19185519R043 45 Wk#15 | 8: EastGouldie_OreSGR+/++_HCT Wk#15 | 9: EastGouldie_Dilution_HCT Wk#15 | 10: VO19249690R009 78 Wk#15 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 | 29-Dec-20 |
| Hg [mg/L] | 14-Jan-21 | 16:05 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Ag [mg/L] | 15-Jan-21 | 14:14 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Al [mg/L] | 15-Jan-21 | 14:14 | 0.058 | 0.039 | 0.043 | 0.068 | 0.060 | 0.039 |
| As [mg/L] | 15-Jan-21 | 14:14 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002 | 0.0002 | 0.0016 |
| Ba [mg/L] | 15-Jan-21 | 14:14 | 0.00118 | 0.00139 | 0.00183 | 0.00156 | 0.00103 | 0.00405 |
| Be [mg/L] | 15-Jan-21 | 14:14 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 15-Jan-21 | 14:14 | 0.005 | 0.004 | 0.004 | 0.003 | 0.004 | 0.003 |
| Bi [mg/L] | 15-Jan-21 | 14:14 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 15-Jan-21 | 14:14 | 2.48 | 7.73 | 14.1 | 9.32 | 4.56 | 1.80 |
| Cd [mg/L] | 15-Jan-21 | 14:14 | < 0.000003 | 0.000004 | 0.000018 | 0.000004 | 0.000005 | < 0.000003 |
| Co [mg/L] | 15-Jan-21 | 14:14 | 0.000010 | 0.000005 | 0.000011 | 0.000011 | 0.000004 | 0.000028 |
| Cr [mg/L] | 15-Jan-21 | 14:14 | 0.00015 | 0.00010 | 0.00013 | < 0.00008 | 0.00012 | 0.00013 |
| Cu [mg/L] | 15-Jan-21 | 14:14 | 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Fe [mg/L] | 15-Jan-21 | 14:14 | 0.010 | < 0.007 | < 0.007 | < 0.007 | 0.008 | 0.010 |
| K [mg/L] | 15-Jan-21 | 14:14 | 1.95 | 3.27 | 2.23 | 2.09 | 2.09 | 2.02 |
| Li [mg/L] | 15-Jan-21 | 14:14 | 0.0007 | 0.0016 | 0.0008 | 0.0008 | 0.0009 | 0.0008 |

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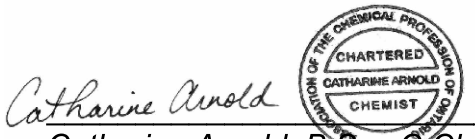
**Hum Cells**

**LR Report :** **CA14194-JAN21**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19125199R0 35 16 Wk#15 | 6: VO19211753R0 46 42 Wk#15 | 7: VO19185519R0 43 45 Wk#15 | 8: EastGouldie_Or eSGR+/++_HCT Wk#15 | 9: EastGouldie_Dil ution_HCT Wk#15 | 10: VO19249690R0 09 78 Wk#15 |
|---|---|---|---|---|---|---|---|---|
| Mg [mg/L] | 15-Jan-21 | 14:14 | 0.201 | 0.564 | 0.235 | 0.432 | 0.260 | 0.280 |
| Mn [mg/L] | 15-Jan-21 | 14:14 | 0.0227 | 0.0372 | 0.0391 | 0.0292 | 0.0218 | 0.00660 |
| Mo [mg/L] | 15-Jan-21 | 14:14 | 0.00020 | 0.00020 | 0.00023 | 0.00054 | 0.00021 | 0.00030 |
| Na [mg/L] | 15-Jan-21 | 14:14 | 0.52 | 1.04 | 0.33 | 0.44 | 0.83 | 0.32 |
| Ni [mg/L] | 15-Jan-21 | 14:14 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 |
| Pb [mg/L] | 15-Jan-21 | 14:14 | 0.00002 | < 0.00001 | 0.00003 | 0.00005 | 0.00002 | 0.00002 |
| Sb [mg/L] | 15-Jan-21 | 14:14 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Se [mg/L] | 15-Jan-21 | 14:14 | 0.00006 | 0.00005 | < 0.00004 | 0.00007 | 0.00010 | 0.00007 |
| Si [mg/L] | 15-Jan-21 | 14:14 | 0.26 | 0.27 | 0.33 | 0.39 | 0.30 | 0.34 |
| Sr [mg/L] | 15-Jan-21 | 14:14 | 0.00637 | 0.124 | 0.117 | 0.0498 | 0.0171 | 0.0103 |
| Sn [mg/L] | 15-Jan-21 | 14:14 | 0.00010 | 0.00009 | < 0.00006 | < 0.00006 | 0.00008 | < 0.00006 |
| Th [mg/L] | 15-Jan-21 | 14:14 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Ti [mg/L] | 15-Jan-21 | 14:14 | 0.00065 | 0.00014 | 0.00007 | 0.00019 | 0.00045 | 0.00033 |
| Tl [mg/L] | 15-Jan-21 | 14:14 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| U [mg/L] | 15-Jan-21 | 14:14 | 0.000499 | 0.000553 | 0.000466 | 0.000574 | 0.000524 | 0.002026 |
| V [mg/L] | 15-Jan-21 | 14:14 | 0.00052 | 0.00070 | 0.00037 | 0.00038 | 0.00048 | 0.00047 |
| W [mg/L] | 15-Jan-21 | 14:14 | 0.00014 | 0.00079 | 0.00076 | 0.00089 | 0.00029 | 0.00008 |
| Zn [mg/L] | 15-Jan-21 | 14:14 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

0002381819



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# Quantitative X-Ray Diffraction by Rietveld Refinement

| | |
|---|---|
| ***Report Prepared for:*** | *Environmental Services* |
| ***Project Number/ LIMS No.*** | *Custom XRD/MI4518-AUG20* |
| ***Sample Receipt:*** | *August 25, 2020* |
| ***Sample Analysis:*** | *August 28, 2020* |
| ***Reporting Date:*** | *September 10, 2020* |

---

| | |
|---|---|
| ***Instrument:*** | BRUKER AXS D8 Advance Diffractometer |
| ***Test Conditions:*** | Co radiation, 35 kV, 40 mA<br>Regular Scanning: Step: 0.02°, Step time: 1s, 2θ range: 3-80° |
| ***Interpretations*** : | PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPlus Eva and Topas software. |
| ***Detection Limit*** : | 0.5-2%. Strongly dependent on crystallinity. |

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***Contents:***

1) Method Summary
2) Quantitative XRD Results
3) XRD Pattern(s)

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

**ACCREDITATION:** SGS Minerals Services Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Canada - Minerals Services - Lakefield: http://palcan.scc.ca/SpecsSearch/GLSearchForm.do.

## Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Minerals Services is accredited to the requirements of ISO/IEC 17025.

***Mineral Identification and Interpretation:***

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

***Quantitative Rietveld Analysis:***

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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**WARNING:** The sample(s) to which the findings recorded herein (the "Findings") relate was(were) drawn and / or provided by the Client or by a third party acting at the Client's direction. The Findings constitute no warranty of the sample's representativeness of any goods and strictly relate to the sample(s). The Company accepts no liability with regard to the origin or source from which the sample(s) is/are said to be extracted.

## Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

| Mineral/Compound | VO19125199R035 16<br>AUG4518-01<br>(wt %) | VO19211753R046 42<br>AUG4518-02<br>(wt %) | VO19185519R043 45<br>AUG4518-03<br>(wt %) | VO19231738R002 47<br>AUG4518-04<br>(wt %) | VO19202589R050 50<br>AUG4518-05<br>(wt %) |
|---|---|---|---|---|---|
| Quartz | 29.9 | 19.0 | 27.2 | 27.9 | 14.4 |
| Microcline | 1.4 | 14.3 | 13.3 | 4.9 | 17.4 |
| Chlorite | 2.4 | 2.0 | 1.9 | 3.0 | 1.6 |
| Biotite | 11.8 | 12.5 | 8.1 | 12.6 | 5.6 |
| Muscovite | 6.4 | 4.8 | 3.8 | 4.1 | 2.6 |
| Calcite | 1.6 | 4.0 | 5.2 | 0.4 | 4.4 |
| Pyrite | 0.3 | 1.5 | 1.7 | 0.3 | 2.5 |
| Magnetite | 0.3 | 0.5 | - | 0.5 | 0.5 |
| Albite | 45.8 | 41.3 | 38.8 | 46.3 | 51.0 |
| TOTAL | 100 | 100 | 100 | 100 | 100 |

*Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.*

*Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.*

*The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.*

| Mineral/Compound | Formula |
|---|---|
| Quartz | $SiO_2$ |
| Microcline | $KAlSi_3O_8$ |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ |
| Biotite | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ |
| Muscovite | $KAl_2(AlSi_3O_{10})(OH)_2$ |
| Calcite | $CaCO_3$ |
| Pyrite | $FeS_2$ |
| Magnetite | $Fe_3O_4$ |
| Albite | $NaAlSi_3O_8$ |

## Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results

| Mineral/Compound | VO19242574R046 60<br>AUG4518-06<br>(wt %) | VO19285337R011 67<br>AUG4518-07<br>(wt %) | VO19285236R008 69<br>AUG4518-08<br>(wt %) | VO18295487R037 73<br>AUG4518-09<br>(wt %) | VO19249690R009 78<br>AUG4518-10<br>(wt %) |
|---|---|---|---|---|---|
| Quartz | 30.1 | 11.2 | 20.1 | 19.8 | 28.1 |
| Microcline | 2.0 | 5.2 | 8.1 | 3.6 | 3.1 |
| Chlorite | 2.5 | 3.8 | 2.9 | 2.0 | 1.5 |
| Biotite | 11.2 | 31.9 | 12.7 | 7.7 | 14.1 |
| Muscovite | 5.4 | 3.9 | 6.9 | 4.3 | 0.8 |
| Calcite | 1.6 | 17.1 | 2.3 | 4.8 | 0.6 |
| Pyrite | 0.4 | 1.9 | 0.9 | 2.0 | 0.3 |
| Magnetite | 0.1 | 0.6 | 0.2 | 0.6 | 0.3 |
| Albite | 46.6 | 24.5 | 45.9 | 55.1 | 51.3 |
| TOTAL | 100 | 100 | 100 | 100 | 100 |

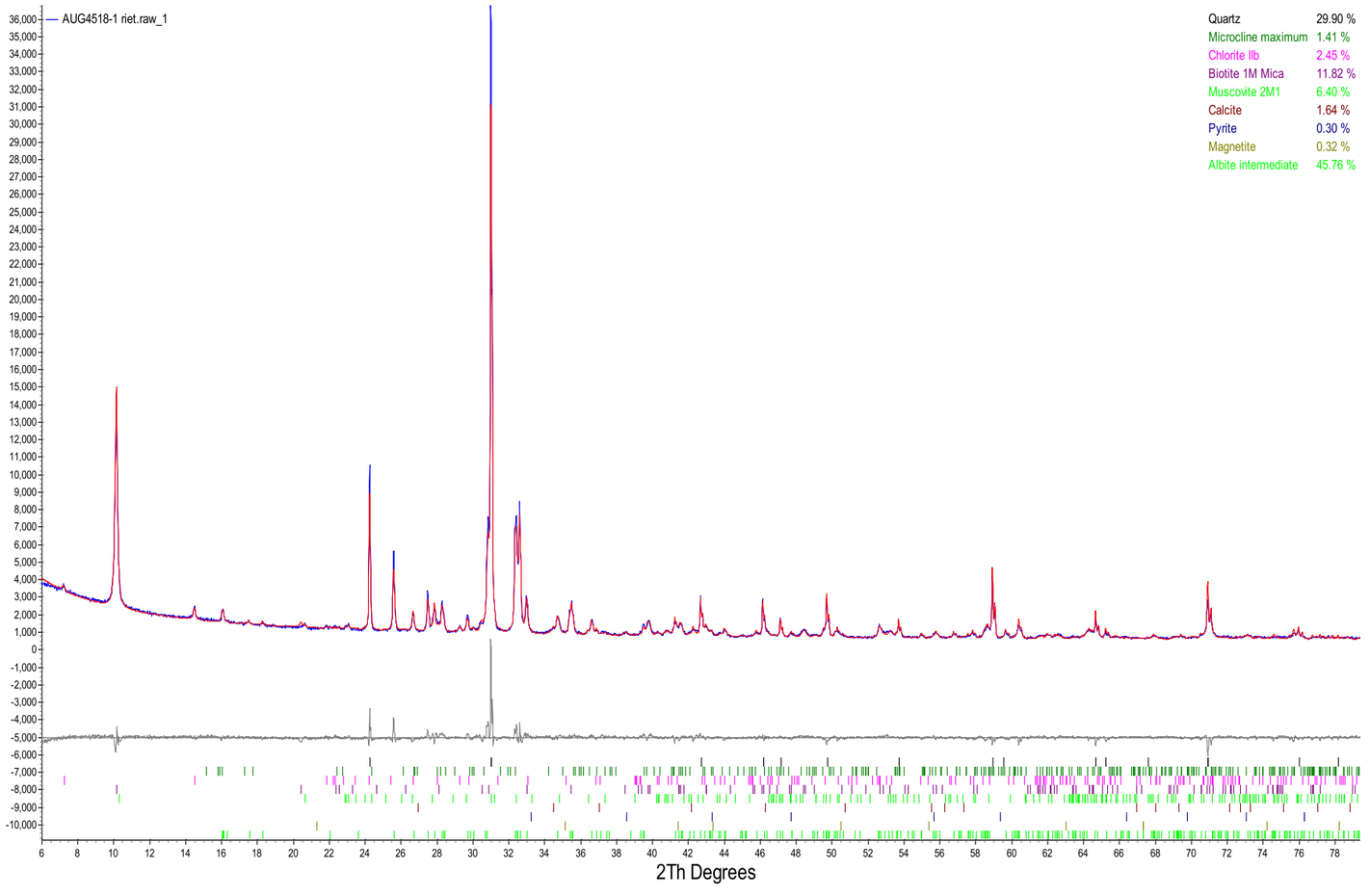
*Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.*

*Dashes indicate that the mineral was not identified by the analyst and not included in the refinement calculation for the sample.*

*The weight percent quantities indicated have been normalized to a sum of 100%. The quantity of amorphous material has not been determined.*

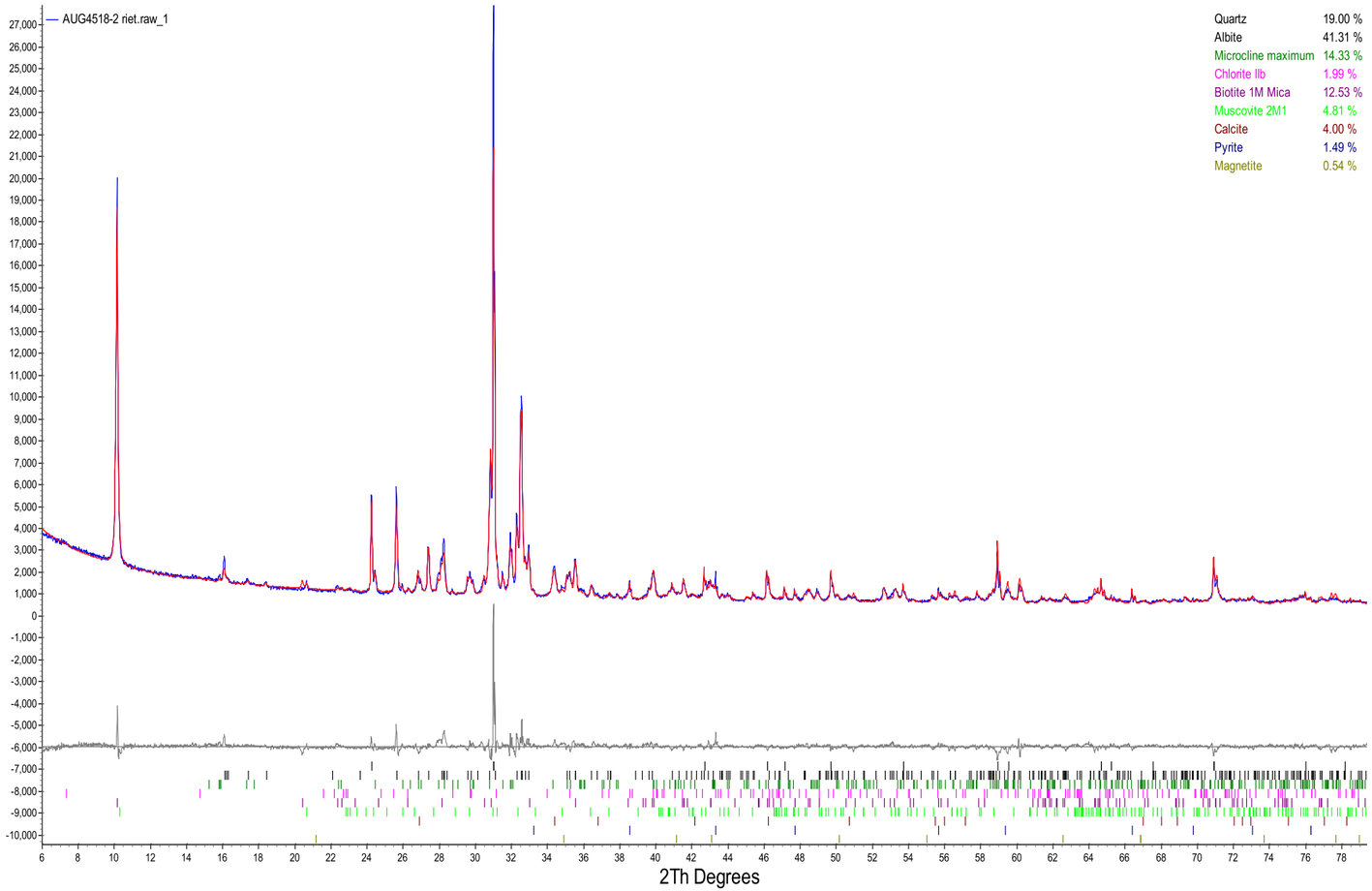
| Mineral/Compound | Formula |
|---|---|
| Quartz | $SiO_2$ |
| Microcline | $KAlSi_3O_8$ |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ |
| Biotite | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ |
| Muscovite | $KAl_2(AlSi_3O_{10})(OH)_2$ |
| Calcite | $CaCO_3$ |
| Pyrite | $FeS_2$ |
| Magnetite | $Fe_3O_4$ |
| Albite | $NaAlSi_3O_8$ |

VO19125199R035 16




| | |
|---|---|
| Quartz | 29.90 % |
| Microcline maximum | 1.41 % |
| Chlorite IIb | 2.45 % |
| Biotite 1M Mica | 11.82 % |
| Muscovite 2M1 | 6.40 % |
| Calcite | 1.64 % |
| Pyrite | 0.30 % |
| Magnetite | 0.32 % |
| Albite intermediate | 45.76 % |

VO19211753R046 42



Environmental Services
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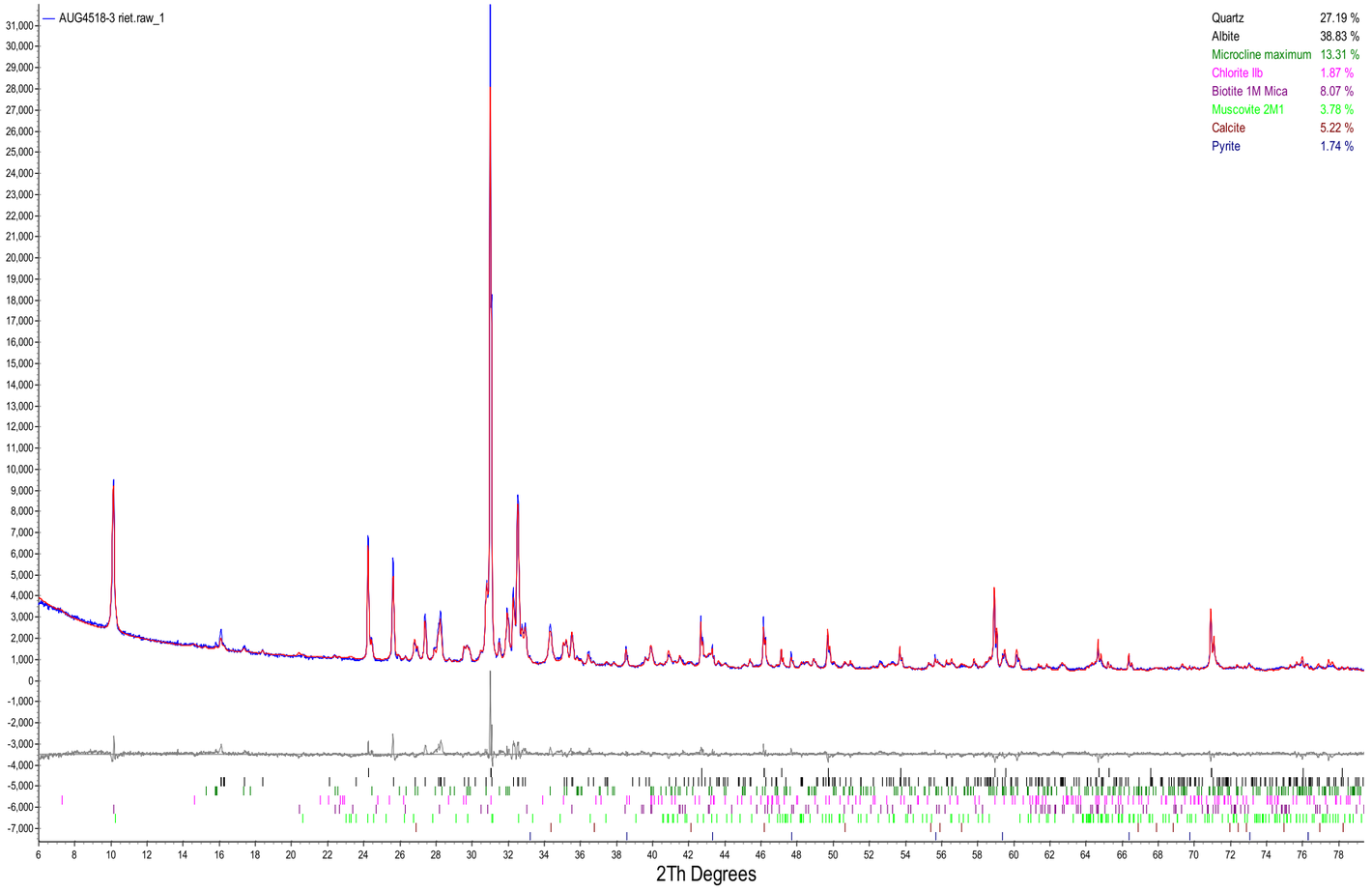
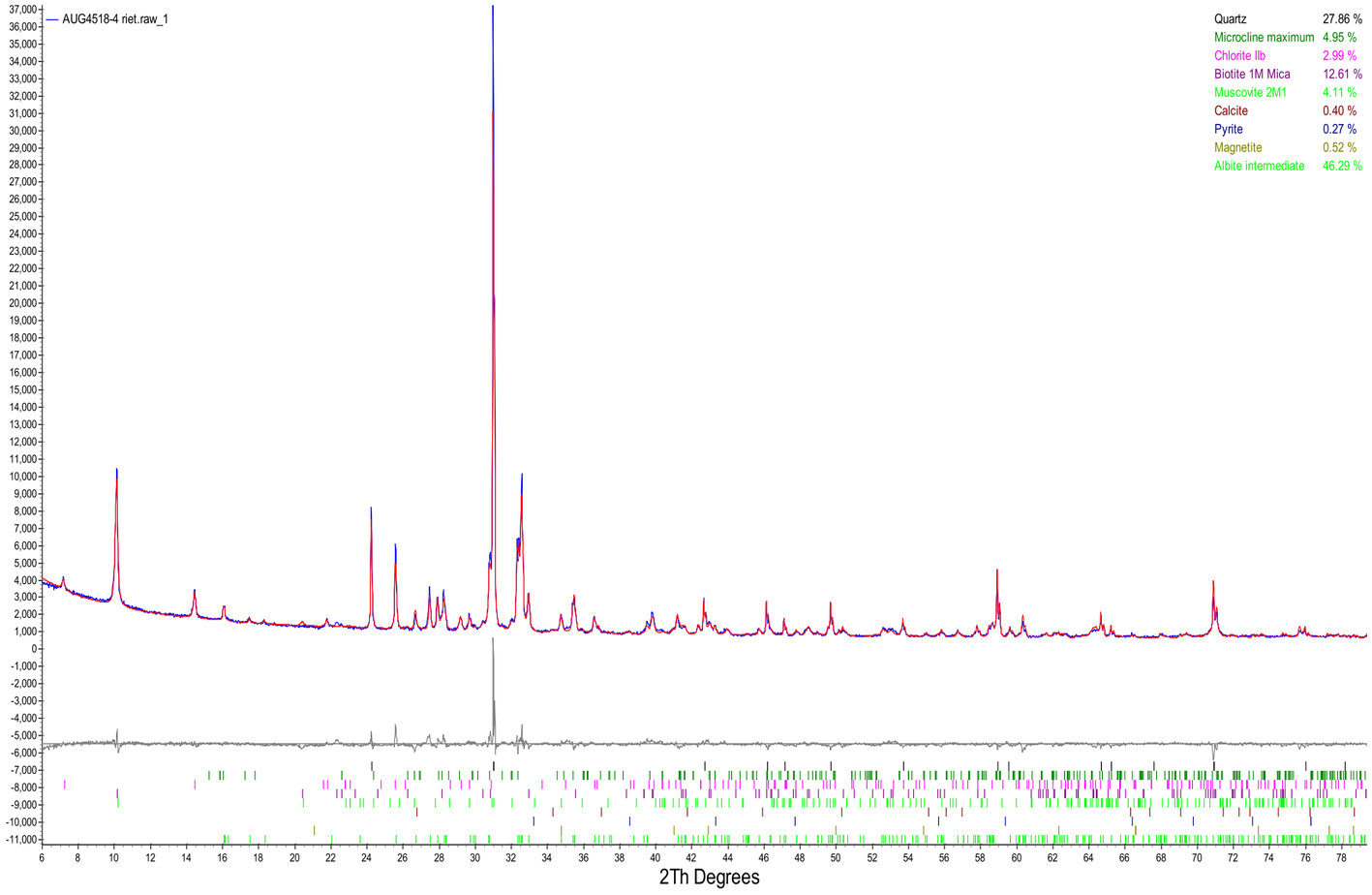
10-Sep-20

VO19185519R043 45




| | |
|---|---|
| Quartz | 27.19 % |
| Albite | 38.83 % |
| Microcline maximum | 13.31 % |
| Chlorite IIb | 1.87 % |
| Biotite 1M Mica | 8.07 % |
| Muscovite 2M1 | 3.78 % |
| Calcite | 5.22 % |
| Pyrite | 1.74 % |

VO19231738R002 47




| | |
|---|---|
| Quartz | 27.86 % |
| Microcline maximum | 4.95 % |
| Chlorite IIb | 2.99 % |
| Biotite 1M Mica | 12.61 % |
| Muscovite 2M1 | 4.11 % |
| Calcite | 0.40 % |
| Pyrite | 0.27 % |
| Magnetite | 0.52 % |
| Albite intermediate | 46.29 % |

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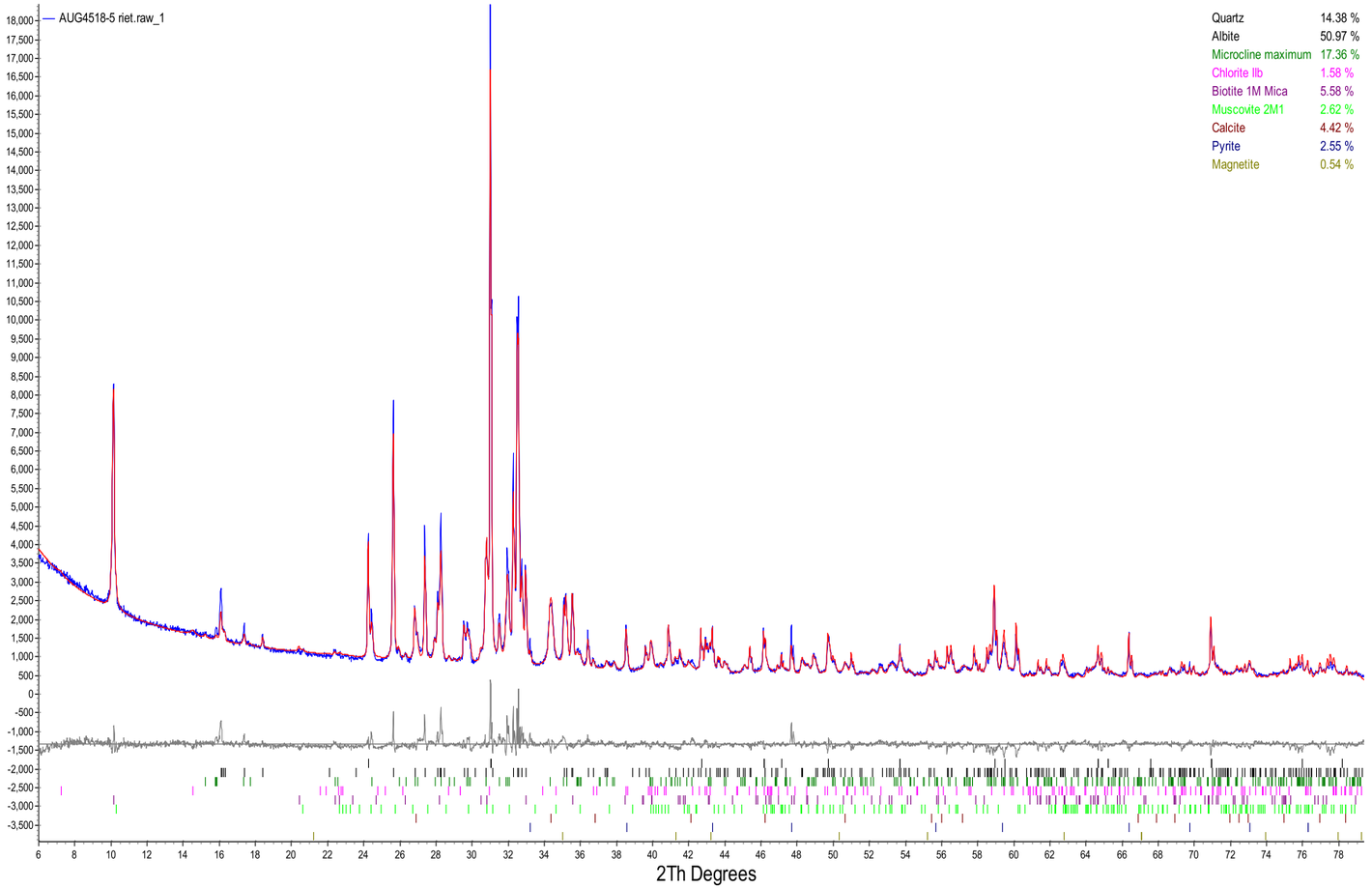
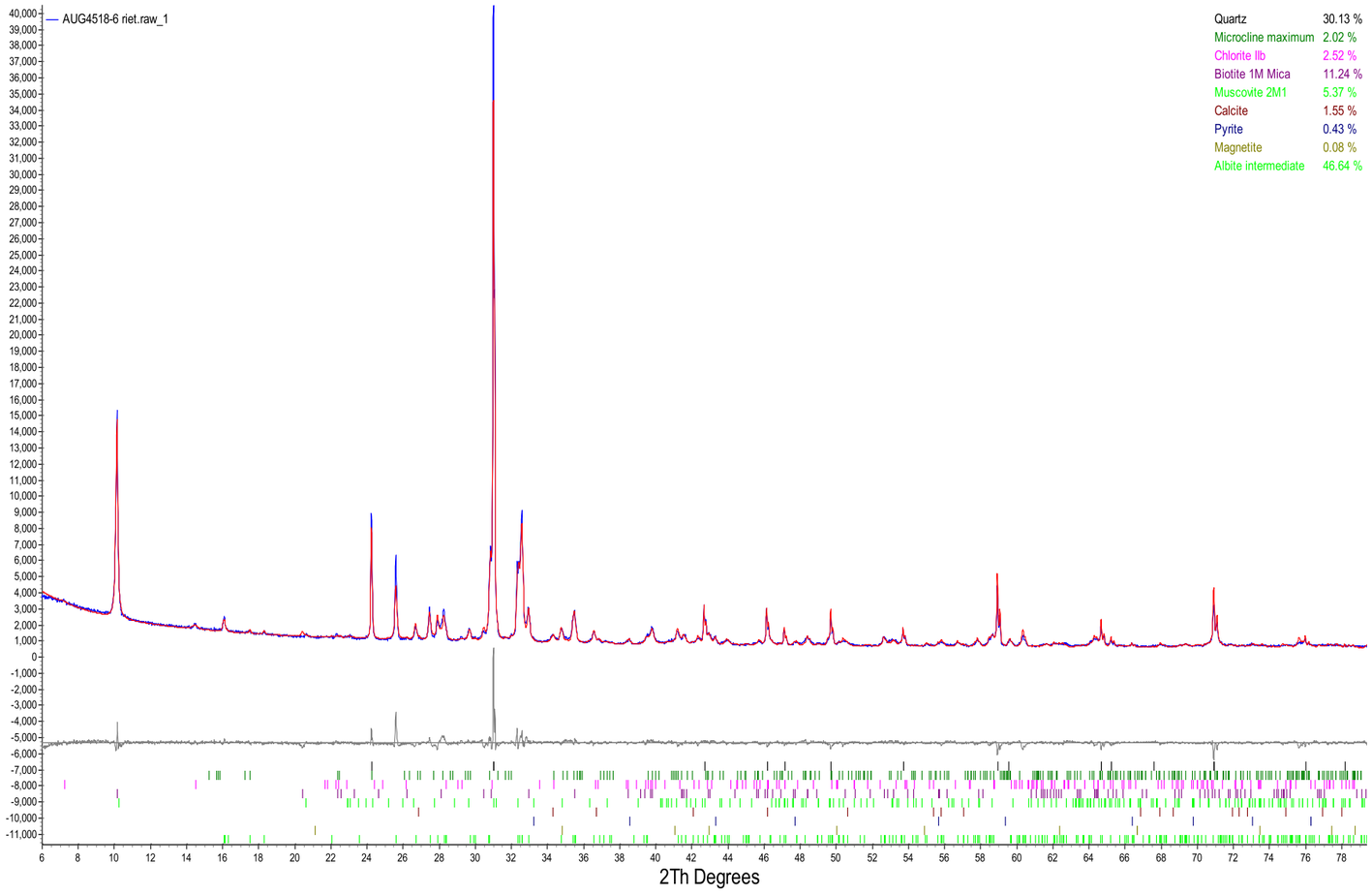
10-Sep-20

VO19202589R050 50



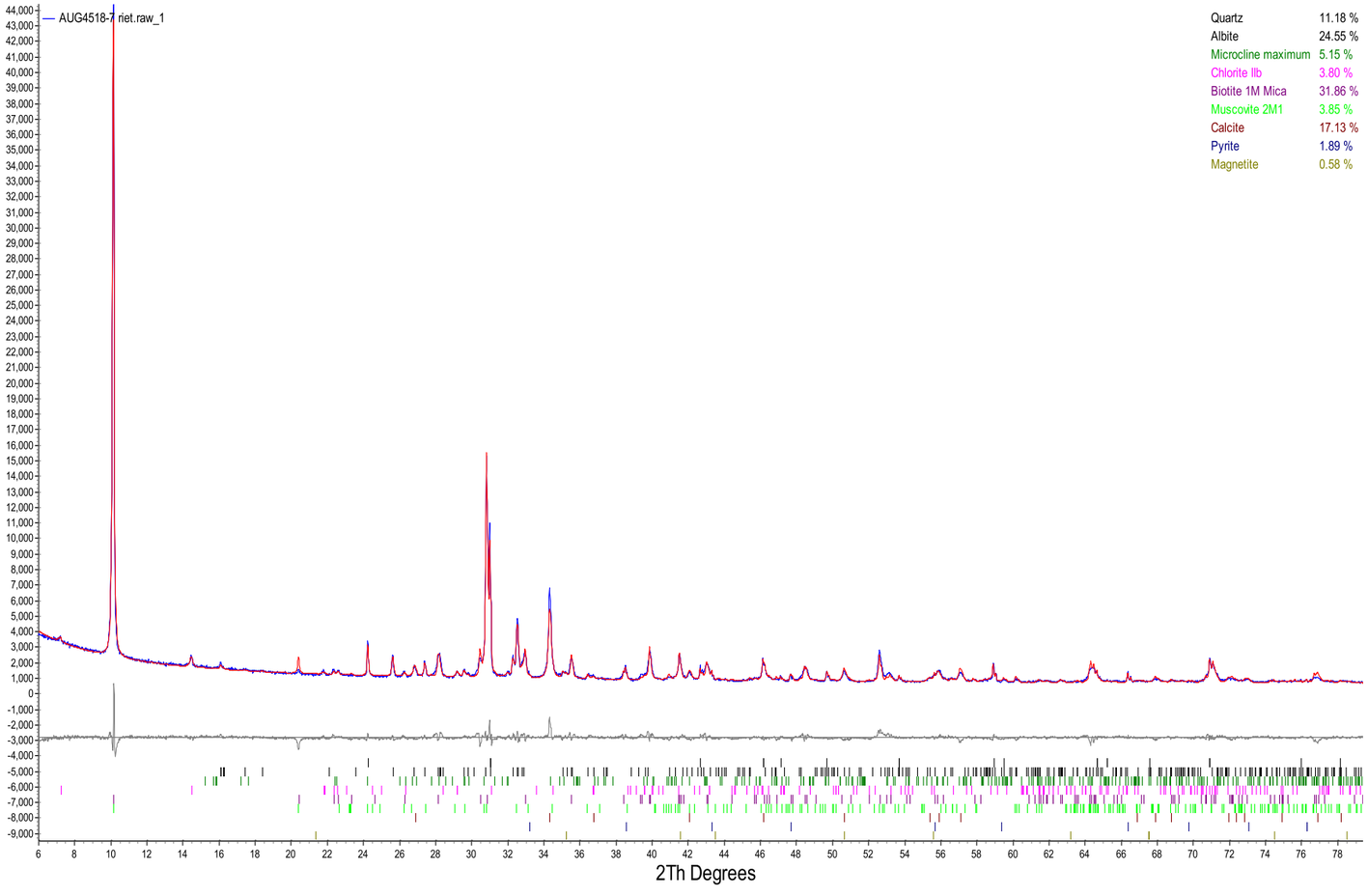

| | |
|---|---|
| Quartz | 14.38 % |
| Albite | 50.97 % |
| Microcline maximum | 17.36 % |
| Chlorite IIb | 1.58 % |
| Biotite 1M Mica | 5.58 % |
| Muscovite 2M1 | 2.62 % |
| Calcite | 4.42 % |
| Pyrite | 2.55 % |
| Magnetite | 0.54 % |

VO19242574R046 60




| | |
|---|---|
| Quartz | 30.13 % |
| Microcline maximum | 2.02 % |
| Chlorite IIb | 2.52 % |
| Biotite 1M Mica | 11.24 % |
| Muscovite 2M1 | 5.37 % |
| Calcite | 1.55 % |
| Pyrite | 0.43 % |
| Magnetite | 0.08 % |
| Albite intermediate | 46.64 % |

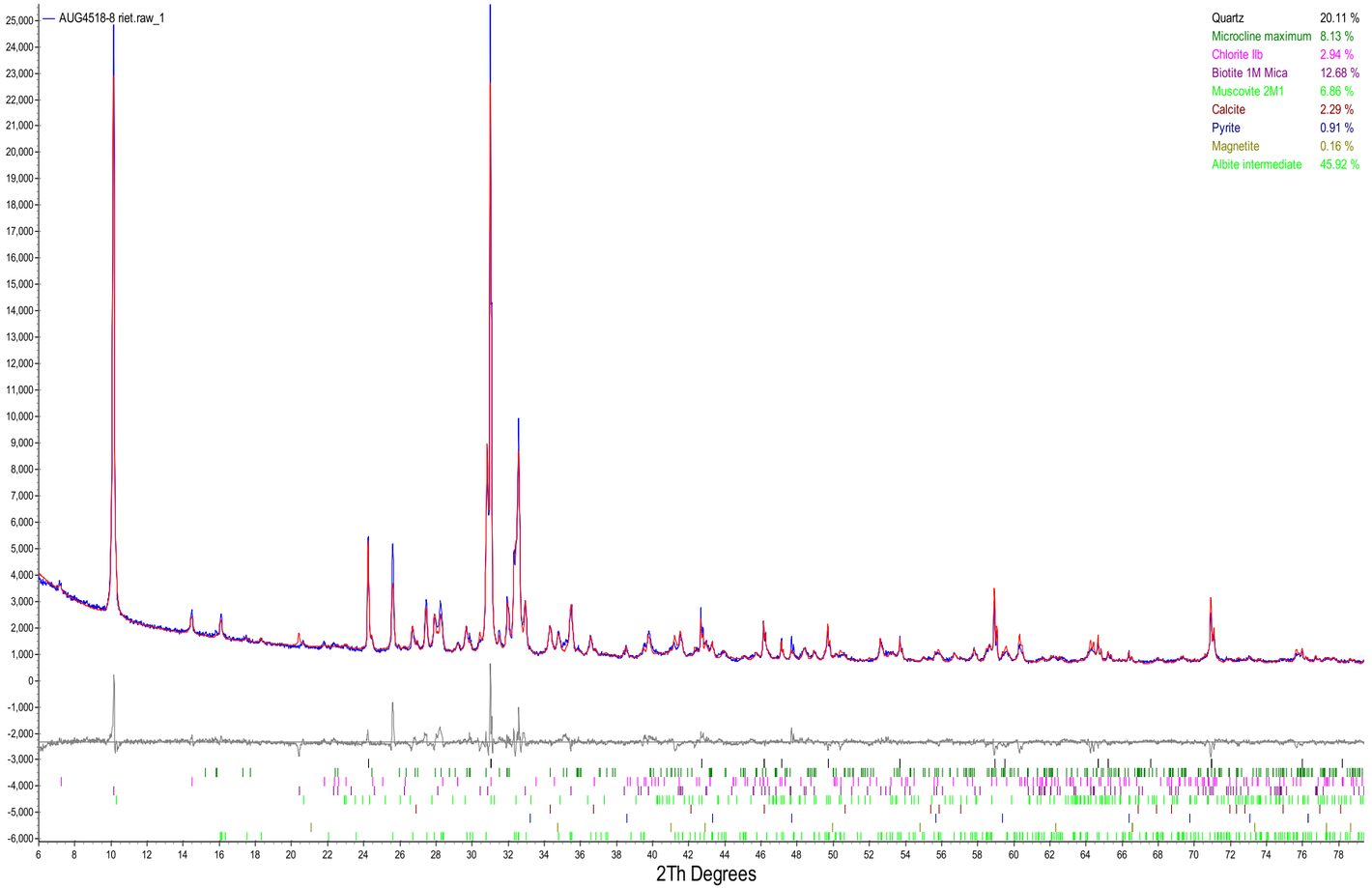
VO19285337R011 67




| | |
|---|---|
| Quartz | 11.18 % |
| Albite | 24.55 % |
| Microcline maximum | 5.15 % |
| Chlorite IIb | 3.80 % |
| Biotite 1M Mica | 31.86 % |
| Muscovite 2M1 | 3.85 % |
| Calcite | 17.13 % |
| Pyrite | 1.89 % |
| Magnetite | 0.58 % |

Environmental Services
Custom XRD/MI4518-AUG20
10-Sep-20

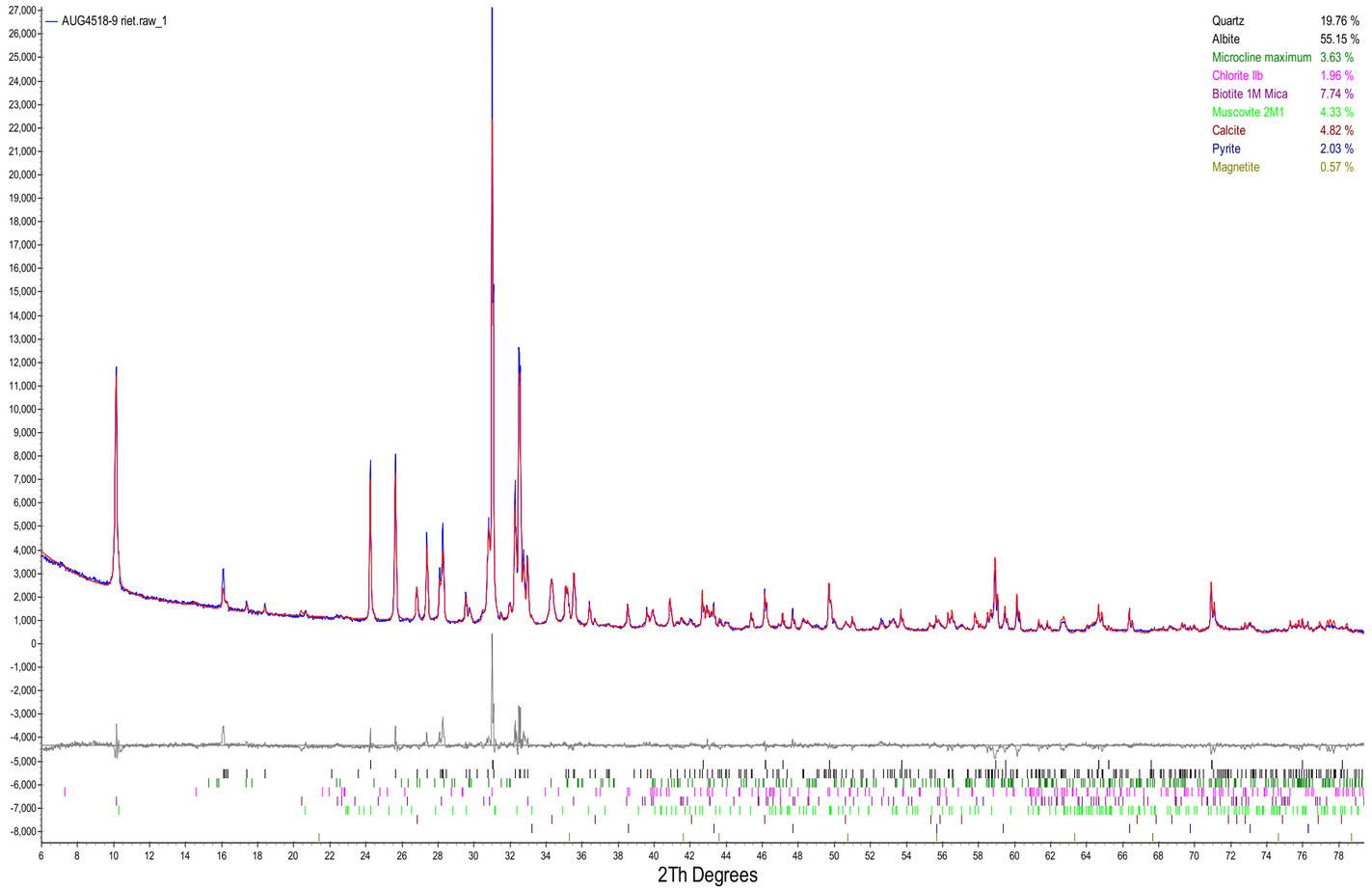
VO19285236R008 69




| | |
|---|---|
| Quartz | 20.11 % |
| Microcline maximum | 8.13 % |
| Chlorite IIb | 2.94 % |
| Biotite 1M Mica | 12.68 % |
| Muscovite 2M1 | 6.86 % |
| Calcite | 2.29 % |
| Pyrite | 0.91 % |
| Magnetite | 0.16 % |
| Albite intermediate | 45.92 % |

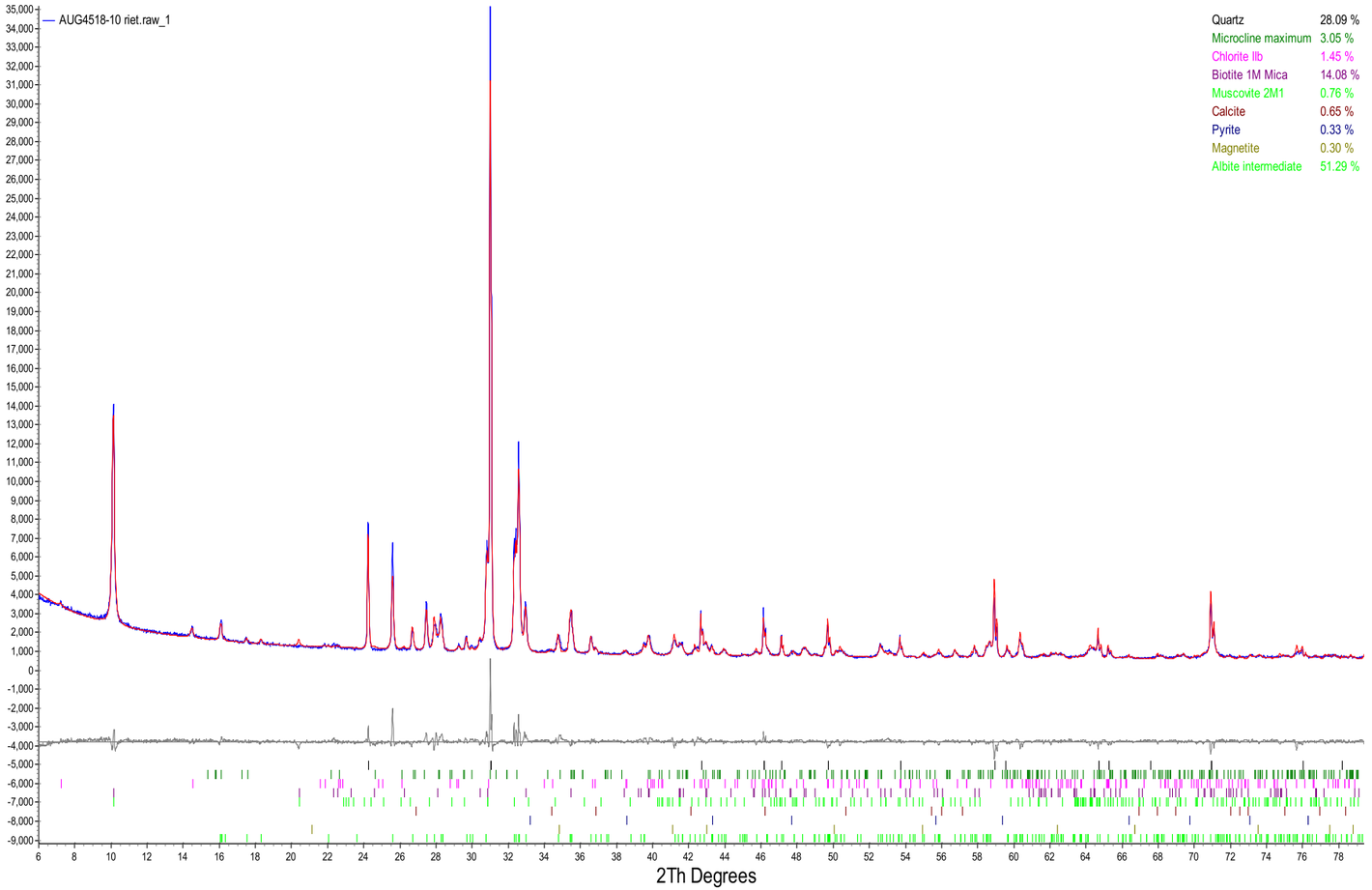
Environmental Services
Custom XRD/MI4518-AUG20
10-Sep-20

VO18295487R037 73




| | |
|---|---|
| Quartz | 19.76 % |
| Albite | 55.15 % |
| Microcline maximum | 3.63 % |
| Chlorite IIb | 1.96 % |
| Biotite 1M Mica | 7.74 % |
| Muscovite 2M1 | 4.33 % |
| Calcite | 4.82 % |
| Pyrite | 2.03 % |
| Magnetite | 0.57 % |

VO19249690R009 78




| | |
|---|---|
| Quartz | 28.09 % |
| Microcline maximum | 3.05 % |
| Chlorite IIb | 1.45 % |
| Biotite 1M Mica | 14.08 % |
| Muscovite 2M1 | 0.76 % |
| Calcite | 0.65 % |
| Pyrite | 0.33 % |
| Magnetite | 0.30 % |
| Albite intermediate | 51.29 % |

**SGS Canada Inc.**
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28-July-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier, Malartic
Canada, J0Y 1Z0
Phone: , Fax:

**Date Rec. :** 07 July 2020
**LR Report:** **CA10054-JUL20**
**Reference:** TR: Modifie - R - 466556

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Sample ID | Sample Date & Time | S % | C % | S % | C % |
|---|---|---|---|---|---|
| 3: Analysis Completed Date | | 09-Jul-20 | 09-Jul-20 | 27-Jul-20 | 27-Jul-20 |
| 4: Analysis Completed Time | | 12:53 | 12:53 | 13:57 | 13:57 |
| 5: VO19104041R006 2 | N/A | 0.402 | 0.013 | --- | --- |
| 6: VO19037627R049 7 | N/A | 0.183 | 0.092 | --- | --- |
| 7: VO19093187R018 19 | N/A | 0.225 | 0.047 | --- | --- |
| 8: V019216516R034 40 | N/A | 0.148 | 0.020 | --- | --- |
| 9: VO18283892R001 61 | N/A | 0.219 | 0.037 | --- | --- |
| 10: VO19295741R024 70 | N/A | 0.233 | 0.013 | --- | --- |
| 11: VO19320118R039 72 | N/A | 0.172 | 0.006 | --- | --- |
| 12: VO18273624R006 1 | N/A | --- | --- | 0.282 | 0.237 |
| 13: VO18227465R012 3 | N/A | --- | --- | 2.33 | 0.589 |
| 14: VO18283892R049 4 | N/A | --- | --- | 0.326 | 0.158 |
| 15: VO18326381R019 5 | N/A | --- | --- | 0.325 | 0.020 |
| 16: VO19018165R040 6 | N/A | --- | --- | 0.467 | 0.470 |
| 17: VO19012423R038 8 | N/A | --- | --- | 0.256 | 0.110 |
| 18: VO19044866R038 9 | N/A | --- | --- | 0.362 | 0.104 |
| 19: VO19049770R019 10 | N/A | --- | --- | 0.224 | 0.058 |
| 20: VO19262649R023 11 | N/A | --- | --- | 0.762 | 0.352 |
| 21: VO19252703R007 12 | N/A | --- | --- | 0.352 | 0.315 |
| 22: VO19252703R042 13 | N/A | --- | --- | 0.894 | 0.194 |
| 23: V019252701R036 14 | N/A | --- | --- | 0.629 | 0.396 |
| 24: V019252701R039 15 | N/A | --- | --- | 0.366 | 0.254 |
| 25: VO19125199R035 16 | N/A | --- | --- | 0.270 | 0.102 |
| 26: VO19124996R002 17 | N/A | --- | --- | 1.07 | 0.420 |
| 27: VO19124999R006 18 | N/A | --- | --- | 0.382 | 0.610 |
| 28: VO19110215R042 20 | N/A | --- | --- | 0.177 | 0.022 |
| 29: VO19140396R013 21 | N/A | --- | --- | 0.716 | 0.523 |
| 30: VO19112306R041 22 | N/A | --- | --- | 0.230 | 0.082 |
| 31: VO19111152R003 23 | N/A | --- | --- | 1.85 | 0.146 |

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00021986892



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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA10054-JUL20**

| Sample ID | Sample Date & Time | S % | C % | S % | C % |
|---|---|---|---|---|---|
| 32: VO19111152R049 24 | N/A | --- | --- | 0.357 | 0.476 |
| 33: VO19137440R016 25 | N/A | --- | --- | 0.089 | 1.34 |
| 34: VO19128730R010 26 | N/A | --- | --- | 1.44 | 0.279 |
| 35: VO19128730R046 27 | N/A | --- | --- | 0.659 | 0.499 |
| 36: VO19118517R008 28 | N/A | --- | --- | 3.50 | 0.661 |
| 37: VO19149798R006 29 | N/A | --- | --- | 0.218 | 0.447 |
| 38: VO19132117R028 30 | N/A | --- | --- | 3.26 | 0.801 |
| 39: VO19132117R032 31 | N/A | --- | --- | 1.16 | 0.478 |
| 40: VO19189405R042 32 | N/A | --- | --- | 0.205 | 0.062 |
| 41: VO19202592R025 33 | N/A | --- | --- | 0.390 | 0.132 |
| 42: VO19241618R008 34 | N/A | --- | --- | 0.587 | 0.451 |
| 43: VO19241601R016 35 | N/A | --- | --- | 2.21 | 0.386 |
| 44: VO19211878R038 36 | N/A | --- | --- | 0.266 | 0.012 |
| 45: V019165010R043 37 | N/A | --- | --- | 0.341 | 0.280 |
| 46: VO19276647R046 38 | N/A | --- | --- | 1.30 | 0.508 |
| 47: VO19195806R022 39 | N/A | --- | --- | 0.147 | 0.017 |
| 48: V019226295R014 41 | N/A | --- | --- | 0.418 | 0.036 |
| 49: VO19211753R046 42 | N/A | --- | --- | 1.64 | 0.397 |
| 50: V019185394R014 43 | N/A | --- | --- | 0.447 | 0.368 |
| 51: VO19185519R031 44 | N/A | --- | --- | 0.536 | 0.425 |
| 52: VO19185519R043 45 | N/A | --- | --- | 2.24 | 0.508 |
| 53: VO19185521R019 46 | N/A | --- | --- | 2.41 | 0.738 |
| 54: VO19231738R002 47 | N/A | --- | --- | 0.301 | 0.039 |
| 55: VO19234800R026 48 | N/A | --- | --- | 0.252 | 0.032 |
| 56: VO19231549R050 49 | N/A | --- | --- | 0.341 | 0.115 |
| 57: VO19202589R050 50 | N/A | --- | --- | 2.92 | 0.626 |
| 58: VO19234784R038 51 | N/A | --- | --- | 0.154 | 0.014 |
| 59: VO19226180R012 52 | N/A | --- | --- | 0.676 | 0.155 |
| 60: VO19226290R005 53 | N/A | --- | --- | 0.459 | 0.413 |
| 61: VO19226290R011 54 | N/A | --- | --- | 0.970 | 0.224 |
| 62: VO19246880R015 55 | N/A | --- | --- | 1.75 | 0.229 |
| 63: VO19246880R020 56 | N/A | --- | --- | 1.62 | 0.366 |
| 64: VO19246880R026 57 | N/A | --- | --- | 0.587 | 0.445 |
| 65: VO19258344R050 58 | N/A | --- | --- | 0.502 | 0.330 |
| 66: VO19258343R007 59 | N/A | --- | --- | 0.520 | 0.164 |
| 67: VO19242574R046 60 | N/A | --- | --- | 0.456 | 0.135 |
| 68: VO19244666R016 62 | N/A | --- | --- | 0.746 | 0.807 |
| 69: VO19244666R045 63 | N/A | --- | --- | 0.196 | 0.061 |
| 70: VO19286662R011 64 | N/A | --- | --- | 1.26 | 0.386 |
| 71: VO19286662R026 65 | N/A | --- | --- | 0.674 | 0.119 |
| 72: VO19283031R002 66 | N/A | --- | --- | 0.177 | 0.075 |
| 73: VO19285337R011 67 | N/A | --- | --- | 1.54 | 1.84 |
| 74: VO19285236R001 68 | N/A | --- | --- | 0.387 | 0.422 |

OnLine LIMS

00021986692



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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples. SGS Canada Inc. Environment-Health & Safety statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

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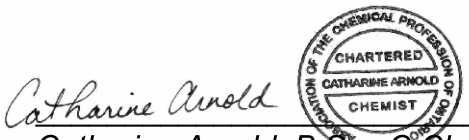
**LR Report :** **CA10054-JUL20**

| Sample ID | Sample Date & Time | S % | C % | S % | C % |
|---|---|---|---|---|---|
| 75: VO19285236R008 69 | N/A | --- | --- | 0.815 | 0.283 |
| 76: VO19281663R011 71 | N/A | --- | --- | 2.04 | 0.554 |
| 77: VO18295487R037 73 | N/A | --- | --- | 2.58 | 0.643 |
| 78: VO19048524R014 74 | N/A | --- | --- | 0.236 | 0.068 |
| 79: VO19054445R009 75 | N/A | --- | --- | 0.922 | 0.277 |
| 80: VO19076137R025 76 | N/A | --- | --- | 0.211 | 0.040 |
| 81: VO19080569R021 77 | N/A | --- | --- | 0.952 | 0.120 |
| 82: VO19249690R009 78 | N/A | --- | --- | 0.369 | 0.040 |
| 83: VO19249697R026 79 | N/A | --- | --- | 0.397 | 0.335 |
| 84: VO19063569R029 80 | N/A | --- | --- | 1.04 | 0.275 |

ASTM E1918 - S and C speciation




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

14-July-2020

**Date Rec. :** 12 June 2020
**LR Report:** **CA11005-JUN20**
**Reference:** TR: Modifie - R - 466556

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Sample ID | Sample Date & Time | Sample weight g | Ext Fluid #1 or #2 | Ext Volume mL | Final pH no unit | Conductivity uS/cm | pH no unit | Alkalinity mg/L as CaCO3 | Acidity mg/L as CaCO3 | SO4 mg/L | Cl mg/L | Br mg/L | NO2 as N mg/L | NO3 as N mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3: Analysis Completed Date | | 06-Jul-20 | 06-Jul-20 | 06-Jul-20 | 06-Jul-20 | 09-Jul-20 | 09-Jul-20 | 09-Jul-20 | 09-Jul-20 | 06-Jul-20 | 06-Jul-20 | 06-Jul-20 | 06-Jul-20 | 06-Jul-20 |
| 4: Analysis Completed Time | | 16:07 | 16:07 | 16:07 | 16:07 | 10:27 | 10:27 | 10:27 | 10:27 | 15:04 | 15:04 | 15:04 | 15:04 | 15:04 |
| 5: VO18273624R006 1 | N/A | 20 | 1 | 400 | 5.40 | 5820 | 5.44 | 2100 | 543 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 6: VO19104041R006 2 | N/A | 20 | 1 | 400 | 4.95 | 4780 | 4.99 | 1280 | 1590 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 7: VO18227465R012 3 | N/A | 20 | 1 | 400 | 5.66 | 6130 | 5.74 | 2640 | 377 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 8: VO18283892R049 4 | N/A | 20 | 1 | 400 | 5.18 | 5330 | 5.22 | 1940 | 1160 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 9: VO18326381R019 5 | N/A | 20 | 1 | 400 | 4.96 | 4810 | 4.98 | 1430 | 1600 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 10: VO19018165R040 6 | N/A | 20 | 1 | 400 | 5.75 | 6100 | 5.85 | 2730 | 328 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 11: VO19037627R049 7 | N/A | 20 | 1 | 400 | 5.06 | 4950 | 5.09 | 1700 | 1370 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 12: VO19012423R038 8 | N/A | 20 | 1 | 400 | 5.12 | 5140 | 5.15 | 1830 | 1230 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 13: VO19044866R038 9 | N/A | 20 | 1 | 400 | 5.07 | 5120 | 5.09 | 1700 | 1390 | 43 | < 20 | < 30 | < 3 | < 6 |
| 14: VO19049770R019 10 | N/A | 20 | 1 | 400 | 5.01 | 4860 | 5.03 | 1610 | 1460 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 15: VO19262649R023 11 | N/A | 20 | 1 | 400 | 5.55 | 5910 | 5.60 | 2520 | 524 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 16: VO19252703R007 12 | N/A | 20 | 1 | 400 | 5.52 | 5870 | 5.57 | 2500 | 509 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 17: VO19252703R042 13 | N/A | 20 | 1 | 400 | 5.24 | 5490 | 5.27 | 1810 | 993 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 18: V019252701R036 14 | N/A | 20 | 1 | 400 | 5.80 | 6040 | 5.91 | 2760 | 302 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 19: V019252701R039 15 | N/A | 20 | 1 | 400 | 5.46 | 5790 | 5.51 | 2420 | 643 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 20: VO19125199R035 16 | N/A | 20 | 1 | 400 | 5.08 | 5130 | 5.12 | 1550 | 1110 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 21: VO19124996R002 17 | N/A | 20 | 1 | 400 | 5.75 | 6140 | 5.84 | 2670 | 309 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 22: VO19124999R006 18 | N/A | 20 | 1 | 400 | 6.19 | 6450 | 6.84 | 3020 | 57 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 23: VO19093187R018 19 | N/A | 20 | 1 | 400 | 5.01 | 4860 | 5.02 | 1540 | 1520 | < 20 | < 20 | < 30 | < 3 | < 6 |

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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report :** **CA11005-JUN20**

| Sample ID | Sample Date & Time | Sample weight g | Ext Fluid #1 or #2 | Ext Volume mL | Final pH no unit | Conductivity uS/cm | pH no unit | Alkalinity mg/L as CaCO3 | Acidity mg/L as CaCO3 | SO4 mg/L | Cl mg/L | Br mg/L | NO2 as N mg/L | NO3 as N mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24: VO19110215R042 20 | N/A | 20 | 1 | 400 | 4.97 | 4750 | 4.99 | 1480 | 1580 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 25: VO19140396R013 21 | N/A | 20 | 1 | 400 | 5.83 | 6040 | 5.96 | 2750 | 304 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 26: VO19112306R041 22 | N/A | 20 | 1 | 400 | 5.05 | 4950 | 5.06 | 1600 | 1380 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 27: VO19111152R003 23 | N/A | 20 | 1 | 400 | 5.20 | 5390 | 5.23 | 1980 | 1090 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 28: VO19111152R049 24 | N/A | 20 | 1 | 400 | 5.72 | 6130 | 5.81 | 2680 | 345 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 29: VO19137440R016 25 | N/A | 20 | 2 | 400 | 5.47 | 4900 | 5.58 | 2380 | 566 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 30: VO19128730R010 26 | N/A | 20 | 1 | 400 | 5.38 | 5670 | 5.41 | 2280 | 752 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 31: VO19128730R046 27 | N/A | 20 | 1 | 400 | 6.13 | 6270 | 6.54 | 3500 | 130 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 32: VO19118517R008 28 | N/A | 20 | 1 | 400 | 5.37 | 5580 | 5.42 | 2480 | 711 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 33: VO19149798R006 29 | N/A | 20 | 1 | 400 | 5.74 | 5810 | 5.81 | 3240 | 323 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 34: VO19132117R028 30 | N/A | 20 | 2 | 400 | 4.74 | 3530 | 4.78 | 1230 | 2000 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 35: VO19132117R032 31 | N/A | 20 | 1 | 400 | 6.09 | 6190 | 6.37 | 3180 | 248 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 36: VO19189405R042 32 | N/A | 20 | 1 | 400 | 5.06 | 4750 | 5.09 | 2110 | 1420 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 37: VO19202592R025 33 | N/A | 20 | 1 | 400 | 5.16 | 5190 | 5.20 | 2500 | 1070 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 38: VO19241618R008 34 | N/A | 20 | 1 | 400 | 5.91 | 6100 | 6.04 | 3320 | 206 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 39: VO19241601R016 35 | N/A | 20 | 1 | 400 | 5.58 | 5850 | 5.63 | 2810 | 392 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 40: VO19211878R038 36 | N/A | 20 | 1 | 400 | 4.95 | 4550 | 4.98 | 1980 | 1560 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 41: V019165010R043 37 | N/A | 20 | 1 | 400 | 5.41 | 5580 | 5.46 | 2520 | 664 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 42: VO19276647R046 38 | N/A | 20 | 1 | 400 | 6.23 | 6370 | 6.75 | 3590 | < 2 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 43: VO19195806R022 39 | N/A | 20 | 1 | 400 | 4.96 | 4630 | 4.98 | 1700 | 1560 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 44: V019216516R034 40 | N/A | 20 | 1 | 400 | 4.95 | 4510 | 4.98 | 2020 | 1620 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 45: V019226295R014 41 | N/A | 20 | 1 | 400 | 5.00 | 4810 | 5.05 | 2060 | 1490 | 27 | < 20 | < 30 | < 3 | < 6 |
| 46: VO19211753R046 42 | N/A | 20 | 1 | 400 | 5.81 | 6040 | 5.92 | 3300 | 257 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 47: V019185394R014 43 | N/A | 20 | 1 | 400 | 5.36 | 5530 | 5.41 | 2790 | 732 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 48: VO19185519R031 44 | N/A | 20 | 1 | 400 | 6.05 | 5970 | 6.37 | 3420 | 108 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 49: VO19185519R043 45 | N/A | 20 | 1 | 400 | 5.85 | 5940 | 5.99 | 3290 | 220 | 32 | < 20 | < 30 | < 3 | < 6 |
| 50: VO19185521R019 46 | N/A | 20 | 1 | 400 | 6.25 | 6340 | 6.79 | 3600 | 31 | 38 | < 20 | < 30 | < 3 | < 6 |
| 51: VO19231738R002 47 | N/A | 20 | 1 | 400 | 4.98 | 4550 | 5.01 | 2040 | 1530 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 52: VO19234800R026 48 | N/A | 20 | 1 | 400 | 4.98 | 4640 | 5.01 | 1980 | 1580 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 53: VO19231549R050 49 | N/A | 20 | 1 | 400 | 5.09 | 4000 | 5.13 | 2280 | 1250 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 54: VO19202589R050 50 | N/A | 20 | 1 | 400 | 6.01 | 5900 | 6.25 | 3410 | 146 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 55: VO19234784R038 51 | N/A | 20 | 1 | 400 | 4.96 | 4600 | 4.99 | 1930 | 1620 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 56: VO19226180R012 52 | N/A | 20 | 1 | 400 | 5.17 | 5210 | 5.20 | 2440 | 1070 | 54 | < 20 | < 30 | < 3 | < 6 |
| 57: VO19226290R005 53 | N/A | 20 | 1 | 400 | 5.53 | 5500 | 5.56 | 2730 | 746 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 58: VO19226290R011 54 | N/A | 20 | 1 | 400 | 5.37 | 5590 | 5.40 | 2590 | 892 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 59: VO19246880R015 55 | N/A | 20 | 1 | 400 | 5.28 | 5440 | 5.30 | 2320 | 914 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 60: VO19246880R020 56 | N/A | 20 | 1 | 400 | 5.48 | 5780 | 5.52 | 2650 | 656 | < 20 | < 20 | < 30 | < 3 | < 6 |

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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report : CA11005-JUN20**

| Sample ID | Sample Date & Time | Sample weight g | Ext Fluid #1 or #2 | Ext Volume mL | Final pH no unit | Conductivity uS/cm | pH no unit | Alkalinity mg/L as CaCO3 | Acidity mg/L as CaCO3 | SO4 mg/L | Cl mg/L | Br mg/L | NO2 as N mg/L | NO3 as N mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 61: VO19246880R026 57 | N/A | 20 | 1 | 400 | 5.73 | 5910 | 5.80 | 2990 | 265 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 62: VO19258344R050 58 | N/A | 20 | 1 | 400 | 5.22 | 5280 | 5.25 | 2300 | 1000 | 27 | < 20 | < 30 | < 3 | < 6 |
| 63: VO19258343R007 59 | N/A | 20 | 1 | 400 | 5.19 | 5270 | 5.22 | 2260 | 753 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 64: VO19242574R046 60 | N/A | 20 | 1 | 400 | 5.10 | 5020 | 5.13 | 2060 | 1280 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 65: VO18283892R001 61 | N/A | 20 | 1 | 400 | 4.95 | 4690 | 4.98 | 1730 | 1380 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 66: VO19244666R016 62 | N/A | 20 | 1 | 400 | 5.76 | 5920 | 5.85 | 3010 | 497 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 67: VO19244666R045 63 | N/A | 20 | 1 | 400 | 4.98 | 4750 | 5.01 | 1820 | 1510 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 68: VO19286662R011 64 | N/A | 20 | 1 | 400 | 5.42 | 5630 | 5.46 | 2560 | 736 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 69: VO19286662R026 65 | N/A | 20 | 1 | 400 | 5.10 | 4900 | 5.13 | 2040 | 1160 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 70: VO19283031R002 66 | N/A | 20 | 1 | 400 | 5.01 | 4810 | 5.04 | 1840 | 1480 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 71: VO19285337R011 67 | N/A | 20 | 2 | 400 | 5.97 | 5700 | 6.59 | 3160 | 131 | 119 | < 20 | < 30 | < 3 | < 6 |
| 72: VO19285236R001 68 | N/A | 20 | 1 | 400 | 5.74 | 6040 | 5.83 | 2970 | 363 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 73: VO19285236R008 69 | N/A | 20 | 1 | 400 | 5.52 | 5760 | 5.56 | 2760 | 579 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 74: VO19295741R024 70 | N/A | 20 | 1 | 400 | 4.94 | 4640 | 4.97 | 1720 | 1640 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 75: VO19281663R011 71 | N/A | 20 | 1 | 400 | 5.86 | 6190 | 6.00 | 3050 | 212 | 52 | < 20 | < 30 | < 3 | < 6 |
| 76: VO19320118R039 72 | N/A | 20 | 1 | 400 | 4.92 | 4550 | 4.95 | 1670 | 1650 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 77: VO18295487R037 73 | N/A | 20 | 1 | 400 | 6.17 | 6220 | 6.61 | 3300 | 111 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 78: VO19048524R014 74 | N/A | 20 | 1 | 400 | 5.00 | 4740 | 5.03 | 1870 | 1680 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 79: VO19054445R009 75 | N/A | 20 | 1 | 400 | 5.40 | 5610 | 5.43 | 2490 | 762 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 80: VO19076137R025 76 | N/A | 20 | 1 | 400 | 4.94 | 4650 | 4.98 | 1740 | 1650 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 81: VO19080569R021 77 | N/A | 20 | 1 | 400 | 5.09 | 5000 | 5.12 | 2080 | 1440 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 82: VO19249690R009 78 | N/A | 20 | 1 | 400 | 4.95 | 4720 | 4.98 | 1750 | 1600 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 83: VO19249697R026 79 | N/A | 20 | 1 | 400 | 5.57 | 5760 | 5.63 | 2820 | 460 | < 20 | < 20 | < 30 | < 3 | < 6 |
| 84: VO19063569R029 80 | N/A | 20 | 1 | 400 | 5.43 | 5700 | 5.47 | 2700 | 660 | < 20 | < 20 | < 30 | < 3 | < 6 |

| Sample ID | NO2+NO3 as N mg/L | F mg/L | Hg mg/L | Al mg/L | As mg/L | Ag mg/L | Ba mg/L | B mg/L | Be mg/L | Bi mg/L | Ca mg/L | Cd mg/L | Cr mg/L | Co mg/L | Cu mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3: Analysis Completed Date | 06-Jul-20 | 06-Jul-20 | 06-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 |
| 4: Analysis Completed Time | 15:04 | 15:29 | 16:04 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 |
| 5: VO18273624R006 1 | < 6 | < 0.06 | < 0.00001 | 0.29 | < 0.002 | < 0.0005 | 0.602 | < 0.02 | 0.00011 | < 0.00007 | 345 | 0.00031 | 0.0036 | 0.00734 | < 0.002 |
| 6: VO19104041R006 2 | < 6 | 0.10 | < 0.00001 | 0.93 | < 0.002 | < 0.0005 | 0.378 | < 0.02 | 0.00014 | 0.00027 | 9.3 | 0.00031 | 0.0098 | 0.00445 | 0.003 |
| 7: VO18227465R012 3 | < 6 | < 0.06 | < 0.00001 | 0.10 | < 0.002 | < 0.0005 | 0.123 | < 0.02 | 0.00012 | 0.00010 | 513 | 0.00134 | < 0.0008 | 0.00136 | < 0.002 |
| 8: VO18283892R049 4 | < 6 | < 0.06 | < 0.00001 | 0.75 | < 0.002 | < 0.0005 | 0.338 | < 0.02 | 0.00033 | 0.00009 | 208 | 0.00041 | 0.0065 | 0.00373 | < 0.002 |
| 9: VO18326381R019 5 | < 6 | < 0.06 | < 0.00001 | 0.71 | < 0.002 | < 0.0005 | 0.846 | < 0.02 | 0.00007 | 0.00011 | 10.8 | 0.00023 | 0.0126 | 0.00973 | < 0.002 |
| 10: VO19018165R040 6 | < 6 | < 0.06 | < 0.00001 | 0.05 | 0.004 | < 0.0005 | 4.05 | < 0.02 | 0.00017 | < 0.00007 | 495 | 0.00178 | < 0.0008 | 0.00339 | < 0.002 |
| 11: VO19037627R049 7 | < 6 | < 0.06 | < 0.00001 | 0.79 | < 0.002 | < 0.0005 | 1.10 | < 0.02 | 0.00007 | 0.00011 | 112 | 0.00056 | 0.0072 | 0.0104 | < 0.002 |

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Phone: 705-652-2000 FAX: 705-652-6365

**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report : CA11005-JUN20**

| Sample ID | NO2+NO3 as N mg/L | F mg/L | Hg mg/L | Al mg/L | As mg/L | Ag mg/L | Ba mg/L | B mg/L | Be mg/L | Bi mg/L | Ca mg/L | Cd mg/L | Cr mg/L | Co mg/L | Cu mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12: VO19012423R038 8 | < 6 | < 0.06 | < 0.00001 | 0.62 | < 0.002 | < 0.0005 | 1.88 | < 0.02 | < 0.00007 | 0.00007 | 154 | 0.00120 | 0.0098 | 0.00434 | < 0.002 |
| 13: VO19044866R038 9 | < 6 | < 0.06 | < 0.00001 | 0.71 | < 0.002 | < 0.0005 | 0.361 | < 0.02 | 0.00017 | 0.00153 | 141 | 0.00072 | 0.0078 | 0.00270 | < 0.002 |
| 14: VO19049770R019 10 | < 6 | < 0.06 | < 0.00001 | 0.92 | < 0.002 | < 0.0005 | 0.301 | < 0.02 | 0.00038 | 0.00015 | 70.1 | 0.00023 | 0.0087 | 0.00443 | < 0.002 |
| 15: VO19262649R023 11 | < 6 | < 0.06 | < 0.00001 | 0.16 | < 0.002 | < 0.0005 | 0.360 | < 0.02 | 0.00026 | < 0.00007 | 460 | 0.00121 | 0.0026 | 0.00269 | < 0.002 |
| 16: VO19252703R007 12 | < 6 | < 0.06 | < 0.00001 | 0.18 | < 0.002 | < 0.0005 | 0.411 | < 0.02 | 0.00016 | < 0.00007 | 447 | 0.00108 | 0.0019 | 0.00290 | < 0.002 |
| 17: VO19252703R042 13 | < 6 | < 0.06 | < 0.00001 | 0.54 | 0.003 | < 0.0005 | 0.168 | < 0.02 | 0.00036 | 0.00008 | 271 | 0.00128 | 0.0053 | 0.00276 | < 0.002 |
| 18: V019252701R036 14 | < 6 | < 0.06 | < 0.00001 | 0.07 | < 0.002 | < 0.0005 | 0.675 | < 0.02 | 0.00017 | < 0.00007 | 547 | 0.00107 | < 0.0008 | 0.00137 | < 0.002 |
| 19: V019252701R039 15 | < 6 | 0.10 | < 0.00001 | 0.24 | < 0.002 | < 0.0005 | 0.233 | < 0.02 | 0.00023 | < 0.00007 | 401 | 0.00148 | 0.0035 | 0.00291 | < 0.002 |
| 20: VO19125199R035 16 | < 6 | < 0.06 | < 0.00001 | 0.72 | < 0.002 | < 0.0005 | 0.501 | < 0.02 | 0.00012 | 0.00026 | 136 | 0.00095 | 0.0064 | 0.00290 | 0.019 |
| 21: VO19124996R002 17 | < 6 | < 0.06 | < 0.00001 | 0.06 | < 0.002 | < 0.0005 | 1.92 | < 0.02 | 0.00027 | < 0.00007 | 530 | 0.00126 | 0.0008 | 0.00174 | < 0.002 |
| 22: VO19124999R006 18 | < 6 | < 0.06 | < 0.00001 | 0.01 | < 0.002 | < 0.0005 | 0.605 | < 0.02 | < 0.00007 | 0.00009 | 625 | 0.00185 | < 0.0008 | 0.00164 | < 0.002 |
| 23: VO19093187R018 19 | < 6 | 0.06 | < 0.00001 | 0.83 | < 0.002 | < 0.0005 | 0.452 | < 0.02 | < 0.00007 | < 0.00007 | 51.4 | 0.00128 | 0.0074 | 0.00830 | 0.003 |
| 24: VO19110215R042 20 | < 6 | 0.07 | < 0.00001 | 0.90 | < 0.002 | < 0.0005 | 0.252 | < 0.02 | 0.00013 | 0.00008 | 21.1 | 0.00030 | 0.0062 | 0.00557 | < 0.002 |
| 25: VO19140396R013 21 | < 6 | < 0.06 | < 0.00001 | 0.05 | < 0.002 | < 0.0005 | 0.447 | < 0.02 | 0.00029 | < 0.00007 | 558 | 0.00134 | < 0.0008 | 0.00184 | < 0.002 |
| 26: VO19112306R041 22 | < 6 | 0.06 | < 0.00001 | 0.94 | < 0.002 | < 0.0005 | 0.583 | < 0.02 | 0.00018 | 0.00021 | 75.3 | 0.00026 | 0.0087 | 0.00483 | < 0.002 |
| 27: VO19111152R003 23 | < 6 | 0.07 | < 0.00001 | 0.67 | < 0.002 | < 0.0005 | 0.137 | < 0.02 | 0.00026 | 0.00022 | 250 | 0.00166 | 0.0080 | 0.00260 | < 0.002 |
| 28: VO19111152R049 24 | < 6 | < 0.06 | < 0.00001 | 0.09 | < 0.002 | < 0.0005 | 0.380 | < 0.02 | 0.00035 | 0.00009 | 521 | 0.00150 | < 0.0008 | 0.00595 | < 0.002 |
| 29: VO19137440R016 25 | < 6 | 0.08 | < 0.00001 | 0.30 | < 0.002 | < 0.0005 | 0.807 | < 0.02 | 0.00035 | < 0.00007 | 1790 | 0.00298 | 0.0052 | 0.00450 | < 0.002 |
| 30: VO19128730R010 26 | < 6 | < 0.06 | < 0.00001 | 0.30 | < 0.002 | < 0.0005 | 0.714 | < 0.02 | 0.00028 | < 0.00007 | 359 | 0.00290 | 0.0042 | 0.00232 | < 0.002 |
| 31: VO19128730R046 27 | < 6 | < 0.06 | < 0.00001 | < 0.01 | < 0.002 | < 0.0005 | 0.999 | < 0.02 | < 0.00007 | < 0.00007 | 610 | 0.00096 | < 0.0008 | 0.00372 | < 0.002 |
| 32: VO19118517R008 28 | < 6 | < 0.06 | < 0.00001 | 0.21 | < 0.002 | < 0.0005 | 0.211 | < 0.02 | 0.00021 | 0.00008 | 362 | 0.00191 | 0.0027 | 0.00073 | < 0.002 |
| 33: VO19149798R006 29 | < 6 | < 0.06 | < 0.00001 | 0.06 | < 0.002 | < 0.0005 | 1.28 | < 0.02 | 0.00008 | < 0.00007 | 480 | 0.00117 | < 0.0008 | 0.00328 | < 0.002 |
| 34: VO19132117R028 30 | < 6 | < 0.06 | < 0.00001 | 1.20 | < 0.002 | < 0.0005 | 0.0836 | < 0.02 | 0.00069 | 0.00035 | 939 | 0.00347 | 0.0193 | 0.00576 | 0.004 |
| 35: VO19132117R032 31 | < 6 | 0.12 | < 0.00001 | 0.02 | < 0.002 | < 0.0005 | 0.222 | < 0.02 | 0.00009 | 0.00007 | 617 | 0.00113 | < 0.0008 | 0.00313 | < 0.002 |
| 36: VO19189405R042 32 | < 6 | 0.08 | < 0.00001 | 0.76 | < 0.002 | < 0.0005 | 0.283 | < 0.02 | 0.00019 | 0.00007 | 98.7 | 0.00062 | 0.0088 | 0.00435 | < 0.002 |
| 37: VO19202592R025 33 | < 6 | < 0.06 | < 0.00001 | 0.61 | < 0.002 | < 0.0005 | 0.361 | < 0.02 | 0.00016 | 0.00008 | 221 | 0.00109 | 0.0074 | 0.00390 | < 0.002 |
| 38: VO19241618R008 34 | < 6 | < 0.06 | < 0.00001 | 0.03 | < 0.002 | < 0.0005 | 0.319 | < 0.02 | 0.00016 | 0.00009 | 542 | 0.00146 | < 0.0008 | 0.00865 | < 0.002 |
| 39: VO19241601R016 35 | < 6 | < 0.06 | < 0.00001 | 0.10 | < 0.002 | < 0.0005 | 0.119 | < 0.02 | 0.00051 | < 0.00007 | 438 | 0.00130 | 0.0008 | 0.00349 | < 0.002 |
| 40: VO19211878R038 36 | < 6 | 0.07 | < 0.00001 | 1.08 | < 0.002 | < 0.0005 | 0.177 | < 0.02 | 0.00015 | 0.00016 | 8.8 | 0.00016 | 0.0120 | 0.00371 | < 0.002 |
| 41: V019165010R043 37 | < 6 | < 0.06 | < 0.00001 | 0.24 | < 0.002 | < 0.0005 | 0.656 | < 0.02 | 0.00031 | < 0.00007 | 384 | 0.00072 | 0.0040 | 0.00155 | < 0.002 |
| 42: VO19276647R046 38 | < 6 | < 0.06 | < 0.00001 | < 0.01 | < 0.002 | < 0.0005 | 1.04 | < 0.02 | 0.00008 | < 0.00007 | 638 | 0.00182 | < 0.0008 | 0.00075 | < 0.002 |
| 43: VO19195806R022 39 | < 6 | < 0.06 | < 0.00001 | 0.76 | < 0.002 | < 0.0005 | 0.404 | < 0.02 | 0.00013 | 0.00013 | 14.4 | 0.00003 | 0.0070 | 0.00438 | < 0.002 |
| 44: V019216516R034 40 | < 6 | < 0.06 | < 0.00001 | 0.68 | 0.002 | < 0.0005 | 0.735 | < 0.02 | < 0.00007 | 0.00007 | 9.6 | 0.00028 | 0.0087 | 0.0137 | < 0.002 |
| 45: V019226295R014 41 | < 6 | < 0.06 | < 0.00001 | 0.70 | < 0.002 | < 0.0005 | 0.365 | < 0.02 | 0.00009 | 0.00016 | 79.6 | 0.00015 | 0.0126 | 0.00721 | < 0.002 |
| 46: VO19211753R046 42 | < 6 | < 0.06 | < 0.00001 | 0.04 | < 0.002 | < 0.0005 | 0.166 | < 0.02 | 0.00018 | 0.00008 | 536 | 0.00224 | < 0.0008 | 0.00178 | < 0.002 |
| 47: V019185394R014 43 | < 6 | < 0.06 | < 0.00001 | 0.25 | 0.004 | < 0.0005 | 0.639 | < 0.02 | 0.00011 | < 0.00007 | 325 | 0.00171 | 0.0039 | 0.00320 | < 0.002 |
| 48: VO19185519R031 44 | < 6 | 0.12 | < 0.00001 | 0.02 | < 0.002 | < 0.0005 | 0.308 | < 0.02 | 0.00009 | 0.00010 | 584 | 0.00100 | < 0.0008 | 0.00189 | < 0.002 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report : CA11005-JUN20**

| Sample ID | NO2+NO3 as N mg/L | F mg/L | Hg mg/L | Al mg/L | As mg/L | Ag mg/L | Ba mg/L | B mg/L | Be mg/L | Bi mg/L | Ca mg/L | Cd mg/L | Cr mg/L | Co mg/L | Cu mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 49: VO19185519R043 45 | < 6 | < 0.06 | < 0.00001 | 0.02 | < 0.002 | < 0.0005 | 0.0893 | < 0.02 | 0.00010 | < 0.00007 | 560 | 0.00186 | < 0.0008 | 0.00112 | < 0.002 |
| 50: VO19185521R019 46 | < 6 | < 0.06 | < 0.00001 | < 0.01 | < 0.002 | < 0.0005 | 0.0930 | < 0.02 | 0.00009 | < 0.00007 | 651 | 0.00266 | < 0.0008 | 0.00217 | < 0.002 |
| 51: VO19231738R002 47 | < 6 | 0.08 | < 0.00001 | 0.79 | < 0.002 | < 0.0005 | 0.573 | < 0.02 | 0.00019 | 0.00007 | 34.7 | 0.00007 | 0.0194 | 0.0444 | < 0.002 |
| 52: VO19234800R026 48 | < 6 | < 0.06 | < 0.00001 | 0.75 | < 0.002 | < 0.0005 | 0.356 | < 0.02 | 0.00010 | 0.00020 | 32.0 | 0.00031 | 0.0079 | 0.00756 | < 0.002 |
| 53: VO19231549R050 49 | < 6 | < 0.06 | < 0.00001 | 0.58 | < 0.002 | < 0.0005 | 0.611 | < 0.02 | < 0.00007 | 0.00007 | 141 | 0.00157 | 0.0077 | 0.00605 | < 0.002 |
| 54: VO19202589R050 50 | < 6 | < 0.06 | < 0.00001 | 0.01 | < 0.002 | < 0.0005 | 0.103 | < 0.02 | 0.00011 | < 0.00007 | 583 | 0.00313 | < 0.0008 | 0.00091 | < 0.002 |
| 55: VO19234784R038 51 | < 6 | 0.11 | < 0.00001 | 1.00 | < 0.002 | < 0.0005 | 0.399 | < 0.02 | 0.00021 | 0.00011 | 9.5 | 0.00006 | 0.0104 | 0.00508 | < 0.002 |
| 56: VO19226180R012 52 | < 6 | < 0.06 | < 0.00001 | 0.47 | 0.002 | < 0.0005 | 0.268 | < 0.02 | 0.00014 | 0.00011 | 231 | 0.00180 | 0.0052 | 0.00292 | < 0.002 |
| 57: VO19226290R005 53 | < 6 | < 0.06 | < 0.00001 | 0.17 | 0.002 | < 0.0005 | 0.667 | < 0.02 | 0.00016 | < 0.00007 | 446 | 0.00130 | 0.0031 | 0.00638 | < 0.002 |
| 58: VO19226290R011 54 | < 6 | < 0.06 | < 0.00001 | 0.32 | < 0.002 | < 0.0005 | 0.173 | < 0.02 | 0.00037 | 0.00019 | 360 | 0.00068 | 0.0037 | 0.0192 | < 0.002 |
| 59: VO19246880R015 55 | < 6 | < 0.06 | < 0.00001 | 0.47 | < 0.002 | < 0.0005 | 0.199 | < 0.02 | 0.00028 | < 0.00007 | 305 | 0.00121 | 0.0040 | 0.00246 | < 0.002 |
| 60: VO19246880R020 56 | < 6 | < 0.06 | < 0.00001 | 0.13 | < 0.002 | < 0.0005 | 1.98 | < 0.02 | 0.00043 | 0.00010 | 409 | 0.00090 | 0.0018 | 0.00209 | < 0.002 |
| 61: VO19246880R026 57 | < 6 | < 0.06 | < 0.00001 | 0.06 | < 0.002 | < 0.0005 | 3.60 | < 0.02 | 0.00052 | 0.00011 | 481 | 0.00219 | < 0.0008 | 0.00248 | < 0.002 |
| 62: VO19258344R050 58 | < 6 | 0.12 | < 0.00001 | 0.49 | < 0.002 | < 0.0005 | 0.912 | < 0.02 | 0.00013 | < 0.00007 | 239 | 0.00150 | 0.0062 | 0.00339 | < 0.002 |
| 63: VO19258343R007 59 | < 6 | 0.11 | < 0.00001 | 0.69 | < 0.002 | < 0.0005 | 0.715 | < 0.02 | 0.00021 | < 0.00007 | 250 | 0.00129 | 0.0105 | 0.00283 | < 0.002 |
| 64: VO19242574R046 60 | < 6 | < 0.06 | < 0.00001 | 0.76 | 0.002 | < 0.0005 | 0.378 | < 0.02 | 0.00010 | 0.00008 | 175 | 0.00070 | 0.0111 | 0.00225 | < 0.002 |
| 65: VO18283892R001 61 | < 6 | 0.06 | 0.00001 | 1.15 | < 0.002 | < 0.0005 | 0.577 | < 0.02 | 0.00009 | < 0.00007 | 41.5 | 0.00010 | 0.0166 | 0.00814 | < 0.002 |
| 66: VO19244666R016 62 | < 6 | < 0.06 | 0.00002 | 0.03 | < 0.002 | < 0.0005 | 0.557 | < 0.02 | 0.00018 | < 0.00007 | 487 | 0.00153 | < 0.0008 | 0.00492 | 0.005 |
| 67: VO19244666R045 63 | < 6 | < 0.06 | 0.00002 | 1.02 | < 0.002 | < 0.0005 | 0.309 | < 0.02 | 0.00015 | 0.00009 | 62.4 | 0.00029 | 0.0083 | 0.00393 | 0.003 |
| 68: VO19286662R011 64 | < 6 | < 0.06 | 0.00001 | 0.09 | < 0.002 | < 0.0005 | 0.746 | < 0.02 | 0.00013 | < 0.00007 | 390 | 0.00152 | 0.0015 | 0.00059 | < 0.002 |
| 69: VO19286662R026 65 | < 6 | 0.10 | < 0.00001 | 0.75 | < 0.002 | < 0.0005 | 0.314 | < 0.02 | 0.00040 | 0.00020 | 180 | 0.00069 | 0.0068 | 0.00206 | < 0.002 |
| 70: VO19283031R002 66 | < 6 | 0.10 | < 0.00001 | 1.03 | 0.004 | < 0.0005 | 0.335 | < 0.02 | 0.00021 | 0.00015 | 85.4 | 0.00064 | 0.0078 | 0.00420 | 0.007 |
| 71: VO19285337R011 67 | < 6 | 0.09 | 0.00001 | 0.03 | < 0.002 | < 0.0005 | 0.506 | < 0.02 | 0.00022 | < 0.00007 | 2010 | 0.00661 | < 0.0008 | 0.00231 | < 0.002 |
| 72: VO19285236R001 68 | < 6 | < 0.06 | < 0.00001 | 0.08 | < 0.002 | < 0.0005 | 0.214 | < 0.02 | 0.00007 | < 0.00007 | 524 | 0.00103 | 0.0012 | 0.00140 | < 0.002 |
| 73: VO19285236R008 69 | < 6 | < 0.06 | < 0.00001 | 0.20 | < 0.002 | < 0.0005 | 0.137 | < 0.02 | 0.00015 | < 0.00007 | 447 | 0.00077 | 0.0024 | 0.00226 | < 0.002 |
| 74: VO19295741R024 70 | < 6 | 0.12 | < 0.00001 | 1.32 | < 0.002 | < 0.0005 | 0.603 | < 0.02 | 0.00009 | < 0.00007 | 18.3 | 0.00028 | 0.0160 | 0.00672 | 0.004 |
| 75: VO19281663R011 71 | < 6 | < 0.06 | 0.00001 | 0.03 | 0.002 | < 0.0005 | 0.408 | < 0.02 | < 0.00007 | < 0.00007 | 614 | 0.00307 | < 0.0008 | 0.00251 | < 0.002 |
| 76: VO19320118R039 72 | < 6 | 0.06 | 0.00001 | 0.92 | < 0.002 | < 0.0005 | 0.449 | < 0.02 | 0.00009 | < 0.00007 | 5.7 | 0.00010 | 0.0078 | 0.00471 | < 0.002 |
| 77: VO18295487R037 73 | < 6 | < 0.06 | < 0.00001 | < 0.01 | 0.002 | < 0.0005 | 0.177 | < 0.02 | < 0.00007 | < 0.00007 | 632 | 0.00137 | < 0.0008 | 0.00452 | < 0.002 |
| 78: VO19048524R014 74 | < 6 | 0.10 | < 0.00001 | 1.12 | < 0.002 | < 0.0005 | 0.437 | < 0.02 | 0.00026 | < 0.00007 | 61.3 | 0.00067 | 0.0089 | 0.00505 | 0.005 |
| 79: VO19054445R009 75 | < 6 | < 0.06 | < 0.00001 | 0.21 | < 0.002 | < 0.0005 | 0.188 | < 0.02 | 0.00018 | < 0.00007 | 369 | 0.00098 | 0.0029 | 0.00294 | 0.003 |
| 80: VO19076137R025 76 | < 6 | 0.08 | < 0.00001 | 0.94 | < 0.002 | < 0.0005 | 0.663 | < 0.02 | < 0.00007 | < 0.00007 | 34.6 | 0.00003 | 0.0098 | 0.00566 | < 0.002 |
| 81: VO19080569R021 77 | < 6 | 0.10 | < 0.00001 | 0.75 | < 0.002 | < 0.0005 | 0.0815 | < 0.02 | 0.00018 | < 0.00007 | 180 | 0.00031 | 0.0093 | 0.00327 | 0.006 |
| 82: VO19249690R009 78 | < 6 | 0.06 | < 0.00001 | 0.90 | 0.007 | < 0.0005 | 0.994 | < 0.02 | < 0.00007 | 0.00009 | 39.0 | 0.00060 | 0.0211 | 0.00944 | < 0.002 |
| 83: VO19249697R026 79 | < 6 | < 0.06 | < 0.00001 | 0.15 | < 0.002 | < 0.0005 | 0.806 | < 0.02 | 0.00014 | < 0.00007 | 455 | 0.00152 | 0.0023 | 0.00656 | < 0.002 |
| 84: VO19063569R029 80 | < 6 | < 0.06 | < 0.00001 | 0.24 | 0.005 | < 0.0005 | 0.267 | < 0.02 | 0.00014 | < 0.00007 | 413 | 0.00322 | 0.0022 | 0.00178 | < 0.002 |

OnLine LIMS

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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report :** **CA11005-JUN20**

| Sample ID | Fe mg/L | K mg/L | Li mg/L | Mg mg/L | Mn mg/L | Mo mg/L | Na mg/L | Ni mg/L | P mg/L | Pb mg/L | U mg/L | Sb mg/L | Se mg/L | Si mg/L | Sn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3: Analysis Completed Date | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 |
| 4: Analysis Completed Time | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 | 13:05 |
| 5: VO18273624R006 1 | 4.09 | 34.7 | 0.014 | 3.91 | 2.68 | < 0.0004 | 1390 | 0.017 | < 0.003 | 0.0084 | 0.00533 | < 0.009 | < 0.0004 | 3.82 | < 0.00006 |
| 6: VO19104041R006 2 | 3.97 | 20.1 | 0.008 | 3.02 | 0.171 | 0.0006 | 1450 | 0.016 | 0.030 | 0.0104 | 0.00901 | < 0.009 | < 0.0004 | 3.50 | < 0.00006 |
| 7: VO18227465R012 3 | 0.10 | 10.2 | 0.001 | 4.55 | 5.58 | < 0.0004 | 1440 | 0.007 | < 0.003 | 0.0097 | 0.00174 | < 0.009 | < 0.0004 | 0.66 | < 0.00006 |
| 8: VO18283892R049 4 | 11.0 | 23.8 | 0.010 | 7.17 | 3.04 | < 0.0004 | 1390 | 0.012 | < 0.003 | 0.0132 | 0.00461 | < 0.009 | < 0.0004 | 2.99 | < 0.00006 |
| 9: VO18326381R019 5 | 7.76 | 23.9 | 0.015 | 2.27 | 0.325 | < 0.0004 | 1440 | 0.029 | 0.010 | 0.0076 | 0.00604 | < 0.009 | < 0.0004 | 2.38 | < 0.00006 |
| 10: VO19018165R040 6 | 8.16 | 50.7 | 0.009 | 8.23 | 6.94 | < 0.0004 | 1400 | 0.009 | 0.010 | 0.0467 | 0.00132 | < 0.009 | < 0.0004 | 1.76 | < 0.00006 |
| 11: VO19037627R049 7 | 6.66 | 31.8 | 0.016 | 3.58 | 1.74 | < 0.0004 | 1440 | 0.017 | < 0.003 | 0.0155 | 0.0109 | < 0.009 | < 0.0004 | 2.99 | < 0.00006 |
| 12: VO19012423R038 8 | 8.59 | 43.0 | 0.042 | 4.46 | 3.49 | < 0.0004 | 1400 | 0.014 | 0.020 | 0.0200 | 0.00996 | < 0.009 | < 0.0004 | 1.86 | < 0.00006 |
| 13: VO19044866R038 9 | 4.87 | 24.0 | 0.005 | 3.50 | 2.47 | < 0.0004 | 1400 | 0.007 | < 0.003 | 0.0172 | 0.00189 | < 0.009 | < 0.0004 | 2.66 | < 0.00006 |
| 14: VO19049770R019 10 | 3.72 | 22.7 | 0.005 | 2.64 | 0.673 | < 0.0004 | 1400 | 0.008 | 0.010 | 0.0103 | 0.00174 | < 0.009 | < 0.0004 | 2.61 | < 0.00006 |
| 15: VO19262649R023 11 | 5.63 | 26.5 | 0.004 | 4.29 | 5.81 | < 0.0004 | 1420 | 0.007 | < 0.003 | 0.0077 | 0.00248 | < 0.009 | < 0.0004 | 2.06 | < 0.00006 |
| 16: VO19252703R007 12 | 7.30 | 36.4 | 0.007 | 4.89 | 6.15 | < 0.0004 | 1440 | 0.009 | 0.030 | 0.0101 | 0.00193 | < 0.009 | < 0.0004 | 2.58 | < 0.00006 |
| 17: VO19252703R042 13 | 6.60 | 28.9 | 0.006 | 4.45 | 5.09 | < 0.0004 | 1490 | 0.011 | 0.020 | 0.0159 | 0.00157 | < 0.009 | < 0.0004 | 2.70 | < 0.00006 |
| 18: V019252701R036 14 | 5.12 | 40.2 | 0.006 | 3.97 | 6.31 | 0.0011 | 1420 | 0.005 | 0.040 | 0.0139 | 0.00211 | < 0.009 | < 0.0004 | 1.84 | < 0.00006 |
| 19: V019252701R039 15 | 5.20 | 34.4 | 0.007 | 3.54 | 6.20 | < 0.0004 | 1420 | 0.014 | 0.010 | 0.0091 | 0.00256 | < 0.009 | < 0.0004 | 2.42 | < 0.00006 |
| 20: VO19125199R035 16 | 5.27 | 24.7 | 0.009 | 3.31 | 3.52 | < 0.0004 | 1480 | 0.010 | < 0.003 | 0.0186 | 0.00326 | < 0.009 | < 0.0004 | 2.34 | < 0.00006 |
| 21: VO19124996R002 17 | 4.80 | 44.0 | 0.004 | 4.45 | 7.06 | < 0.0004 | 1410 | 0.006 | 0.040 | 0.0361 | 0.00252 | < 0.009 | < 0.0004 | 1.64 | < 0.00006 |
| 22: VO19124999R006 18 | 2.83 | 37.0 | 0.003 | 10.6 | 11.6 | < 0.0004 | 1410 | 0.005 | 0.020 | 0.0036 | 0.00053 | < 0.009 | < 0.0004 | 1.61 | 0.00011 |
| 23: VO19093187R018 19 | 3.77 | 23.8 | 0.008 | 2.13 | 1.50 | < 0.0004 | 1390 | 0.024 | 0.010 | 0.0091 | 0.00542 | < 0.009 | < 0.0004 | 2.65 | < 0.00006 |
| 24: VO19110215R042 20 | 5.35 | 29.6 | 0.010 | 2.32 | 0.534 | < 0.0004 | 1410 | 0.027 | < 0.003 | 0.0079 | 0.00353 | < 0.009 | < 0.0004 | 4.19 | < 0.00006 |
| 25: VO19140396R013 21 | 8.05 | 34.0 | 0.004 | 8.45 | 9.46 | < 0.0004 | 1430 | 0.006 | 0.020 | 0.0148 | 0.00047 | < 0.009 | < 0.0004 | 1.76 | < 0.00006 |
| 26: VO19112306R041 22 | 12.6 | 28.0 | 0.013 | 9.00 | 3.28 | < 0.0004 | 1420 | 0.013 | < 0.003 | 0.0189 | 0.00297 | < 0.009 | < 0.0004 | 3.72 | < 0.00006 |
| 27: VO19111152R003 23 | 3.28 | 26.2 | 0.006 | 3.96 | 4.37 | 0.0008 | 1520 | 0.014 | < 0.003 | 0.0153 | 0.00180 | < 0.009 | < 0.0004 | 2.60 | < 0.00006 |
| 28: VO19111152R049 24 | 13.6 | 38.6 | 0.003 | 10.5 | 9.97 | < 0.0004 | 1450 | 0.007 | 0.010 | 0.0176 | 0.00061 | < 0.009 | < 0.0004 | 1.77 | < 0.00006 |
| 29: VO19137440R016 25 | 27.0 | 41.6 | 0.013 | 22.5 | 22.8 | < 0.0004 | 2.0 | 0.005 | 0.040 | 0.0355 | 0.00076 | < 0.009 | < 0.0004 | 2.30 | < 0.00006 |
| 30: VO19128730R010 26 | 3.75 | 24.6 | 0.004 | 4.61 | 5.83 | < 0.0004 | 1390 | 0.005 | 0.010 | 0.0207 | 0.00343 | < 0.009 | < 0.0004 | 1.69 | < 0.00006 |
| 31: VO19128730R046 27 | 1.74 | 31.1 | 0.004 | 5.06 | 7.45 | 0.0011 | 1350 | 0.004 | < 0.003 | 0.0054 | 0.00027 | < 0.009 | < 0.0004 | 1.20 | < 0.00006 |
| 32: VO19118517R008 28 | 1.15 | 17.2 | 0.002 | 2.94 | 5.50 | < 0.0004 | 1430 | 0.005 | < 0.003 | 0.0404 | 0.00277 | < 0.009 | < 0.0004 | 0.91 | < 0.00006 |
| 33: VO19149798R006 29 | 10.9 | 48.8 | 0.019 | 8.38 | 7.93 | < 0.0004 | 1410 | 0.009 | < 0.003 | 0.0084 | 0.00124 | < 0.009 | < 0.0004 | 1.23 | < 0.00006 |
| 34: VO19132117R028 30 | 12.0 | 23.5 | 0.004 | 58.5 | 15.5 | < 0.0004 | 4.1 | 0.021 | < 0.003 | 0.0504 | 0.00760 | < 0.009 | < 0.0004 | 1.86 | < 0.00006 |
| 35: VO19132117R032 31 | 1.17 | 37.8 | 0.005 | 3.75 | 7.67 | 0.0006 | 1410 | 0.008 | < 0.003 | 0.0042 | 0.00060 | < 0.009 | < 0.0004 | 1.47 | 0.00007 |
| 36: VO19189405R042 32 | 6.43 | 25.7 | 0.028 | 3.33 | 1.22 | < 0.0004 | 1380 | 0.013 | < 0.003 | 0.0128 | 0.00313 | < 0.009 | < 0.0004 | 3.39 | < 0.00006 |
| 37: VO19202592R025 33 | 7.36 | 29.8 | 0.008 | 3.92 | 4.63 | 0.0004 | 1520 | 0.012 | < 0.003 | 0.0251 | 0.00283 | < 0.009 | < 0.0004 | 3.40 | 0.00016 |
| 38: VO19241618R008 34 | 7.75 | 34.3 | 0.004 | 7.19 | 7.55 | < 0.0004 | 1420 | 0.005 | < 0.003 | 0.0138 | 0.00045 | < 0.009 | < 0.0004 | 1.21 | 0.00007 |
| 39: VO19241601R016 35 | 3.37 | 32.3 | 0.003 | 8.40 | 7.61 | < 0.0004 | 1410 | 0.007 | < 0.003 | 0.0228 | 0.00069 | < 0.009 | < 0.0004 | 1.17 | < 0.00006 |

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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report :** **CA11005-JUN20**

| Sample ID | Fe mg/L | K mg/L | Li mg/L | Mg mg/L | Mn mg/L | Mo mg/L | Na mg/L | Ni mg/L | P mg/L | Pb mg/L | U mg/L | Sb mg/L | Se mg/L | Si mg/L | Sn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40: VO19211878R038 36 | 4.67 | 18.4 | 0.009 | 2.81 | 0.148 | < 0.0004 | 1420 | 0.015 | < 0.003 | 0.0086 | 0.00688 | < 0.009 | < 0.0004 | 3.43 | < 0.00006 |
| 41: V019165010R043 37 | 5.09 | 23.6 | 0.006 | 3.71 | 4.31 | < 0.0004 | 1410 | 0.007 | < 0.003 | 0.0047 | 0.00180 | < 0.009 | < 0.0004 | 2.24 | < 0.00006 |
| 42: VO19276647R046 38 | 1.98 | 55.6 | 0.004 | 6.58 | 8.71 | < 0.0004 | 1420 | 0.005 | < 0.003 | 0.0084 | 0.00061 | < 0.009 | < 0.0004 | 1.44 | < 0.00006 |
| 43: VO19195806R022 39 | 4.02 | 25.7 | 0.015 | 2.35 | 0.254 | 0.0005 | 1460 | 0.020 | < 0.003 | 0.0076 | 0.00246 | < 0.009 | < 0.0004 | 2.99 | 0.00018 |
| 44: V019216516R034 40 | 4.21 | 26.7 | 0.010 | 2.77 | 0.510 | < 0.0004 | 1480 | 0.025 | < 0.003 | 0.0062 | 0.00243 | < 0.009 | < 0.0004 | 2.09 | < 0.00006 |
| 45: V019226295R014 41 | 3.76 | 20.9 | 0.009 | 1.95 | 0.509 | < 0.0004 | 1420 | 0.010 | < 0.003 | 0.0069 | 0.00322 | < 0.009 | < 0.0004 | 2.29 | < 0.00006 |
| 46: VO19211753R046 42 | 5.49 | 39.2 | 0.006 | 7.60 | 9.02 | < 0.0004 | 1430 | 0.010 | < 0.003 | 0.0086 | 0.00112 | < 0.009 | < 0.0004 | 1.52 | < 0.00006 |
| 47: V019185394R014 43 | 11.8 | 28.2 | 0.007 | 8.47 | 7.10 | < 0.0004 | 1410 | 0.008 | < 0.003 | 0.0223 | 0.00218 | < 0.009 | < 0.0004 | 1.82 | < 0.00006 |
| 48: VO19185519R031 44 | 3.26 | 40.5 | 0.008 | 6.19 | 7.58 | 0.0005 | 1430 | 0.007 | < 0.003 | 0.0049 | 0.00031 | < 0.009 | < 0.0004 | 2.03 | 0.00016 |
| 49: VO19185519R043 45 | 0.58 | 23.5 | 0.003 | 4.92 | 8.25 | < 0.0004 | 1440 | 0.006 | < 0.003 | 0.0198 | 0.00075 | < 0.009 | < 0.0004 | 0.89 | 0.00008 |
| 50: VO19185521R019 46 | 0.27 | 32.7 | 0.004 | 10.9 | 10.0 | < 0.0004 | 1450 | 0.009 | < 0.003 | 0.0028 | 0.00056 | < 0.009 | < 0.0004 | 1.00 | < 0.00006 |
| 51: VO19231738R002 47 | 5.40 | 21.0 | 0.007 | 3.67 | 0.295 | < 0.0004 | 1440 | 0.020 | < 0.003 | 0.0026 | 0.00161 | < 0.009 | < 0.0004 | 2.99 | < 0.00006 |
| 52: VO19234800R026 48 | 5.95 | 27.0 | 0.012 | 2.49 | 0.524 | < 0.0004 | 1440 | 0.028 | < 0.003 | 0.0083 | 0.00309 | < 0.009 | < 0.0004 | 2.94 | < 0.00006 |
| 53: VO19231549R050 49 | 7.27 | 27.9 | 0.012 | 3.33 | 4.00 | 0.0015 | 1450 | 0.029 | < 0.003 | 0.0212 | 0.00478 | < 0.009 | < 0.0004 | 1.79 | < 0.00006 |
| 54: VO19202589R050 50 | 0.86 | 19.7 | 0.003 | 7.11 | 8.64 | 0.0008 | 1410 | 0.009 | < 0.003 | 0.0104 | 0.00079 | < 0.009 | < 0.0004 | 0.88 | < 0.00006 |
| 55: VO19234784R038 51 | 6.03 | 22.8 | 0.010 | 3.05 | 0.141 | 0.0008 | 1500 | 0.021 | < 0.003 | 0.0053 | 0.00356 | < 0.009 | < 0.0004 | 3.73 | 0.00021 |
| 56: VO19226180R012 52 | 6.27 | 25.4 | 0.004 | 3.52 | 4.68 | < 0.0004 | 1460 | 0.007 | < 0.003 | 0.0114 | 0.00240 | < 0.009 | < 0.0004 | 1.86 | < 0.00006 |
| 57: VO19226290R005 53 | 5.93 | 29.2 | 0.008 | 6.15 | 6.51 | < 0.0004 | 1460 | 0.008 | 0.010 | 0.0131 | 0.00119 | < 0.009 | < 0.0004 | 2.35 | 0.00010 |
| 58: VO19226290R011 54 | 3.29 | 24.3 | 0.008 | 3.57 | 4.99 | < 0.0004 | 1420 | 0.009 | 0.020 | 0.0087 | 0.00135 | < 0.009 | < 0.0004 | 2.35 | 0.00019 |
| 59: VO19246880R015 55 | 2.04 | 27.4 | 0.007 | 2.93 | 5.14 | < 0.0004 | 1400 | 0.012 | 0.010 | 0.0297 | 0.00285 | < 0.009 | < 0.0004 | 2.59 | 0.00008 |
| 60: VO19246880R020 56 | 7.65 | 57.4 | 0.018 | 7.50 | 5.81 | < 0.0004 | 1390 | 0.011 | < 0.003 | 0.0710 | 0.00264 | < 0.009 | < 0.0004 | 1.35 | 0.00013 |
| 61: VO19246880R026 57 | 12.5 | 74.9 | 0.018 | 10.2 | 9.33 | < 0.0004 | 1400 | 0.008 | 0.010 | 0.0389 | 0.00069 | < 0.009 | < 0.0004 | 1.64 | 0.00013 |
| 62: VO19258344R050 58 | 16.8 | 25.5 | 0.009 | 17.3 | 5.96 | < 0.0004 | 1360 | 0.011 | 0.020 | 0.0167 | 0.00355 | < 0.009 | < 0.0004 | 2.35 | < 0.00006 |
| 63: VO19258343R007 59 | 6.75 | 30.0 | 0.012 | 4.67 | 3.93 | < 0.0004 | 1440 | 0.013 | < 0.003 | 0.0143 | 0.00951 | < 0.009 | < 0.0004 | 4.41 | 0.00006 |
| 64: VO19242574R046 60 | 5.45 | 25.4 | 0.007 | 2.67 | 2.95 | < 0.0004 | 1450 | 0.009 | 0.010 | 0.0136 | 0.00307 | < 0.009 | < 0.0004 | 3.29 | 0.00019 |
| 65: VO18283892R001 61 | 5.52 | 26.0 | 0.020 | 2.80 | 0.564 | < 0.0004 | 1470 | 0.013 | 0.020 | 0.0094 | 0.00504 | < 0.009 | < 0.0004 | 3.14 | < 0.00006 |
| 66: VO19244666R016 62 | 17.5 | 44.7 | 0.007 | 25.8 | 7.97 | < 0.0004 | 1400 | 0.013 | < 0.003 | 0.0263 | 0.00022 | < 0.009 | < 0.0004 | 1.58 | 0.00019 |
| 67: VO19244666R045 63 | 5.30 | 25.5 | 0.009 | 3.11 | 1.63 | < 0.0004 | 1410 | 0.014 | 0.010 | 0.0135 | 0.00545 | < 0.009 | < 0.0004 | 3.70 | 0.00006 |
| 68: VO19286662R011 64 | 1.10 | 13.8 | 0.004 | 4.90 | 4.45 | 0.0004 | 1370 | 0.006 | 0.020 | 0.0498 | 0.00064 | < 0.009 | < 0.0004 | 0.61 | 0.00016 |
| 69: VO19286662R026 65 | 3.66 | 28.3 | 0.007 | 2.54 | 2.29 | < 0.0004 | 1440 | 0.010 | < 0.003 | 0.0315 | 0.00249 | < 0.009 | < 0.0004 | 2.79 | 0.00008 |
| 70: VO19283031R002 66 | 9.54 | 31.4 | 0.011 | 5.49 | 2.42 | < 0.0004 | 1420 | 0.014 | 0.040 | 0.0100 | 0.00388 | < 0.009 | < 0.0004 | 4.82 | 0.00015 |
| 71: VO19285337R011 67 | 10.2 | 44.2 | 0.006 | 14.5 | 19.4 | < 0.0004 | 1.9 | 0.006 | 0.020 | 0.0438 | 0.00101 | < 0.009 | < 0.0004 | 1.60 | < 0.00006 |
| 72: VO19285236R001 68 | 5.26 | 38.0 | 0.007 | 3.39 | 6.50 | 0.0025 | 1380 | 0.005 | < 0.003 | 0.0169 | 0.00247 | < 0.009 | < 0.0004 | 1.85 | 0.00016 |
| 73: VO19285236R008 69 | 3.26 | 37.4 | 0.009 | 3.54 | 5.72 | < 0.0004 | 1430 | 0.010 | < 0.003 | 0.0097 | 0.00451 | < 0.009 | < 0.0004 | 2.93 | < 0.00006 |
| 74: VO19295741R024 70 | 7.12 | 28.3 | 0.017 | 5.02 | 0.239 | < 0.0004 | 1460 | 0.027 | < 0.003 | 0.0053 | 0.00530 | < 0.009 | < 0.0004 | 6.05 | < 0.00006 |
| 75: VO19281663R011 71 | 1.89 | 21.2 | 0.004 | 7.88 | 8.99 | < 0.0004 | 1420 | 0.006 | < 0.003 | 0.0281 | 0.00047 | < 0.009 | < 0.0004 | 1.05 | < 0.00006 |
| 76: VO19320118R039 72 | 5.41 | 26.2 | 0.020 | 2.16 | 0.119 | < 0.0004 | 1390 | 0.026 | 0.010 | 0.0060 | 0.00333 | < 0.009 | < 0.0004 | 3.76 | < 0.00006 |

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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report :** **CA11005-JUN20**

| Sample ID | Fe mg/L | K mg/L | Li mg/L | Mg mg/L | Mn mg/L | Mo mg/L | Na mg/L | Ni mg/L | P mg/L | Pb mg/L | U mg/L | Sb mg/L | Se mg/L | Si mg/L | Sn mg/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 77: VO18295487R037 73 | 0.24 | 23.8 | 0.002 | 4.28 | 9.01 | 0.0009 | 1370 | 0.010 | < 0.003 | 0.0448 | 0.00223 | < 0.009 | < 0.0004 | 1.17 | 0.00015 |
| 78: VO19048524R014 74 | 14.6 | 27.5 | 0.014 | 12.8 | 3.73 | 0.0020 | 1450 | 0.016 | < 0.003 | 0.0116 | 0.00228 | < 0.009 | < 0.0004 | 4.46 | 0.00008 |
| 79: VO19054445R009 75 | 26.1 | 34.6 | 0.007 | 3.05 | 5.91 | < 0.0004 | 1390 | 0.012 | < 0.003 | 0.0146 | 0.00401 | < 0.009 | < 0.0004 | 1.68 | 0.00012 |
| 80: VO19076137R025 76 | 5.47 | 27.6 | 0.016 | 3.24 | 0.545 | < 0.0004 | 1420 | 0.013 | 0.010 | 0.0141 | 0.00456 | < 0.009 | < 0.0004 | 3.28 | < 0.00006 |
| 81: VO19080569R021 77 | 2.64 | 27.6 | 0.009 | 2.32 | 1.62 | < 0.0004 | 1400 | 0.011 | 0.040 | 0.0019 | 0.00141 | < 0.009 | < 0.0004 | 2.40 | < 0.00006 |
| 82: VO19249690R009 78 | 6.35 | 31.1 | 0.009 | 3.73 | 1.23 | < 0.0004 | 1470 | 0.027 | < 0.003 | 0.0161 | 0.00591 | < 0.009 | < 0.0004 | 2.49 | < 0.00006 |
| 83: VO19249697R026 79 | 11.1 | 36.1 | 0.005 | 7.21 | 8.76 | < 0.0004 | 1450 | 0.008 | 0.030 | 0.0188 | 0.00166 | < 0.009 | < 0.0004 | 2.35 | < 0.00006 |
| 84: VO19063569R029 80 | 6.19 | 30.4 | 0.007 | 6.06 | 7.39 | < 0.0004 | 1460 | 0.007 | < 0.003 | 0.0198 | 0.00178 | < 0.009 | < 0.0004 | 1.87 | 0.00006 |

| Sample ID | Sr mg/L | Ti mg/L | Tl mg/L | V mg/L | Zn mg/L | Pulv200M 250g | |
|---|---|---|---|---|---|---|---|
| 3: Analysis Completed Date | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 14-Jul-20 | 13-Jul-20 | --- | --- |
| 4: Analysis Completed Time | 13:05 | 13:05 | 13:05 | 13:05 | 16:10 | --- | --- |
| 5: VO18273624R006 1 | 0.404 | < 0.0005 | 0.00008 | 0.00070 | 0.02 | 1 | 1 |
| 6: VO19104041R006 2 | 0.0978 | 0.0022 | 0.00009 | 0.00147 | < 0.02 | 1 | 1 |
| 7: VO18227465R012 3 | 0.967 | 0.0017 | 0.00012 | 0.00014 | < 0.02 | 1 | 1 |
| 8: VO18283892R049 4 | 0.314 | 0.0008 | 0.00016 | 0.00038 | 0.03 | 1 | 1 |
| 9: VO18326381R019 5 | 0.0543 | 0.0018 | 0.00009 | 0.00117 | < 0.02 | 1 | 1 |
| 10: VO19018165R040 6 | 2.90 | < 0.0005 | 0.00035 | 0.00036 | 0.04 | 1 | 1 |
| 11: VO19037627R049 7 | 0.233 | 0.0015 | 0.00012 | 0.00225 | 0.03 | 1 | 1 |
| 12: VO19012423R038 8 | 0.168 | 0.0009 | 0.00045 | 0.00204 | 0.03 | 1 | 1 |
| 13: VO19044866R038 9 | 0.429 | 0.0023 | 0.00008 | 0.00209 | 0.03 | 1 | 1 |
| 14: VO19049770R019 10 | 0.229 | 0.0011 | 0.00009 | 0.00125 | 0.03 | 1 | 1 |
| 15: VO19262649R023 11 | 0.928 | < 0.0005 | 0.00020 | 0.00046 | < 0.02 | 1 | 1 |
| 16: VO19252703R007 12 | 0.551 | < 0.0005 | 0.00013 | 0.00110 | 0.02 | 1 | 1 |
| 17: VO19252703R042 13 | 0.602 | 0.0010 | 0.00012 | 0.00120 | 0.02 | 1 | 1 |
| 18: V019252701R036 14 | 1.19 | < 0.0005 | 0.00021 | 0.00061 | 0.04 | 1 | 1 |
| 19: V019252701R039 15 | 0.500 | < 0.0005 | 0.00015 | 0.00149 | 0.02 | 1 | 1 |
| 20: VO19125199R035 16 | 0.186 | 0.0015 | 0.00012 | 0.00115 | < 0.02 | 1 | 1 |
| 21: VO19124996R002 17 | 2.47 | < 0.0005 | 0.00021 | 0.00019 | < 0.02 | 1 | 1 |
| 22: VO19124999R006 18 | 2.12 | < 0.0005 | 0.00015 | 0.00011 | < 0.02 | 1 | 1 |
| 23: VO19093187R018 19 | 0.0636 | 0.0010 | 0.00013 | 0.00131 | 0.07 | 1 | 1 |
| 24: VO19110215R042 20 | 0.0808 | 0.0012 | 0.00009 | 0.00194 | < 0.02 | 1 | 1 |
| 25: VO19140396R013 21 | 2.52 | < 0.0005 | 0.00022 | 0.00013 | 0.04 | 1 | 1 |
| 26: VO19112306R041 22 | 0.332 | 0.0011 | 0.00010 | 0.00082 | 0.03 | 1 | 1 |
| 27: VO19111152R003 23 | 0.391 | 0.0011 | 0.00015 | 0.00134 | 0.02 | 1 | 1 |

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Phone: 705-652-2000 FAX: 705-652-6365



| Sample ID | Sr mg/L | Ti mg/L | Tl mg/L | V mg/L | Zn mg/L | Pulv200M 250g | |
|---|---|---|---|---|---|---|---|
| 28: VO19111152R049 24 | 2.83 | < 0.0005 | 0.00024 | 0.00041 | < 0.02 | 1 | 1 |
| 29: VO19137440R016 25 | 2.78 | < 0.0005 | 0.00043 | 0.00096 | < 0.02 | 1 | 1 |
| 30: VO19128730R010 26 | 1.04 | < 0.0005 | 0.00022 | 0.00067 | < 0.02 | 1 | 1 |
| 31: VO19128730R046 27 | 1.14 | < 0.0005 | 0.00014 | 0.00006 | < 0.02 | 1 | 1 |
| 32: VO19118517R008 28 | 1.20 | < 0.0005 | 0.00016 | 0.00003 | < 0.02 | 1 | 1 |
| 33: VO19149798R006 29 | 0.712 | < 0.0005 | 0.00059 | 0.00071 | < 0.02 | 1 | 1 |
| 34: VO19132117R028 30 | 3.71 | 0.0005 | 0.00031 | 0.00010 | 0.07 | 1 | 1 |
| 35: VO19132117R032 31 | 1.29 | 0.0005 | 0.00018 | 0.00045 | < 0.02 | 1 | 1 |
| 36: VO19189405R042 32 | 0.205 | 0.0012 | 0.00007 | 0.00122 | 0.02 | 1 | 1 |
| 37: VO19202592R025 33 | 0.234 | 0.0026 | 0.00006 | 0.00133 | < 0.02 | 1 | 1 |
| 38: VO19241618R008 34 | 2.29 | < 0.0005 | 0.00025 | 0.00018 | < 0.02 | 1 | 1 |
| 39: VO19241601R016 35 | 2.50 | < 0.0005 | 0.00032 | 0.00001 | 0.02 | 1 | 1 |
| 40: VO19211878R038 36 | 0.0621 | 0.0006 | 0.00009 | 0.00047 | 0.02 | 1 | 1 |
| 41: V019165010R043 37 | 2.40 | < 0.0005 | 0.00010 | 0.00053 | < 0.02 | 1 | 1 |
| 42: VO19276647R046 38 | 4.04 | < 0.0005 | 0.00016 | 0.00002 | < 0.02 | 1 | 1 |
| 43: VO19195806R022 39 | 0.0962 | 0.0013 | 0.00007 | 0.00177 | < 0.02 | 1 | 1 |
| 44: V019216516R034 40 | 0.0375 | 0.0015 | 0.00007 | 0.00383 | < 0.02 | 1 | 1 |
| 45: V019226295R014 41 | 0.170 | 0.0010 | 0.00008 | 0.00173 | < 0.02 | 1 | 1 |
| 46: VO19211753R046 42 | 1.83 | < 0.0005 | 0.00021 | 0.00026 | < 0.02 | 1 | 1 |
| 47: V019185394R014 43 | 0.475 | 0.0009 | 0.00008 | 0.00101 | 0.03 | 1 | 1 |
| 48: VO19185519R031 44 | 0.887 | < 0.0005 | 0.00012 | 0.00018 | < 0.02 | 1 | 1 |
| 49: VO19185519R043 45 | 1.37 | < 0.0005 | 0.00017 | < 0.00001 | < 0.02 | 1 | 1 |
| 50: VO19185521R019 46 | 3.78 | < 0.0005 | 0.00024 | 0.00004 | < 0.02 | 1 | 1 |
| 51: VO19231738R002 47 | 0.170 | 0.0009 | 0.00009 | 0.00107 | 0.02 | 1 | 1 |
| 52: VO19234800R026 48 | 0.107 | 0.0007 | 0.00010 | 0.00198 | 0.02 | 1 | 1 |
| 53: VO19231549R050 49 | 0.127 | 0.0012 | 0.00011 | 0.00182 | 0.04 | 1 | 1 |
| 54: VO19202589R050 50 | 1.96 | < 0.0005 | 0.00015 | 0.00004 | < 0.02 | 1 | 1 |
| 55: VO19234784R038 51 | 0.0605 | 0.0015 | 0.00006 | 0.00098 | 0.02 | 1 | 1 |
| 56: VO19226180R012 52 | 0.496 | 0.0012 | 0.00008 | 0.00218 | < 0.02 | 1 | 1 |
| 57: VO19226290R005 53 | 1.72 | 0.0007 | 0.00006 | 0.00069 | < 0.02 | 1 | 1 |
| 58: VO19226290R011 54 | 0.893 | < 0.0005 | 0.00012 | 0.00059 | < 0.02 | 1 | 1 |
| 59: VO19246880R015 55 | 0.477 | 0.0006 | 0.00008 | 0.00083 | < 0.02 | 1 | 1 |
| 60: VO19246880R020 56 | 3.18 | < 0.0005 | 0.00054 | 0.00009 | < 0.02 | 1 | 1 |
| 61: VO19246880R026 57 | 4.38 | < 0.0005 | 0.00037 | 0.00033 | 0.02 | 1 | 1 |
| 62: VO19258344R050 58 | 0.975 | < 0.0005 | < 0.00005 | 0.00080 | 0.03 | 1 | 1 |
| 63: VO19258343R007 59 | 1.69 | 0.0016 | < 0.00005 | 0.00069 | < 0.02 | 1 | 1 |
| 64: VO19242574R046 60 | 0.251 | 0.0012 | < 0.00005 | 0.00166 | < 0.02 | 1 | 1 |

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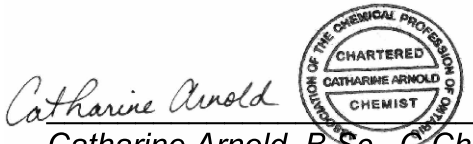
| Sample ID | Sr mg/L | Ti mg/L | Tl mg/L | V mg/L | Zn mg/L | | Pulv200M 250g |
|---|---|---|---|---|---|---|---|
| 65: VO18283892R001 61 | 0.125 | 0.0009 | 0.00006 | 0.00203 | 0.03 | 1 | 1 |
| 66: VO19244666R016 62 | 4.64 | < 0.0005 | 0.00025 | 0.00002 | 0.03 | 1 | 1 |
| 67: VO19244666R045 63 | 0.141 | 0.0021 | < 0.00005 | 0.00175 | 0.02 | 1 | 1 |
| 68: VO19286662R011 64 | 1.26 | < 0.0005 | 0.00015 | < 0.00001 | < 0.02 | 1 | 1 |
| 69: VO19286662R026 65 | 0.272 | 0.0012 | < 0.00005 | 0.00228 | 0.02 | 1 | 1 |
| 70: VO19283031R002 66 | 0.451 | 0.0014 | < 0.00005 | 0.00135 | 0.04 | 1 | 1 |
| 71: VO19285337R011 67 | 10.4 | 0.0005 | 0.00032 | 0.00057 | < 0.02 | 1 | 1 |
| 72: VO19285236R001 68 | 1.02 | 0.0011 | 0.00022 | 0.00111 | < 0.02 | 1 | 1 |
| 73: VO19285236R008 69 | 0.591 | < 0.0005 | 0.00014 | 0.00048 | < 0.02 | 1 | 1 |
| 74: VO19295741R024 70 | 0.0768 | 0.0012 | < 0.00005 | 0.00090 | 0.03 | 1 | 1 |
| 75: VO19281663R011 71 | 9.01 | < 0.0005 | 0.00008 | < 0.00001 | < 0.02 | 1 | 1 |
| 76: VO19320118R039 72 | 0.0366 | 0.0015 | < 0.00005 | 0.00247 | 0.02 | 1 | 1 |
| 77: VO18295487R037 73 | 1.46 | < 0.0005 | 0.00013 | 0.00009 | < 0.02 | 1 | 1 |
| 78: VO19048524R014 74 | 0.243 | 0.0009 | < 0.00005 | 0.00115 | 0.03 | 1 | 1 |
| 79: VO19054445R009 75 | 0.664 | < 0.0005 | 0.00022 | < 0.00001 | 0.82 | 1 | 1 |
| 80: VO19076137R025 76 | 0.134 | 0.0013 | < 0.00005 | 0.00221 | 0.04 | 1 | 1 |
| 81: VO19080569R021 77 | 0.213 | 0.0007 | 0.00012 | 0.00061 | < 0.02 | 1 | 1 |
| 82: VO19249690R009 78 | 0.166 | 0.0017 | 0.00007 | 0.00209 | 0.03 | 1 | 1 |
| 83: VO19249697R026 79 | 0.944 | < 0.0005 | < 0.00005 | 0.00081 | 0.02 | 1 | 1 |
| 84: VO19063569R029 80 | 0.841 | 0.0012 | 0.00005 | 0.00133 | < 0.02 | 1 | 1 |

Extraction Fluid #1 - pH 4.93 ± 0.05
5.7mLs of acetic acid plus 64.3 mLs of 1.0N NaOH bulked to 1L with deionized water.

Extraction Fluid #2 - pH 2.88 ± 0.05
5.7 mLs of acetic acid bulked to 1L with deionized water.




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
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10-September-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 21 August 2020
**LR Report:** **CA11006-AUG20**
**Reference:** East Gouldie

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO18283892R0 49 4 | 6: VO19125199R0 35 16 | 7: VO19132117R0 32 31 | 8: VO19241601R0 16 35 | 9: VO19211753R0 46 42 | 10: VO19185519R0 31 44 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 27-Aug-20 | 11:30 | 2.02 | 1.98 | 1.99 | 2.00 | 2.00 | 1.99 |
| Initial pH | 27-Aug-20 | 11:30 | 9.76 | 9.73 | 9.82 | 9.83 | 9.81 | 9.78 |
| Vol H2SO4 [mL] | 27-Aug-20 | 11:30 | 0.95 | 0.70 | 1.85 | 1.50 | 1.60 | 1.65 |
| H2SO4 [Normality] | 27-Aug-20 | 11:30 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NP [t CaCO3/1000 t] | 27-Aug-20 | 11:30 | 23.5 | 17.7 | 46.5 | 37.5 | 40.0 | 41.5 |
| AP [t CaCO3/1000 t] | 09-Sep-20 | 16:29 | 9.56 | 7.44 | 37.7 | 71.6 | 52.1 | 16.8 |
| NNP [kg CaCO3/ tonne] | 09-Sep-20 | 16:29 | 14 | 10 | 8.8 | -34.1 | -12.1 | 25 |
| S [%] | 09-Sep-20 | 16:29 | 0.306 | 0.238 | 1.20 | 2.29 | 1.67 | 0.536 |
| Acid Leachable SO4-S [%] | 09-Sep-20 | 16:28 | 0.15 | 0.08 | 0.16 | 0.23 | 0.25 | 0.10 |
| Sulphide [%] | 04-Sep-20 | 09:05 | 0.16 | 0.16 | 1.05 | 2.06 | 1.42 | 0.44 |
| C [%] | 02-Sep-20 | 16:49 | 0.169 | 0.108 | 0.475 | 0.371 | 0.399 | 0.419 |
| CO3 [%] | 02-Sep-20 | 16:49 | 0.570 | 0.385 | 1.65 | 1.17 | 1.27 | 1.62 |

| Analysis | 11: VO19185519R0 43 45 | 12: VO19231738R0 02 47 | 13: VO19234800R0 26 48 | 14: VO19202589R0 50 50 | 15: VO19226290R0 11 54 | 16: VO19258344R0 50 58 | 17: VO19258343R0 07 59 | 18: VO19242574R0 46 60 |
|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 1.99 | 1.99 | 2.01 | 2.02 | 2.00 | 2.01 | 2.01 | 1.99 |
| Initial pH | 9.64 | 9.64 | 9.62 | 9.72 | 9.64 | 9.52 | 9.60 | 9.39 |
| Vol H2SO4 [mL] | 1.85 | 0.60 | 0.55 | 2.15 | 1.15 | 5.30 | 0.95 | 0.85 |
| H2SO4 [Normality] | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NP [t CaCO3/1000 t] | 46.5 | 15.1 | 13.7 | 53.2 | 28.8 | 132 | 23.6 | 21.4 |
| AP [t CaCO3/1000 t] | 68.5 | 9.28 | 7.84 | 89.5 | 30.7 | 16.5 | 15.3 | 14.2 |
| NNP [kg CaCO3/ tonne] | -22.0 | 5.8 | 5.9 | -36.3 | -1.9 | 115 | 8.3 | 7.2 |
| S [%] | 2.19 | 0.297 | 0.251 | 2.86 | 0.981 | 0.528 | 0.489 | 0.456 |
| Acid Leachable SO4-S [%] | 0.06 | 0.10 | 0.11 | < 0.04 | 0.04 | 0.12 | 0.07 | 0.10 |
| Sulphide [%] | 2.13 | 0.20 | 0.14 | 2.86 | 0.94 | 0.41 | 0.42 | 0.36 |
| C [%] | 0.503 | 0.040 | 0.033 | 0.622 | 0.225 | 0.328 | 0.157 | 0.144 |
| CO3 [%] | 1.65 | 0.100 | 0.070 | 1.99 | 0.784 | 1.21 | 0.540 | 0.485 |

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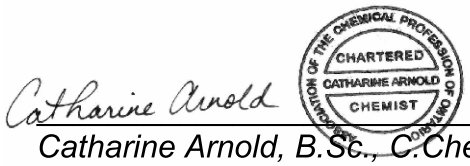
**LR Report :** **CA11006-AUG20**

| Analysis | 19: VO19285337R0 11 67 | 20: VO19285236R0 08 69 | 21: VO18295487R0 37 73 | 22: VO19054445R0 09 75 | 23: VO19076137R0 25 76 | 24: VO19249690R0 09 78 |
|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 2.00 | 2.02 | 1.99 | 2.00 | 1.99 | 2.00 |
| Initial pH | 9.18 | 9.42 | 9.58 | 9.50 | 9.34 | 9.27 |
| Vol H2SO4 [mL] | 6.15 | 1.25 | 2.25 | 1.25 | 0.55 | 0.55 |
| H2SO4 [Normality] | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NP [t CaCO3/1000 t] | 154 | 30.9 | 56.5 | 31.2 | 13.8 | 13.8 |
| AP [t CaCO3/1000 t] | 49.8 | 26.0 | 81.7 | 29.6 | 6.88 | 12.2 |
| NNP [kg CaCO3/ tonne] | 104 | 4.9 | -25.2 | 1.6 | 6.9 | 1.6 |
| S [%] | 1.59 | 0.831 | 2.62 | 0.946 | 0.220 | 0.389 |
| Acid Leachable SO4-S [%] | 0.33 | 0.06 | 0.14 | 0.09 | 0.10 | 0.20 |
| Sulphide [%] | 1.26 | 0.77 | 2.48 | 0.86 | 0.12 | 0.19 |
| C [%] | 1.86 | 0.272 | 0.640 | 0.270 | 0.046 | 0.040 |
| CO3 [%] | 7.97 | 0.969 | 2.28 | 0.949 | 0.115 | 0.090 |

MA110 ACISOL 1.0

Gross NP (kg CaCO3/tonne) Section 7.3
AP (kg CaCO3/tonne) = Total S x 31.25

ASTM E1918 - S and C speciation

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*Project Specialist,*
*Environment, Health & Safety*

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

03-July-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 12 June 2020
**LR Report:** **CA11006-JUN20**
**Reference:** TR: Modifie - R - 466556

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO18273624R0 06 1 | 6: VO19104041R0 06 2 | 7: VO18227465R0 12 3 | 8: VO18283892R0 49 4 | 9: VO18326381R0 19 5 | 10: VO19018165R0 40 6 | 11: VO19037627R0 49 7 | 12: VO19012423R0 38 8 | 13: VO19044866R0 38 9 | 14: VO19049770R0 19 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 23-Jun-20 | 15:07 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ext Fluid [#1 or #2] | 23-Jun-20 | 15:07 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 23-Jun-20 | 15:07 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 23-Jun-20 | 15:07 | 9.56 | 9.06 | 9.15 | 9.50 | 9.20 | 9.66 | 9.61 | 9.62 | 9.20 | 9.55 |
| Fluoride [mg/L] | 24-Jun-20 | 13:26 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Sulphate [mg/L] | 29-Jun-20 | 11:07 | 3.8 | 3.6 | 8.3 | 3.1 | 4.3 | 4.1 | 2.9 | 3.3 | 50 | 2.9 |
| Chloride [mg/L] | 26-Jun-20 | 20:49 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | 26-Jun-20 | 20:49 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | 26-Jun-20 | 20:49 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | 26-Jun-20 | 20:49 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 29-Jun-20 | 10:31 | 67 | 36 | 73 | 59 | 45 | 65 | 57 | 56 | 153 | 53 |
| Alkalinity [mg/L as CaCO3] | 26-Jun-20 | 14:05 | 28 | 12 | 23 | 26 | 12 | 28 | 32 | 30 | 15 | 23 |
| Acidity [mg/L as CaCO3] | 26-Jun-20 | 14:05 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| pH [no unit] | 26-Jun-20 | 14:05 | 8.15 | 8.00 | 8.10 | 8.06 | 7.79 | 9.04 | 8.66 | 8.56 | 7.85 | 7.97 |
| Mercury [mg/L] | 26-Jun-20 | 10:03 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 30-Jun-20 | 15:19 | 0.770 | 0.604 | 0.367 | 0.809 | 0.498 | 0.467 | 0.795 | 0.606 | 0.456 | 0.762 |
| Arsenic [mg/L] | 26-Jun-20 | 10:04 | 0.0006 | < 0.0002 | 0.0006 | 0.0006 | < 0.0002 | 0.0016 | 0.0004 | 0.0024 | 0.0005 | 0.0007 |
| Silver [mg/L] | 26-Jun-20 | 10:04 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 26-Jun-20 | 10:04 | 0.00238 | 0.00351 | 0.00695 | 0.00516 | 0.00828 | 0.0982 | 0.00860 | 0.0202 | 0.00839 | 0.00564 |
| Beryllium [mg/L] | 26-Jun-20 | 10:04 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | 26-Jun-20 | 10:04 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

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Phone: 705-652-2000 FAX: 705-652-6365

**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO18273624R0 06 1 | 6: VO19104041R0 06 2 | 7: VO18227465R0 12 3 | 8: VO18283892R0 49 4 | 9: VO18326381R0 19 5 | 10: VO19018165R0 40 6 | 11: VO19037627R0 49 7 | 12: VO19012423R0 38 8 | 13: VO19044866R0 38 9 | 14: VO19049770R0 19 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bismuth [mg/L] | 26-Jun-20 | 10:04 | < 0.000007 | 0.000021 | 0.000008 | < 0.000007 | 0.000013 | < 0.000007 | < 0.000007 | 0.000007 | 0.000008 | 0.000007 |
| Calcium [mg/L] | 26-Jun-20 | 10:04 | 4.45 | 1.47 | 9.79 | 5.40 | 2.66 | 5.04 | 4.04 | 4.57 | 19.5 | 4.30 |
| Cadmium [mg/L] | 26-Jun-20 | 10:04 | < 0.000003 | 0.000005 | 0.000003 | 0.000004 | < 0.000003 | 0.000003 | < 0.000003 | 0.000003 | < 0.000003 | 0.000004 |
| Cobalt [mg/L] | 26-Jun-20 | 10:04 | 0.000006 | 0.000032 | 0.000010 | 0.000007 | 0.000042 | < 0.000004 | 0.000033 | 0.000012 | 0.000007 | 0.000021 |
| Chromium [mg/L] | 26-Jun-20 | 10:04 | 0.00017 | 0.00033 | < 0.00008 | 0.00008 | 0.00042 | 0.00016 | 0.00022 | 0.00026 | < 0.00008 | 0.00022 |
| Copper [mg/L] | 26-Jun-20 | 10:04 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002 | < 0.0002 | < 0.0002 | 0.0003 |
| Iron [mg/L] | 26-Jun-20 | 10:04 | 0.014 | 0.067 | < 0.007 | 0.016 | 0.075 | 0.015 | 0.051 | 0.029 | < 0.007 | 0.052 |
| Potassium [mg/L] | 26-Jun-20 | 10:04 | 9.47 | 5.62 | 2.35 | 6.72 | 6.05 | 7.46 | 7.90 | 7.34 | 7.41 | 6.03 |
| Lithium [mg/L] | 26-Jun-20 | 10:04 | 0.0030 | 0.0022 | 0.0005 | 0.0013 | 0.0043 | 0.0018 | 0.0041 | 0.0074 | 0.0018 | 0.0007 |
| Magnesium [mg/L] | 26-Jun-20 | 10:04 | 0.332 | 0.301 | 0.325 | 0.384 | 0.350 | 0.379 | 0.304 | 0.314 | 0.529 | 0.318 |
| Manganese [mg/L] | 26-Jun-20 | 10:04 | 0.00035 | 0.00105 | 0.00216 | 0.00067 | 0.00143 | 0.00047 | 0.00102 | 0.00094 | 0.00137 | 0.00075 |
| Molybdenum [mg/L] | 26-Jun-20 | 10:04 | 0.00023 | 0.00244 | 0.00037 | 0.00023 | 0.00017 | 0.00013 | 0.00016 | 0.00004 | 0.00018 | 0.00009 |
| Sodium [mg/L] | 26-Jun-20 | 10:04 | 2.02 | 1.43 | 1.47 | 1.50 | 1.27 | 2.51 | 1.45 | 1.33 | 1.55 | 1.60 |
| Nickel [mg/L] | 26-Jun-20 | 10:04 | < 0.0001 | 0.0002 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | 26-Jun-20 | 10:04 | < 0.003 | 0.012 | < 0.003 | < 0.003 | 0.013 | 0.005 | 0.011 | 0.009 | 0.008 | 0.006 |
| Lead [mg/L] | 26-Jun-20 | 10:04 | 0.00002 | 0.00083 | 0.00078 | 0.00079 | 0.00010 | 0.00003 | 0.00048 | 0.00004 | 0.00002 | 0.00005 |
| Antimony [mg/L] | 26-Jun-20 | 10:04 | < 0.0009 | 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | 0.0017 | < 0.0009 | 0.0011 | < 0.0009 | < 0.0009 |
| Selenium [mg/L] | 26-Jun-20 | 10:04 | 0.00019 | 0.00012 | 0.00006 | 0.00018 | 0.00010 | 0.00022 | 0.00014 | 0.00014 | 0.00015 | < 0.00004 |
| Silicon [mg/L] | 26-Jun-20 | 10:04 | 2.06 | 1.45 | 1.80 | 1.67 | 1.49 | 2.12 | 2.02 | 1.64 | 1.73 | 1.93 |
| Tin [mg/L] | 26-Jun-20 | 10:04 | < 0.00006 | 0.00020 | 0.00014 | 0.00006 | 0.00022 | < 0.00006 | 0.00011 | 0.00025 | 0.00011 | 0.00016 |
| Strontium [mg/L] | 03-Jul-20 | 14:38 | 0.0188 | 0.00906 | 0.0420 | 0.0182 | 0.0138 | 0.0767 | 0.0190 | 0.0175 | 0.128 | 0.0305 |
| Titanium [mg/L] | 26-Jun-20 | 10:04 | 0.00084 | 0.00338 | 0.00022 | 0.00067 | 0.00481 | 0.00023 | 0.00342 | 0.00149 | 0.00032 | 0.00297 |
| Thallium [mg/L] | 26-Jun-20 | 10:04 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 |
| Uranium [mg/L] | 26-Jun-20 | 10:04 | 0.000071 | 0.000018 | 0.000106 | 0.000144 | 0.000746 | 0.000129 | 0.000235 | 0.000071 | 0.000046 | 0.000153 |
| Vanadium [mg/L] | 26-Jun-20 | 10:04 | 0.00546 | 0.00243 | 0.00066 | 0.00298 | 0.00224 | 0.00404 | 0.00403 | 0.00330 | 0.00220 | 0.00292 |
| Zinc [mg/L] | 26-Jun-20 | 10:04 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 15: VO19262649R0 23 11 | 16: VO19252703R0 07 12 | 17: VO19252703R0 42 13 | 18: V019252701R0 36 14 | 19: V019252701R0 39 15 | 20: VO19125199R0 35 16 | 21: VO19124996R0 02 17 | 22: VO19124999R0 06 18 | 23: VO19093187R0 18 19 | 24: VO19110215R0 42 20 | 25: VO19140396R0 13 21 | 26: VO19112306R0 41 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 9.38 | 9.49 | 9.36 | 9.55 | 9.59 | 9.52 | 9.61 | 9.62 | 9.48 | 9.53 | 9.56 | 9.58 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Sulphate [mg/L] | 16 | 16 | 15 | 3.3 | 3.1 | 4.4 | 5.4 | 5.6 | 3.6 | 3.0 | 4.1 | 3.3 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 15: VO19262649R0 23 11 | 16: VO19252703R0 07 12 | 17: VO19252703R0 42 13 | 18: V019252701R0 36 14 | 19: V019252701R0 39 15 | 20: VO19125199R0 35 16 | 21: VO19124996R0 02 17 | 22: VO19124999R0 06 18 | 23: VO19093187R0 18 19 | 24: VO19110215R0 42 20 | 25: VO19140396R0 13 21 | 26: VO19112306R0 41 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 85 | 84 | 87 | 62 | 60 | 59 | 62 | 64 | 52 | 55 | 64 | 58 |
| Alkalinity [mg/L as CaCO3] | 29 | 22 | 24 | 31 | 27 | 24 | 31 | 26 | 24 | 25 | 29 | 27 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| pH [no unit] | 8.17 | 8.47 | 7.98 | 8.55 | 8.06 | 7.96 | 8.39 | 8.34 | 8.24 | 8.11 | 8.65 | 8.26 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.479 | 0.674 | 0.724 | 0.725 | 0.779 | 0.675 | 0.460 | 0.570 | 0.840 | 0.951 | 0.604 | 0.615 |
| Arsenic [mg/L] | 0.0006 | 0.0007 | 0.0016 | 0.0010 | 0.0005 | 0.0005 | 0.0007 | 0.0023 | < 0.0002 | 0.0007 | 0.0007 | 0.0005 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.00342 | 0.00314 | 0.00233 | 0.00446 | 0.00159 | 0.00454 | 0.0566 | 0.00513 | 0.00348 | 0.00195 | 0.00382 | 0.00353 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.003 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000016 | 0.000007 | 0.000008 | 0.000008 | < 0.000007 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 8.86 | 8.00 | 8.28 | 5.32 | 4.78 | 5.03 | 5.70 | 6.14 | 5.13 | 3.57 | 5.80 | 4.34 |
| Cadmium [mg/L] | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000003 |
| Cobalt [mg/L] | 0.000005 | 0.000010 | 0.000010 | < 0.000004 | 0.000007 | 0.000025 | 0.000005 | 0.000006 | 0.000033 | 0.000026 | 0.000005 | 0.000010 |
| Chromium [mg/L] | < 0.00008 | 0.00013 | 0.00015 | 0.00012 | 0.00016 | 0.00032 | 0.00009 | < 0.00008 | 0.00032 | 0.00025 | 0.00012 | 0.00023 |
| Copper [mg/L] | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0002 | < 0.0002 | < 0.0002 | 0.0002 | < 0.0002 | < 0.0002 | 0.0003 |
| Iron [mg/L] | < 0.007 | 0.011 | 0.015 | 0.009 | 0.020 | 0.061 | 0.007 | < 0.007 | 0.055 | 0.052 | 0.008 | 0.027 |
| Potassium [mg/L] | 5.19 | 7.99 | 7.63 | 6.47 | 7.48 | 5.88 | 5.68 | 5.71 | 5.71 | 8.64 | 5.48 | 6.88 |
| Lithium [mg/L] | 0.0010 | 0.0020 | 0.0022 | 0.0022 | 0.0026 | 0.0023 | 0.0008 | 0.0012 | 0.0023 | 0.0025 | 0.0011 | 0.0024 |
| Magnesium [mg/L] | 0.476 | 0.404 | 0.428 | 0.335 | 0.315 | 0.403 | 0.337 | 0.447 | 0.313 | 0.251 | 0.484 | 0.460 |
| Manganese [mg/L] | 0.00082 | 0.00067 | 0.00091 | 0.00057 | 0.00075 | 0.00200 | 0.00070 | 0.00110 | 0.00182 | 0.00111 | 0.00082 | 0.00137 |
| Molybdenum [mg/L] | 0.00016 | 0.00025 | 0.00205 | 0.00008 | 0.00022 | 0.00020 | 0.00014 | 0.00019 | 0.00020 | 0.00010 | 0.00016 | 0.00012 |
| Sodium [mg/L] | 2.35 | 1.53 | 1.76 | 2.03 | 1.37 | 1.71 | 1.89 | 1.75 | 0.71 | 1.16 | 1.78 | 1.99 |
| Nickel [mg/L] | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | < 0.003 | < 0.003 | 0.003 | < 0.003 | 0.003 | 0.007 | < 0.003 | < 0.003 | 0.009 | 0.013 | < 0.003 | 0.008 |
| Lead [mg/L] | 0.00025 | 0.00001 | 0.00003 | < 0.00001 | 0.00018 | 0.00013 | 0.00015 | 0.00029 | 0.00006 | 0.00003 | 0.00001 | 0.00003 |
| Antimony [mg/L] | < 0.0009 | 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | 0.0012 | < 0.0009 | 0.0011 | < 0.0009 | < 0.0009 |
| Selenium [mg/L] | 0.00010 | 0.00013 | 0.00017 | 0.00012 | 0.00014 | 0.00016 | 0.00012 | 0.00007 | 0.00010 | 0.00009 | 0.00009 | 0.00006 |
| Silicon [mg/L] | 1.95 | 1.97 | 2.16 | 2.24 | 2.27 | 1.62 | 1.84 | 1.87 | 1.98 | 2.09 | 2.03 | 2.02 |
| Tin [mg/L] | < 0.00006 | 0.00018 | < 0.00006 | < 0.00006 | 0.00019 | < 0.00006 | 0.00020 | 0.00019 | 0.00020 | < 0.00006 | 0.00025 | 0.00008 |
| Strontium [mg/L] | 0.0732 | 0.0380 | 0.0533 | 0.0259 | 0.0174 | 0.0180 | 0.0871 | 0.179 | 0.0128 | 0.00861 | 0.0734 | 0.0270 |
| Titanium [mg/L] | 0.00018 | 0.00058 | 0.00104 | 0.00053 | 0.00135 | 0.00396 | 0.00046 | 0.00028 | 0.00382 | 0.00286 | 0.00039 | 0.00165 |
| Thallium [mg/L] | < 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000005 | 0.000005 | < 0.000005 | < 0.000005 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 15: VO19262649R0 23 11 | 16: VO19252703R0 07 12 | 17: VO19252703R0 42 13 | 18: V019252701R0 36 14 | 19: V019252701R0 39 15 | 20: VO19125199R0 35 16 | 21: VO19124996R0 02 17 | 22: VO19124999R0 06 18 | 23: VO19093187R0 18 19 | 24: VO19110215R0 42 20 | 25: VO19140396R0 13 21 | 26: VO19112306R0 41 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Uranium [mg/L] | 0.000075 | 0.000304 | 0.000055 | 0.000089 | 0.000116 | 0.000051 | 0.000067 | 0.000070 | 0.000429 | 0.000120 | 0.000021 | 0.000138 |
| Vanadium [mg/L] | 0.00295 | 0.00393 | 0.00463 | 0.00474 | 0.00476 | 0.00262 | 0.00204 | 0.00295 | 0.00351 | 0.00347 | 0.00333 | 0.00260 |
| Zinc [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 27: VO19111152R0 03 23 | 28: VO19111152R0 49 24 | 29: VO19137440R0 16 25 | 30: VO19128730R0 10 26 | 31: VO19128730R0 46 27 | 32: VO19118517R0 08 28 | 33: VO19149798R0 06 29 | 34: VO19132117R0 28 30 | 35: VO19132117R0 32 31 | 36: VO19189405R0 42 32 | 37: VO19202592R0 25 33 | 38: VO19241618R0 08 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 9.47 | 9.67 | 9.72 | 9.35 | 9.58 | 9.34 | 9.78 | 9.35 | 9.54 | 9.60 | 9.51 | 9.51 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | 0.08 | < 0.06 | < 0.06 | < 0.06 |
| Sulphate [mg/L] | 5.7 | 2.6 | 2.5 | 10 | 4.1 | 5.1 | 2.7 | 13 | 7.5 | 3.0 | 9.2 | 3.3 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 61 | 58 | 62 | 75 | 60 | 62 | 57 | 85 | 72 | 56 | 71 | 66 |
| Alkalinity [mg/L as CaCO3] | 22 | 27 | 30 | 26 | 27 | 22 | 24 | 22 | 24 | 25 | 32 | 26 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| pH [no unit] | 7.81 | 8.45 | 8.38 | 8.00 | 8.18 | 7.93 | 8.30 | 7.97 | 7.95 | 8.32 | 8.51 | 8.01 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.664 | 0.724 | 0.620 | 0.615 | 0.534 | 0.477 | 0.557 | 0.244 | 0.448 | 0.786 | 0.719 | 0.634 |
| Arsenic [mg/L] | 0.0008 | 0.0007 | < 0.0002 | 0.0008 | 0.0006 | 0.0002 | < 0.0002 | 0.0008 | 0.0003 | 0.0003 | 0.0007 | 0.0006 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.00181 | 0.00292 | 0.0106 | 0.0100 | 0.00942 | 0.00310 | 0.0204 | 0.00254 | 0.00261 | 0.00229 | 0.00260 | 0.00360 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.003 | < 0.002 | < 0.002 |
| Bismuth [mg/L] | 0.000008 | 0.000008 | 0.000011 | 0.000010 | 0.000010 | 0.000011 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000009 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 5.59 | 5.56 | 4.66 | 8.34 | 5.59 | 7.46 | 5.46 | 9.10 | 6.05 | 4.19 | 6.06 | 6.22 |
| Cadmium [mg/L] | 0.000004 | < 0.000003 | 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000004 | < 0.000003 | < 0.000003 | 0.000003 | < 0.000003 |
| Cobalt [mg/L] | 0.000009 | 0.000005 | < 0.000004 | 0.000008 | < 0.000004 | 0.000007 | 0.000004 | 0.000010 | < 0.000004 | 0.000035 | 0.000022 | < 0.000004 |
| Chromium [mg/L] | 0.00028 | < 0.00008 | 0.00015 | < 0.00008 | < 0.00008 | < 0.00008 | < 0.00008 | 0.00008 | 0.00012 | 0.00026 | 0.00025 | 0.00010 |
| Copper [mg/L] | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0003 | < 0.0002 | < 0.0002 | 0.0002 |
| Iron [mg/L] | 0.029 | 0.014 | < 0.007 | 0.008 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | 0.051 | 0.036 | < 0.007 |
| Potassium [mg/L] | 6.65 | 5.91 | 9.65 | 4.99 | 4.22 | 2.79 | 6.36 | 4.06 | 6.81 | 7.32 | 7.90 | 5.40 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report : CA11006-JUN20**

| Analysis | 27: VO19111152R0 03 23 | 28: VO19111152R0 49 24 | 29: VO19137440R0 16 25 | 30: VO19128730R0 10 26 | 31: VO19128730R0 46 27 | 32: VO19118517R0 08 28 | 33: VO19149798R0 06 29 | 34: VO19132117R0 28 30 | 35: VO19132117R0 32 31 | 36: VO19189405R0 42 32 | 37: VO19202592R0 25 33 | 38: VO19241618R0 08 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lithium [mg/L] | 0.0022 | 0.0008 | 0.0027 | 0.0013 | 0.0008 | 0.0007 | 0.0038 | 0.0010 | 0.0018 | 0.0060 | 0.0027 | 0.0015 |
| Magnesium [mg/L] | 0.445 | 0.437 | 0.239 | 0.424 | 0.372 | 0.311 | 0.281 | 0.842 | 0.486 | 0.303 | 0.422 | 0.412 |
| Manganese [mg/L] | 0.00130 | 0.00073 | 0.00024 | 0.00096 | 0.00059 | 0.00165 | 0.00033 | 0.00234 | 0.00070 | 0.00080 | 0.00107 | 0.00066 |
| Molybdenum [mg/L] | 0.00046 | 0.00031 | 0.00006 | 0.00026 | 0.00031 | 0.00022 | < 0.00004 | 0.00027 | 0.00074 | 0.00006 | 0.00022 | 0.00009 |
| Sodium [mg/L] | 0.94 | 1.50 | 0.76 | 1.83 | 2.10 | 1.96 | 1.04 | 2.13 | 2.40 | 1.36 | 1.68 | 1.87 |
| Nickel [mg/L] | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0002 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | 0.003 | < 0.003 | < 0.003 | 0.005 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | 0.015 | 0.004 | < 0.003 |
| Lead [mg/L] | 0.00006 | 0.00004 | 0.00003 | 0.00021 | 0.00008 | 0.00003 | 0.00002 | < 0.00001 | 0.00002 | 0.00008 | 0.00006 | 0.00002 |
| Antimony [mg/L] | < 0.0009 | 0.0011 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Selenium [mg/L] | 0.00007 | 0.00004 | 0.00006 | 0.00006 | 0.00010 | 0.00012 | 0.00005 | 0.00012 | 0.00006 | 0.00021 | 0.00020 | 0.00007 |
| Silicon [mg/L] | 1.88 | 1.89 | 1.82 | 2.01 | 1.84 | 1.76 | 1.88 | 1.67 | 1.65 | 1.99 | 2.07 | 2.03 |
| Tin [mg/L] | 0.00011 | 0.00015 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00019 | < 0.00006 | < 0.00006 | 0.00048 | 0.00020 | < 0.00006 | < 0.00006 |
| Strontium [mg/L] | 0.0161 | 0.0346 | 0.0301 | 0.155 | 0.0463 | 0.0404 | 0.0264 | 0.124 | 0.0502 | 0.0226 | 0.0205 | 0.125 |
| Titanium [mg/L] | 0.00227 | 0.00103 | 0.00020 | 0.00055 | 0.00015 | 0.00024 | 0.00038 | 0.00025 | 0.00016 | 0.00328 | 0.00263 | 0.00037 |
| Thallium [mg/L] | 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000005 | 0.000005 | 0.000005 | 0.000005 | < 0.000005 | < 0.000005 |
| Uranium [mg/L] | 0.000075 | 0.000019 | 0.000009 | 0.000104 | 0.000024 | 0.000117 | 0.000070 | 0.000034 | 0.000010 | 0.000052 | 0.000121 | 0.000023 |
| Vanadium [mg/L] | 0.00526 | 0.00550 | 0.00493 | 0.00299 | 0.00297 | 0.00150 | 0.00295 | 0.00102 | 0.00401 | 0.00392 | 0.00390 | 0.00347 |
| Zinc [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.021 |

| Analysis | 39: VO19241601R0 16 35 | 40: VO19211878R0 38 36 | 41: V019165010R0 43 37 | 42: VO19276647R0 46 38 | 43: VO19195806R0 22 39 | 44: V019216516R0 34 40 | 45: V019226295R0 14 41 | 46: VO19211753R0 46 42 | 47: V019185394R0 14 43 | 48: VO19185519R0 31 44 | 49: VO19185519R0 43 45 | 50: VO19185521R0 19 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 9.45 | 9.05 | 9.35 | 9.58 | 9.38 | 9.13 | 8.97 | 9.43 | 9.55 | 9.58 | 9.08 | 9.14 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | 0.06 | < 0.06 | < 0.06 |
| Sulphate [mg/L] | 4.3 | 2.6 | 12 | 3.4 | 3.7 | 2.5 | 44 | 8.4 | 3.5 | 3.3 | 37 | 38 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 63 | 36 | 86 | 60 | 54 | 38 | 146 | 79 | 70 | 72 | 136 | 141 |
| Alkalinity [mg/L as CaCO3] | 25 | 13 | 23 | 27 | 17 | 12 | 15 | 26 | 26 | 33 | 22 | 22 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| pH [no unit] | 8.42 | 8.05 | 7.86 | 8.59 | 7.98 | 7.78 | 7.75 | 7.99 | 8.03 | 8.10 | 7.64 | 7.83 |

OnLine LIMS

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 39: VO19241601R0 16 35 | 40: VO19211878R0 38 36 | 41: V019165010R0 43 37 | 42: VO19276647R0 46 38 | 43: VO19195806R0 22 39 | 44: V019216516R0 34 40 | 45: V019226295R0 14 41 | 46: VO19211753R0 46 42 | 47: V019185394R0 14 43 | 48: VO19185519R0 31 44 | 49: VO19185519R0 43 45 | 50: VO19185521R0 19 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.574 | 0.841 | 0.587 | 0.593 | 0.800 | 0.719 | 0.587 | 0.612 | 1.23 | 0.725 | 0.349 | 0.350 |
| Arsenic [mg/L] | 0.0012 | < 0.0002 | 0.0006 | 0.0011 | 0.0027 | 0.0014 | 0.0007 | 0.0017 | 0.0014 | 0.0006 | 0.0005 | 0.0008 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.00313 | 0.00212 | 0.0311 | 0.00848 | 0.00372 | 0.00698 | 0.0142 | 0.00207 | 0.00703 | 0.00162 | 0.00515 | 0.00621 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | 0.004 | 0.005 | 0.004 | 0.003 | 0.004 | 0.003 | 0.003 | 0.003 | 0.003 | 0.002 | 0.002 | 0.002 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | 0.000008 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 7.02 | 2.36 | 10.1 | 5.39 | 3.09 | 1.15 | 19.1 | 7.19 | 5.89 | 5.40 | 18.3 | 17.6 |
| Cadmium [mg/L] | < 0.000003 | < 0.000003 | < 0.000003 | 0.000005 | 0.000004 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000004 | < 0.000003 | < 0.000003 | < 0.000003 |
| Cobalt [mg/L] | < 0.000004 | 0.000045 | 0.000014 | 0.000005 | 0.000035 | 0.000047 | 0.000018 | 0.000004 | 0.000009 | 0.000004 | 0.000007 | 0.000007 |
| Chromium [mg/L] | 0.00011 | 0.00035 | 0.00008 | 0.00012 | 0.00026 | 0.00036 | 0.00009 | 0.00013 | 0.00014 | 0.00013 | < 0.00008 | < 0.00008 |
| Copper [mg/L] | < 0.0002 | 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Iron [mg/L] | < 0.007 | 0.112 | 0.011 | < 0.007 | 0.046 | 0.060 | 0.010 | < 0.007 | 0.012 | < 0.007 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 6.13 | 5.22 | 5.35 | 6.27 | 6.15 | 5.75 | 7.88 | 7.57 | 5.59 | 8.76 | 5.24 | 6.12 |
| Lithium [mg/L] | 0.0011 | 0.0011 | 0.0011 | 0.0013 | 0.0048 | 0.0035 | 0.0031 | 0.0026 | 0.0023 | 0.0029 | 0.0017 | 0.0017 |
| Magnesium [mg/L] | 0.519 | 0.336 | 0.420 | 0.370 | 0.279 | 0.316 | 0.481 | 0.500 | 0.429 | 0.465 | 0.552 | 0.944 |
| Manganese [mg/L] | 0.00094 | 0.00124 | 0.00063 | 0.00059 | 0.00111 | 0.00174 | 0.00071 | 0.00116 | 0.00105 | 0.00066 | 0.00394 | 0.00374 |
| Molybdenum [mg/L] | 0.00015 | 0.00015 | 0.00023 | 0.00013 | 0.00042 | 0.00005 | 0.00013 | 0.00013 | 0.00015 | 0.00037 | 0.00068 | 0.00014 |
| Sodium [mg/L] | 1.17 | 1.18 | 2.47 | 2.48 | 1.59 | 1.28 | 1.30 | 1.58 | 1.71 | 1.81 | 1.34 | 1.76 |
| Nickel [mg/L] | 0.0005 | 0.0005 | 0.0003 | 0.0003 | 0.0003 | 0.0003 | 0.0002 | 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | < 0.003 | 0.009 | < 0.003 | < 0.003 | 0.015 | 0.014 | < 0.003 | 0.003 | 0.008 | < 0.003 | < 0.003 | < 0.003 |
| Lead [mg/L] | 0.00001 | 0.00006 | 0.00002 | 0.00049 | 0.00003 | 0.00005 | 0.00015 | < 0.00001 | 0.00019 | 0.00001 | 0.00005 | < 0.00001 |
| Antimony [mg/L] | < 0.0009 | < 0.0009 | < 0.0009 | 0.0012 | < 0.0009 | 0.0012 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Selenium [mg/L] | 0.00012 | 0.00014 | 0.00009 | 0.00018 | 0.00009 | 0.00005 | 0.00008 | 0.00008 | 0.00007 | 0.00015 | 0.00010 | 0.00005 |
| Silicon [mg/L] | 1.92 | 1.33 | 2.04 | 2.15 | 1.66 | 1.42 | 1.48 | 1.88 | 2.02 | 2.32 | 1.67 | 1.57 |
| Tin [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Strontium [mg/L] | 0.0600 | 0.00977 | 1.21 | 0.0551 | 0.0188 | 0.00542 | 0.0741 | 0.107 | 0.0271 | 0.0212 | 0.179 | 0.560 |
| Titanium [mg/L] | 0.00044 | 0.00435 | 0.00059 | 0.00035 | 0.00383 | 0.00428 | 0.00063 | 0.00034 | 0.00106 | 0.00016 | 0.00013 | 0.00009 |
| Thallium [mg/L] | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000006 | 0.000005 | < 0.000005 |
| Uranium [mg/L] | 0.000010 | 0.000024 | 0.000016 | 0.000021 | 0.000013 | 0.000012 | 0.000101 | 0.000022 | 0.000020 | 0.000027 | 0.000037 | 0.000039 |
| Vanadium [mg/L] | 0.00531 | 0.00213 | 0.00388 | 0.00221 | 0.00292 | 0.00276 | 0.00226 | 0.00559 | 0.00330 | 0.00436 | 0.00155 | 0.00135 |
| Zinc [mg/L] | < 0.002 | 0.010 | 0.004 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report : CA11006-JUN20**

| Analysis | 51: VO19231738R0 02 47 | 52: VO19234800R0 26 48 | 53: VO19231549R0 50 49 | 54: VO19202589R0 50 50 | 55: VO19234784R0 38 51 | 56: VO19226180R0 12 52 | 57: VO19226290R0 05 53 | 58: VO19226290R0 11 54 | 59: VO19246880R0 15 55 | 60: VO19246880R0 20 56 | 61: VO19246880R0 26 57 | 62: VO19258344R0 50 58 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 9.48 | 9.46 | 9.55 | 9.27 | 9.19 | 9.14 | 9.56 | 9.47 | 9.40 | 9.60 | 9.71 | 9.33 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Sulphate [mg/L] | 3.2 | 2.9 | 3.1 | 6.4 | 2.4 | 49 | 3.8 | 4.3 | 5.2 | 3.7 | 2.8 | 29 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 58 | 64 | 61 | 71 | 38 | 152 | 61 | 62 | 66 | 64 | 62 | 110 |
| Alkalinity [mg/L as CaCO3] | 24 | 25 | 25 | 25 | 14 | 16 | 31 | 21 | 30 | 30 | 33 | 26 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| pH [no unit] | 8.08 | 8.09 | 8.00 | 7.87 | 7.86 | 7.80 | 7.96 | 7.98 | 7.93 | 8.11 | 8.25 | 7.87 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.668 | 1.13 | 0.911 | 0.542 | 0.852 | 0.537 | 0.604 | 0.558 | 0.677 | 0.456 | 0.628 | 0.592 |
| Arsenic [mg/L] | 0.0002 | 0.0012 | 0.0012 | 0.0015 | < 0.0002 | 0.0010 | 0.0009 | 0.0007 | 0.0013 | 0.0011 | 0.0011 | 0.0009 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.00717 | 0.00273 | 0.00829 | 0.00226 | 0.00397 | 0.00755 | 0.00980 | 0.00152 | 0.00192 | 0.0299 | 0.0502 | 0.0533 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | 0.003 | 0.002 | 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | 0.000010 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 4.46 | 4.10 | 5.43 | 8.82 | 1.84 | 22.7 | 5.70 | 6.26 | 6.41 | 5.68 | 5.18 | 12.8 |
| Cadmium [mg/L] | 0.000003 | 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000007 | < 0.000003 | < 0.000003 | 0.000006 | < 0.000003 | < 0.000003 | < 0.000003 |
| Cobalt [mg/L] | 0.000019 | 0.000033 | 0.000016 | 0.000004 | 0.000041 | 0.000008 | 0.000004 | 0.000008 | 0.000013 | 0.000005 | 0.000004 | 0.000006 |
| Chromium [mg/L] | 0.00032 | 0.00031 | 0.00022 | 0.00009 | 0.00031 | < 0.00008 | 0.00012 | 0.00009 | 0.00011 | 0.00012 | 0.00008 | < 0.00008 |
| Copper [mg/L] | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0006 | < 0.0002 | < 0.0002 | < 0.0002 |
| Iron [mg/L] | 0.032 | 0.049 | 0.024 | < 0.007 | 0.056 | < 0.007 | < 0.007 | < 0.007 | 0.020 | < 0.007 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 5.30 | 8.04 | 6.45 | 4.06 | 5.70 | 7.50 | 6.17 | 5.21 | 6.28 | 7.27 | 8.31 | 5.98 |
| Lithium [mg/L] | 0.0012 | 0.0046 | 0.0045 | 0.0018 | 0.0020 | 0.0017 | 0.0018 | 0.0015 | 0.0024 | 0.0024 | 0.0026 | 0.0028 |
| Magnesium [mg/L] | 0.383 | 0.304 | 0.283 | 0.471 | 0.342 | 0.527 | 0.437 | 0.428 | 0.421 | 0.449 | 0.337 | 1.06 |
| Manganese [mg/L] | 0.00065 | 0.00107 | 0.00166 | 0.00211 | 0.00086 | 0.00225 | 0.00079 | 0.00071 | 0.00107 | 0.00053 | 0.00053 | 0.00284 |
| Molybdenum [mg/L] | 0.00030 | 0.00038 | 0.00010 | 0.00032 | 0.00031 | 0.00009 | 0.00016 | 0.00009 | 0.00055 | 0.00046 | 0.00011 | 0.00009 |
| Sodium [mg/L] | 2.69 | 1.41 | 1.21 | 1.83 | 1.46 | 1.66 | 2.11 | 1.95 | 1.59 | 2.67 | 2.26 | 1.52 |
| Nickel [mg/L] | 0.0001 | 0.0001 | 0.0001 | < 0.0001 | 0.0003 | 0.0002 | < 0.0001 | 0.0001 | 0.0002 | 0.0003 | 0.0002 | 0.0002 |
| Phosphorus [mg/L] | 0.015 | 0.013 | 0.005 | < 0.003 | 0.010 | 0.005 | 0.003 | < 0.003 | 0.004 | < 0.003 | 0.006 | < 0.003 |
| Lead [mg/L] | 0.00002 | 0.00017 | 0.00016 | 0.00003 | 0.00013 | 0.00026 | < 0.00001 | 0.00004 | 0.00006 | 0.00006 | 0.00001 | < 0.00001 |
| Antimony [mg/L] | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | 0.0013 | 0.0009 | < 0.0009 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 51: VO19231738R0 02 47 | 52: VO19234800R0 26 48 | 53: VO19231549R0 50 49 | 54: VO19202589R0 50 50 | 55: VO19234784R0 38 51 | 56: VO19226180R0 12 52 | 57: VO19226290R0 05 53 | 58: VO19226290R0 11 54 | 59: VO19246880R0 15 55 | 60: VO19246880R0 20 56 | 61: VO19246880R0 26 57 | 62: VO19258344R0 50 58 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Selenium [mg/L] | 0.00013 | 0.00017 | 0.00016 | 0.00026 | 0.00006 | 0.00006 | 0.00006 | 0.00006 | 0.00007 | 0.00018 | 0.00009 | 0.00008 |
| Silicon [mg/L] | 2.21 | 2.08 | 1.94 | 1.84 | 1.69 | 1.72 | 2.19 | 2.04 | 1.82 | 2.09 | 2.13 | 1.45 |
| Tin [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Strontium [mg/L] | 0.0422 | 0.0158 | 0.0174 | 0.0619 | 0.00649 | 0.161 | 0.0680 | 0.0371 | 0.0320 | 0.0713 | 0.0630 | 0.313 |
| Titanium [mg/L] | 0.00264 | 0.00366 | 0.00239 | 0.00012 | 0.00384 | 0.00012 | 0.00033 | 0.00044 | 0.00095 | 0.00026 | 0.00044 | 0.00033 |
| Thallium [mg/L] | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 |
| Uranium [mg/L] | 0.000020 | 0.000100 | 0.000130 | 0.000047 | 0.000034 | 0.000121 | 0.000010 | 0.000010 | 0.000018 | 0.000016 | 0.000008 | 0.000176 |
| Vanadium [mg/L] | 0.00392 | 0.00472 | 0.00429 | 0.00170 | 0.00278 | 0.00327 | 0.00384 | 0.00541 | 0.00317 | 0.00325 | 0.00444 | 0.00224 |
| Zinc [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 63: VO19258343R0 07 59 | 64: VO19242574R0 46 60 | 65: VO18283892R0 01 61 | 66: VO19244666R0 16 62 | 67: VO19244666R0 45 63 | 68: VO19286662R0 11 64 | 69: VO19286662R0 26 65 | 70: VO19283031R0 02 66 | 71: VO19285337R0 11 67 | 72: VO19285236R0 01 68 | 73: VO19285236R0 08 69 | 74: VO19295741R0 24 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 9.49 | 9.49 | 9.51 | 9.49 | 9.49 | 9.40 | 9.53 | 9.60 | 8.97 | 9.61 | 9.46 | 8.11 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | 0.08 | 0.08 | < 0.06 | < 0.06 | 0.06 |
| Sulphate [mg/L] | 6.3 | 5.2 | 3.0 | 4.3 | 3.1 | 3.5 | 3.2 | 2.5 | 136 | 4.1 | 10 | 2.7 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 72 | 61 | 50 | 73 | 58 | 54 | 56 | 58 | 311 | 56 | 78 | 96 |
| Alkalinity [mg/L as CaCO3] | 30 | 30 | 28 | 29 | 28 | 23 | 25 | 27 | 11 | 31 | 25 | 37 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| pH [no unit] | 8.03 | 8.09 | 8.36 | 8.00 | 8.18 | 7.47 | 8.11 | 8.78 | 7.46 | 8.86 | 7.96 | 7.49 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.802 | 0.791 | 0.759 | 0.443 | 1.05 | 0.264 | 0.833 | 0.992 | 0.376 | 0.794 | 0.728 | 0.200 |
| Arsenic [mg/L] | 0.0014 | 0.0012 | 0.0005 | 0.0006 | 0.0021 | 0.0010 | 0.0017 | 0.0003 | < 0.0002 | 0.0006 | 0.0003 | < 0.0002 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.00729 | 0.00281 | 0.00516 | 0.00700 | 0.00258 | 0.0252 | 0.00412 | 0.00198 | 0.0806 | 0.00136 | 0.00182 | 0.0131 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.003 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000012 | < 0.000007 | 0.000007 | < 0.000007 |
| Calcium [mg/L] | 6.28 | 5.53 | 4.50 | 6.48 | 4.54 | 7.85 | 5.22 | 4.25 | 55.1 | 5.84 | 7.07 | 8.90 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 63: VO19258343R0 07 59 | 64: VO19242574R0 46 60 | 65: VO18283892R0 01 61 | 66: VO19244666R0 16 62 | 67: VO19244666R0 45 63 | 68: VO19286662R0 11 64 | 69: VO19286662R0 26 65 | 70: VO19283031R0 02 66 | 71: VO19285337R0 11 67 | 72: VO19285236R0 01 68 | 73: VO19285236R0 08 69 | 74: VO19295741R0 24 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cadmium [mg/L] | 0.000004 | 0.000003 | < 0.000003 | 0.000004 | 0.000003 | < 0.000003 | < 0.000003 | 0.000003 | < 0.000003 | < 0.000003 | 0.000004 | < 0.000003 |
| Cobalt [mg/L] | 0.000006 | 0.000009 | 0.000017 | 0.000005 | 0.000030 | 0.000005 | 0.000008 | 0.000011 | 0.000011 | < 0.000004 | 0.000007 | 0.000014 |
| Chromium [mg/L] | 0.00021 | 0.00018 | 0.00022 | < 0.00008 | 0.00029 | < 0.00008 | 0.00029 | 0.00022 | < 0.00008 | < 0.00008 | 0.00011 | < 0.00008 |
| Copper [mg/L] | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Iron [mg/L] | 0.009 | 0.022 | 0.025 | < 0.007 | 0.044 | < 0.007 | 0.020 | 0.028 | < 0.007 | < 0.007 | < 0.007 | 0.008 |
| Potassium [mg/L] | 8.85 | 5.95 | 5.68 | 5.58 | 8.67 | 2.65 | 6.49 | 9.73 | 13.2 | 5.80 | 8.48 | 11.4 |
| Lithium [mg/L] | 0.0018 | 0.0017 | 0.0034 | 0.0013 | 0.0026 | 0.0009 | 0.0015 | 0.0016 | 0.0023 | 0.0017 | 0.0023 | 0.0041 |
| Magnesium [mg/L] | 0.392 | 0.341 | 0.321 | 0.954 | 0.375 | 0.336 | 0.337 | 0.355 | 1.26 | 0.318 | 0.498 | 1.23 |
| Manganese [mg/L] | 0.00060 | 0.00103 | 0.00076 | 0.00097 | 0.00148 | 0.00145 | 0.00080 | 0.00097 | 0.00622 | 0.00062 | 0.00069 | 0.00352 |
| Molybdenum [mg/L] | 0.00018 | 0.00021 | 0.00006 | 0.00011 | 0.00040 | 0.00006 | 0.00027 | 0.00011 | 0.00022 | 0.00007 | 0.00018 | 0.00027 |
| Sodium [mg/L] | 2.96 | 2.00 | 1.57 | 2.01 | 1.73 | 1.14 | 1.44 | 1.58 | 0.62 | 1.66 | 1.92 | 2.65 |
| Nickel [mg/L] | 0.0003 | 0.0009 | 0.0010 | 0.0005 | 0.0007 | 0.0004 | 0.0003 | 0.0003 | 0.0002 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | 0.004 | 0.005 | 0.012 | 0.003 | 0.006 | < 0.003 | 0.008 | 0.006 | < 0.003 | < 0.003 | < 0.003 | 0.008 |
| Lead [mg/L] | 0.00004 | 0.00008 | 0.00013 | 0.00002 | 0.00007 | 0.00001 | 0.00006 | 0.00008 | < 0.00001 | < 0.00001 | 0.00007 | 0.00003 |
| Antimony [mg/L] | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | 0.0010 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Selenium [mg/L] | 0.00024 | 0.00019 | 0.00010 | 0.00015 | 0.00028 | 0.00011 | 0.00022 | 0.00019 | 0.00008 | 0.00005 | 0.00012 | 0.00005 |
| Silicon [mg/L] | 1.98 | 2.20 | 1.78 | 1.80 | 2.18 | 1.81 | 2.36 | 2.20 | 1.20 | 1.99 | 2.12 | 1.69 |
| Tin [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Strontium [mg/L] | 0.497 | 0.0251 | 0.0190 | 0.112 | 0.0157 | 0.0599 | 0.0147 | 0.0216 | 1.97 | 0.0307 | 0.0328 | 0.0267 |
| Titanium [mg/L] | 0.00081 | 0.00221 | 0.00189 | 0.00018 | 0.00435 | 0.00007 | 0.00184 | 0.00285 | < 0.00005 | 0.00033 | 0.00043 | 0.00068 |
| Thallium [mg/L] | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000008 | < 0.000005 | 0.000005 | 0.000009 |
| Uranium [mg/L] | 0.000131 | 0.000087 | 0.000038 | 0.000009 | 0.000351 | 0.000017 | 0.000091 | 0.000179 | 0.000052 | 0.000094 | 0.000140 | 0.000009 |
| Vanadium [mg/L] | 0.00606 | 0.00321 | 0.00320 | 0.00168 | 0.00503 | 0.00057 | 0.00508 | 0.00426 | 0.00270 | 0.00377 | 0.00469 | 0.00131 |
| Zinc [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.003 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 75: VO19281663R0 11 71 | 76: VO19320118R0 39 72 | 77: VO18295487R0 37 73 | 78: VO19048524R0 14 74 | 79: VO19054445R0 09 75 | 80: VO19076137R0 25 76 | 81: VO19080569R0 21 77 | 82: VO19249690R0 09 78 | 83: VO19249697R0 26 79 | 84: VO19063569R0 29 80 | 85: V019252701R0 39 15 | 86: VO19202592R0 25 33 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 9.01 | 8.97 | 9.28 | 9.55 | 9.51 | 9.53 | 9.41 | 9.57 | 9.51 | 9.39 | 9.61 | 9.52 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Sulphate [mg/L] | 49 | 2.5 | 6.9 | 2.8 | 4.4 | 2.9 | 10 | 2.9 | 2.9 | 18 | 3.1 | 9.3 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 75: VO19281663R0 11 71 | 76: VO19320118R0 39 72 | 77: VO18295487R0 37 73 | 78: VO19048524R0 14 74 | 79: VO19054445R0 09 75 | 80: VO19076137R0 25 76 | 81: VO19080569R0 21 77 | 82: VO19249690R0 09 78 | 83: VO19249697R0 26 79 | 84: VO19063569R0 29 80 | 85: V019252701R0 39 15 | 86: VO19202592R0 25 33 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 158 | 32 | 71 | 56 | 63 | 51 | 70 | 51 | 60 | 90 | 58 | 74 |
| Alkalinity [mg/L as CaCO3] | 23 | 11 | 25 | 25 | 25 | 23 | 21 | 23 | 27 | 21 | 26 | 24 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| pH [no unit] | 7.62 | 7.82 | 8.12 | 7.95 | 8.02 | 8.66 | 7.92 | 8.05 | 7.99 | 8.32 | 8.40 | 8.32 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.227 | 0.713 | 0.474 | 0.733 | 0.722 | 0.686 | 0.549 | 0.758 | 0.812 | 0.668 | 0.703 | 0.743 |
| Arsenic [mg/L] | 0.0003 | 0.0002 | 0.0015 | 0.0006 | 0.0008 | < 0.0002 | < 0.0002 | 0.0041 | 0.0022 | 0.0023 | 0.0004 | 0.0008 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.0425 | 0.00201 | 0.00274 | 0.00263 | 0.00144 | 0.00686 | 0.00108 | 0.0143 | 0.00620 | 0.00354 | 0.00206 | 0.00342 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bismuth [mg/L] | 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000007 |
| Calcium [mg/L] | 30.6 | 0.81 | 8.32 | 4.41 | 6.59 | 4.31 | 6.82 | 4.12 | 5.34 | 10.0 | 4.85 | 5.92 |
| Cadmium [mg/L] | < 0.000003 | < 0.000003 | < 0.000003 | 0.000004 | < 0.000003 | < 0.000003 | 0.000003 | 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 |
| Cobalt [mg/L] | 0.000009 | 0.000038 | 0.000004 | 0.000020 | 0.000008 | 0.000016 | 0.000010 | 0.000025 | 0.000007 | 0.000007 | 0.000008 | 0.000016 |
| Chromium [mg/L] | < 0.00008 | 0.00031 | 0.00011 | 0.00025 | 0.00015 | 0.00020 | 0.00014 | 0.00036 | 0.00013 | 0.00009 | 0.00020 | 0.00030 |
| Copper [mg/L] | < 0.0002 | 0.0003 | < 0.0002 | 0.0003 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 | < 0.0002 |
| Iron [mg/L] | < 0.007 | 0.055 | < 0.007 | 0.027 | 0.010 | 0.026 | 0.015 | 0.040 | 0.009 | < 0.007 | 0.018 | 0.036 |
| Potassium [mg/L] | 3.99 | 5.59 | 4.24 | 8.04 | 6.61 | 6.07 | 5.66 | 6.25 | 6.24 | 7.10 | 7.55 | 8.08 |
| Lithium [mg/L] | 0.0010 | 0.0044 | 0.0013 | 0.0028 | 0.0016 | 0.0034 | 0.0024 | 0.0019 | 0.0011 | 0.0019 | 0.0022 | 0.0029 |
| Magnesium [mg/L] | 0.550 | 0.227 | 0.570 | 0.531 | 0.408 | 0.322 | 0.624 | 0.340 | 0.384 | 0.503 | 0.335 | 0.414 |
| Manganese [mg/L] | 0.00402 | 0.00098 | 0.00128 | 0.00213 | 0.00102 | 0.00081 | 0.00114 | 0.00147 | 0.00071 | 0.00129 | 0.00077 | 0.00099 |
| Molybdenum [mg/L] | 0.00021 | < 0.00004 | 0.00040 | 0.00016 | 0.00026 | 0.00017 | 0.00021 | 0.00007 | 0.00010 | 0.00010 | 0.00028 | 0.00028 |
| Sodium [mg/L] | 1.90 | 1.16 | 1.95 | 1.56 | 1.72 | 1.64 | 1.67 | 1.46 | 2.00 | 1.54 | 1.33 | 1.71 |
| Nickel [mg/L] | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | < 0.003 | 0.015 | < 0.003 | 0.011 | 0.012 | 0.015 | < 0.003 | 0.005 | < 0.003 | 0.009 | 0.006 | 0.009 |
| Lead [mg/L] | 0.00010 | 0.00004 | 0.00003 | 0.00004 | 0.00024 | 0.00009 | 0.00007 | 0.00006 | < 0.00001 | 0.00003 | 0.00024 | 0.00024 |
| Antimony [mg/L] | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Selenium [mg/L] | 0.00028 | 0.00005 | 0.00014 | 0.00012 | 0.00015 | 0.00008 | 0.00010 | 0.00011 | 0.00009 | 0.00007 | 0.00015 | 0.00021 |
| Silicon [mg/L] | 1.37 | 1.36 | 1.63 | 1.90 | 1.91 | 1.64 | 1.47 | 1.68 | 2.25 | 1.76 | 2.08 | 2.20 |
| Tin [mg/L] | < 0.00006 | < 0.00006 | 0.00012 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00007 | 0.00009 |
| Strontium [mg/L] | 4.91 | 0.00487 | 0.0775 | 0.0171 | 0.0273 | 0.0302 | 0.0305 | 0.0200 | 0.0265 | 0.0833 | 0.0170 | 0.0213 |
| Titanium [mg/L] | 0.00005 | 0.00441 | 0.00017 | 0.00216 | 0.00081 | 0.00210 | 0.00154 | 0.00309 | 0.00105 | 0.00043 | 0.00115 | 0.00290 |
| Thallium [mg/L] | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | 0.000005 |
| Uranium [mg/L] | 0.000022 | 0.000010 | 0.000039 | 0.000026 | 0.000074 | 0.000013 | 0.000014 | 0.000081 | 0.000059 | 0.000047 | 0.000090 | 0.000144 |
| Vanadium [mg/L] | 0.00006 | 0.00248 | 0.00170 | 0.00297 | 0.00424 | 0.00270 | 0.00270 | 0.00292 | 0.00491 | 0.00403 | 0.00434 | 0.00431 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 75: VO19281663R0 11 71 | 76: VO19320118R0 39 72 | 77: VO18295487R0 37 73 | 78: VO19048524R0 14 74 | 79: VO19054445R0 09 75 | 80: VO19076137R0 25 76 | 81: VO19080569R0 21 77 | 82: VO19249690R0 09 78 | 83: VO19249697R0 26 79 | 84: VO19063569R0 29 80 | 85: V019252701R0 39 15 | 86: VO19202592R0 25 33 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zinc [mg/L] | < 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 87:BLK: $SPLP1312 Blank #1 | 88: VO19185521R0 19 46 | 89: VO19283031R0 02 66 | 90: VO19063569R0 29 80 | 91:BLK: $SPLP1312 Blank #1 |
|---|---|---|---|---|---|
| Sample weight [g] | --- | 20 | 20 | 20 | --- |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 4.25 | 9.14 | 9.68 | 9.38 | 4.25 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Sulphate [mg/L] | 2.1 | 41 | 2.6 | 18 | 2.1 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Conductivity [uS/cm] | 21 | 142 | 62 | 90 | 19 |
| Alkalinity [mg/L as CaCO3] | < 2 | 17 | 33 | 21 | < 2 |
| Acidity [mg/L as CaCO3] | 3 | < 2 | < 2 | < 2 | 4 |
| pH [no unit] | 4.37 | 7.72 | 8.13 | 8.25 | 4.42 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.003 | 0.344 | 1.05 | 0.662 | 0.001 |
| Arsenic [mg/L] | < 0.0002 | 0.0008 | 0.0002 | 0.0024 | < 0.0002 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.00225 | 0.00460 | 0.00182 | 0.00370 | 0.00024 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Boron [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Bismuth [mg/L] | 0.000009 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 0.03 | 19.6 | 4.25 | 9.96 | 0.02 |
| Cadmium [mg/L] | < 0.000003 | < 0.000003 | < 0.000003 | 0.000004 | 0.000003 |
| Cobalt [mg/L] | 0.000024 | 0.000009 | 0.000017 | 0.000007 | < 0.000004 |
| Chromium [mg/L] | < 0.00008 | 0.00011 | 0.00022 | < 0.00008 | < 0.00008 |
| Copper [mg/L] | 0.0010 | < 0.0002 | < 0.0002 | < 0.0002 | 0.0005 |
| Iron [mg/L] | < 0.007 | < 0.007 | 0.030 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 0.080 | 6.73 | 10.1 | 6.56 | 0.096 |
| Lithium [mg/L] | < 0.0001 | 0.0015 | 0.0016 | 0.0019 | 0.0001 |
| Magnesium [mg/L] | 0.005 | 1.02 | 0.363 | 0.495 | 0.002 |

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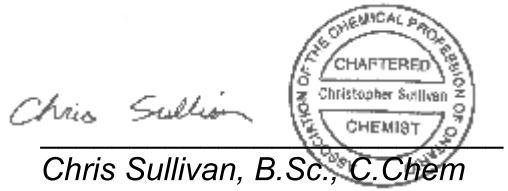
**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Analysis | 87:BLK: $SPLP1312 Blank #1 | 88: VO19185521R0 19 46 | 89: VO19283031R0 02 66 | 90: VO19063569R0 29 80 | 91:BLK: $SPLP1312 Blank #1 |
|---|---|---|---|---|---|
| Manganese [mg/L] | 0.00031 | 0.00457 | 0.00098 | 0.00145 | 0.00010 |
| Molybdenum [mg/L] | 0.00008 | 0.00032 | 0.00015 | 0.00027 | < 0.00004 |
| Sodium [mg/L] | < 0.01 | 1.91 | 1.70 | 1.56 | < 0.01 |
| Nickel [mg/L] | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | < 0.003 | < 0.003 | 0.012 | 0.004 | < 0.003 |
| Lead [mg/L] | 0.00006 | 0.00006 | 0.00005 | 0.00003 | 0.00015 |
| Antimony [mg/L] | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 | < 0.0009 |
| Selenium [mg/L] | < 0.00004 | 0.00005 | 0.00021 | 0.00006 | < 0.00004 |
| Silicon [mg/L] | < 0.02 | 1.61 | 2.24 | 1.75 | < 0.02 |
| Tin [mg/L] | 0.00011 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00011 |
| Strontium [mg/L] | 0.00015 | 0.622 | 0.0191 | 0.0852 | 0.00014 |
| Titanium [mg/L] | 0.00021 | < 0.00005 | 0.00311 | 0.00060 | 0.00009 |
| Thallium [mg/L] | < 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 |
| Uranium [mg/L] | 0.000018 | 0.000032 | 0.000231 | 0.000046 | < 0.000002 |
| Vanadium [mg/L] | 0.00001 | 0.00138 | 0.00469 | 0.00381 | < 0.00001 |
| Zinc [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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# Method Descriptions

| Parameter | Units | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|---|
| Acidity | mg/L as CaCO3 | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2310 | N |
| Alkalinity | mg/L as CaCO3 | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2320 | N |
| Anions by IC | mg/L | ME-CA-[ENV]IC-LAK-AN-001 | EPA300/MA300-Ions1.3 | Y |
| Conductivity | uS/cm | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2510 | Y |
| Fluoride by Specific Ion Electrode | mg/L | ME-CA-[ENV]EWL-LAK-AN-014 | SM 4500 | Y |
| Inorganics-General | mg/L | ME-CA-[ENV]SPE-LAK-AN-004 | EPA 7471A/SM 3112B | Y |
| Metals in aqueous samples - ICP-MS | mg/L | ME-CA-[ENV]SPE-LAK-AN-006 | SM 3030/EPA 200.8 | Y |
| pH | No unit | ME-CA-[ENV]EWL-LAK-AN-006 | SM 4500 | Y |

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# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Acidity - QCBatchID: EWL0359-JUN20* | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | 2 | | | ND | 20 | 100 | 90 | 110 | NA | | |
| *Acidity - QCBatchID: EWL0378-JUN20* | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | < 2 | | | NV | 20 | 98 | 90 | 110 | NA | | |
| *Acidity - QCBatchID: EWL0418-JUN20* | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | 2 | | | ND | 20 | 100 | 90 | 110 | NA | | |
| *Acidity - QCBatchID: EWL0431-JUN20* | | | | | | | | | | | | | |
| Acidity | 2 | mg/L as Ca | < 2 | | | ND | 20 | 100 | 90 | 110 | NA | | |
| *Alkalinity - QCBatchID: EWL0359-JUN20* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 4 | 20 | 104 | 80 | 120 | NA | | |
| *Alkalinity - QCBatchID: EWL0378-JUN20* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | ND | 20 | 106 | 80 | 120 | NA | | |
| *Alkalinity - QCBatchID: EWL0418-JUN20* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 3 | 20 | 104 | 80 | 120 | NA | | |
| *Alkalinity - QCBatchID: EWL0431-JUN20* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 1 | 20 | 106 | 80 | 120 | NA | | |
| *Alkalinity - QCBatchID: EWL0453-JUN20* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 0 | 20 | 98 | 80 | 120 | NA | | |
| *Anions by IC - QCBatchID: DIO0460-JUN20* | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | | | | ND | 20 | 97 | 80 | 120 | 91 | 75 | 125 |
| Chloride | 0.2 | mg/L | | | | 8 | 20 | 94 | 80 | 120 | 96 | 75 | 125 |
| Nitrate (as N) | 0.06 | mg/L | | | | 2 | 20 | 101 | 80 | 120 | 107 | 75 | 125 |
| Nitrite (as N) | 0.03 | mg/L | | | | ND | 20 | 101 | 80 | 120 | 112 | 75 | 125 |
| Sulphate | 0.2 | mg/L | | | | 1 | 20 | 92 | 80 | 120 | 96 | 75 | 125 |
| *Anions by IC - QCBatchID: DIO0466-JUN20* | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | | | | ND | 20 | 97 | 80 | 120 | 91 | 75 | 125 |
| Chloride | 0.2 | mg/L | | | | 14 | 20 | 95 | 80 | 120 | 96 | 75 | 125 |
| Nitrate (as N) | 0.06 | mg/L | | | | 15 | 20 | 102 | 80 | 120 | 102 | 75 | 125 |
| Nitrite (as N) | 0.03 | mg/L | | | | ND | 20 | 104 | 80 | 120 | 109 | 75 | 125 |
| Sulphate | 0.2 | mg/L | | | | 5 | 20 | 94 | 80 | 120 | 90 | 75 | 125 |
| *Anions by IC - QCBatchID: DIO0524-JUN20* | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | | | | ND | 20 | 94 | 80 | 120 | 98 | 75 | 125 |
| Chloride | 0.2 | mg/L | | | | 11 | 20 | 98 | 80 | 120 | 103 | 75 | 125 |
| Nitrate (as N) | 0.06 | mg/L | | | | ND | 20 | 99 | 80 | 120 | 103 | 75 | 125 |
| Nitrite (as N) | 0.03 | mg/L | | | | ND | 20 | 95 | 80 | 120 | 100 | 75 | 125 |
| Sulphate | 0.2 | mg/L | | | | 1 | 20 | 97 | 80 | 120 | 98 | 75 | 125 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0)**
**20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Anions by IC - QCBatchID: DIO0534-JUN20* | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | | | | ND | 20 | 98 | 80 | 120 | 86 | 75 | 125 |
| Chloride | 0.2 | mg/L | | | | 3 | 20 | 95 | 80 | 120 | 96 | 75 | 125 |
| Nitrate (as N) | 0.06 | mg/L | | | | 6 | 20 | 100 | 80 | 120 | 104 | 75 | 125 |
| Nitrite (as N) | 0.03 | mg/L | | | | ND | 20 | 100 | 80 | 120 | 106 | 75 | 125 |
| Sulphate | 0.2 | mg/L | | | | 2 | 20 | 94 | 80 | 120 | 97 | 75 | 125 |
| *Anions by IC - QCBatchID: DIO0597-JUN20* | | | | | | | | | | | | | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 9 | 20 | 95 | 80 | 120 | 99 | 75 | 125 |
| *Conductivity - QCBatchID: EWL0359-JUN20* | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 5 | 20 | 99 | 90 | 110 | NA | | |
| *Conductivity - QCBatchID: EWL0378-JUN20* | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 3 | 20 | 98 | 90 | 110 | NA | | |
| *Conductivity - QCBatchID: EWL0418-JUN20* | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 3 | 20 | 93 | 90 | 110 | NA | | |
| *Conductivity - QCBatchID: EWL0431-JUN20* | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 2 | 20 | 100 | 90 | 110 | NA | | |
| *Conductivity - QCBatchID: EWL0464-JUN20* | | | | | | | | | | | | | |
| Conductivity | 2 | uS/cm | < 2 | | | 0 | 20 | 100 | 90 | 110 | NA | | |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0394-JUN20* | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 105 | 90 | 110 | 100 | 75 | 125 |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0406-JUN20* | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 103 | 90 | 110 | NV | 75 | 125 |
| *Fluoride by Specific Ion Electrode - QCBatchID: EWL0417-JUN20* | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 104 | 90 | 110 | 102 | 75 | 125 |
| *Inorganics-General - QCBatchID: EHG0017-JUN20* | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 107 | 80 | 120 | 110 | 70 | 130 |
| *Inorganics-General - QCBatchID: EHG0026-JUN20* | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 101 | 80 | 120 | 98 | 70 | 130 |
| *Metals - QCBatchID: EMS0111-JUN20* | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | ND | 20 | 102 | 90 | 110 | 100 | 70 | 130 |
| *Metals - QCBatchID: EMS0142-JUN20* | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | 16 | 20 | 99 | 90 | 110 | 98 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0111-JUN20* | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | ND | 20 | 95 | 90 | 110 | 113 | 70 | 130 |
| Antimony | 0.0009 | mg/L | <0.0009 | | | ND | 20 | 102 | 90 | 110 | 124 | 70 | 130 |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | ND | 20 | 98 | 90 | 110 | 98 | 70 | 130 |
| Barium | 0.00002 | mg/L | <0.00002 | | | ND | 20 | 100 | 90 | 110 | 101 | 70 | 130 |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 95 | 90 | 110 | 96 | 70 | 130 |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 99 | 90 | 110 | 83 | 70 | 130 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0)**
**20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Boron | 0.002 | mg/L | <0.002 | | | ND | 20 | 96 | 90 | 110 | 98 | 70 | 130 |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | ND | 20 | 102 | 90 | 110 | 107 | 70 | 130 |
| Calcium | 0.01 | mg/L | <0.01 | | | 8 | 20 | 101 | 90 | 110 | 99 | 70 | 130 |
| Chromium | 0.00008 | mg/L | <0.00008 | | | ND | 20 | 101 | 90 | 110 | 91 | 70 | 130 |
| Copper | 0.0002 | mg/L | <0.0002 | | | ND | 20 | 103 | 90 | 110 | 111 | 70 | 130 |
| Iron | 0.007 | mg/L | <0.007 | | | ND | 20 | 102 | 90 | 110 | NV | 70 | 130 |
| Lead | 0.00001 | mg/L | <0.00001 | | | ND | 20 | 99 | 90 | 110 | 97 | 70 | 130 |
| Lithium | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 98 | 90 | 110 | 97 | 70 | 130 |
| Magnesium | 0.001 | mg/L | <0.001 | | | ND | 20 | 101 | 90 | 110 | 98 | 70 | 130 |
| Manganese | 0.00001 | mg/L | <0.00001 | | | ND | 20 | 98 | 90 | 110 | 98 | 70 | 130 |
| Molybdenum | 0.00004 | mg/L | <0.00004 | | | ND | 20 | 105 | 90 | 110 | 101 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 98 | 90 | 110 | 102 | 70 | 130 |
| Phosphorus | 0.003 | mg/L | <0.003 | | | ND | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.009 | | | ND | 20 | 102 | 90 | 110 | 95 | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | ND | 20 | 100 | 90 | 110 | 103 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | ND | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 101 | 90 | 110 | 98 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | ND | 20 | 100 | 90 | 110 | 100 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | ND | 20 | 97 | 90 | 110 | 96 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | ND | 20 | 101 | 90 | 110 | 101 | 70 | 130 |
| Tin | 0.00006 | mg/L | <0.00006 | | | ND | 20 | 101 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 95 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | ND | 20 | 106 | 90 | 110 | 105 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | ND | 20 | 96 | 90 | 110 | 97 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | ND | 20 | 101 | 90 | 110 | 106 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0124-JUN20* | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 1 | 20 | 95 | 90 | 110 | 113 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0142-JUN20* | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 5 | 20 | 101 | 90 | 110 | 128 | 70 | 130 |
| Antimony | 0.0009 | mg/L | <0.0009 | | | ND | 20 | 102 | 90 | 110 | 91 | 70 | 130 |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | 4 | 20 | 102 | 90 | 110 | 106 | 70 | 130 |
| Barium | 0.00002 | mg/L | <0.00002 | | | 3 | 20 | 101 | 90 | 110 | 101 | 70 | 130 |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | 13 | 20 | 105 | 90 | 110 | 104 | 70 | 130 |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 95 | 90 | 110 | 88 | 70 | 130 |
| Boron | 0.002 | mg/L | <0.002 | | | 0 | 20 | 99 | 90 | 110 | NV | 70 | 130 |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | 11 | 20 | 101 | 90 | 110 | 98 | 70 | 130 |
| Calcium | 0.01 | mg/L | <0.01 | | | 2 | 20 | 102 | 90 | 110 | 104 | 70 | 130 |
| Chromium | 0.00008 | mg/L | <0.00008 | | | 10 | 20 | 103 | 90 | 110 | 104 | 70 | 130 |
| Copper | 0.0002 | mg/L | <0.0002 | | | 8 | 20 | 103 | 90 | 110 | 114 | 70 | 130 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0)**
**20:1 L/S ratio, 18hr**

**LR Report :** **CA11006-JUN20**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Iron | 0.007 | mg/L | <0.007 | | | 2 | 20 | 101 | 90 | 110 | NV | 70 | 130 |
| Lead | 0.00001 | mg/L | <0.00001 | | | 0 | 20 | 106 | 90 | 110 | 88 | 70 | 130 |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 1 | 20 | 106 | 90 | 110 | 109 | 70 | 130 |
| Magnesium | 0.001 | mg/L | <0.001 | | | 1 | 20 | 102 | 90 | 110 | 103 | 70 | 130 |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 1 | 20 | 102 | 90 | 110 | 106 | 70 | 130 |
| Molybdenum | 0.00004 | mg/L | <0.00004 | | | 3 | 20 | 105 | 90 | 110 | 99 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | 6 | 20 | 100 | 90 | 110 | 109 | 70 | 130 |
| Phosphorus | 0.003 | mg/L | <0.003 | | | 9 | 20 | 103 | 90 | 110 | NV | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.009 | | | 15 | 20 | 99 | 90 | 110 | 103 | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | 4 | 20 | 103 | 90 | 110 | 115 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 2 | 20 | 105 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 101 | 90 | 110 | 96 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 0 | 20 | 108 | 90 | 110 | 110 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 103 | 90 | 110 | 102 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | 0 | 20 | 93 | 90 | 110 | 93 | 70 | 130 |
| Tin | 0.00006 | mg/L | <0.00006 | | | ND | 20 | 103 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | 7 | 20 | 105 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 1 | 20 | 90 | 90 | 110 | 91 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | 12 | 20 | 100 | 90 | 110 | 103 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | 10 | 20 | 104 | 90 | 110 | 120 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0160-JUN20* | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 19 | 20 | 96 | 90 | 110 | 107 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 96 | 90 | 110 | 99 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0173-JUN20* | | | | | | | | | | | | | |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 96 | 90 | 110 | 99 | 70 | 130 |
| *pH - QCBatchID: EWL0359-JUN20* | | | | | | | | | | | | | |
| pH | 0.05 | no unit | NA | | | 0 | | 100 | | | NA | | |
| *pH - QCBatchID: EWL0378-JUN20* | | | | | | | | | | | | | |
| pH | 0.05 | no unit | NA | | | 3 | | 100 | | | NA | | |
| *pH - QCBatchID: EWL0418-JUN20* | | | | | | | | | | | | | |
| pH | 0.05 | no unit | NA | | | 1 | | 101 | | | NA | | |
| *pH - QCBatchID: EWL0431-JUN20* | | | | | | | | | | | | | |
| pH | 0.05 | no unit | NA | | | 0 | | 98 | | | NA | | |
| *pH - QCBatchID: EWL0459-JUN20* | | | | | | | | | | | | | |
| pH | 0.05 | no unit | NA | | | 0 | | 100 | | | NA | | |

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0002171260

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Phone: 705-652-2000 FAX: 705-652-6365

18-September-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 21 August 2020
**LR Report:** **CA11007-AUG20**
**Reference:** East Gouldie

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| **Analysis** | **5: VO19125199R 035 16** | **6: VO19211753R 046 42** | **7: VO19185519R 043 45** | **8: VO19231738R 002 47** | **9: VO19202589R 050 50** | **10: VO19242574R 046 60** | **11: VO19285337R 011 67** | **12: VO19285236R 008 69** | **13: VO18295487R 037 73** | **14: VO19249690R 009 78** |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| SiO2 [%] | 64.6 | 60.2 | 66.0 | 64.8 | 61.6 | 66.2 | 43.8 | 61.3 | 62.8 | 66.5 |
| Al2O3 [%] | 15.4 | 14.8 | 12.2 | 14.8 | 14.1 | 14.4 | 11.7 | 15.2 | 13.2 | 14.4 |
| Fe2O3 [%] | 5.49 | 5.64 | 4.34 | 5.51 | 4.70 | 5.34 | 8.70 | 6.04 | 4.93 | 5.54 |
| MgO [%] | 2.60 | 2.86 | 2.09 | 3.37 | 1.66 | 2.22 | 8.18 | 2.77 | 2.31 | 2.78 |
| CaO [%] | 3.10 | 2.63 | 3.09 | 2.40 | 3.16 | 2.62 | 9.35 | 3.29 | 3.23 | 2.33 |
| Na2O [%] | 3.38 | 3.96 | 3.89 | 4.03 | 5.25 | 3.89 | 1.81 | 3.74 | 5.49 | 4.08 |
| K2O [%] | 2.51 | 4.59 | 3.40 | 2.24 | 3.78 | 2.45 | 4.98 | 3.66 | 2.16 | 2.01 |
| TiO2 [%] | 0.58 | 0.59 | 0.43 | 0.55 | 0.49 | 0.51 | 0.70 | 0.61 | 0.47 | 0.53 |
| P2O5 [%] | 0.19 | 0.14 | 0.06 | 0.14 | 0.12 | 0.14 | 0.17 | 0.12 | 0.08 | 0.14 |
| MnO [%] | 0.10 | 0.07 | 0.07 | 0.07 | 0.06 | 0.08 | 0.18 | 0.09 | 0.06 | 0.08 |
| Cr2O3 [%] | 0.03 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | 0.08 | 0.03 | 0.02 | 0.04 |
| V2O5 [%] | 0.02 | 0.03 | 0.01 | 0.01 | < 0.01 | 0.01 | 0.05 | 0.02 | 0.01 | 0.02 |
| LOI [%] | 0.95 | 3.15 | 3.35 | 1.57 | 3.17 | 1.51 | 7.01 | 2.58 | 3.72 | 1.14 |
| Sum [%] | 99.0 | 98.7 | 98.9 | 99.6 | 98.1 | 99.5 | 96.6 | 99.5 | 98.5 | 99.6 |

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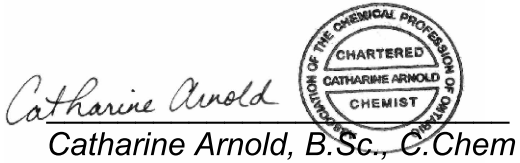
**LR Report :** **CA11007-AUG20**




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

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29-December-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 10 December 2020
**LR Report:** **CA11007-DEC20**

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19104041R 006 2 | 6: VO19216516R 034 40 | 7: VO18283892R 001 61 |
|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | | | N/A | N/A | N/A |
| Br [µg/g] | 24-Dec-20 | 11:46 | 29-Dec-20 | 16:28 | < 1.5 | < 1.5 | < 1.5 |
| F [µg/g] | 16-Dec-20 | 15:39 | 17-Dec-20 | 09:27 | 3.94 | 2.20 | 2.16 |
| Hg [µg/g] | 17-Dec-20 | 15:19 | 18-Dec-20 | 12:07 | < 0.05 | < 0.05 | < 0.05 |
| Ag [µg/g] | 22-Dec-20 | 02:36 | 22-Dec-20 | 13:08 | 0.09 | 0.08 | 0.11 |
| Al [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 25000 | 33000 | 21000 |
| As [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 0.9 | 0.7 | 0.6 |
| B [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 1 | < 1 | < 1 |
| Ba [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 330 | 600 | 290 |
| Be [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 0.11 | 0.08 | 0.08 |
| Bi [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 0.75 | 0.37 | 0.38 |
| Ca [µg/g] | 21-Dec-20 | 11:26 | 21-Dec-20 | 14:20 | 2400 | 2700 | 2900 |
| Cd [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 0.07 | 0.06 | 0.04 |
| Co [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 24 | 23 | 18 |
| Cr [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 150 | 180 | 140 |
| Cu [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 47 | 45 | 46 |
| Fe [µg/g] | 21-Dec-20 | 11:26 | 21-Dec-20 | 14:20 | 38000 | 49000 | 33000 |
| K [µg/g] | 21-Dec-20 | 11:26 | 21-Dec-20 | 14:20 | 18000 | 24000 | 13000 |
| Li [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 25 | 27 | 29 |
| Mg [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 16000 | 16000 | 12000 |
| Mn [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 350 | 410 | 360 |
| Mo [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 28 | 1.6 | 1.0 |
| Na [µg/g] | 21-Dec-20 | 11:26 | 21-Dec-20 | 14:20 | 570 | 750 | 630 |
| Ni [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 88 | 91 | 59 |
| P [µg/g] | 21-Dec-20 | 11:26 | 21-Dec-20 | 14:20 | 700 | 660 | 640 |
| Pb [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 3.3 | 2.9 | 3.3 |
| Sb [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | < 0.8 | < 0.8 | < 0.8 |
| Se [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | < 0.7 | < 0.7 | < 0.7 |
| Sn [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 0.5 | 1.0 | 0.6 |

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Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA11007-DEC20**

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO19104041R 006 2 | 6: VO19216516R 034 40 | 7: VO18283892R 001 61 |
|---|---|---|---|---|---|---|---|
| Sr [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 15 | 7.9 | 13 |
| Ti [µg/g] | 18-Dec-20 | 12:28 | 22-Dec-20 | 13:08 | 1700 | 2000 | 1300 |
| Tl [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 0.40 | 0.26 | 0.25 |
| U [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 1.6 | 1.7 | 1.3 |
| V [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 88 | 110 | 72 |
| Zn [µg/g] | 18-Dec-20 | 12:28 | 21-Dec-20 | 14:20 | 76 | 75 | 68 |

| Analysis | 8: VO19093187R 018 19 | 9: VO19295741R 024 70 | 10: VO19037627R 049 7 | 11: VO19320118R 039 72 |
|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A |
| Br [µg/g] | < 1.5 | < 1.5 | < 1.5 | < 1.5 |
| F [µg/g] | 3.14 | 1.82 | 1.99 | 1.83 |
| Hg [µg/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Ag [µg/g] | 0.08 | 0.06 | 0.05 | 0.06 |
| Al [µg/g] | 26000 | 22000 | 26000 | 27000 |
| As [µg/g] | 0.6 | 0.5 | 0.6 | < 0.5 |
| B [µg/g] | < 1 | < 1 | < 1 | < 1 |
| Ba [µg/g] | 330 | 390 | 570 | 340 |
| Be [µg/g] | 0.10 | 0.09 | 0.10 | 0.08 |
| Bi [µg/g] | 0.48 | 0.43 | 0.39 | 0.28 |
| Ca [µg/g] | 3800 | 2500 | 4100 | 2100 |
| Cd [µg/g] | 0.07 | 0.03 | 0.06 | 0.03 |
| Co [µg/g] | 26 | 22 | 23 | 23 |
| Cr [µg/g] | 200 | 170 | 140 | 150 |
| Cu [µg/g] | 57 | 45 | 49 | 47 |
| Fe [µg/g] | 41000 | 34000 | 40000 | 40000 |
| K [µg/g] | 20000 | 15000 | 21000 | 20000 |
| Li [µg/g] | 26 | 24 | 32 | 30 |
| Mg [µg/g] | 16000 | 15000 | 17000 | 16000 |
| Mn [µg/g] | 520 | 340 | 460 | 380 |
| Mo [µg/g] | 3.5 | 2.0 | 1.2 | 2.5 |
| Na [µg/g] | 540 | 430 | 520 | 520 |
| Ni [µg/g] | 98 | 84 | 81 | 81 |
| P [µg/g] | 680 | 630 | 510 | 640 |
| Pb [µg/g] | 2.9 | 2.5 | 3.2 | 2.3 |
| Sb [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Se [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Sn [µg/g] | 0.7 | < 0.5 | 0.6 | 0.5 |
| Sr [µg/g] | 11 | 15 | 15 | 8.2 |
| Ti [µg/g] | 2200 | 1600 | 2100 | 1800 |

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Lakefield - Ontario - KOL 2HO
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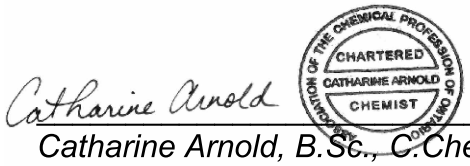
**LR Report :** **CA11007-DEC20**

| Analysis | 8: VO19093187R 018 19 | 9: VO19295741R 024 70 | 10: VO19037627R 049 7 | 11: VO19320118R 039 72 |
|---|---|---|---|---|
| Tl [µg/g] | 0.41 | 0.28 | 0.40 | 0.31 |
| U [µg/g] | 1.2 | 1.2 | 1.8 | 1.3 |
| V [µg/g] | 120 | 86 | 100 | 92 |
| Zn [µg/g] | 85 | 72 | 71 | 75 |




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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15-July-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 12 June 2020
**LR Report:** **CA11007-JUN20**
**Reference:** TR: Modifie - R - 466556

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO18273624R0 06 1 | 6: VO19104041R0 06 2 | 7: VO18227465R0 12 3 | 8: VO18283892R0 49 4 | 9: VO18326381R0 19 5 | 10: VO19018165R0 40 6 | 11: VO19037627R0 49 7 | 12: VO19012423R0 38 8 | 13: VO19044866R0 38 9 | 14: VO19049770R0 19 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | | | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 09-Jul-20 | 16:08 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 09-Jul-20 | 16:08 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 09-Jul-20 | 16:08 | 8.97 | 8.73 | 8.13 | 8.72 | 8.73 | 8.81 | 9.23 | 9.33 | 8.47 | 9.12 |
| Alkalinity [mg/L as CaCO3] | 14-Jul-20 | 11:33 | 82 | 63 | 75 | 84 | 56 | 80 | 78 | 72 | 26 | 65 |
| Acidity [mg/L as CaCO3] | 14-Jul-20 | 11:33 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Conductivity [uS/cm] | 14-Jul-20 | 11:33 | 335 | 296 | 503 | 281 | 307 | 326 | 263 | 226 | 741 | 230 |
| pH [no unit] | 14-Jul-20 | 09:39 | 8.46 | 8.20 | 8.16 | 8.39 | 8.16 | 8.58 | 8.81 | 8.67 | 7.74 | 8.67 |
| F [mg/L] | 10-Jul-20 | 14:32 | 0.80 | 0.74 | 0.34 | 0.59 | 0.62 | 0.42 | 0.64 | 0.50 | 0.51 | 0.77 |
| Cl [mg/L] | 10-Jul-20 | 13:54 | 6.2 | < 2 | 4.9 | 5.0 | 4.2 | < 2 | 2.4 | 2.9 | < 2 | 5.1 |
| SO4 [mg/L] | 14-Jul-20 | 12:53 | 31 | 37 | 120 | 20 | 27 | 43 | 20 | 15 | 300 | 17 |
| Br [mg/L] | 10-Jul-20 | 13:54 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| NO2 [as N mg/L] | 10-Jul-20 | 13:54 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO3 [as N mg/L] | 10-Jul-20 | 13:54 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| NO2+NO3 [as N mg/L] | 10-Jul-20 | 13:54 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Hg [mg/L] | 13-Jul-20 | 16:53 | 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Al [mg/L] | 15-Jul-20 | 12:20 | 0.981 | 1.11 | 0.089 | 0.746 | 0.894 | 0.167 | 1.34 | 1.11 | 0.214 | 1.74 |
| As [mg/L] | 15-Jul-20 | 12:20 | 0.0023 | 0.0015 | 0.0013 | 0.0025 | 0.0006 | 0.0078 | 0.0016 | 0.0128 | 0.0005 | 0.0019 |
| Ag [mg/L] | 15-Jul-20 | 12:20 | < 0.00005 | 0.00015 | 0.00083 | < 0.00005 | 0.00014 | 0.00039 | < 0.00005 | < 0.00005 | 0.00010 | 0.00008 |
| Ba [mg/L] | 15-Jul-20 | 12:20 | 0.00880 | 0.0154 | 0.0216 | 0.00664 | 0.0278 | 0.134 | 0.0184 | 0.0183 | 0.0443 | 0.0116 |

OnLine LIMS

0002183707



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| Analysis | 3: Analysis Completed Date | 4: Analysis Completed Time | 5: VO18273624R0 06 1 | 6: VO19104041R0 06 2 | 7: VO18227465R0 12 3 | 8: VO18283892R0 49 4 | 9: VO18326381R0 19 5 | 10: VO19018165R0 40 6 | 11: VO19037627R0 49 7 | 12: VO19012423R0 38 8 | 13: VO19044866R0 38 9 | 14: VO19049770R0 19 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Be [mg/L] | 15-Jul-20 | 12:20 | < 0.000007 | 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000009 | < 0.000007 | < 0.000007 | 0.000018 |
| B [mg/L] | 15-Jul-20 | 12:20 | 0.013 | 0.017 | 0.010 | 0.012 | 0.008 | 0.011 | 0.010 | 0.017 | 0.008 | 0.012 |
| Bi [mg/L] | 15-Jul-20 | 12:20 | 0.000010 | 0.000073 | 0.000010 | 0.000020 | 0.000047 | 0.000035 | 0.000024 | 0.000020 | 0.000007 | 0.000049 |
| Ca [mg/L] | 15-Jul-20 | 12:20 | 4.56 | 5.13 | 46.5 | 7.69 | 6.35 | 7.92 | 3.44 | 3.26 | 83.6 | 3.21 |
| Cd [mg/L] | 15-Jul-20 | 12:20 | 0.000009 | 0.000013 | 0.000011 | 0.000012 | 0.000010 | < 0.000003 | 0.000003 | 0.000006 | < 0.000003 | 0.000004 |
| Co [mg/L] | 15-Jul-20 | 12:20 | 0.000081 | 0.000255 | 0.000067 | 0.000049 | 0.000223 | 0.000022 | 0.000256 | 0.000167 | 0.000032 | 0.000331 |
| Cr [mg/L] | 15-Jul-20 | 12:20 | 0.00310 | 0.00350 | 0.00016 | 0.00122 | 0.00279 | 0.00062 | 0.00331 | 0.00408 | 0.00040 | 0.00406 |
| Cu [mg/L] | 15-Jul-20 | 12:20 | 0.0005 | 0.0010 | < 0.0002 | 0.0008 | 0.0010 | 0.0007 | 0.0010 | 0.0011 | 0.0010 | 0.0008 |
| Fe [mg/L] | 15-Jul-20 | 12:20 | 0.164 | 0.545 | < 0.007 | 0.093 | 0.546 | < 0.007 | 0.569 | 0.445 | < 0.007 | 0.838 |
| K [mg/L] | 15-Jul-20 | 12:20 | 65.4 | 51.8 | 32.5 | 47.1 | 50.6 | 36.0 | 47.1 | 39.7 | 72.8 | 40.0 |
| Li [mg/L] | 15-Jul-20 | 12:20 | 0.0107 | 0.0120 | 0.0139 | 0.0058 | 0.0430 | 0.0101 | 0.0228 | 0.0368 | 0.0253 | 0.0021 |
| Mg [mg/L] | 15-Jul-20 | 12:20 | 0.795 | 1.36 | 6.12 | 1.66 | 1.51 | 1.52 | 0.619 | 0.472 | 5.37 | 0.852 |
| Mn [mg/L] | 15-Jul-20 | 12:20 | 0.00246 | 0.00583 | 0.0231 | 0.00286 | 0.00753 | 0.00157 | 0.00695 | 0.00606 | 0.00652 | 0.00946 |
| Mo [mg/L] | 15-Jul-20 | 12:20 | 0.00462 | 0.0438 | 0.0150 | 0.00663 | 0.0101 | 0.00721 | 0.00440 | 0.00494 | 0.0125 | 0.00485 |
| Na [mg/L] | 15-Jul-20 | 12:20 | 18.2 | 17.0 | 26.4 | 15.6 | 18.7 | 33.3 | 17.8 | 17.2 | 22.9 | 16.8 |
| Ni [mg/L] | 15-Jul-20 | 12:20 | 0.0004 | 0.0014 | 0.0006 | 0.0004 | 0.0011 | 0.0002 | 0.0011 | 0.0008 | 0.0002 | 0.0018 |
| P [mg/L] | 15-Jul-20 | 12:20 | 0.012 | 0.027 | 0.004 | 0.016 | 0.029 | 0.016 | 0.039 | 0.038 | 0.003 | 0.037 |
| Pb [mg/L] | 15-Jul-20 | 12:20 | 0.00042 | 0.00045 | 0.00002 | 0.00023 | 0.00034 | 0.00008 | 0.00032 | 0.00034 | 0.00002 | 0.00055 |
| Sb [mg/L] | 15-Jul-20 | 12:20 | 0.0033 | 0.0037 | 0.0025 | 0.0031 | 0.0035 | 0.0145 | 0.0028 | 0.0083 | 0.0023 | 0.0021 |
| Se [mg/L] | 15-Jul-20 | 12:20 | 0.00091 | 0.00105 | 0.00027 | 0.00110 | 0.00070 | 0.00164 | 0.00133 | 0.00102 | 0.00116 | 0.00078 |
| Si [mg/L] | 15-Jul-20 | 12:20 | 2.62 | 3.64 | 5.89 | 2.74 | 4.62 | 5.64 | 4.10 | 4.57 | 3.60 | 3.80 |
| Sn [mg/L] | 15-Jul-20 | 12:20 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Sr [mg/L] | 15-Jul-20 | 12:20 | 0.0290 | 0.0295 | 0.336 | 0.0448 | 0.0389 | 0.194 | 0.0188 | 0.0158 | 0.532 | 0.0401 |
| Ti [mg/L] | 15-Jul-20 | 12:20 | 0.00954 | 0.0290 | 0.00011 | 0.00359 | 0.0359 | 0.00031 | 0.0329 | 0.0262 | 0.00044 | 0.0466 |
| Tl [mg/L] | 15-Jul-20 | 12:20 | 0.000026 | 0.000043 | 0.000012 | 0.000023 | 0.000014 | 0.000016 | 0.000030 | 0.000011 | 0.000049 | 0.000025 |
| U [mg/L] | 15-Jul-20 | 12:20 | 0.00254 | 0.00352 | 0.00184 | 0.00347 | 0.00221 | 0.000743 | 0.00254 | 0.00311 | 0.000667 | 0.000504 |
| V [mg/L] | 15-Jul-20 | 12:20 | 0.0293 | 0.0198 | 0.00170 | 0.0114 | 0.0155 | 0.0165 | 0.0402 | 0.0512 | 0.00541 | 0.0282 |
| Zn [mg/L] | 15-Jul-20 | 12:20 | < 0.002 | 0.002 | < 0.002 | < 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.008 | 0.003 |

| Analysis | 15: VO19262649R0 23 11 | 16: VO19252703R0 07 12 | 17: VO19252703R0 42 13 | 18: V019252701R0 36 14 | 19: V019252701R0 39 15 | 20: VO19125199R0 35 16 | 21: VO19124996R0 02 17 | 22: VO19124999R0 06 18 | 23: VO19093187R0 18 19 | 24: VO19110215R0 42 20 | 25: VO19140396R0 13 21 | 26: VO19112306R0 41 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |

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**CTEU-9--(4:1 L/S ratio, 7 day on 100mesh)**

**LR Report :** **CA11007-JUN20**

| Analysis | 15: VO19262649R0 23 11 | 16: VO19252703R0 07 12 | 17: VO19252703R0 42 13 | 18: V019252701R0 36 14 | 19: V019252701R0 39 15 | 20: VO19125199R0 35 16 | 21: VO19124996R0 02 17 | 22: VO19124999R0 06 18 | 23: VO19093187R0 18 19 | 24: VO19110215R0 42 20 | 25: VO19140396R0 13 21 | 26: VO19112306R0 41 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Final pH [no unit] | 8.53 | 8.72 | 8.35 | 8.97 | 9.25 | 9.29 | 8.85 | 8.90 | 8.84 | 9.28 | 8.89 | 9.06 |
| Alkalinity [mg/L as CaCO3] | 52 | 43 | 56 | 75 | 77 | 68 | 67 | 84 | 56 | 71 | 87 | 86 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Conductivity [uS/cm] | 442 | 451 | 436 | 307 | 273 | 221 | 350 | 306 | 232 | 233 | 307 | 266 |
| pH [no unit] | 8.08 | 8.15 | 8.06 | 8.46 | 8.88 | 8.64 | 8.31 | 8.46 | 8.11 | 8.86 | 8.57 | 8.58 |
| F [mg/L] | 0.63 | 0.60 | 0.76 | 0.63 | 0.98 | 0.55 | 0.44 | 0.61 | 0.70 | 0.61 | 0.69 | 0.60 |
| Cl [mg/L] | 2.4 | < 2 | < 2 | 3.9 | 2.2 | 3.2 | < 2 | < 2 | < 2 | < 2 | 2.4 | 2.6 |
| SO4 [mg/L] | 120 | 130 | 110 | 35 | 25 | 16 | 54 | 42 | 23 | 15 | 33 | 18 |
| Br [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| NO2 [as N mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| NO2+NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Hg [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Al [mg/L] | 0.210 | 0.328 | 0.281 | 0.371 | 0.716 | 1.99 | 0.213 | 0.382 | 1.62 | 3.24 | 0.299 | 1.19 |
| As [mg/L] | 0.0006 | 0.0012 | 0.0017 | 0.0012 | 0.0018 | 0.0032 | 0.0013 | 0.0048 | 0.0008 | 0.0014 | 0.0014 | 0.0011 |
| Ag [mg/L] | 0.00021 | 0.00010 | 0.00029 | 0.00026 | 0.00013 | 0.00007 | 0.00040 | 0.00014 | < 0.00005 | 0.00009 | 0.00023 | 0.00012 |
| Ba [mg/L] | 0.0153 | 0.0156 | 0.00801 | 0.00818 | 0.00296 | 0.0120 | 0.0874 | 0.0104 | 0.0129 | 0.0167 | 0.0122 | 0.0114 |
| Be [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000009 | < 0.000007 | < 0.000007 | 0.000011 | 0.000019 | < 0.000007 | 0.000007 |
| B [mg/L] | 0.012 | 0.011 | 0.008 | 0.008 | 0.010 | 0.009 | 0.009 | 0.007 | 0.013 | 0.006 | 0.008 | 0.007 |
| Bi [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000043 | < 0.000007 | 0.000019 | 0.000047 | 0.000158 | < 0.000007 | 0.000012 |
| Ca [mg/L] | 26.2 | 18.1 | 19.9 | 5.62 | 3.70 | 3.78 | 10.0 | 7.33 | 4.53 | 1.84 | 7.68 | 4.64 |
| Cd [mg/L] | 0.000008 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000006 | 0.000005 | 0.000003 | < 0.000003 | 0.000012 | 0.000017 | < 0.000003 | 0.000003 |
| Co [mg/L] | 0.000021 | 0.000019 | 0.000016 | 0.000009 | 0.000021 | 0.000227 | 0.000090 | 0.000009 | 0.000561 | 0.000998 | 0.000011 | 0.000154 |
| Cr [mg/L] | 0.00063 | 0.00068 | 0.00067 | 0.00095 | 0.00150 | 0.00360 | 0.00056 | 0.00066 | 0.00651 | 0.00734 | 0.00066 | 0.00250 |
| Cu [mg/L] | 0.0003 | 0.0004 | 0.0003 | 0.0002 | 0.0005 | 0.0016 | 0.0002 | 0.0002 | 0.0020 | 0.0033 | 0.0002 | 0.0005 |
| Fe [mg/L] | < 0.007 | 0.008 | 0.009 | 0.009 | 0.037 | 0.621 | < 0.007 | 0.007 | 1.11 | 2.00 | 0.007 | 0.444 |
| K [mg/L] | 40.7 | 74.3 | 66.4 | 43.8 | 53.5 | 39.9 | 42.8 | 45.9 | 53.6 | 55.2 | 47.3 | 45.3 |
| Li [mg/L] | 0.0088 | 0.0308 | 0.0179 | 0.0161 | 0.0143 | 0.0087 | 0.0094 | 0.0100 | 0.0166 | 0.0067 | 0.0070 | 0.0082 |
| Mg [mg/L] | 4.08 | 2.58 | 3.11 | 0.888 | 0.588 | 0.678 | 1.61 | 1.53 | 1.10 | 0.798 | 2.51 | 1.29 |
| Mn [mg/L] | 0.00641 | 0.00303 | 0.00511 | 0.00123 | 0.00128 | 0.00919 | 0.00239 | 0.00251 | 0.0137 | 0.0198 | 0.00251 | 0.00727 |
| Mo [mg/L] | 0.0103 | 0.00939 | 0.00803 | 0.00485 | 0.00817 | 0.00476 | 0.00708 | 0.00714 | 0.00688 | 0.00251 | 0.00573 | 0.00607 |
| Na [mg/L] | 31.0 | 20.0 | 21.6 | 25.2 | 16.4 | 14.0 | 31.9 | 24.3 | 15.5 | 11.7 | 23.2 | 19.7 |
| Ni [mg/L] | 0.0002 | 0.0001 | 0.0002 | < 0.0001 | 0.0002 | 0.0014 | < 0.0001 | < 0.0001 | 0.0022 | 0.0033 | < 0.0001 | 0.0008 |
| P [mg/L] | 0.007 | 0.011 | 0.017 | 0.009 | 0.029 | 0.054 | 0.008 | 0.006 | 0.058 | 0.084 | 0.006 | 0.035 |
| Pb [mg/L] | 0.00001 | < 0.00001 | < 0.00001 | 0.00002 | 0.00004 | 0.00067 | 0.00003 | 0.00001 | 0.00044 | 0.00116 | 0.00002 | 0.00037 |
| Sb [mg/L] | 0.0017 | 0.0048 | 0.0028 | 0.0020 | 0.0017 | 0.0013 | 0.0034 | 0.0076 | 0.0045 | 0.0054 | 0.0036 | 0.0027 |

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**LR Report :** **CA11007-JUN20**

| Analysis | 15: VO19262649R0 23 11 | 16: VO19252703R0 07 12 | 17: VO19252703R0 42 13 | 18: V019252701R0 36 14 | 19: V019252701R0 39 15 | 20: VO19125199R0 35 16 | 21: VO19124996R0 02 17 | 22: VO19124999R0 06 18 | 23: VO19093187R0 18 19 | 24: VO19110215R0 42 20 | 25: VO19140396R0 13 21 | 26: VO19112306R0 41 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Se [mg/L] | 0.00056 | 0.00074 | 0.00063 | 0.00069 | 0.00120 | 0.00130 | 0.00077 | 0.00073 | 0.00044 | 0.00101 | 0.00052 | 0.00065 |
| Si [mg/L] | 4.02 | 3.27 | 3.20 | 3.47 | 3.02 | 3.75 | 3.96 | 3.71 | 3.68 | 4.67 | 3.31 | 3.19 |
| Sn [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00009 | 0.00009 | < 0.00006 | < 0.00006 |
| Sr [mg/L] | 0.261 | 0.123 | 0.159 | 0.0429 | 0.0199 | 0.0193 | 0.212 | 0.180 | 0.0165 | 0.00832 | 0.165 | 0.0356 |
| Ti [mg/L] | 0.00040 | 0.00063 | 0.00095 | 0.00079 | 0.00258 | 0.0390 | 0.00054 | 0.00047 | 0.0734 | 0.0974 | 0.00047 | 0.0221 |
| Tl [mg/L] | 0.000032 | 0.000035 | 0.000045 | 0.000018 | 0.000030 | 0.000021 | 0.000008 | 0.000026 | 0.000028 | 0.000038 | 0.000027 | 0.000029 |
| U [mg/L] | 0.00185 | 0.000777 | 0.000741 | 0.00108 | 0.00105 | 0.00174 | 0.000871 | 0.00119 | 0.00162 | 0.00144 | 0.000543 | 0.00104 |
| V [mg/L] | 0.00667 | 0.0129 | 0.00840 | 0.0228 | 0.0340 | 0.0310 | 0.00733 | 0.0181 | 0.0367 | 0.0387 | 0.0113 | 0.0164 |
| Zn [mg/L] | < 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.002 | < 0.002 | < 0.002 | 0.005 | 0.107 | < 0.002 | < 0.002 |

| Analysis | 27: VO19111152R0 03 23 | 28: VO19111152R0 49 24 | 29: VO19137440R0 16 25 | 30: VO19128730R0 10 26 | 31: VO19128730R0 46 27 | 32: VO19118517R0 08 28 | 33: VO19149798R0 06 29 | 34: VO19132117R0 28 30 | 35: VO19132117R0 32 31 | 36: VO19189405R0 42 32 | 37: VO19202592R0 25 33 | 38: VO19241618R0 08 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 8.56 | 9.05 | 9.45 | 8.46 | 8.74 | 8.33 | 9.04 | 8.18 | 8.50 | 9.16 | 8.85 | 8.89 |
| Alkalinity [mg/L as CaCO3] | 67 | 86 | 89 | 70 | 77 | 76 | 78 | 92 | 79 | 76 | 65 | 81 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Conductivity [uS/cm] | 401 | 274 | 249 | 435 | 313 | 423 | 266 | 546 | 410 | 233 | 330 | 296 |
| pH [no unit] | 8.26 | 8.57 | 9.23 | 8.19 | 8.42 | 8.19 | 8.56 | 8.16 | 8.29 | 8.58 | 8.30 | 8.46 |
| F [mg/L] | 0.69 | 0.63 | 1.07 | 0.68 | 0.52 | 0.73 | 0.62 | 0.19 | 0.98 | 0.69 | 0.63 | 0.68 |
| Cl [mg/L] | 4.2 | < 2 | < 2 | 2.1 | 8.5 | 3.2 | 4.8 | 7.3 | 9.7 | 2.2 | < 2 | < 2 |
| SO4 [mg/L] | 66 | 22 | 12 | 98 | 36 | 85 | 20 | 110 | 66 | 17 | 58 | 34 |
| Br [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| NO2 [as N mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| NO2+NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Hg [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Al [mg/L] | 0.256 | 0.524 | 0.468 | 0.222 | 0.335 | 0.148 | 0.413 | 0.065 | 0.205 | 1.93 | 0.462 | 0.334 |
| As [mg/L] | 0.0015 | 0.0029 | 0.0006 | 0.0010 | 0.0011 | 0.0005 | 0.0004 | 0.0007 | 0.0005 | 0.0015 | 0.0019 | 0.0018 |
| Ag [mg/L] | 0.00087 | 0.00025 | 0.00006 | 0.00076 | 0.00025 | 0.00250 | 0.00012 | 0.00396 | 0.00049 | < 0.00005 | 0.00019 | 0.00021 |
| Ba [mg/L] | 0.00810 | 0.00623 | 0.00859 | 0.0549 | 0.0203 | 0.0155 | 0.0186 | 0.0151 | 0.0126 | 0.0137 | 0.00963 | 0.00876 |
| Be [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 0.009 | 0.006 | 0.006 | 0.008 | 0.008 | 0.009 | 0.010 | 0.007 | 0.011 | 0.020 | 0.007 | 0.009 |

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| Analysis | 27: VO19111152R0 03 23 | 28: VO19111152R0 49 24 | 29: VO19137440R0 16 25 | 30: VO19128730R0 10 26 | 31: VO19128730R0 46 27 | 32: VO19118517R0 08 28 | 33: VO19149798R0 06 29 | 34: VO19132117R0 28 30 | 35: VO19132117R0 32 31 | 36: VO19189405R0 42 32 | 37: VO19202592R0 25 33 | 38: VO19241618R0 08 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bi [mg/L] | 0.000015 | 0.000009 | < 0.000007 | 0.000008 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000054 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 16.5 | 4.53 | 2.30 | 23.0 | 9.10 | 26.1 | 5.12 | 42.7 | 15.6 | 2.78 | 8.69 | 7.81 |
| Cd [mg/L] | 0.000010 | < 0.000003 | < 0.000003 | 0.000004 | < 0.000003 | 0.000006 | < 0.000003 | 0.000010 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 |
| Co [mg/L] | 0.000030 | 0.000029 | 0.000009 | 0.000021 | 0.000013 | 0.000024 | 0.000012 | 0.000062 | 0.000021 | 0.000384 | 0.000042 | 0.000008 |
| Cr [mg/L] | 0.00065 | 0.00148 | 0.00396 | 0.00054 | 0.00076 | 0.00032 | 0.00152 | 0.00022 | 0.00117 | 0.00363 | 0.00180 | 0.00058 |
| Cu [mg/L] | 0.0003 | 0.0005 | 0.0002 | < 0.0002 | 0.0002 | 0.0007 | 0.0002 | 0.0003 | 0.0003 | 0.0012 | 0.0003 | < 0.0002 |
| Fe [mg/L] | 0.044 | 0.041 | 0.019 | < 0.007 | 0.009 | < 0.007 | 0.018 | < 0.007 | < 0.007 | 0.648 | 0.100 | 0.007 |
| K [mg/L] | 68.4 | 47.2 | 70.4 | 50.0 | 35.3 | 34.0 | 58.4 | 40.9 | 64.6 | 50.0 | 64.4 | 43.9 |
| Li [mg/L] | 0.0221 | 0.0041 | 0.0100 | 0.0156 | 0.0051 | 0.0166 | 0.0180 | 0.0178 | 0.0138 | 0.0065 | 0.0212 | 0.0081 |
| Mg [mg/L] | 3.23 | 1.08 | 0.561 | 4.32 | 2.27 | 4.88 | 1.01 | 10.9 | 4.00 | 0.783 | 1.42 | 1.46 |
| Mn [mg/L] | 0.00700 | 0.00137 | 0.00072 | 0.00696 | 0.00339 | 0.0122 | 0.00220 | 0.0237 | 0.00514 | 0.00818 | 0.00316 | 0.00193 |
| Mo [mg/L] | 0.00916 | 0.00518 | 0.00176 | 0.0102 | 0.00589 | 0.0126 | 0.00364 | 0.0102 | 0.0104 | 0.00492 | 0.0156 | 0.00842 |
| Na [mg/L] | 13.0 | 24.9 | 7.64 | 31.1 | 33.5 | 39.0 | 15.1 | 36.6 | 26.8 | 14.3 | 19.6 | 26.3 |
| Ni [mg/L] | 0.0005 | 0.0003 | < 0.0001 | 0.0002 | 0.0001 | 0.0002 | 0.0002 | 0.0005 | 0.0002 | 0.0018 | 0.0003 | 0.0001 |
| P [mg/L] | 0.013 | 0.023 | 0.019 | 0.011 | 0.009 | 0.005 | 0.020 | 0.009 | 0.007 | 0.048 | 0.022 | 0.011 |
| Pb [mg/L] | 0.00007 | 0.00032 | 0.00002 | 0.00002 | 0.00004 | 0.00004 | 0.00006 | 0.00005 | 0.00002 | 0.00058 | 0.00008 | 0.00003 |
| Sb [mg/L] | 0.0018 | 0.0051 | 0.0016 | < 0.0009 | < 0.0009 | 0.0010 | 0.0036 | 0.0014 | 0.0009 | 0.0012 | 0.0012 | 0.0018 |
| Se [mg/L] | 0.00045 | 0.00073 | 0.00055 | 0.00033 | 0.00078 | 0.00071 | 0.00070 | 0.00049 | 0.00022 | 0.00237 | 0.00129 | 0.00047 |
| Si [mg/L] | 3.17 | 3.03 | 3.77 | 3.64 | 3.63 | 4.99 | 3.74 | 6.49 | 4.13 | 4.45 | 3.12 | 4.05 |
| Sn [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00012 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00007 | < 0.00006 | 0.00006 |
| Sr [mg/L] | 0.0759 | 0.0546 | 0.0256 | 0.537 | 0.102 | 0.226 | 0.0391 | 0.637 | 0.184 | 0.0269 | 0.0392 | 0.215 |
| Ti [mg/L] | 0.00458 | 0.00277 | 0.00150 | 0.00087 | 0.00082 | 0.00044 | 0.00154 | 0.00015 | 0.00057 | 0.0547 | 0.0105 | 0.00095 |
| Tl [mg/L] | 0.000031 | 0.000016 | 0.000051 | 0.000029 | 0.000010 | 0.000013 | 0.000020 | 0.000013 | 0.000046 | 0.000023 | 0.000011 | 0.000022 |
| U [mg/L] | 0.000948 | 0.000638 | 0.000119 | 0.00161 | 0.000615 | 0.00165 | 0.000447 | 0.00203 | 0.000477 | 0.00126 | 0.000699 | 0.000614 |
| V [mg/L] | 0.00811 | 0.0403 | 0.0512 | 0.00603 | 0.0109 | 0.00426 | 0.0245 | 0.00158 | 0.00830 | 0.0345 | 0.0186 | 0.0163 |
| Zn [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.002 | < 0.002 | 0.005 |

| Analysis | 39: VO19241601R0 16 35 | 40: VO19211878R0 38 36 | 41: V019165010R0 43 37 | 42: VO19276647R0 46 38 | 43: VO19195806R0 22 39 | 44: V019216516R0 34 40 | 45: V019226295R0 14 41 | 46: VO19211753R0 46 42 | 47: V019185394R0 14 43 | 48: VO19185519R0 31 44 | 49: VO19185519R0 43 45 | 50: VO19185521R0 19 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 8.42 | 8.97 | 8.73 | 8.79 | 9.05 | 9.47 | 8.49 | 8.60 | 9.03 | 8.86 | 8.15 | 8.22 |
| Alkalinity [mg/L as CaCO3] | 83 | 61 | 55 | 85 | 63 | 85 | 34 | 74 | 83 | 89 | 46 | 46 |

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LR Report : CA11007-JUN20

| Analysis | 39: VO19241601R0 16 35 | 40: VO19211878R0 38 36 | 41: V019165010R0 43 37 | 42: VO19276647R0 46 38 | 43: VO19195806R0 22 39 | 44: V019216516R0 34 40 | 45: V019226295R0 14 41 | 46: VO19211753R0 46 42 | 47: V019185394R0 14 43 | 48: VO19185519R0 31 44 | 49: VO19185519R0 43 45 | 50: VO19185521R0 19 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Conductivity [uS/cm] | 450 | 192 | 346 | 362 | 227 | 233 | 506 | 425 | 303 | 331 | 712 | 722 |
| pH [no unit] | 8.27 | 8.31 | 8.28 | 8.19 | 8.41 | 9.30 | 7.95 | 8.29 | 8.89 | 8.48 | 7.99 | 8.01 |
| F [mg/L] | 0.54 | 0.63 | 0.65 | 0.31 | 0.49 | 0.61 | 0.45 | 0.65 | 0.60 | 0.93 | 0.33 | 0.31 |
| Cl [mg/L] | < 2 | 2.8 | 4.6 | < 2 | 5.2 | < 2 | 3.2 | 3.5 | 4.6 | 4.2 | 3.4 | 3.2 |
| SO4 [mg/L] | 75 | 13 | 76 | 49 | 19 | 11 | 160 | 82 | 31 | 34 | 240 | 240 |
| Br [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| NO2 [as N mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| NO2+NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Hg [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Al [mg/L] | 0.135 | 1.95 | 0.320 | 0.242 | 2.54 | 2.72 | 0.401 | 0.252 | 0.440 | 0.396 | 0.100 | 0.093 |
| As [mg/L] | 0.0013 | 0.0007 | 0.0011 | 0.0014 | 0.0148 | 0.0173 | 0.0008 | 0.0016 | 0.0036 | 0.0012 | 0.0007 | 0.0007 |
| Ag [mg/L] | 0.00122 | < 0.00005 | 0.00007 | 0.00070 | < 0.00005 | < 0.00005 | 0.00007 | 0.00102 | 0.00028 | 0.00026 | 0.00076 | 0.00064 |
| Ba [mg/L] | 0.0170 | 0.00808 | 0.0451 | 0.0167 | 0.0201 | 0.0511 | 0.0322 | 0.0122 | 0.0124 | 0.00653 | 0.0282 | 0.0277 |
| Be [mg/L] | < 0.000007 | 0.000010 | < 0.000007 | < 0.000007 | 0.000014 | 0.000012 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 0.008 | 0.013 | 0.011 | 0.007 | 0.010 | 0.006 | 0.008 | 0.006 | 0.007 | 0.008 | 0.007 | 0.007 |
| Bi [mg/L] | < 0.000007 | 0.000087 | < 0.000007 | 0.000008 | 0.000093 | 0.000163 | 0.000015 | < 0.000007 | 0.000019 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 21.2 | 2.84 | 18.1 | 8.83 | 3.42 | 1.80 | 39.1 | 17.1 | 5.81 | 7.33 | 70.9 | 71.9 |
| Cd [mg/L] | 0.000005 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000005 | 0.000034 | 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000004 | 0.000005 |
| Co [mg/L] | 0.000024 | 0.000416 | 0.000025 | 0.000012 | 0.000674 | 0.002110 | 0.000044 | 0.000022 | 0.000013 | 0.000012 | 0.000048 | 0.000043 |
| Cr [mg/L] | 0.00040 | 0.00459 | 0.00065 | 0.00054 | 0.00658 | 0.0139 | 0.00078 | 0.00062 | 0.00076 | 0.00085 | 0.00023 | 0.00024 |
| Cu [mg/L] | 0.0004 | 0.0009 | 0.0002 | 0.0006 | 0.0021 | 0.0061 | 0.0012 | 0.0004 | 0.0005 | 0.0002 | 0.0005 | 0.0003 |
| Fe [mg/L] | < 0.007 | 0.844 | 0.051 | 0.007 | 1.25 | 2.55 | 0.043 | 0.010 | 0.022 | < 0.007 | < 0.007 | < 0.007 |
| K [mg/L] | 75.0 | 36.7 | 43.8 | 45.0 | 41.4 | 45.9 | 66.2 | 74.6 | 50.4 | 63.3 | 62.9 | 63.9 |
| Li [mg/L] | 0.0191 | 0.0016 | 0.0065 | 0.0147 | 0.0131 | 0.0162 | 0.0322 | 0.0327 | 0.0237 | 0.0160 | 0.0311 | 0.0293 |
| Mg [mg/L] | 4.87 | 1.02 | 2.81 | 1.58 | 1.11 | 1.53 | 4.06 | 3.60 | 1.09 | 2.12 | 12.0 | 12.9 |
| Mn [mg/L] | 0.00881 | 0.00948 | 0.00275 | 0.00238 | 0.0168 | 0.0360 | 0.00348 | 0.00603 | 0.00146 | 0.00214 | 0.0313 | 0.0319 |
| Mo [mg/L] | 0.0131 | 0.00613 | 0.00973 | 0.00999 | 0.00924 | 0.00418 | 0.0133 | 0.00835 | 0.00735 | 0.00843 | 0.0121 | 0.0123 |
| Na [mg/L] | 20.5 | 14.1 | 27.8 | 37.0 | 18.5 | 17.6 | 17.6 | 24.2 | 24.0 | 21.9 | 30.1 | 31.8 |
| Ni [mg/L] | 0.0003 | 0.0019 | 0.0003 | 0.0002 | 0.0034 | 0.0060 | 0.0004 | 0.0003 | 0.0002 | 0.0001 | 0.0004 | 0.0004 |
| P [mg/L] | 0.006 | 0.045 | 0.010 | 0.014 | 0.063 | 0.124 | 0.010 | 0.009 | 0.029 | 0.012 | 0.007 | 0.006 |
| Pb [mg/L] | 0.00002 | 0.00067 | 0.00004 | 0.00006 | 0.00079 | 0.00148 | 0.00008 | 0.00009 | 0.00006 | 0.00002 | 0.00005 | 0.00003 |
| Sb [mg/L] | 0.0017 | 0.0035 | 0.0015 | 0.0061 | 0.0046 | 0.0052 | 0.0017 | 0.0019 | 0.0021 | 0.0013 | 0.0016 | 0.0015 |
| Se [mg/L] | 0.00028 | 0.00143 | 0.00049 | 0.00069 | 0.00107 | 0.00096 | 0.00057 | 0.00040 | 0.00095 | 0.00079 | 0.00035 | 0.00029 |
| Si [mg/L] | 4.36 | 3.16 | 3.87 | 4.37 | 4.83 | 7.02 | 3.15 | 4.02 | 3.75 | 3.52 | 5.28 | 5.48 |

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Phone: 705-652-2000 FAX: 705-652-6365



| Analysis | 39: VO19241601R0 16 35 | 40: VO19211878R0 38 36 | 41: V019165010R0 43 37 | 42: VO19276647R0 46 38 | 43: VO19195806R0 22 39 | 44: V019216516R0 34 40 | 45: V019226295R0 14 41 | 46: VO19211753R0 46 42 | 47: V019185394R0 14 43 | 48: VO19185519R0 31 44 | 49: VO19185519R0 43 45 | 50: VO19185521R0 19 46 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sn [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00010 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00008 |
| Sr [mg/L] | 0.276 | 0.0138 | 1.60 | 0.140 | 0.0243 | 0.00844 | 0.186 | 0.315 | 0.0388 | 0.0479 | 1.60 | 1.76 |
| Ti [mg/L] | 0.00078 | 0.0331 | 0.00371 | 0.00105 | 0.0746 | 0.166 | 0.00337 | 0.00153 | 0.00210 | 0.00083 | 0.00028 | 0.00023 |
| Tl [mg/L] | 0.000037 | 0.000022 | 0.000020 | 0.000010 | 0.000028 | 0.000027 | 0.000033 | 0.000041 | 0.000014 | 0.000026 | 0.000026 | 0.000027 |
| U [mg/L] | 0.000463 | 0.00229 | 0.000546 | 0.00123 | 0.00107 | 0.000752 | 0.000965 | 0.000980 | 0.000794 | 0.00108 | 0.00119 | 0.00112 |
| V [mg/L] | 0.00751 | 0.0230 | 0.00917 | 0.00687 | 0.0312 | 0.0635 | 0.00611 | 0.0124 | 0.0225 | 0.0151 | 0.00238 | 0.00225 |
| Zn [mg/L] | < 0.002 | 0.003 | < 0.002 | < 0.002 | 0.004 | 0.007 | < 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 51: VO19231738R0 02 47 | 52: VO19234800R0 26 48 | 53: VO19231549R0 50 49 | 54: VO19202589R0 50 50 | 55: VO19234784R0 38 51 | 56: VO19226180R0 12 52 | 57: VO19226290R0 05 53 | 58: VO19226290R0 11 54 | 59: VO19246880R0 15 55 | 60: VO19246880R0 20 56 | 61: VO19246880R0 26 57 | 62: VO19258344R0 50 58 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 8.71 | 8.84 | 9.16 | 8.10 | 8.98 | 8.11 | 8.70 | 8.39 | 8.38 | 8.42 | 9.04 | 8.49 |
| Alkalinity [mg/L as CaCO3] | 68 | 67 | 70 | 92 | 68 | 29 | 77 | 74 | 79 | 79 | 86 | 55 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Conductivity [uS/cm] | 276 | 260 | 237 | 537 | 218 | 854 | 321 | 396 | 413 | 348 | 300 | 496 |
| pH [no unit] | 8.20 | 8.17 | 8.61 | 8.20 | 8.31 | 7.75 | 8.34 | 8.23 | 8.19 | 8.21 | 8.76 | 8.06 |
| F [mg/L] | 0.78 | 0.60 | 0.52 | 0.27 | 0.62 | 0.52 | 0.82 | 0.80 | 0.73 | 0.31 | 0.34 | 0.47 |
| Cl [mg/L] | 6.3 | 2.4 | 2.9 | 4.6 | 2.1 | < 2 | 3.0 | 6.0 | 5.9 | 2.0 | < 2 | 2.0 |
| SO4 [mg/L] | 28 | 22 | 16 | 110 | 16 | 380 | 40 | 57 | 67 | 50 | 29 | 160 |
| Br [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| NO2 [as N mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| NO2+NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Hg [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Al [mg/L] | 0.456 | 1.17 | 1.42 | 0.095 | 1.84 | 0.174 | 0.281 | 0.196 | 0.250 | 0.122 | 0.306 | 0.192 |
| As [mg/L] | 0.0010 | 0.0040 | 0.0048 | 0.0010 | 0.0007 | 0.0009 | 0.0020 | 0.0009 | 0.0016 | 0.0016 | 0.0042 | 0.0009 |
| Ag [mg/L] | 0.00014 | < 0.00005 | < 0.00005 | 0.00144 | 0.00009 | 0.00029 | 0.00033 | 0.00043 | 0.00174 | 0.00134 | 0.00049 | 0.00009 |
| Ba [mg/L] | 0.0160 | 0.00947 | 0.0125 | 0.0157 | 0.0134 | 0.0434 | 0.0202 | 0.00805 | 0.0115 | 0.0352 | 0.0339 | 0.0694 |
| Be [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| B [mg/L] | 0.017 | 0.009 | 0.011 | 0.011 | 0.008 | 0.006 | 0.008 | 0.009 | 0.009 | 0.008 | 0.007 | 0.005 |
| Bi [mg/L] | 0.000030 | 0.000049 | 0.000020 | 0.000009 | 0.000044 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000008 | < 0.000007 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 6.35 | 3.97 | 3.59 | 42.0 | 2.99 | 97.5 | 7.76 | 15.1 | 18.6 | 12.6 | 4.38 | 33.0 |

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| Analysis | 51: VO19231738R0 02 47 | 52: VO19234800R0 26 48 | 53: VO19231549R0 50 49 | 54: VO19202589R0 50 50 | 55: VO19234784R0 38 51 | 56: VO19226180R0 12 52 | 57: VO19226290R0 05 53 | 58: VO19226290R0 11 54 | 59: VO19246880R0 15 55 | 60: VO19246880R0 20 56 | 61: VO19246880R0 26 57 | 62: VO19258344R0 50 58 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cd [mg/L] | 0.000006 | 0.000004 | 0.000008 | 0.000005 | < 0.000003 | 0.000006 | 0.000004 | < 0.000003 | 0.000012 | 0.000017 | < 0.000003 | < 0.000003 |
| Co [mg/L] | 0.000473 | 0.000249 | 0.000222 | 0.000085 | 0.000361 | 0.000073 | 0.000017 | 0.000035 | 0.000053 | 0.000023 | 0.000014 | 0.000018 |
| Cr [mg/L] | 0.00314 | 0.00298 | 0.00390 | 0.00030 | 0.00360 | 0.00044 | 0.00094 | 0.00043 | 0.00073 | 0.00048 | 0.00082 | 0.00051 |
| Cu [mg/L] | 0.0010 | 0.0029 | 0.0011 | 0.0003 | 0.0011 | 0.0003 | 0.0003 | 0.0003 | 0.0007 | 0.0008 | 0.0005 | < 0.0002 |
| Fe [mg/L] | 0.272 | 0.388 | 0.458 | < 0.007 | 0.564 | < 0.007 | 0.012 | 0.011 | 0.051 | 0.007 | 0.014 | 0.007 |
| K [mg/L] | 34.6 | 46.0 | 43.8 | 46.7 | 34.2 | 68.8 | 49.3 | 51.1 | 56.4 | 30.9 | 40.1 | 57.0 |
| Li [mg/L] | 0.0036 | 0.0108 | 0.0296 | 0.0169 | 0.0027 | 0.0240 | 0.0109 | 0.0117 | 0.0173 | 0.0118 | 0.0133 | 0.0212 |
| Mg [mg/L] | 1.69 | 0.843 | 0.543 | 5.87 | 0.886 | 6.72 | 1.59 | 3.10 | 3.14 | 2.48 | 0.811 | 8.32 |
| Mn [mg/L] | 0.00480 | 0.00537 | 0.00856 | 0.0307 | 0.00497 | 0.0141 | 0.00184 | 0.00526 | 0.00850 | 0.00313 | 0.00113 | 0.0110 |
| Mo [mg/L] | 0.0103 | 0.0186 | 0.00577 | 0.0115 | 0.00795 | 0.01263 | 0.01011 | 0.00819 | 0.00906 | 0.01800 | 0.00761 | 0.00738 |
| Na [mg/L] | 27.0 | 17.4 | 15.9 | 34.0 | 16.9 | 26.7 | 25.3 | 25.5 | 22.2 | 41.7 | 33.6 | 22.2 |
| Ni [mg/L] | 0.0011 | 0.0009 | 0.0010 | 0.0005 | 0.0013 | 0.0001 | < 0.0001 | < 0.0001 | 0.0003 | 0.0001 | < 0.0001 | < 0.0001 |
| P [mg/L] | 0.034 | 0.032 | 0.035 | 0.005 | 0.045 | 0.004 | 0.014 | 0.013 | 0.009 | 0.014 | 0.015 | 0.005 |
| Pb [mg/L] | 0.00014 | 0.00039 | 0.00025 | 0.00003 | 0.00035 | < 0.00001 | 0.00002 | < 0.00001 | 0.00024 | 0.00005 | 0.00004 | 0.00003 |
| Sb [mg/L] | < 0.0009 | 0.0044 | 0.0042 | 0.0031 | 0.0039 | 0.0019 | 0.0019 | 0.0014 | 0.0034 | 0.0064 | 0.0073 | 0.0014 |
| Se [mg/L] | 0.00113 | 0.00118 | 0.00087 | 0.00083 | 0.00094 | 0.00041 | 0.00048 | 0.00030 | 0.00037 | 0.00108 | 0.00111 | 0.00059 |
| Si [mg/L] | 4.01 | 2.73 | 3.11 | 4.13 | 2.93 | 3.56 | 3.88 | 3.46 | 3.25 | 5.09 | 4.12 | 3.06 |
| Sn [mg/L] | 0.00008 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Sr [mg/L] | 0.0658 | 0.0190 | 0.0135 | 0.411 | 0.0123 | 0.780 | 0.119 | 0.119 | 0.120 | 0.206 | 0.0903 | 1.26 |
| Ti [mg/L] | 0.0213 | 0.0222 | 0.0366 | 0.00058 | 0.0239 | 0.00055 | 0.00104 | 0.00087 | 0.00500 | 0.00043 | 0.00090 | 0.00038 |
| Tl [mg/L] | 0.000023 | 0.000031 | 0.000015 | 0.000017 | 0.000024 | 0.000030 | 0.000034 | 0.000027 | 0.000031 | 0.000007 | 0.000008 | 0.000036 |
| U [mg/L] | 0.000845 | 0.00221 | 0.00343 | 0.00149 | 0.00173 | 0.00124 | 0.000665 | 0.000692 | 0.00168 | 0.00210 | 0.000345 | 0.00167 |
| V [mg/L] | 0.0165 | 0.0277 | 0.0499 | 0.00285 | 0.0231 | 0.00593 | 0.0164 | 0.0119 | 0.00768 | 0.0102 | 0.0321 | 0.00493 |
| Zn [mg/L] | < 0.002 | 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 63: VO19258343R0 07 59 | 64: VO19242574R0 46 60 | 65: VO18283892R0 01 61 | 66: VO19244666R0 16 62 | 67: VO19244666R0 45 63 | 68: VO19286662R0 11 64 | 69: VO19286662R0 26 65 | 70: VO19283031R0 02 66 | 71: VO19285337R0 11 67 | 72: VO19285236R0 01 68 | 73: VO19285236R0 08 69 | 74: VO19295741R0 24 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 8.97 | 8.99 | 9.05 | 8.69 | 9.39 | 8.64 | 9.06 | 9.37 | 8.19 | 9.29 | 8.80 | 9.07 |
| Alkalinity [mg/L as CaCO3] | 72 | 71 | 65 | 111 | 79 | 62 | 71 | 88 | 23 | 67 | 60 | 70 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Conductivity [uS/cm] | 325 | 295 | 213 | 352 | 251 | 273 | 314 | 248 | 1730 | 263 | 393 | 259 |

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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365



| Analysis | 63: VO19258343R0 07 59 | 64: VO19242574R0 46 60 | 65: VO18283892R0 01 61 | 66: VO19244666R0 16 62 | 67: VO19244666R0 45 63 | 68: VO19286662R0 11 64 | 69: VO19286662R0 26 65 | 70: VO19283031R0 02 66 | 71: VO19285337R0 11 67 | 72: VO19285236R0 01 68 | 73: VO19285236R0 08 69 | 74: VO19295741R0 24 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| pH [no unit] | 8.72 | 8.52 | 8.57 | 8.48 | 8.95 | 8.20 | 8.35 | 8.85 | 7.42 | 8.81 | 8.21 | 8.19 |
| F [mg/L] | 0.78 | 0.62 | 0.57 | 0.35 | 0.69 | 0.20 | 0.84 | 0.62 | 0.87 | 0.68 | 0.77 | 0.78 |
| Cl [mg/L] | 4.3 | 3.1 | 4.2 | 3.8 | 3.6 | 3.9 | 3.2 | 2.8 | 2.7 | 2.4 | 5.3 | 3.9 |
| SO4 [mg/L] | 45 | 43 | 15 | 35 | 16 | 37 | 27 | 14 | 900 | 33 | 79 | 22 |
| Br [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| NO2 [as N mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| NO2+NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Hg [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Al [mg/L] | 0.417 | 0.412 | 1.28 | 0.147 | 2.35 | 0.047 | 1.30 | 1.71 | 0.085 | 0.411 | 0.250 | 2.80 |
| As [mg/L] | 0.0028 | 0.0036 | 0.0027 | 0.0008 | 0.0087 | 0.0019 | 0.0041 | 0.0012 | < 0.0002 | 0.0022 | 0.0003 | 0.0017 |
| Ag [mg/L] | 0.00025 | 0.00040 | 0.00006 | 0.00032 | 0.00010 | 0.00088 | 0.00045 | 0.00007 | 0.00013 | 0.00015 | 0.00026 | < 0.00005 |
| Ba [mg/L] | 0.0164 | 0.00588 | 0.0116 | 0.0147 | 0.0180 | 0.0233 | 0.0135 | 0.00991 | 0.0961 | 0.00202 | 0.00435 | 0.0371 |
| Be [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000020 | < 0.000007 | 0.000012 | 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000018 |
| B [mg/L] | 0.009 | 0.008 | 0.009 | 0.009 | 0.010 | 0.012 | 0.009 | 0.009 | 0.006 | 0.007 | 0.008 | 0.015 |
| Bi [mg/L] | < 0.000007 | 0.000039 | 0.000050 | 0.000016 | 0.000197 | 0.000024 | 0.000075 | 0.000077 | < 0.000007 | 0.000017 | < 0.000007 | 0.000168 |
| Ca [mg/L] | 7.54 | 6.24 | 3.16 | 10.4 | 1.90 | 14.6 | 4.56 | 2.48 | 364 | 3.56 | 12.8 | 2.42 |
| Cd [mg/L] | 0.000005 | 0.000003 | 0.000017 | < 0.000003 | 0.000023 | 0.000006 | 0.000011 | 0.000021 | < 0.000003 | 0.000004 | 0.000005 | 0.000015 |
| Co [mg/L] | 0.000038 | 0.000042 | 0.000332 | 0.000096 | 0.000721 | 0.000022 | 0.000262 | 0.000343 | 0.000107 | 0.000012 | 0.000024 | 0.00146 |
| Cr [mg/L] | 0.00163 | 0.00086 | 0.00406 | 0.00041 | 0.00680 | 0.00026 | 0.00464 | 0.00370 | 0.00100 | 0.00086 | 0.00105 | 0.0150 |
| Cu [mg/L] | 0.0005 | 0.0010 | 0.0013 | 0.0004 | 0.0033 | 0.0004 | 0.0013 | 0.0017 | 0.0003 | 0.0003 | 0.0003 | 0.0030 |
| Fe [mg/L] | 0.050 | 0.064 | 0.573 | 0.013 | 1.29 | < 0.007 | 0.636 | 0.703 | < 0.007 | 0.007 | 0.008 | 2.12 |
| K [mg/L] | 48.3 | 43.5 | 31.9 | 39.5 | 46.5 | 15.2 | 46.1 | 49.2 | 119 | 39.3 | 57.7 | 42.8 |
| Li [mg/L] | 0.0065 | 0.0089 | 0.0071 | 0.0085 | 0.0064 | 0.0084 | 0.0092 | 0.0036 | 0.0272 | 0.0115 | 0.0122 | 0.0063 |
| Mg [mg/L] | 1.30 | 1.10 | 0.858 | 6.86 | 0.869 | 2.48 | 1.14 | 0.778 | 19.3 | 0.564 | 2.42 | 1.73 |
| Mn [mg/L] | 0.00185 | 0.00185 | 0.00793 | 0.00526 | 0.0189 | 0.00576 | 0.00946 | 0.0106 | 0.0537 | 0.00081 | 0.00329 | 0.0250 |
| Mo [mg/L] | 0.00622 | 0.00863 | 0.00552 | 0.00846 | 0.00687 | 0.00919 | 0.00789 | 0.00507 | 0.00589 | 0.00589 | 0.00629 | 0.00946 |
| Na [mg/L] | 27.2 | 25.8 | 21.4 | 30.0 | 16.8 | 28.4 | 23.0 | 17.1 | 9.38 | 24.1 | 24.0 | 22.0 |
| Ni [mg/L] | 0.0002 | 0.0006 | 0.0013 | 0.0004 | 0.0031 | 0.0004 | 0.0017 | 0.0015 | 0.0004 | 0.0001 | 0.0002 | 0.0060 |
| P [mg/L] | 0.011 | 0.027 | 0.067 | 0.006 | 0.054 | 0.005 | 0.046 | 0.052 | < 0.003 | 0.006 | 0.006 | 0.066 |
| Pb [mg/L] | 0.00006 | 0.00008 | 0.00057 | 0.00005 | 0.00110 | 0.00008 | 0.00074 | 0.00058 | 0.00001 | 0.00003 | 0.00001 | 0.00160 |
| Sb [mg/L] | 0.0015 | 0.0011 | 0.0031 | 0.0056 | 0.0036 | 0.0019 | 0.0053 | 0.0023 | 0.0010 | 0.0019 | < 0.0009 | 0.0018 |
| Se [mg/L] | 0.00140 | 0.00138 | 0.00122 | 0.00136 | 0.00186 | 0.00103 | 0.00129 | 0.00186 | 0.00057 | 0.00082 | 0.00061 | 0.00115 |
| Si [mg/L] | 2.65 | 2.99 | 3.34 | 3.64 | 3.90 | 8.14 | 3.27 | 3.54 | 2.76 | 3.40 | 2.89 | 4.74 |
| Sn [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Sr [mg/L] | 0.623 | 0.0399 | 0.0170 | 0.260 | 0.00975 | 0.177 | 0.0217 | 0.0148 | 11.1 | 0.0311 | 0.0827 | 0.0155 |

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| Analysis | 63: VO19258343R0 07 59 | 64: VO19242574R0 46 60 | 65: VO18283892R0 01 61 | 66: VO19244666R0 16 62 | 67: VO19244666R0 45 63 | 68: VO19286662R0 11 64 | 69: VO19286662R0 26 65 | 70: VO19283031R0 02 66 | 71: VO19285337R0 11 67 | 72: VO19285236R0 01 68 | 73: VO19285236R0 08 69 | 74: VO19295741R0 24 70 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ti [mg/L] | 0.00447 | 0.00548 | 0.0333 | 0.00116 | 0.0908 | 0.00053 | 0.0412 | 0.0478 | 0.00026 | 0.00070 | 0.00091 | 0.136 |
| Tl [mg/L] | 0.000024 | 0.000023 | 0.000021 | 0.000013 | 0.000030 | < 0.000005 | 0.000025 | 0.000024 | 0.000160 | 0.000018 | 0.000035 | 0.000049 |
| U [mg/L] | 0.002507 | 0.00180 | 0.00200 | 0.000292 | 0.00147 | 0.000666 | 0.00149 | 0.00207 | 0.000512 | 0.000926 | 0.00130 | 0.00102 |
| V [mg/L] | 0.0193 | 0.0164 | 0.0275 | 0.00362 | 0.0496 | 0.00340 | 0.0292 | 0.0326 | 0.00387 | 0.0333 | 0.00981 | 0.0424 |
| Zn [mg/L] | < 0.002 | < 0.002 | 0.002 | < 0.002 | 0.005 | < 0.002 | 0.003 | 0.005 | < 0.002 | < 0.002 | < 0.002 | 0.006 |

| Analysis | 75: VO19281663R0 11 71 | 76: VO19320118R0 39 72 | 77: VO18295487R0 37 73 | 78: VO19048524R0 14 74 | 79: VO19054445R0 09 75 | 80: VO19076137R0 25 76 | 81: VO19080569R0 21 77 | 82: VO19249690R0 09 78 | 83: VO19249697R0 26 79 | 84: VO19063569R0 29 80 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date & Time | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH [no unit] | 8.00 | 9.30 | 8.26 | 9.11 | 8.66 | 9.02 | 8.48 | 9.00 | 9.10 | 8.51 |
| Alkalinity [mg/L as CaCO3] | 47 | 61 | 71 | 86 | 72 | 65 | 52 | 66 | 76 | 48 |
| Acidity [mg/L as CaCO3] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Conductivity [uS/cm] | 768 | 208 | 439 | 266 | 352 | 257 | 381 | 255 | 273 | 452 |
| pH [no unit] | 7.71 | 8.30 | 7.99 | 8.38 | 7.96 | 8.23 | 7.91 | 8.22 | 8.49 | 7.80 |
| F [mg/L] | 0.31 | 0.63 | 0.38 | 0.75 | 0.82 | 0.69 | 0.85 | 0.57 | 0.73 | 0.57 |
| Cl [mg/L] | 2.9 | 2.0 | 12 | 2.1 | 4.0 | 6.0 | 11 | < 2 | 2.2 | 2.1 |
| SO4 [mg/L] | 300 | 12 | 80 | 17 | 50 | 21 | 77 | 21 | 25 | 130 |
| Br [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| NO2 [as N mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| NO2+NO3 [as N mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Hg [mg/L] | < 0.00001 | 0.00001 | 0.00001 | < 0.00001 | < 0.00001 | 0.00001 | 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Al [mg/L] | 0.064 | 3.34 | 0.119 | 2.63 | 0.292 | 1.71 | 0.224 | 1.16 | 0.575 | 0.272 |
| As [mg/L] | 0.0010 | 0.0023 | 0.0021 | 0.0035 | 0.0017 | 0.0009 | 0.0003 | 0.0225 | 0.0072 | 0.0016 |
| Ag [mg/L] | 0.00006 | 0.00006 | 0.00155 | 0.00012 | 0.00099 | < 0.00005 | 0.00062 | 0.00020 | 0.00027 | 0.00026 |
| Ba [mg/L] | 0.0595 | 0.0325 | 0.0139 | 0.0184 | 0.00600 | 0.0229 | 0.00495 | 0.0270 | 0.00956 | 0.0179 |
| Be [mg/L] | < 0.000007 | 0.000013 | < 0.000007 | 0.000012 | < 0.000007 | 0.000010 | < 0.000007 | 0.000008 | < 0.000007 | < 0.000007 |
| B [mg/L] | 0.013 | 0.008 | 0.010 | 0.008 | 0.014 | 0.011 | 0.011 | 0.006 | 0.007 | 0.007 |
| Bi [mg/L] | 0.000014 | 0.000157 | < 0.000007 | 0.000055 | < 0.000007 | 0.000038 | < 0.000007 | 0.000075 | < 0.000007 | < 0.000007 |
| Ca [mg/L] | 156 | 1.37 | 25.8 | 3.78 | 10.5 | 4.20 | 16.6 | 3.94 | 3.96 | 21.8 |
| Cd [mg/L] | 0.000012 | 0.000015 | 0.000007 | 0.000011 | 0.000009 | 0.000008 | 0.000004 | 0.000020 | 0.000004 | 0.000003 |
| Co [mg/L] | 0.000080 | 0.00179 | 0.000038 | 0.000545 | 0.000023 | 0.000523 | 0.000045 | 0.000466 | 0.000057 | 0.000026 |

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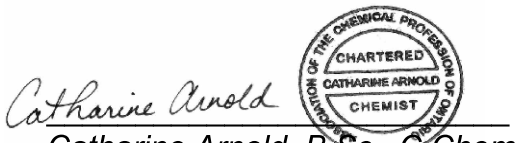
LR Report : CA11007-JUN20

| Analysis | 75: VO19281663R0 11 71 | 76: VO19320118R0 39 72 | 77: VO18295487R0 37 73 | 78: VO19048524R0 14 74 | 79: VO19054445R0 09 75 | 80: VO19076137R0 25 76 | 81: VO19080569R0 21 77 | 82: VO19249690R0 09 78 | 83: VO19249697R0 26 79 | 84: VO19063569R0 29 80 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cr [mg/L] | 0.00018 | 0.0117 | 0.00043 | 0.00562 | 0.00094 | 0.00673 | 0.00098 | 0.00586 | 0.00137 | 0.00014 |
| Cu [mg/L] | < 0.0002 | 0.0052 | < 0.0002 | 0.0017 | 0.0008 | 0.0011 | 0.0004 | 0.0017 | 0.0004 | 0.0004 |
| Fe [mg/L] | 0.018 | 2.32 | < 0.007 | 0.911 | 0.027 | 1.09 | 0.036 | 0.745 | 0.064 | 0.011 |
| K [mg/L] | 34.5 | 39.3 | 39.9 | 50.9 | 55.2 | 43.0 | 51.8 | 40.3 | 41.6 | 65.5 |
| Li [mg/L] | 0.0121 | 0.0127 | 0.0154 | 0.0073 | 0.0157 | 0.0111 | 0.0155 | 0.0081 | 0.0050 | 0.0217 |
| Mg [mg/L] | 8.95 | 1.35 | 4.76 | 1.39 | 1.89 | 1.40 | 3.15 | 1.26 | 0.758 | 3.05 |
| Mn [mg/L] | 0.0476 | 0.0269 | 0.0117 | 0.0157 | 0.00322 | 0.0143 | 0.00360 | 0.0134 | 0.00184 | 0.00536 |
| Mo [mg/L] | 0.0130 | 0.00450 | 0.00752 | 0.00860 | 0.0105 | 0.0103 | 0.00802 | 0.00988 | 0.00721 | 0.0104 |
| Na [mg/L] | 34.0 | 15.8 | 32.5 | 18.3 | 21.4 | 20.5 | 23.7 | 21.5 | 25.6 | 21.7 |
| Ni [mg/L] | 0.0005 | 0.0050 | 0.0002 | 0.0025 | 0.0002 | 0.0022 | 0.0003 | 0.0019 | 0.0004 | < 0.0001 |
| P [mg/L] | 0.006 | 0.095 | 0.005 | 0.076 | 0.023 | 0.052 | 0.012 | 0.052 | 0.019 | 0.015 |
| Pb [mg/L] | 0.00001 | 0.00171 | 0.00005 | 0.00050 | 0.00005 | 0.00062 | < 0.00001 | 0.00071 | 0.00005 | 0.00005 |
| Sb [mg/L] | 0.0024 | 0.0021 | 0.0032 | 0.0022 | 0.0018 | 0.0026 | < 0.0009 | 0.0027 | 0.0054 | 0.0016 |
| Se [mg/L] | 0.00120 | 0.00113 | 0.00045 | 0.00121 | 0.00075 | 0.00111 | 0.00049 | 0.00110 | 0.00119 | 0.00036 |
| Si [mg/L] | 4.44 | 4.58 | 3.86 | 3.58 | 2.90 | 3.72 | 3.16 | 4.12 | 2.87 | 2.33 |
| Sn [mg/L] | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 | < 0.00006 |
| Sr [mg/L] | 17.8 | 0.00681 | 0.374 | 0.0227 | 0.0703 | 0.0434 | 0.112 | 0.0263 | 0.0315 | 0.255 |
| Ti [mg/L] | 0.00012 | 0.139 | 0.00022 | 0.0580 | 0.00265 | 0.0686 | 0.00327 | 0.0528 | 0.00499 | 0.00104 |
| Tl [mg/L] | 0.000018 | 0.000039 | 0.000021 | 0.000046 | 0.000039 | 0.000038 | 0.000041 | 0.000018 | 0.000017 | 0.000043 |
| U [mg/L] | 0.000640 | 0.00109 | 0.00189 | 0.000868 | 0.00197 | 0.000961 | 0.000269 | 0.00177 | 0.000701 | 0.000645 |
| V [mg/L] | 0.00047 | 0.0472 | 0.00411 | 0.0300 | 0.0120 | 0.0261 | 0.00907 | 0.0235 | 0.0334 | 0.00392 |
| Zn [mg/L] | < 0.002 | 0.007 | < 0.002 | 0.003 | < 0.002 | 0.004 | < 0.002 | 0.003 | < 0.002 | < 0.002 |

RL raised for some NO2, NO3, Br and Cl results due to sample matrix.




*Catharine Arnold, B.Sc., C.Chem*
*Project Specialist,*
*Environment, Health & Safety*

OnLine LIMS

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14-July-2020

**Canadian Malartic GP**
Attn : Francois Bergeron

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0, Canada

Phone:
Fax:

**Date Rec. :** 12 June 2020
**LR Report:** **CA11008-JUN20**
**Reference:** TR: Modifie - R - 466556

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Sample ID | Sample Date & Time | F µg/g | Br µg/g | C(g) % |
|---|---|---|---|---|
| 3: Analysis Completed Date | | 14-Jul-20 | 29-Jun-20 | --- |
| 4: Analysis Completed Time | | 11:09 | 13:54 | --- |
| 5: VO18273624R006 1 | N/A | < 1 | < 1.5 | < 0.05 |
| 6: VO19104041R006 2 | N/A | < 1 | < 1.5 | < 0.05 |
| 7: VO18227465R012 3 | N/A | < 1 | < 1.5 | < 0.05 |
| 8: VO18283892R049 4 | N/A | < 1 | < 1.5 | < 0.05 |
| 9: VO18326381R019 5 | N/A | < 1 | < 1.5 | < 0.05 |
| 10: VO19018165R040 6 | N/A | < 1 | < 1.5 | < 0.05 |
| 11: VO19037627R049 7 | N/A | < 1 | < 1.5 | < 0.05 |
| 12: VO19012423R038 8 | N/A | < 1 | < 1.5 | < 0.05 |
| 13: VO19044866R038 9 | N/A | < 1 | < 1.5 | < 0.05 |
| 14: VO19049770R019 10 | N/A | < 1 | < 1.5 | < 0.05 |
| 15: VO19262649R023 11 | N/A | < 1 | < 1.5 | < 0.05 |
| 16: VO19252703R007 12 | N/A | < 1 | < 1.5 | < 0.05 |
| 17: VO19252703R042 13 | N/A | < 1 | < 1.5 | < 0.05 |
| 18: V019252701R036 14 | N/A | < 1 | < 1.5 | < 0.05 |
| 19: V019252701R039 15 | N/A | < 1 | < 1.5 | < 0.05 |
| 20: VO19125199R035 16 | N/A | < 1 | < 1.5 | < 0.05 |
| 21: VO19124996R002 17 | N/A | < 1 | < 1.5 | < 0.05 |
| 22: VO19124999R006 18 | N/A | < 1 | < 1.5 | < 0.05 |
| 23: VO19093187R018 19 | N/A | < 1 | < 1.5 | < 0.05 |
| 24: VO19110215R042 20 | N/A | < 1 | < 1.5 | < 0.05 |
| 25: VO19140396R013 21 | N/A | < 1 | < 1.5 | < 0.05 |
| 26: VO19112306R041 22 | N/A | < 1 | < 1.5 | < 0.05 |
| 27: VO19111152R003 23 | N/A | < 1 | < 1.5 | < 0.05 |
| 28: VO19111152R049 24 | N/A | < 1 | < 1.5 | < 0.05 |
| 29: VO19137440R016 25 | N/A | < 1 | < 1.5 | 0.10 |
| 30: VO19128730R010 26 | N/A | < 1 | < 1.5 | < 0.05 |
| 31: VO19128730R046 27 | N/A | < 1 | < 1.5 | < 0.05 |

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Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA11008-JUN20**

| Sample ID | Sample Date & Time | F µg/g | Br µg/g | C(g) % |
|---|---|---|---|---|
| 32: VO19118517R008 28 | N/A | < 1 | < 1.5 | < 0.05 |
| 33: VO19149798R006 29 | N/A | < 1 | < 1.5 | 0.06 |
| 34: VO19132117R028 30 | N/A | < 1 | < 1.5 | 0.06 |
| 35: VO19132117R032 31 | N/A | 1 | < 1.5 | < 0.05 |
| 36: VO19189405R042 32 | N/A | < 1 | < 1.5 | < 0.05 |
| 37: VO19202592R025 33 | N/A | < 1 | < 1.5 | < 0.05 |
| 38: VO19241618R008 34 | N/A | < 1 | < 1.5 | 0.06 |
| 39: VO19241601R016 35 | N/A | < 1 | < 1.5 | < 0.05 |
| 40: VO19211878R038 36 | N/A | < 1 | < 1.5 | < 0.05 |
| 41: V019165010R043 37 | N/A | < 1 | < 1.5 | < 0.05 |
| 42: VO19276647R046 38 | N/A | < 1 | < 1.5 | < 0.05 |
| 43: VO19195806R022 39 | N/A | < 1 | < 1.5 | < 0.05 |
| 44: V019216516R034 40 | N/A | < 1 | < 1.5 | < 0.05 |
| 45: V019226295R014 41 | N/A | < 1 | < 1.5 | < 0.05 |
| 46: VO19211753R046 42 | N/A | < 1 | < 1.5 | < 0.05 |
| 47: V019185394R014 43 | N/A | < 1 | < 1.5 | < 0.05 |
| 48: VO19185519R031 44 | N/A | 1 | < 1.5 | < 0.05 |
| 49: VO19185519R043 45 | N/A | < 1 | < 1.5 | < 0.05 |
| 50: VO19185521R019 46 | N/A | < 1 | < 1.5 | < 0.05 |
| 51: VO19231738R002 47 | N/A | < 1 | < 1.5 | < 0.05 |
| 52: VO19234800R026 48 | N/A | < 1 | < 1.5 | < 0.05 |
| 53: VO19231549R050 49 | N/A | < 1 | < 1.5 | < 0.05 |
| 54: VO19202589R050 50 | N/A | < 1 | < 1.5 | 0.06 |
| 55: VO19234784R038 51 | N/A | < 1 | < 1.5 | < 0.05 |
| 56: VO19226180R012 52 | N/A | < 1 | < 1.5 | < 0.05 |
| 57: VO19226290R005 53 | N/A | < 1 | < 1.5 | < 0.05 |
| 58: VO19226290R011 54 | N/A | < 1 | < 1.5 | < 0.05 |
| 59: VO19246880R015 55 | N/A | < 1 | < 1.5 | < 0.05 |
| 60: VO19246880R020 56 | N/A | < 1 | < 1.5 | < 0.05 |
| 61: VO19246880R026 57 | N/A | < 1 | < 1.5 | < 0.05 |
| 62: VO19258344R050 58 | N/A | < 1 | < 1.5 | < 0.05 |
| 63: VO19258343R007 59 | N/A | < 1 | < 1.5 | < 0.05 |
| 64: VO19242574R046 60 | N/A | < 1 | < 1.5 | < 0.05 |
| 65: VO18283892R001 61 | N/A | < 1 | < 1.5 | < 0.05 |
| 66: VO19244666R016 62 | N/A | < 1 | < 1.5 | 0.07 |
| 67: VO19244666R045 63 | N/A | < 1 | < 1.5 | < 0.05 |
| 68: VO19286662R011 64 | N/A | < 1 | < 1.5 | < 0.05 |
| 69: VO19286662R026 65 | N/A | < 1 | < 1.5 | < 0.05 |
| 70: VO19283031R002 66 | N/A | < 1 | < 1.5 | < 0.05 |
| 71: VO19285337R011 67 | N/A | 1 | < 1.5 | 0.14 |
| 72: VO19285236R001 68 | N/A | < 1 | < 1.5 | 0.06 |
| 73: VO19285236R008 69 | N/A | < 1 | < 1.5 | 0.05 |
| 74: VO19295741R024 70 | N/A | < 1 | < 1.5 | < 0.05 |

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**LR Report :** **CA11008-JUN20**

| Sample ID | Sample Date & Time | F µg/g | Br µg/g | C(g) % |
|---|---|---|---|---|
| 75: VO19281663R011 71 | N/A | < 1 | < 1.5 | 0.05 |
| 76: VO19320118R039 72 | N/A | < 1 | < 1.5 | < 0.05 |
| 77: VO18295487R037 73 | N/A | < 1 | < 1.5 | 0.06 |
| 78: VO19048524R014 74 | N/A | < 1 | < 1.5 | < 0.05 |
| 79: VO19054445R009 75 | N/A | < 1 | < 1.5 | < 0.05 |
| 80: VO19076137R025 76 | N/A | < 1 | < 1.5 | < 0.05 |
| 81: VO19080569R021 77 | N/A | < 1 | < 1.5 | < 0.05 |
| 82: VO19249690R009 78 | N/A | < 1 | < 1.5 | < 0.05 |
| 83: VO19249697R026 79 | N/A | < 1 | < 1.5 | < 0.05 |
| 84: VO19063569R029 80 | N/A | < 1 | < 1.5 | < 0.05 |

Catharine Arnold

CHARTERED CATHARINE ARNOLD CHEMIST

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# ANNEXE

# QCM-2B

## PROJET ODYSSEY (MINE CANADIAN MALARTIC) - DEMANDE DE MODIFICATION DU DÉCRET -RÉPONSE À LA QUESTION QCM-2 (GOLDER, 2021)

GOLDER
MEMBRE DE WSP

**CONFIDENTIEL**

**DATE** 7 octobre 2021 **Reference No.** 0667-20439682-71901-Rev1

**À** Kim Cournoyer, Surintendante environnement
Mine Canadian Malartic

**C.C** Christine Martineau, Blandine Arseneault

**DE** Elizabeth Walsh, Valérie Bertrand

**ADRESSE COURRIEL**
**valerie_bertrand@golder.com**

**PROJET ODYSSEY (MINE CANADIAN MALARTIC) - DEMANDE DE MODIFICATION DU DÉCRET -RÉPONSE À QUESTION QCM-2 PAR LE MELCC**

Mine Canadian Malartic General Partnership (CMGP) prépare une demande de modification du décret d'Odyssey. Le projet Odyssey, qui inclut les secteurs Odyssey, East Gouldie et East Malartic, est au stade de l'exploration avancée et pourrait être exploité par mine souterraine.

Dans le cadre de la demande de modification du décret, CMGP a reçu une question (**QCM-2**) du Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) par rapport aux études géochimiques ci-dessous.

***Question QCM-2***

> *Le rapport de caractérisation géochimique (EcoMetrix 2017 et 2019) utilisé dans le cadre de la présente demande de modification inclut les résultats de caractérisation des matériaux miniers provenant des zones Odyssey Sud, Odyssey Nord, East Malartic et Sheehan.*
>
> *a) L'initiateur doit préciser si le rapport d'EcoMetrix traite également les résultats obtenus pour les matériaux échantillonnés dans la nouvelle zone minéralisée incluse au projet sous le nom de East Gouldie et préciser sous quel nom cette zone est présentée dans le rapport. Dans le cas contraire, les résultats de caractérisation géochimique des matériaux miniers provenant de cette nouvelle zone minéralisée doivent être présentés par l'initiateur.*
>
> *b) Les résidus miniers d'usinage n'ont pas été caractérisés dans le cadre de la présente demande de modification. En l'absence d'échantillons des résidus d'usinage, à l'étape d'avant-projet, des conclusions préliminaires concernant les caractéristiques géochimiques de ce type des résidus miniers peuvent être faites en se basant sur les résultats obtenus pour les échantillons du minerai. Cependant, dès que possible, la caractérisation des échantillons des résidus d'usinage doit être réalisée afin de vérifier la validité des conclusions préliminaires. Dans ce contexte, l'initiateur doit s'engager à réaliser et fournir au ministère une étude de caractérisation des résidus miniers d'usinage générés à partir du minerai du projet Odyssey, au plus tard lors du dépôt de la première demande d'autorisation en vertu de l'article 22 de la LQE afin de confirmer que ces résidus peuvent être gérés de façon sécuritaire dans les aires d'accumulation existantes de la mine Canadian Malartic.*



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CMGP a demandé à Golder de répondre à la question **QCM-2b)**.

***Réponse à QCM-2b)***

Des échantillons de résidus ont été générés à la suite des travaux rapportés par EcoMetrix (2017 et 2019), dans le cadre d'un projet de valorisation des futurs rejets miniers de la mine Canadian Malartic (secteurs Canadian Malartic, Barnat, Odyssey, East Malartic et East Gouldie). Cette étude est toujours en cours. Un rapport sera remis à MCM lorsque la fin des tests sera réalisée. Un sommaire des résultats disponibles est présenté ci-après, en guise de démonstration des propriétés géochimiques des futurs résidus qui seront générés les secteurs Odyssey, East Malartic et East Gouldie.

L'étude réalisée comprend un volet de caractérisation géochimique des résidus avant et après désulfuration, et une évaluation des effets de la désulfuration sur les propriétés géoenvironnementales des résidus. Les résidus utilisés proviennent de chaque lithologie de minerai dans chacun des secteurs Odyssey, East Malartic et East Gouldie. Les échantillons de minerai ont été prélevés de carottes de forage, ont été broyés et soumis aux procédés simulant l'extraction d'or et la détoxification des cyanures à la mine. Les essais cinétiques sur les résidus sont en cours pour ce projet.

Les résultats clés par rapport au potentiel acidogène et de lixiviation pour chaque lithologie, type de matériel et secteur sont présentés au tableau 1, et discutés ci-dessous.

**Tableau 1 – sommaire de résultats des résidus pour chaque secteur et chaque lithologie**

| Lithologie | Type | Secteur Odyssey | Secteur East Malartic | Secteur East Gouldie |
|---|---|---|---|---|
| Sédimentaire | Résidus | • PGA<br>• Lixiviabilité suggérée par l'essai cinétique (arsenic) | • PGA<br>• Lixiviabilité variable suggérée par les tests statiques et cinétiques (argent et/ou manganèse) | • PGA<br>• Lixiviabilité variable suggérée par les tests statiques et cinétiques (arsenic et/ou manganèse) |
| Porphyre | Résidus | • Non PGA (variable)<br>• Lixiviabilité variable suggérée par les essais cinétiques (arsenic, manganèse, et/ou molybdène) | • PGA<br>• Lixiviabilité variable suggérée par les essais statiques (argent) | - |
| Ultramafique | Résidus | • Non PGA<br>• Lixiviabilité suggérée par l'essai cinétique (arsenic) | • Non PGA<br>• Lixiviabilité variable suggérée par essai cinétique (arsenic) | - |

**Notes :**
« - » = lithologie non présente dans ce gisement, aucun test réalisé.

## Secteur Odyssey

L'échantillon de résidu sédimentaire est PGA tandis que les échantillons de résidus porphyre et ultramafique sont généralement non PGA (PGA variable pour le porphyre). Les échantillons de résidus sont classifiés lixiviables et ne sont pas à risque élevé.

## Secteur East Malartic

Les échantillons de résidus sédimentaire et porphyre sont PGA. Les échantillons de résidus ultramafique sont non PGA. Les échantillons de résidus sédimentaire, porphyre, et ultramafique sont variablement lixiviables mais ne sont pas à risque élevé.

## Secteur East Gouldie

Ce secteur est constitué uniquement de la lithologie sédimentaire. Tous les échantillons de résidus sont PGA. Les échantillons de résidu sont classifiés variablement lixiviables mais ne sont pas à risque élevé.

## Test Cinétiques – Toutes Secteurs

Les échantillons sélectionnés pour les essais cinétiques ont une composition chimique qui représente le quartile supérieur ou médian de concentration en soufre (pour le lithologies sédimentaire et porphyre) et de lixiviation (toutes les lithologies) des échantillons analysés du Secteur East Gouldie, Odyssey et East Malartic.

En somme, les essais corroborent la classification acidogène des matériaux testés mais indiquent un délai avant l'acidification sous les conditions du test (une lixiviation accélérée en laboratoire). Le lixiviat de chacun des tests cinétiques demeure à pH neutre et montre un faible taux d'oxydation (peu de sulfates) après 20 cycles de rinçage. Le relâchement d'éléments chimiques est également moindre qu'en test de lixiviation statique après 20 cycles de tests cinétiques. La déposition de résidus sera telle que les résidus seront continuellement recouverts, ce qui limitera leur exposition durant l'opération. Ainsi, le délai pourrait être vraisemblablement plus long sur le site étant donné l'exposition, l'infiltration diminuée et les hivers gelés.

## Conclusion

Dans tous les secteurs, les échantillons ultramafiques sont généralement non PGA, avec le potentiel pour la lixiviation. Les échantillons sédimentaires et porphyriques sont légèrement moins homogènes entre les secteurs mais les différences n'affectent pas leur classification géochimique. En somme, du point de vue lithologique, les caractéristiques géochimiques d'intérêt, nommément le potentiel acidogène et de lixiviation, sont similaires entre les résidus de chacune des lithologies. De plus, chacune des lithologies est généralement similaire entre les différentes zones et secteurs de la mine MCM. Tous les résidus lixivient peu en condition de tests cinétiques de laboratoire et montrent un délai avant l'oxydation qui est apte à être plus long à la mine (durant l'opération) en raison de la plus courte période d'exposition des résidus.

La cohérence des résultats analytiques suggère que les propriétés géochimiques de ces matériaux sont suffisamment comprises, à cette étape du projet, pour élaborer les plans de gestion des matériaux minés qui s'appliqueront à tous les matériaux qui seront rencontrés.

# SIGNATURES

**Golder Associés Ltée**

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EW/VB/ll

# ANNEXE

# QCM-3

## BILAN HYDRIQUE POUR VÉRIFIER LA CAPACITÉ DES INSTALLATIONS DE GESTION DES EAUX À GÉRER LES FLUX DU PROJET ODYSSEY (GOLDER, 2021)

GOLDER
MEMBRE DE WSP

**CONFIDENTIEL**

# MEMORANDUM TECHNIQUE

**DATE** 26 octobre 2021 **N° de référence** 0683-20439682-23504-MTF-Rev1

**À** Nathalie Tremblay, Directrice de l'Environnement
Mine Canadian Malartic

**C.C** Marielle Limoges

**DE** Emanuelle Desrochers, Vlad Rojanschi **ADRESSE COURRIEL edesrochers@golder.com**

**BILAN HYDRIQUE POUR VÉRIFIER LA CAPACITÉ DES INSTALLATIONS DE GESTION DES EAUX POUR GÉRER LES FLUX DU PROJET ODYSSEY**

## 1.0 INTRODUCTION ET MISE EN CONTEXTE

Golder Associés Ltée (Golder) a été mandatée par la mine Canadian Malartic (MCM) pour vérifier que la capacité des installations de gestion des eaux de la mine est adéquate pour gérer de façon sécuritaire les eaux supplémentaires générées par le développement du projet de mine souterraine Odyssey (projet Odyssey) et pour satisfaire aux critères de la Directive 019 sur l'industrie minière (MELCC, 2012). Ce mémorandum technique présente une analyse des flux d'eau du projet Odyssey qui devront être gérés sur la période 2021 à 2039 (durée de vie projetée de la mine selon le *Life Of Mine* (LOM) 2021 transmis par MCM ainsi que la façon dont MCM prévoit gérer ces flux. L'analyse par le biais d'un bilan hydrique est focalisée sur les deux bassins suivants (qui recevront les eaux du projet Odyssey) : le bassin Nord-est (BNE, bassin de pompage) et le bassin Sud-est (BSE, bassin collecteur principal des eaux du site de la mine) et incorpore la considération des impacts potentiels des changements climatiques.

Les limitations incluses à la Section 9 sont applicables à ce document.

## 2.0 DESCRIPTION DE LA GESTION DES FLUX D'EAU DU PROJET ODYSSEY

### Flux d'eau du projet Odyssey

Les flux d'eau principaux générés par le projet Odyssey incluent :

- le ruissellement sur le bassin versant des infrastructures du projet Odyssey (qui draine vers le BNE);
- l'infiltration d'eau souterraine dans les ouvertures des quatre zones minéralisées du projet Odyssey;
- l'infiltration d'eau souterraine dans les ouvertures souterraines historiques;
- l'évacuation des eaux accumulées dans les ouvertures souterraines historiques;



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- l'eau fraîche issue de la surface et servant à alimenter les équipements souterrains, qui se mélangera avec les infiltrations d'eaux souterraines.

**Gestion des eaux actuelle**

Actuellement, les eaux des développements souterrains du projet Odyssey sont envoyées par pompage vers le BNE. Le BNE reçoit également les eaux de ruissellement générées sur son bassin versant, qui inclut les infrastructures de surface du projet Odyssey; le ruissellement est acheminé au BNE par gravité, via le fossé Odyssey, ou via un point de pompage localisé au puits principal Odyssey.

Le BNE est un bassin de pompage qui est conçu pour gérer sans débordement vers l'environnement un évènement de récurrence 1 :100 ans tel que recommandé par la Directive 019 sur l'industrie minière (Directive 019) (MELCC, 2012). Le bassin est divisé en deux parties distinctes par une digue séparatrice : la partie nord et la partie sud. Mis à part le bassin versant de la portion sud du bassin, l'ensemble des eaux allant au BNE sont acheminées à la partie nord d'abord. L'eau est transférée dans la partie sud via une usine de traitement des matières en suspension. De la partie sud, l'eau est pompée soit vers le bassin de polissage, ou vers le BSE dans le cas où la qualité de l'eau ne respecte pas les exigences réglementaires.

Le BSE est le principal bassin collecteur des eaux minières usées du site. Il est conçu pour gérer la crue de projet de la Directive 019 (MELCC, 2012), soit la superposition de la fonte sur 30 jours du couvert de neige de récurrence 1:100 ans à une averse de pluie de récurrence 1:2 000 ans et de durée 24 heures. Le BSE reçoit majoritairement les eaux du parc à résidus (ruissellement sur la plage de résidus, et eau de ressuage issue des résidus). Ce bassin fournit la plus grande partie de l'eau de procédé nécessaire pour le fonctionnement de l'usine de traitement de minerai (UTM). L'excédent d'eau du bassin (lorsqu'il y a lieu) est pompé vers le bassin de polissage lorsque la qualité respecte les exigences réglementaires. Une usine de traitement d'une capacité de 1 000 $m^3/h$ est en place pour traiter, si nécessaire, les eaux du BSE avant l'évacuation vers le bassin de polissage. Une nouvelle vérification de la qualité de l'eau est effectuée au bassin de polissage avant la décharge vers le ruisseau Raymond. Le BSE a présentement une capacité de 5,5 M $m^3$ au seuil de son déversoir d'urgence.

**Gestion des eaux future**

Le BNE a la capacité de gérer les eaux futures d'Odyssey, y compris les eaux d'infiltration. Si la qualité de l'eau le demande, MCM pourrait éventuellement pomper directement vers le BSE l'infiltration d'eau dans les développements souterrains du projet Odyssey et l'eau fraîche servant à remplir le besoin en eau des équipements. Advenant le cas, ces eaux pourraient ne plus transiter par le BNE. L'infiltration dans les ouvertures souterraines historiques continuerait à être pompée vers le BNE; le BNE recevra toujours les eaux du bassin versant correspondant aux infrastructures de surface du projet Odyssey. Comme actuellement, les eaux du BNE seront pompées vers le bassin de polissage après la vérification de leur qualité.

L'évacuation des eaux accumulées actuellement dans les ouvertures souterraines historiques sera faite directement par pompage au bassin de polissage après la vérification de leur qualité.

Le BSE recevra dans le futur, en plus des flux Odyssey mentionnés ci-dessus, les eaux du parc à résidus agrandi du site (ajout des cellules PR6, PR7, PR8 et ajout de la déposition des résidus dans la fosse Canadian Malartic). La capacité du BSE sera réduite de 5,5 M $m^3$ à 4,7 M $m^3$ suivant le développement de la cellule PR7, puisque cette cellule empiètera sur la partie ouest du BSE actuel.

# 3.0 MÉTHODOLOGIE

Pour le BNE, un bilan d'eau a été simulé sur une période de 30 jours en évaluant deux évènements de crue de récurrence 100 ans (section 5.1), soit un évènement estival et un printanier, incluant une majoration pour considérer l'impact potentiel des changements climatiques. L'évènement engendrant les niveaux d'eau les plus élevés a été retenu pour vérifier si les capacités de pompage en place dans les parties nord et sud du bassin sont adéquates et pour les ajuster au besoin. L'année de la vie du projet pour laquelle les flux du projet Odyssey sont maximaux a été utilisée pour l'analyse.

Pour le BSE, un bilan d'eau a été développé intégrant l'ensemble des flux qui seront acheminés vers le bassin pour chaque année future. L'année avec le surplus d'eau le plus important a été utilisée pour définir la capacité de traitement requise au BSE pour gérer l'évènement de conception (la crue de projet de la Directive 019).

# 4.0 DONNÉES COMMUNES

**Flux Odyssey**

Considérant l'échéancier de développement des quatre zones minéralisées du projet Odyssey présenté dans Golder (2020), les flux d'eau provenant d'Odyssey seront maximaux en 2031. La valeur maximale des flux d'eau est estimée pour l'année 2031 et est égale à 10 486 $m^3$/jour. Cette valeur comprend les flux suivants :

- l'infiltration d'eau souterraine dans les ouvertures du projet Odyssey pour les quatre zones minéralisées (East Malartic, East Gouldie, Odyssey Sud, Odyssey Nord) : 6 310 $m^3$/jour (scénario réaliste, tiré de Golder, 2020);
- l'évacuation d'infiltration d'eau souterraine dans les ouvertures minières historiques : 3 500 $m^3$/jour (scénario réaliste, tiré de Golder, 2020);
- l'eau fraîche servant à remplir le besoin en eau des équipements : 676 $m^3$/jour (hypothèse que 25 % de la demande en eau totale des équipements sous terre Odyssey est de l'eau fraîche, et que la balance de la demande en eau des équipements est issue de la recirculation de l'eau sous terre, fournie par MCM, 2021).

**Considération des changements climatiques**

L'effet potentiel des changements climatiques sur la performance du système de gestion des eaux a été inclus dans l'analyse, en pondérant les données de précipitations liquides extrêmes et de précipitations liquides combinées à la fonte de neige extrême par des facteurs jugés appropriés tels que justifiés ci-dessous :

- Selon Ouranos (2015), le climat dans la région du site de MCM évolue vers un régime plus chaud et plus humide. Les précipitations annuelles moyennes augmenteraient de 2 à 12 % à l'horizon 2041-2070. Les changements prévus seront plus accentués pour la saison hivernale que pour la saison estivale.
- On s'attend aussi à des hausses significatives pour les indices de précipitations abondantes et extrêmes (Ouranos, 2015). Le MELCC (2020) recommande, pour la région du site de MCM, la majoration de 18 % des intensités de précipitation de récurrence supérieure ou égale à 2 ans pour le calcul de débit de crue afin de tenir compte des effets des changements climatiques. La recommandation est basée sur Mailhot et coll. (2014) qui a calculé cette majoration pour l'horizon 2050.

- L'augmentation prévue des températures hivernales conduira à une diminution de la neige au sol (Ouranos, 2015).
- L'impact des changements climatiques sur les crues printanières (crue 1:100 ans ou la crue de projet de la Directive 019) est une fonction des changements des épaisseurs du couvert de neige, des précipitations printanières, et des intensités de fonte des neiges. Le CEHQ (2015) suggère une augmentation possible du volume des crues printanières pour l'Abitibi de l'ordre de 8 % à l'horizon 2050.
- Pour la crue de projet de la Directive 019 spécifiquement, la définition de la crue est liée directement à l'épaisseur d'un couvert extrême de neige. Comme les projections disponibles indiquent une baisse générale de l'épaisseur du couvert de neige, une augmentation du volume de cette crue n'est pas attendue.
- En considérant la période de 18 ans (2021 à 2039), durant laquelle MCM prévoit d'exploiter le projet Odyssey, Golder a utilisé les facteurs de majoration suivants pour évaluer la performance du système de gestion des eaux :
  - Pour le BNE :
    - Pour les précipitations annuelles moyennes : 12 % selon Ouranos (2015);
    - Pour les intensités de précipitation de courte durée : 18 % selon MELCC (2020) ;
    - Pour la crue printanière 1 :100 ans : 8 % selon CEHQ (2015); et
  - Pour le BSE :
    - Pour la crue de projet de la Directive 019 : aucune majoration.

# 5.0 BILAN HYDRIQUE BASSIN NORD-EST

## 5.1 Données de base

Les données et les précédentes études, listées ci-dessous, ont été utilisées pour l'analyse du bilan hydrique :

- Les données d'arpentage du BNE à la suite de la construction de la digue interne divisant le bassin en deux parties (nord et sud). L'arpentage a été réalisé par MCM le 2 juin 2021.
- Le bassin versant affluant au BNE (soit par gravité directement, par pompage, ou par le biais du fossé Odyssey), d'une superficie de 0,34 $km^2$ (excluant l'aire du BNE lui-même).
- La capacité de l'usine de traitement des matières en suspension en place qui transfère l'eau entre les parties nord et sud du BNE est de 500 $m^3/h$ (valeur fournie par MCM, 27 septembre 2021).
- La capacité d'évacuation de l'eau de la partie sud du BNE vers le bassin de polissage ou vers le BSE, est de 840 $m^3/h$ (valeur fournie par MCM, 27 septembre 2021).
- La vérification a été faite selon la gestion des eaux actuelle, selon laquelle jusqu'à 10 486 $m^3$/jour seraient pompés vers le BNE. Il s'agit d'une approche conservatrice qui ne considère pas l'intention de MCM de pomper une partie de ce flux vers le BSE directement.

- Les données de précipitations liquides extrêmes et de précipitations liquides combinées à la fonte de neige extrême, pour des durées de 1 à 30 jours, calculées à partir des données climatiques de la station Val-d'Or ont été utilisées. Ces données sont tirées de l'analyse climatique (Golder, 2014) et sont présentées au tableau 1. Le tableau 1 présente également les précipitations y compris la pondération pour considérer l'impact potentiel des changements climatiques (section 4.0).

**Tableau 1: Précipitations liquides extrêmes et précipitations liquides combinées à la fonte de neige extrême de 1 à 30 jours pour une récurrence 100 ans – avec et sans majoration pour les changements climatiques, station Val-d'Or (Golder, 2014)**

| Durée de l'évènement (jours) | Précipitation liquide (évènement estival) (mm) | | Précipitation liquide + fonte de neige (évènement printanier) (mm) | |
|---|---|---|---|---|
| | Statistiques des données historiques | Avec majoration de 18 % | Statistiques des données historiques | Avec majoration de 8 % |
| **1** | 96 | 113 | 71 | 77 |
| **2** | 107 | 126 | 98 | 106 |
| **3** | 116 | 137 | 123 | 133 |
| **4** | 125 | 148 | 145 | 157 |
| **5** | 133 | 157 | 165 | 178 |
| **6** | 140 | 165 | 185 | 200 |
| **7** | 147 | 174 | 204 | 220 |
| **8** | 153 | 181 | 222 | 240 |
| **9** | 159 | 188 | 238 | 246 |
| **10** | 165 | 195 | 252 | 272 |
| **15** | 191 | 225 | 305 | 329 |
| **20** | 215 | 254 | 341 | 368 |
| **25** | 237 | 280 | 373 | 403 |
| **30** | 258 | 304 | 402 | 434 |

## 5.2 Hypothèses et méthodologie

La capacité du BNE de gérer un évènement de crue d'une récurrence 100 ans sans débordement, comme recommandé par la Directive 019 sur l'industrie minière (MELCC, 2012), est vérifiée.

Le tableau 2 présente les flux d'eau entrants et sortants dans les deux parties BNE.

**Tableau 2: Flux d'eau entrants et sortants considérés dans le bilan hydrique du BNE**

| | Flux entrants (Apports) | Flux sortants |
|---|---|---|
| BNE partie nord | ■ Précipitation directe sur la partie nord du bassin<br>■ Flux d'eaux souterraines<br>■ Ruissellement provenant du fossé Odyssey<br>■ Ruissellement sur le bassin versant drainant directement par gravité vers la partie nord du bassin<br>■ Ruissellement sur le bassin versant pompé vers la partie nord du bassin | ■ Débit envoyé vers l'usine de traitement des matières en suspension et, ensuite, vers la partie sud du BNE |
| BNE partie sud | ■ Précipitation directe sur la partie sud du bassin<br>■ Débit transféré depuis la partie nord du bassin | ■ Débit pompé vers le bassin de polissage ou le BSE |

Les hypothèses suivantes ont été posées dans les calculs du bilan hydrique :

- Des coefficients de ruissellement volumétriques constants sur 30 jours pour les évènements de crue estival et printanier ont été considérés dans l'analyse :
  - 0,80 pour les zones minières développées (plateforme, routes, infrastructures) du projet Odyssey
  - 0,65 pour la zone naturelle à l'est du BNE;
  - 1,0 pour l'aire des parties nord et sud du bassin (précipitation directe sur les plans d'eau)
- Les niveaux maximums d'opération, soit les niveaux maximums à atteindre en conditions climatiques normales qui ont été pris en compte dans l'analyse sont définis ci-dessous. Les niveaux ont été discutés et entendus avec MCM :
  - 305,30 m (correspondant à une profondeur de 1,30 m) dans la partie nord. Ce niveau est défini afin de laisser une profondeur minimale pour la sédimentation des matières en suspension.

  - 305,65 m (correspondant à une profondeur de 1,65 m) dans la partie sud. Ce niveau est défini pour répondre aux besoins opérationnels.

- Les niveaux maximaux lors de la crue 1 :100 ans doivent être limités à 306,0 m, 0,4 m en dessous de la crête de la digue interne et 0,1 m en dessous du seuil du déversoir situé sur la digue interne.
- Les niveaux maximaux de crue de projet ont été estimés en tenant compte du fait que le niveau d'eau initial avant la crue est égal au niveau maximal d'opération.
- Le bilan hydrique ne tient pas compte du délai de démarrage des pompes à partir du début de l'évènement climatique.

## 5.3 Résultats

L'analyse par bilan hydrique a fait ressortir les points suivants :

- L'évènement critique pour le BNE (évènement générant le niveau d'eau le plus élevé) est l'évènement estival.
- Les capacités de pompage qui sont présentement en place dans les parties nord et sud du BNE sont insuffisantes pour gérer les flux Odyssey dans le futur. Ces capacités doivent être augmentées de 500 $m^3/h$ à 1 083 $m^3/h$ pour la partie nord et de 840 $m^3/h$ à 1 140 $m^3/h$ pour la partie sud. Ces capacités assument que le niveau maximum d'opération est de 305,3 m dans la partie nord et 305,65 m dans la partie sud.
- Les capacités de transfert et d'évacuation pourraient être optimisées (réduites) suivant l'envoi possible des eaux suivantes directement vers le BSE sans transiter via le BNE : les infiltrations d'eaux souterraines dans les ouvertures souterraines Odyssey et l'eau fraîche servant à remplir le besoin en eau des équipements sous terre. MCM vérifiera cet aspect après avoir confirmé la stratégie de gestion des eaux.

Les résultats de simulation du bilan hydrique considérant les capacités de pompage recommandées pour le futur sont présentés au tableau 3.

**Tableau 3: Résultats du bilan hydrique – Évènement de récurrence 1 :100 ans, incluant l'effet des changements climatiques.**

| Paramètre | Partie nord | Partie sud | Commentaire |
|---|---|---|---|
| Niveau du fond du bassin (m) | Environ 304 | Environ 304 | Élévation la plus basse selon les données d'arpentage du bassin, au-dessus de la couche l'enrochement. |
| Capacité d'emmagasinement actif dans le bassin ($m^3$) | 37 800 | 16 100 | Volume disponible entre le niveau du fond du bassin (304 m) jusqu'à la crête de la digue interne, soit à l'élévation 306,4 m. |
| Niveau maximal d'opération en conditions climatiques normales (m) | 305,30 | 305,65 | Le niveau d'eau de la partie nord a été fixé afin de laisser une profondeur d'eau minimale pour la sédimentation des matières en suspension.<br><br>Le niveau d'eau de la partie sud a été fixé afin de répondre aux besoins opérationnels.<br><br>Les niveaux d'eau dans les bassins ne doivent pas dépasser ces niveaux maximaux d'opération à l'exception des conditions de crue. |
| Volume maximal d'opération en conditions climatiques normales ($m^3$) | 14 500 | 9 500 | Volume correspondant au niveau maximal d'opération. |
| Niveau maximal de crue de projet (m) | 306,0 | 306,0 | Niveau (élévation) calculé en considérant un niveau initial dans le bassin correspondant au niveau maximal d'opération. |
| Volume maximal dans le bassin atteint lors de la crue de projet ($m^3$) | 29 200 | 12 400 | Volume calculé en considérant un volume initial dans le bassin correspondant au volume maximal d'opération. |
| Débit de pompage nécessaire ($m^3/h$) | 1 083 | 1 140 | Débits de pompage nécessaires afin de respecter les critères de conception. |

## 5.4 Conclusions et recommandations

Avec la mise en place prévue des capacités de pompage et des niveaux d'opération maximaux recommandés (section 5.3), le BNE satisfait aux recommandations de la Directive 019 de gérer une crue de projet de récurrence 100 ans sans débordement. Les parties nord et sud seront opérées respectivement jusqu'à un niveau maximal en dehors des crues de 305,3 m et 305,65 m et jusqu'à un niveau maximal en condition de crue de 306,0 m.

Les recommandations suivantes traitent le suivi et le maintien en conformité du BNE:

- Les niveaux d'eau dans les parties nord et sud du BNE ne doivent pas dépasser les niveaux d'opération maximaux de 305,3 m et 305,65 m respectivement, sauf lors de conditions de crue, afin de permettre l'emmagasinement de la crue de projet en dessous du seuil du déversoir de la digue interne.
- Les stations de pompage des parties nord et sud du BNE devront être équipées de systèmes automatiques « Démarrage/Arrêt » qui permettront de démarrer le pompage dès que l'eau dépasse les niveaux maximaux d'opération, ou à des niveaux d'eau inférieurs selon la gestion souhaitée par MCM.
- Le bilan hydrique n'a pas tenu compte de la perte de volume due à l'accumulation de sédiments dans le fond du bassin. Il est supposé que MCM surveille cet aspect régulièrement.

# 6.0 BILAN HYDRIQUE BASSIN SUD-EST

Cette section documente sommairement le bilan hydrique du BSE. L'objectif du bilan hydrique du BSE est de vérifier que le BSE pourra gérer les flux d'eaux usées minières qui y seront acheminés dans le futur (incluant les flux du projet Odyssey) pour l'évènement de crue de projet de la Directive 019 et de déterminer la stratégie de gestion des surplus d'eau.

## 6.1 Données de base et hypothèses

Les données de base et hypothèses principales sont listées ci-dessous. Une liste exhaustive des données sera documentée dans un document séparé.

- Les flux Odyssey acheminés au BSE considérés pour l'analyse sont documentés à la section 4.0. Pour l'analyse sur le BSE, il est considéré que l'infiltration d'eau dans les ouvertures souterraines historiques est envoyée au BNE et que les infiltrations d'eaux souterraines et l'eau fraîche pour les équipements pourraient être évacuées directement vers le BSE si la qualité des eaux d'infiltration le demande.
- La capacité d'emmagasinement du BSE jusqu'au seuil du déversoir d'urgence (élévation 325,15 m) est présentement de 5,5 M $m^3$. La création de la cellule de déposition des résidus PR7 diminuera la capacité d'emmagasinement à 4,7 M $m^3$.
- L'analyse de bilan d'eau du BSE considère les deux changements suivants à la gestion des eaux que MCM planifie de mettre en place :
  - déplacer la prise d'eau de recirculation du BSE vers l'usine de traitement de minerai pour abaisser le niveau minimal d'opération de l'élévation actuelle 321,5 m à l'élévation 319,0 m et, ainsi, disposer de plus de volume d'emmagasinement lors d'une crue;

- dévier les eaux du bassin d'urgence (au nord de l'usine de traitement du minerai) vers le système de collecte des eaux de la halde à stériles plutôt que de les envoyer dans le système de gestion des eaux du BSE.

## 6.2 Résultats

L'analyse par bilan d'eau sur l'année climatique moyenne a démontré que l'année d'opération 2033 est celle ayant les conditions associées aux plus gros volumes d'eau à gérer par MCM dans le BSE. Les faits saillants de cette analyse sont résumés dans les paragraphes suivants.

- Pour des conditions climatiques moyennes pour l'année critique 2033, le surplus d'eau au niveau du BSE est de l'ordre de 8,5 M $m^3$/an. Le surplus d'eau sera traité par MCM pour améliorer sa qualité jusqu'au point que l'eau puisse être transférée au bassin de polissage et, de là, être déchargée vers le ruisseau Raymond, à l'est du site minier.
- Le taux de traitement est dimensionné pour gérer la crue de projet Directive 019 sans déversement non contrôlé. Un taux de traitement maximal de 2 950 $m^3$/h est prévu. Ce taux de traitement considère que la prise d'eau du BSE est abaissée pour permettre un niveau d'opération minimum à l'élévation 319 m et que les eaux du bassin d'urgence sont déviées vers le système de collecte des eaux de la halde à stériles. Si ces options ne sont pas mises en place, le taux de traitement maximal devra être revu à la hausse. La figure 1 présente l'évolution du niveau d'eau dans le BSE correspondant à la configuration étudiée en 2033 et lors d'une crue de projet de la Directive 019.
- MCM évalue actuellement plusieurs mesures additionnelles au BSE qui permettraient de contrôler la crue de projet de la Directive 019 avec un taux de traitement plus faible. La finalisation future de l'évaluation appuiera la décision de MCM quant à leur mise en œuvre. Sans s'y limiter, les mesures en cours d'évaluation sont :
  - le rehaussement des digues du BSE pour augmenter la capacité d'emmagasinement du bassin;
  - l'optimisation de la stratégie de traitement des eaux en séparant les flux d'eau de plusieurs sources qui ont une qualité de l'eau différente (par exemple, plage de résidus non active, plage de résidus active, pompage de l'eau souterraine, etc.) et en traitant ces flux d'eau séparément.

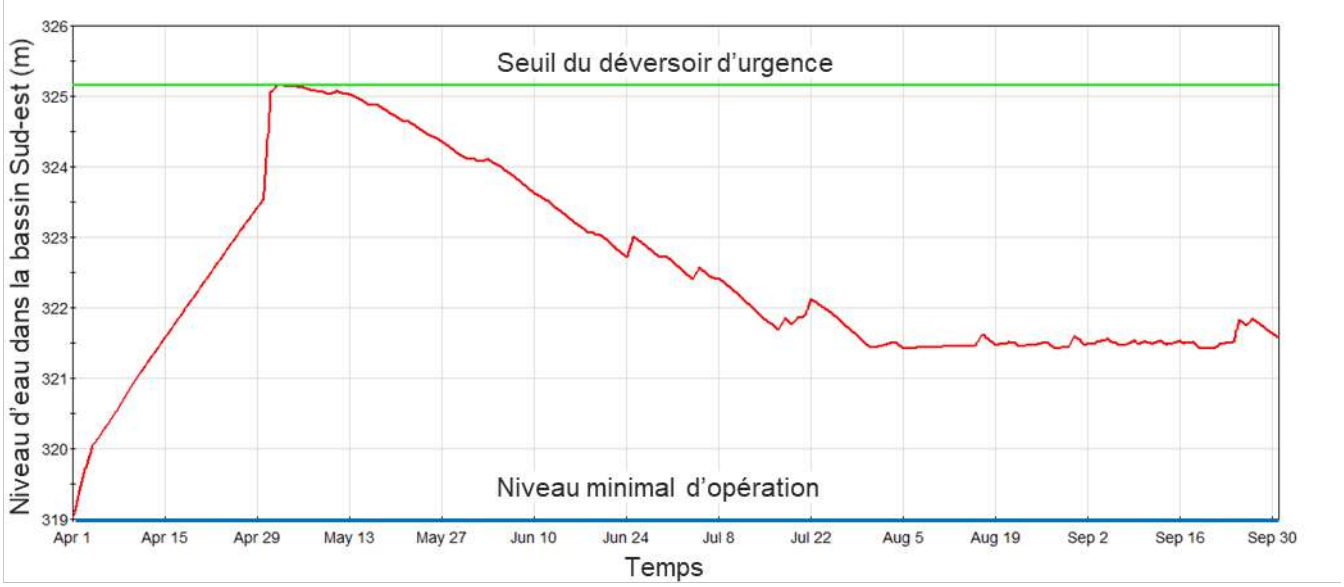


**Figure 1 : Gestion de la crue Directive 019 dans le BSE selon la configuration projetée pour l'année 2033.**

## 7.0 CONCLUSIONS

Une analyse de bilan d'eau a été préparée pour vérifier que la capacité des installations de gestion des eaux de la mine est adéquate pour gérer de façon sécuritaire les eaux supplémentaires générées par le développement du projet de mine souterraine Odyssey (projet Odyssey) et pour satisfaire aux critères de la Directive 019 sur l'industrie minière (MELCC, 2012). L'analyse a conclu que les modifications suivantes sont nécessaires :

- Bassin Nord-est :
  - Augmentation de la capacité de transfert entre la partie nord et la partie sud du BNE de 500 $m^3/h$ à 1 083 $m^3/h$.
  - Augmentation de la capacité d'évacuation de la partie sud (soit vers le bassin de polissage ou le BSE) de 840 $m^3/h$ à 1 140 $m^3/h$.
  - Mettre en place et maintenir les niveaux maximums d'opération dans la partie nord et la partie sud du bassin à 305,3 m et 305,65 m respectivement.
  - Les capacités de transfert et d'évacuation pourraient être optimisées (réduites) suivant l'envoi possible des eaux suivantes directement vers le BSE sans nécessairement transiter via le BNE : les infiltrations d'eaux souterraines dans les ouvertures souterraines Odyssey et l'eau fraîche servant à remplir le besoin en eau des équipements sous terre. MCM vérifiera cet aspect après avoir défini sa stratégie de gestion des eaux.

- Bassin Sud-est :
  - Mise en place d'une usine de traitement de l'eau au BSE avant la décharge des eaux au bassin de polissage. MCM évalue actuellement plusieurs mesures additionnelles, incluant le rehaussement des digues du BSE, qui permettraient de réduire le taux de traitement requis pour contrôler la crue de projet de la Directive 019 au BSE. La finalisation future de l'évaluation appuiera la décision de MCM quant à leur mise en œuvre.
  - Déviation des eaux du bassin d'urgence vers le système de collecte des eaux de la halde à stériles.
  - Abaissement de la prise d'eau du BSE pour permettre un niveau d'opération minimum de 319 m.

**Golder Associés Ltée**

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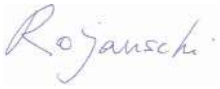

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ED/VR/ab/cd

PJ : Conditions générales et limitations - rapport d'expertise technique et de modélisation

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CONDITIONS GÉNÉRALES ET LIMITATIONS
RAPPORT D'EXPERTISE TECHNIQUE ET DE MODÉLISATION



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Ce rapport a été préparé pour l'usage exclusif du Client ou de ses agents. Les données factuelles, les interprétations, les commentaires ainsi que les recommandations qu'il contient sont spécifiques à l'étude qu'il couvre et ne s'appliquent à aucun autre projet ou autre site. Ce rapport doit être lu dans son ensemble, puisque des sections pourraient être faussement interprétées lorsque prises individuellement ou hors contexte. Par ailleurs, le texte de la version finale de ce rapport prévaut sur tout autre texte, opinion ou version préliminaire émis par Golder.

À moins d'avis contraire, les interprétations, commentaires et les recommandations présentés dans ce rapport ont été formulés, conformément à la portée de l'expertise. Ces mêmes interprétations, commentaires et recommandations ont été formulés en tenant compte des limitations générales décrites sur cette page de même qu'à la lumière de nos connaissances concernant l'utilisation courante et/ou prévue du site, l'emplacement du site, les règlements, normes et critères environnementaux en vigueur ainsi que les règles et pratiques professionnelles reconnues et acceptées au moment de l'étude.

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## CONDITIONS DU SITE

L'expertise technique effectuée par Golder et décrite dans ce rapport a été réalisée conformément aux règles et pratiques professionnelles reconnues et acceptées au moment de sa réalisation. À moins d'avis contraire, les résultats de travaux antérieurs ou simultanés, provenant d'autres sources que Golder, cités et/ou utilisés dans ce rapport furent considérés comme ayant été obtenus en respectant les règles et pratiques professionnelles reconnues et acceptées et, conséquemment, comme étant valides.

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## MODÉLISATION

Un modèle numérique utilise des lois scientifiques et des hypothèses dictées par le jugement professionnel pour intégrer les données disponibles à l'intérieur d'une représentation mathématique conceptualisant les caractéristiques essentielles d'un système existant ou prévu. Bien qu'un modèle numérique ne puisse représenter toute la réalité détaillée d'un système, un modèle numérique valide est un outil capable d'en simuler de façon raisonnable le comportement sous diverses contraintes et conditions. La validité du modèle ainsi que sa précision dépendent de la quantité, de la qualité et de la distribution des données disponibles de même que de la complexité du contexte climatique, hydrologique, géologique et géochimique entres autres. Ainsi, chaque modélisation est une simplification d'un système réel ou envisagé et les résultats obtenus doivent donc être interprétés et utilisés avec précaution et discernement. Le modèle décrit dans ce rapport ne fait pas exception.

Ce modèle constitue un outil scientifique de prédiction permettant d'évaluer les impacts de modifications imposées à un système existant et/ou permettant de comparer divers scénarios dans le cadre d'un processus décisionnel. Cependant, la précision du modèle demeure liée à l'incertitude normale inhérente aux travaux de modélisation et, même si une attention professionnelle a été apportée lors de sa construction et des simulations, aucune garantie directe ou indirecte n'est donnée.

# ANNEXE

# QCM-5

## ÉTUDE DE MODÉLISATION DE LA DISPERSION ATMOSPHÉRIQUE – RÉVISION 1

CANADIAN MALARTIC GP

# PROJET D'EXPLOITATION DES ZONES SOUTERRAINES MINÉRALISÉES DU PROJET ODYSSEY

## ÉTUDE DE MODÉLISATION DE LA DISPERSION ATMOSPHÉRIQUE

NOVEMBRE 2021 RÉVISION 1

# PROJET D'EXPLOITATION DES ZONES SOUTERRAINES MINÉRALISÉES DU PROJET ODYSSEY

## ÉTUDE DE MODÉLISATION DE LA DISPERSION ATMOSPHÉRIQUE

## CANADIAN MALARTIC GP

RAPPORT TECHNIQUE
RÉVISION 1

PROJET N$^{O}$ : 171-08287-03
DATE : NOVEMBRE 2021

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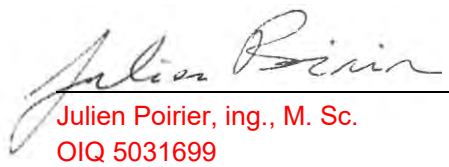

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Date

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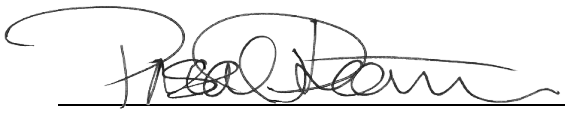

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8 novembre 2021
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# 1 INTRODUCTION

## 1.1 MISE EN CONTEXTE

Dans le cadre du projet Odyssey, Canadian Malartic GP (CMGP) projette d'exploiter quatre zones minéralisées, soit East Malartic, East Gouldie, Odyssey Sud et Odyssey Nord. Il est prévu que ces zones soient exploitées au moyen de galeries souterraines à proximité de la mine Canadian Malartic (MCM). Ce projet nécessitera, entre autres, l'aménagement d'un puits et d'une rampe pour accéder aux gisements.

Le projet Odyssey est situé dans l'empreinte existante du projet d'extension présenté par Canadian Malartic GP (CMGP) en 2015 au ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) dans le cadre de l'étude d'impact sur l'environnement (ÉIE) et autorisé par décret émis par le gouvernement du Québec en 2017 (décret 388-2017). Le 28 novembre 2018, le décret 1370-2018 a été adopté, modifiant le décret n° 388-2017 de la mine Canadian Malartic et autorisant CMGP à réaliser son projet Odyssey. La présente demande de modification du décret vise l'ajout de l'exploitation souterraine des zones East Malartic et East Gouldie au projet Odyssey. Cette modification de décret permettrait une production d'environ 20 000 tonnes de minerai par jour.

Dans ce contexte, CMGP a mandaté WSP afin de procéder à l'analyse de la qualité de l'air projetée à l'aide d'une modélisation de la dispersion atmosphérique dans la zone affectée par le projet.

## 1.2 OBJECTIFS DE L'ÉTUDE

Ce rapport est déposé en tant qu'étude complémentaire évaluant l'impact sur la qualité de l'air des émissions provenant des opérations futures au site minier soit le projet Odyssey, et ce, sur la base des normes du *Règlement sur l'assainissement de l'atmosphère* (RAA).

La démarche de modélisation préconisée dans la présente étude s'appuie sur la méthodologie proposée par le ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC)[1] dans le *Guide de modélisation de la dispersion atmosphérique* (MDDEP, 2005) et dans le *Guide d'instruction – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers* (MDDELCC, 2017a). L'étude prend en compte les données fournies et des informations obtenues auprès des responsables de la planification des opérations et de la conception des installations de MCM.

Le présent document doit également être interprété dans le contexte d'une modification de décret, et donc, relativement aux modélisations antérieures qui ont été effectuées; notamment celles présentées dans le cadre de l'étude d'impact du Projet Extension Canadian Malartic et Déviation de la 117 (modélisation 2015) et de celles de 2018, dans le cadre du projet Odyssey menant à l'obtention du décret 1370-2018 (modélisation 2018). En effet, la méthode de détermination des taux d'émission et la méthode d'élaboration des scénarios de modélisation demeurent identiques depuis 2015.

Le présent rapport constitue une révision, dénommé Révision 1, de l'*Étude sectorielle sur la modélisation de la dispersion atmosphérique* (WSP, 2021a) [ci-après Révision 0], présentée dans le cadre de la demande de modification de décret soumise en février 2021 au MELCC. Depuis le dépôt de la Révision 0, une première série de questions et commentaires a été déposée par le MELCC le 9 juillet 2021 (MELCC, 2021). L'objectif principal de la Révision 1 est donc de répondre à ces questions et d'intégrer les commentaires du MELCC. De plus, des

[1] Les dénominations ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP), ministère du Développement durable, de l'Environnement et des Parcs (MDDEP) et ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) sont également utilisées dans le présent rapport bien que ce ministère ait été renommé ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) depuis octobre 2018, et ce, afin d'éviter la confusion dans les références.

modifications de faibles ampleurs au projet Odyssey ont également été considérées, et ce, afin d'offrir une évaluation la plus à jour possible. Enfin, depuis le dépôt de la Révision 0, CMGP a obtenu deux autorisations de modification de certificat d'autorisation (CA) pour l'opération du concasseur mobile permanent et du concasseur saisonnier (MCM, 2021a; MCM, 2021b). Bien que ces modifications ne fassent pas partie intégrante du projet Odyssey, celles-ci ont également été considérées puisqu'elles influencent le scénario de modélisation de référence. Ce choix se justifie davantage dans le contexte où CMGP a déposé au MELCC une seconde modification de décret pour l'agrandissement du parc à résidus (WSP, 2021b), basée sur ce même scénario de référence. C'est donc dans le but d'offrir une évaluation harmonisée entre les deux dossiers que ces modifications ont été intégrées à la présente étude. Les principales modifications apportées dans la présente étude sont discutées à la sous-section suivante.

L'étude propose la caractérisation des situations maximisant l'impact sur la qualité de l'air. Deux situations ont été retenues, soit l'année où l'exploitation combinée des fosses à ciel ouvert de MCM conjointement au projet Odyssey est maximale et l'année où l'exploitation du projet Odyssey est maximale survenant à la suite de la fin de l'exploitation des fosses à ciel ouvert de MCM. Ces scénarios sont ensuite modélisés sur un ensemble de données météorologiques de cinq années afin d'estimer l'impact du projet sur la qualité de l'air lors des conditions de dispersion les plus défavorables. Les résultats du présent rapport correspondent donc à des situations modélisées sur des années météorologiques passées, à partir de taux d'émission estimés selon les opérations prévues dans les plans miniers et informations techniques actuellement disponibles.

Les sections suivantes décrivent la procédure suivie pour modéliser les concentrations des composés particulaires et gazeux dans l'air ambiant. Les niveaux ambiants retenus ainsi que les normes et critères de qualité de l'atmosphère considérés pour évaluer la conformité des concentrations modélisées à la réglementation québécoise sont aussi exposés. Enfin, les résultats détaillés sont présentés et interprétés en fonction des hypothèses retenues pour la modélisation. Il convient finalement de spécifier que toutes les cartes techniques de la modélisation mentionnées dans ce rapport sont regroupées à l'annexe B.

## 1.3 DESCRIPTION DE LA RÉVISION 1

L'objectif de la Révision 1 est d'abord d'intégrer les modifications au projet Odyssey afin de satisfaire les exigences du MELCC et ensuite de considérer les récentes autorisations modifiant le scénario de référence, et ce, afin d'offrir une évaluation harmonisée entre les différents dossiers de demande d'autorisation de CMGP. Aucune modification n'a été effectuée sur la méthodologie de modélisation et de caractérisation générale des sources d'émissions. Les modifications considérées sont décrites ci-dessous.

**Les modifications au projet Odyssey** considérées sont :

- Mise à jour des dépoussiéreurs de l'usine de remblai en pâte :
  La caractérisation des sources de dépoussiérage de l'usine de remblai en pâte a été mise à jour selon le design le plus récent de l'usine. Les sources ponctuelles décrites aux sections 4.1.2.5 et 4.2.1.6 ont donc été mises à jour. L'effet de cette modification sur les émissions de particules totales de ces sources correspond à une augmentation de 2 % pour le scénario 1 et une augmentation de 100 % pour le scénario 2. Néanmoins, ces sources représentent moins de 1 % des émissions de l'ensemble des sources associées au projet Odyssey.
- Ajout d'un silo pour les stériles acheminés à la surface par le chevalement :
  La description actuelle du projet prévoit maintenant l'utilisation d'un silo pour les stériles acheminés à la surface par le chevalement. Cette modification réduit la remanipulation des stériles en surface et entraine donc le retrait d'une source de déchargement aux sections 4.1.2.1 et 4.2.1.1. De plus, ceci évite le recours à une pile tampon de stériles et entraine donc le retrait d'une source d'érosion éolienne aux sections 4.1.2.6 et 4.2.1.8.
- Augmentation des stériles acheminés à la surface :
  L'estimation de la quantité des stériles acheminés à la surface a été révisé et la figure 2 reflète ce changement. Pour le scénario 1, aucun changement sur les stériles manipulés n'est envisagé, cette modification n'a donc pas d'effet sur ce scénario. Pour le scénario 2, la quantité de stériles acheminée à la surface est maintenant estimée à 0,9 Mt plutôt que le 0,2 Mt initialement prévu. Cette augmentation correspond à une augmentation de 9 % des matériaux manipulés en surface (minerai et stériles) de ce scénario et influence les sources présentées aux sections 4.2.1.1 et 4.2.1.3. Ceci correspond, par exemple, par une augmentation de 5,8 % des émissions de routage du scénario 2.

En somme, les modifications considérées au projet Odyssey influencent principalement le scénario 2.

**Les modifications au scénario de référence** considérées sont :

- Déplacement du concasseur mobile permanent :
  La description de l'arrangement général présenté à la demande de modification de CA pour l'opération du concasseur mobile permanent (MCM, 2021b) a été considérée. Cette modification entraine, entre autres, le déplacement des sources de concassage présentées à la section 4.1.1.5. De plus, le nombre d'équipements de concassage et d'équipements mobiles, leur capacité nominale et leur arrangement ont été ajustés selon la description détaillée de cette demande de modification. Enfin, cette modification entraine également l'ajustement de certains trajets de transport, et ce, en particulier à ce qui a trait au minerai préconcassé.
- Déplacement du concasseur saisonnier :
  La description de l'arrangement général présenté à la demande de modification de CA pour l'opération du concasseur saisonnier (MCM, 2021a) a été considérée. Cette modification entraine, entre autres, l'ajout des sources de concassage présentées à la section 4.1.1.6. Cette modification entraine également l'ajustement de certains trajets de transport, et ce, en particulier à ce qui a trait à la portion de stériles revalorisée.

En somme, les modifications considérées au scénario de référence influencent uniquement les sources du scénario 1 qui ne sont pas associées au projet Odyssey.

## 1.4 ZONE D'ÉTUDE

Le site de MCM se situe à la latitude 48°7'22,50" Nord et à la longitude 78°6'38,83" Ouest. Dans le système de projection UTM (Zone 17, NAD83), le site a pour coordonnées X = 715 000 m et Y = 5 334 000 m. Le projet Odyssey, pour sa part, se situe à la latitude 48°7'30,53" Nord et à la longitude 78°4'8,74" Ouest et a pour coordonnées X = 718 093 m et Y = 5 334 365 m dans la projection UTM17.

La mine à ciel ouvert est située au sud de la ville de Malartic, tandis que le projet Odyssey est situé au sud-est de la ville de Malartic. La carte B-1-1 présente la localisation du projet.

# 2 CADRE RÉGLEMENTAIRE

## 2.1 NORMES ET CRITÈRES DE QUALITÉ DE L'ATMOSPHÈRE

Au Québec, les normes et critères de qualité de l'atmosphère ont été établis par le MELCC afin de faciliter l'évaluation de la qualité de l'air ambiant. Ils peuvent être utilisés pour analyser les résultats de mesures effectuées dans le cadre de différents programmes de suivi, pour établir l'indice de la qualité de l'air ou pour juger les résultats des études de modélisation de la dispersion atmosphérique réalisées dans le cadre des demandes d'autorisation et des études d'impact sur l'environnement.

L'application de normes de qualité de l'atmosphère est encadrée par le Titre IV du RAA (chapitre Q-2, r. 4.1). Pour les substances ne faisant pas l'objet d'une norme dans le RAA, des critères de qualité de l'atmosphère sont aussi déterminés et sont appliqués en vertu de l'article 20 de la Loi sur la qualité de l'environnement (LQE).

La détermination d'une norme ou d'un critère de qualité de l'atmosphère exige des étapes d'évaluation et de gestion des risques qui doivent être encadrées par un ensemble de principes et de lignes directrices. En effet, il est nécessaire de maintenir une certaine cohérence dans le traitement de la multitude d'effets potentiels des contaminants sur la santé et l'environnement, dans l'application administrative des exigences requises pour le respect des normes et des critères de qualité de l'atmosphère et dans la gestion des risques auxquels seront exposés la population et l'environnement.

Les normes et critères de qualité de l'atmosphère sont définis dans le document *Normes et critères québécois de qualité de l'atmosphère* (MELCC, 2018) et décrits dans le document *Normes et critères de qualité de l'atmosphère du Québec : Cadre de détermination et d'application* (MDDELCC, 2017b). Deux types de critères y sont définis par le MELCC :

1. Le **critère de qualité de l'atmosphère** est le résultat de l'évaluation scientifique des risques et représente la concentration limite dans l'air ambiant établie en considérant seulement les arguments scientifiques et méthodologiques. Le critère de qualité de l'atmosphère est établi à un niveau de risque négligeable. Il est placé volontairement à un niveau inférieur à plusieurs risques rencontrés dans la vie courante. L'intention est de fixer des critères qui assurent une protection de la santé des populations et du milieu et qui favorisent la mise en place des meilleures technologies de production et d'épuration des émissions atmosphériques.
   Des concentrations sans effet peuvent être déterminées pour quatre grands types d'effets : les effets par exposition directe (p. ex., inhalation), les effets par exposition indirecte (p. ex., ingestion des contaminants), les nuisances (p. ex., odeurs) et les effets écotoxicologiques. Pour chaque contaminant, les critères de qualité de l'atmosphère sont établis à partir des concentrations sans effet les plus contraignantes parmi celles ayant été déterminées en fonction de l'information disponible. Ceci permet d'assurer la protection de tous les usages d'un milieu qui sont couverts par chacune des quatre concentrations sans effet.
   Enfin, le critère de qualité de l'atmosphère sert notamment à baliser la notion de susceptibilité de causer un effet qui est prévue à l'article 20 de la LQE.
2. Le **critère provisoire de gestion** est une valeur qui prend en compte d'autres éléments que les effets, tels que les coûts et les bénéfices en santé publique et en environnement ou la faisabilité technologique. Les critères provisoires de gestion de qualité de l'atmosphère peuvent donc être établis à des valeurs correspondant à un risque supérieur à celui dit négligeable. Un risque peut être considéré comme acceptable même s'il est supérieur au niveau de risque négligeable à la condition qu'il ne dépasse pas les niveaux de risques, environnementaux ou autres, auxquels une personne est normalement exposée dans la vie courante. Ces risques supplémentaires doivent aussi être contrebalancés par des bénéfices sociaux et de santé publique en matière d'emploi, d'élévation du niveau de vie ou autre. Enfin, ces risques considérés comme acceptables doivent être acceptés par une grande majorité de la population.

Finalement, lorsqu'un critère ou un critère provisoire de gestion est intégré dans le RAA, il devient une **norme de qualité de l'atmosphère** (norme). Les normes sont normalement basées sur les critères de qualité de l'atmosphère, mais, dans certains cas, elles peuvent être basées sur des critères de gestion en raison de difficultés d'application.

Ces définitions sont résumées au tableau 2 du document *Normes et critères de qualité de l'atmosphère du Québec : Cadre de détermination et d'application*, qui est repris ci-contre au tableau 1.

**Tableau 1 : Valeurs de référence – Cadre de détermination et d'application des normes et critères**

| Critère de qualité de l'atmosphère | Critère provisoire de gestion | Norme de qualité de l'atmosphère |
|---|---|---|
| Seuil de référence correspondant à la valeur la plus contraignante parmi les quatre concentrations sans effet. | Seuil de référence déterminé à partir de la concentration sans effet la plus contraignante et de considérations scientifiques, techniques ou socioéconomiques. | Critère de qualité de l'atmosphère ou critère provisoire de gestion ayant été intégré au Règlement sur l'assainissement de l'atmosphère. |
| Niveau de risque : négligeable | Niveau de risque : acceptable | Niveau de risque : négligeable ou acceptable |

Dans ce contexte, le respect des normes et critères permet d'assurer un environnement sécuritaire pour la santé humaine et pour l'environnement. Par conséquent, les effets appréhendés des composés particulaires et gazeux sur la santé humaine et sur l'environnement peuvent être considérés comme négligeables ou acceptables lorsque les normes et critères sont respectés.

## 2.2 SUBSTANCES MODÉLISÉES

Les substances considérées dans cette étude sont les substances émises identifiées à la section 3.2 et pour lesquelles une norme ou un critère est défini dans le document *Normes et critères québécois de qualité de l'atmosphère* du MELCC.

La présente étude concerne donc les **matières particulaires (PMT et $PM_{2,5}$)**, le **monoxyde de carbone (CO)**, le **dioxyde d'azote ($NO_2$)**, le **dioxyde de soufre ($SO_2$)**. De plus, les métaux contenus dans les matières particulaires sont également considérés. Un ensemble de 19 **métaux et métalloïdes** est donc pris en considération. Parmi ces métaux, 14 possèdent une norme de qualité de l'atmosphère définie dans le RAA. Il s'agit de l'antimoine (Sb), l'argent (Ag), l'arsenic (As), le baryum (Ba), le béryllium (Be), le cadmium (Cd), le chrome trivalent (Cr(III)), le cuivre (Cu), le mercure (Hg), le nickel (Ni), le plomb (Pb), le thallium (Tl), le vanadium (V) et le zinc (Z). Enfin, des critères ont été établis par le MELCC pour le cobalt (Co), le manganèse (Mn), le sélénium (Se), la silice cristalline[2] ($SiO_2$) et le titane (Ti). Les normes et critères des métaux sont définis sur les PMT, à l'exception du manganèse, du nickel, de la silice cristalline 1 heure et du titane qui sont définis sur les $PM_{10}$ et de la silice cristalline annuelle qui est définie sur les $PM_4$.

L'ensemble des normes et critères considérés sont présentés au tableau 2.

## 2.3 LIMITE ET DOMAINE D'APPLICATION

Afin de vérifier la conformité des opérations vis-à-vis des normes et critères de qualité de l'atmosphère, une limite géographique à partir de laquelle ces valeurs limites s'appliquent doit être définie. Cette limite est appelée « **limite d'application des normes et critères** » (ci-après limite d'application) et est définie par la limite de propriété ou de la zone industrielle projetée lorsqu'une telle limite existe. Dans le cas où le projet se trouve en totalité ou en partie sur des terres publiques, le MELCC définit les exigences d'évaluation dans le guide d'instruction pour une modélisation d'un projet minier (MDDELCC, 2017a). La section 4.3 stipule que les normes et critères soient évalués à partir d'une distance de 300 m des différentes installations. Le promoteur est ensuite tenu de respecter par

[2] Dans la présente étude, la silice cristalline est regroupée dans les métaux. Or, même si le silicium est souvent mentionné comme un métal, il possède autant les caractéristiques d'un métal que d'un non-métal.

modélisation les normes et critères aux récepteurs sensibles tandis que la limite d'application à 300 m est plutôt utilisée comme guide afin de s'assurer que les mesures d'atténuation courantes sont appliquées.

Dans le cas du présent projet, les installations sont situées en partie sur des terres privées, mais elle comprend également des installations en territoire public ou en bordure d'une zone industrielle. Par conséquent, la limite d'application a été tracée sur la limite de propriété dans les zones privées, sur la limite des zones industrielles adjacentes au site minier et à 300 m autour des installations en territoire public. Puisque les infrastructures de surfaces du projet Odyssey sont similaires à celles déjà considérées dans l'étude 2018 du projet Odyssey (WSP, 2018a), la même limite d'application a été utilisée. La limite d'application est présentée à la carte B-1-2.

L'utilisation d'une même limite d'application offre également l'avantage d'obtenir une même base comparative avec les diverses études de dispersion atmosphérique réalisées dans le passé pour l'exploitation de MCM.

La vérification du respect des valeurs limites se fait à cette limite d'application et au-delà. Les concentrations des contaminants modélisées dans l'air ambiant à l'intérieur de cette limite ne sont donc pas prises en compte lors de la vérification du respect des normes et critères de la qualité de l'air. En résumé, seuls les résultats de modélisations dans le « **domaine d'application des normes et critères** » (ci-après domaine d'application), constitué de la limite d'application et de la zone au-delà de celle-ci, seront comparés aux normes et critères de qualité de l'atmosphère en vigueur.

## 2.4 NIVEAUX AMBIANTS

Le niveau ambiant (ou concentration initiale) représente la concentration préexistante d'un contaminant dans l'air ambiant. Or, conformément au guide de modélisation du MELCC (MDDEP, 2005), les concentrations obtenues par modélisation doivent être additionnées à des niveaux ambiants représentatifs de la région étudiée. Afin de vérifier le respect des normes et critères, la somme de la concentration initiale et des concentrations modélisées doit ainsi être inférieure à la norme ou au critère pour chacune des substances.

Pour déterminer les niveaux ambiants des contaminants, différentes approches peuvent être envisagées. Les concentrations initiales peuvent être déterminées à partir :

- de mesures effectuées sur le site dans le but d'obtenir des valeurs réelles;
- de mesures effectuées par les stations du Réseau de surveillance de la qualité de l'air du MELCC;
- de concentrations initiales génériques définies par le MELCC.

Toutefois, en ce qui concerne la présente étude, le MELCC considère que les concentrations initiales des particules provenant du RAA surestiment les concentrations réelles susceptibles d'être rencontrées dans le secteur à l'étude.

Des concentrations initiales ont donc été fournies par le MELCC pour les matières particulaires (PMT et $PM_{2,5}$) et le $NO_2$. En revanche, les concentrations initiales pour le CO, le $SO_2$ et les métaux et métalloïdes correspondent à celles publiées dans le document *Normes et critères québécois de qualité de l'atmosphère* (MELCC, 2018). Le tableau 2 présente les concentrations initiales des contaminants modélisés.

**Tableau 2 : Concentrations initiales et seuils applicables pour les substances modélisées**

| Paramètres | Acronyme | Période | Statistique | Valeur limite ($\mu g/m^3$) | Concentration initiale ($\mu g/m^3$) | Référence |
|---|---|---|---|---|---|---|
| Particules totales | PMT | 24 heures | 1er maximum | 120 | **40** [3] | Normes (RAA) |
| Particules fines | $PM_{2,5}$ | 24 heures | 1er maximum | 30 | **15** [3] | |
| Monoxyde de carbone | CO | 1 heure | 1er maximum | 34000 | 2650 | |
| | | 8 heures | 1er maximum | 12700 | 1750 | |
| Dioxyde d'azote | $NO_2$ | 1 heure | 1er maximum | 414 | **40** [3] | |
| | | 24 heures | 1er maximum | 207 | **30** [3] | |
| | | Annuelle | 1er maximum | 103 | **10** [3] | |
| Dioxyde de soufre | $SO_2$ | 4 minutes | 1er maximum | 1310 | 150 | |
| | | 4 minutes | 99.5e percentile | 1050 | 150 | |
| | | 24 heures | 1er maximum | 288 | 50 | |
| | | Annuelle | 1er maximum | 52 | 20 | |
| Antimoine | Sb | Annuelle | 1er maximum | 0,17 | 0,007 | |
| Argent | Ag | Annuelle | 1er maximum | 0,23 | 0,005 | |
| Arsenic | As | Annuelle | 1er maximum | 0,003 | 0,002 | |
| Baryum | Ba | Annuelle | 1er maximum | 0,05 | 0,025 | |
| Béryllium | Be | Annuelle | 1er maximum | 0,0004 | 0 | |
| Cadmium | Cd | Annuelle | 1er maximum | 0,0036 | 0,003 | Normes (RAA) |
| Chrome (trivalent) | Cr(III) | Annuelle | 1er maximum | 0,1 | 0,01 | |
| Cobalt | Co | Annuelle | 1er maximum | 0,1 | 0 | Critère (MELCC, 2018) |
| Cuivre | Cu | 24 heures | 1er maximum | 2,5 | 0,2 | Normes (RAA) |
| Manganèse [1] | Mn | Annuelle | 1er maximum | 0,025 | 0,02 | Critère (MELCC, 2018) |
| Mercure | Hg | Annuelle | 1er maximum | 0,005 | 0,002 | Normes (RAA) |
| Nickel [1] | Ni | 24 heures | 1er maximum | 0,014 | 0,002 | |
| Plomb | Pb | Annuelle | 1er maximum | 0,1 | 0,025 | |
| Sélénium | Se | 1 heure | 1er maximum | 2 | 0,15 | Critère (MELCC, 2018) |
| Silice cristalline [1,2] | $SiO_2$ | 1 heure | 1er maximum | 23 | 6 | |
| | | Annuelle | 1er maximum | 0,07 | 0,04 | |
| Thallium | Tl | Annuelle | 1er maximum | 0,25 | 0,05 | Normes (RAA) |
| Titane [1] | Ti | 24 heures | 1er maximum | 2,5 | 0 | Critère (MELCC, 2018) |
| Vanadium | V | Annuelle | 1er maximum | 1 | 0,01 | Normes (RAA) |
| Zinc | Zn | 24 heures | 1er maximum | 2,5 | 0,1 | |

[1] Mesuré dans les $PM_{10}$.
[2] Mesuré dans les $PM_4$.
[3] Communication par courriel, MDDEFP, 11 avril 2012 et 19 novembre 2013.

# 3 CONTEXTE DE MODÉLISATION

Dans le cadre d'une étude de dispersion atmosphérique, il est important, en premier lieu, de définir le ou les scénarios de modélisation. Pour ce faire, il faut identifier les principales sources d'émissions, les substances émises ainsi que les normes en vigueur pour ces différentes substances. Plus spécifiquement, les substances considérées et les périodes des normes définies pour celles-ci vont influencer le choix des scénarios de modélisation.

## 3.1 DESCRIPTION SOMMAIRE DES OPÉRATIONS

Bien que le projet Odyssey fera partie intégrante des installations de MCM, dans cette étude, une distinction est faite entre les opérations liées aux infrastructures actuelles de MCM et celles du projet Odyssey, et ce, dans l'objectif de mettre en évidence la contribution du projet Odyssey. Lors de la description des opérations, les activités de MCM font donc référence à l'exploitation des fosses à ciel ouvert et des infrastructures actuelles existantes, telles que l'usine de traitement du minerai. Enfin, lorsque l'exploitation des fosses à ciel ouvert est terminée, l'ensemble des activités est alors associé au projet Odyssey.

Les principales opérations prévues pour le présent projet peuvent donc être regroupées de la façon suivante :

### MINE CANADIAN MALARTIC

Un total de deux fosses sont prévues être actives sur le site de la mine à divers moments : les fosses Canadian Malartic et Barnat. Du minerai et des stériles sont extraits de ces fosses. Les matériaux sont sautés avant d'être chargés dans les camions miniers à l'aide d'excavatrices.

Le minerai est transporté soit vers les concasseurs ou bien entreposé sur les piles de minerai. Les stériles sont, quant à eux, entreposés sur la halde à stériles jusqu'à environ 2023-2024 et, par la suite, ils seront déposés dans la fosse Canadian Malartic dont l'exploitation sera alors terminée.

Des bouteurs sont également utilisés dans les aires de chargement, près du concasseur primaire et sur la halde afin de préparer les matériaux et d'aménager les stériles. Enfin, une partie des stériles est revalorisée notamment pour la construction des routes et du parc à résidus.

Une fois déchargé au concasseur, le minerai est concassé, broyé et acheminé à l'usine de traitement afin de produire des lingots. Le traitement du minerai s'effectue de manière continue. Enfin, les résidus produits par le procédé sont entreposés dans un parc à résidus. À la fin de l'exploitation de la fosse Canadian Malartic, il est planifié de déposer les résidus dans la fosse.

### PROJET ODYSSEY

Le projet Odyssey prévoit l'exploitation d'une mine souterraine. Le projet comprend quatre secteurs, soit les zones Odyssey Nord, Odyssey Sud, East-Malartic et East-Gouldie. Pour les zones Odyssey Sud et la partie moins profonde de East-Malartic (0-600m), le minerai sera acheminé à la surface à l'aide de camion minier par une rampe d'accès. Pour les zones Odyssey Nord, la partie plus profonde de East-Malartic (600-2000m) et East-Gouldie, le minerai sera acheminé à la surface par un puits d'accès équipé d'un chevalement. Une portion des stériles manipulés sous terre sera également acheminée à la surface, et ce, de manière plus importante lors des premières années.

Pour les matériaux extraits par la rampe, les matériaux seront déposés sur des haldes temporaires avant d'être chargés dans les camions miniers de surface. Pour les matériaux extraits par le chevalement, le minerai et les stériles seront entreposés dans un silo pour être ensuite chargés dans les camions miniers de surface. Dans les deux cas, les matériaux seront acheminés aux mêmes secteurs que les matériaux extraits des fosses actuelles.

## 3.2 IDENTIFICATION DES SOURCES ET DES SUBSTANCES ÉMISES

L'exploitation d'une mine à ciel ouvert implique plusieurs types d'activités susceptibles de générer des émissions fugitives. Plus spécifiquement, les opérations de forage ainsi que le chargement et le déchargement des camions de transport sont reconnus comme des sources fugitives de matières particulaires (PMT et les $PM_{2,5}$). Le sautage représente également une source fugitive de particules et de gaz de combustion (CO, le $NO_2$ et le $SO_2$). L'entraînement de la poussière lors du passage des véhicules lourds sur le réseau de routes non pavées de la mine représente pour sa part une source de particules. En effet, le routage des différentes matières est habituellement le principal contributeur parmi toutes les sources fugitives d'un complexe minier.

Les opérations souterraines du projet Odyssey, dont la manipulation de matériaux, l'utilisation de machinerie et les sautages, sont susceptibles de générer des émissions de matières particulaires et de gaz d'échappement. Ces émissions sont canalisées à la surface par les cinq sorties de ventilation prévues (incluant la rampe d'accès). Les infrastructures du projet Odyssey prévoient également deux phases d'une usine à pâte pour le remblai des chantiers souterrains, dont l'utilisation de dépoussiéreurs est prévue pour les silos de liant. Ces derniers représentent des sources ponctuelles de matières particulaires.

Les poussières de minerai concassé sont captées lors du procédé à l'usine de traitement du minerai par plusieurs dépoussiéreurs. Parmi ceux-ci, ceux possédant une sortie à l'atmosphère représentent des sources ponctuelles de particules. Plus précisément, il s'agit des dépoussiéreurs du concasseur giratoire, du dôme, des fours à induction et du réservoir de sulfate de cuivre. Les dépoussiéreurs ne possédant pas de sortie vers l'extérieur ou qui présentent des émissions considérées comme négligeables ont été écartés de la liste des sources ponctuelles.

Les gaz d'échappement des divers équipements utilisés pour l'exploitation de MCM représentent des sources ponctuelles de gaz de combustion et de particules. Les chaudières de gaz naturel #1 et #2 ainsi que les fours de réactivation – combustion #1 et #2 installés à l'usine de traitement représentent également des sources de gaz de combustion et de particules.

Finalement, les diverses haldes et piles de stockage sont quant à elles sujettes à l'érosion éolienne et sont considérées comme des sources surfaciques de matière particulaire.

## 3.3 SCÉNARIOS DE MODÉLISATION

Afin de satisfaire aux exigences du MELCC, la modélisation vise à représenter les conditions qui maximiseront les répercussions sur la qualité de l'air. Pour ce faire, des « scénarios pires cas » doivent être considérés. Dans le cas où la modélisation de ces scénarios conservateurs respecte les normes de qualité de l'air, il est fort probable que les normes soient respectées en tout temps au cours de la durée de vie du projet.

La sélection des scénarios de modélisation dépend de la variabilité des opérations durant toute la durée de vie du projet. Ainsi, une description détaillée des variantes des opérations est donnée à la section suivante.

### 3.3.1 *VARIATION DES OPÉRATIONS*

#### *3.3.1.1 MINE CANADIAN MALARTIC*

L'exploitation de la mine prévoit l'extraction de matériaux des différentes fosses, soit Canadian Malartic et Barnat. La figure 1 présente le tonnage extrait par année en fonction des fosses selon la planification minière 2020. La quantité de matériaux extraits pour chacune des fosses varie au cours des années. Ainsi, la position des opérations, de même que leur élévation, varieront au cours de la durée de vie de la mine. La fosse Canadian Malartic devrait être exploitée jusqu'en 2023 et la fosse Barnat jusqu'à la fin de la durée de vie de la mine à ciel ouvert. À partir de l'année 2025, le tonnage extrait chutera considérablement (diminution de près de 50 % par rapport à 2021).

L'opération de la mine est effectuée en continu à un rythme de 24 heures par jour. Les sautages de production ont lieu à raison d'environ deux sautages par jour, quatre jours par semaine. Lorsque les vents sont défavorables, c'est-à-dire en direction de la ville de Malartic, les sautages sont reportés.

Le minerai extrait est soit acheminé au concasseur primaire, aux piles de minerai ou au concasseur mobile permanent. Du minerai est également remanipulé, c'est-à-dire déposé temporairement sur les piles de minerai avant d'être réacheminé au concasseur primaire. La quantité de minerai acheminé au concasseur primaire et au concasseur mobile permanent est constante pour la durée de vie de la mine, alors que celle déposée ou retirée des piles de minerai est variable selon la production de minerai des fosses.

La portion du minerai concassée au concasseur mobile permanent est acheminée à l'usine de traitement du minerai sans transiter par le concasseur primaire, soit près de 11 000 tonnes par jour. Le concasseur mobile permanent (*concasseur Barette*) est situé au nord de l'usine de traitement. Le minerai préconcassé est ensuite acheminé à une trémie qui est située au sud du concasseur primaire. Ce point de dépôt constitue un point d'accès au convoyeur d'alimentation de l'usine.

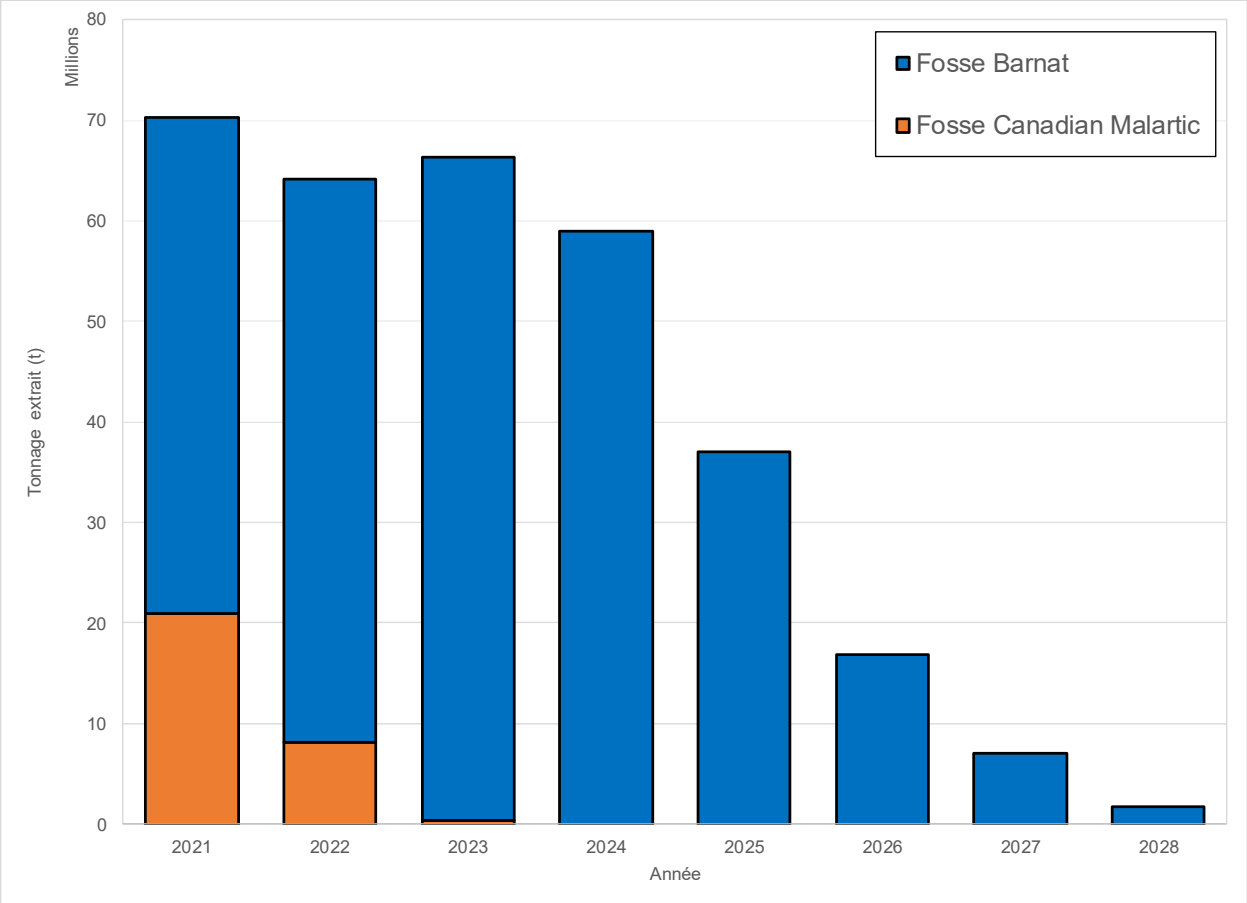



**Figure 1 : Tonnage total annuel extrait selon la planification minière 2020 de la mine Canadian Malartic – sans le projet Odyssey**

Les stériles extraits sont acheminés et entreposés sur la halde à stériles. Une portion des stériles est revalorisée comme bourre de sautage et d'abrasif pour les routes. La déposition des stériles se fera également dans la fosse Canadian Malartic une fois l'exploitation terminée. Le remblai de la fosse débuterait au cours de l'année 2023.

Enfin, l'opération de l'usine de traitement du minerai est effectuée en continu à un taux d'alimentation de 57 000 tonnes par jour. L'année 2025 est la dernière année prévue d'opération de l'usine à pleine capacité. Par la suite, la production sera alors réduite au tiers.

### 3.3.1.2 PROJET ODYSSEY

Le projet Odyssey prévoit l'exploitation d'une mine souterraine. Selon les zones d'exploitation, les matériaux extraits seront acheminés à la surface soit par camion via la rampe ou hissés par le puits. La figure 2 présente le tonnage extrait vers la surface, selon la planification minière du projet Odyssey, en fonction des années du projet, et ce, en fonction du type de matériaux et du point de sortie. Pour les années 2023 à 2026, le minerai sera exclusivement acheminé à la surface par la rampe, à un rythme d'environ 3 000 tonnes par jour, tandis qu'à partir de l'année 2027 du minerai sera également acheminé à la surface par le puits à un rythme pouvant atteindre 18 000 tonnes par jour. La production totale de minerai pourrait atteindre environ 20 000 tonnes par jour. La première année du projet où l'exploitation de la première zone, Odyssey Sud, sera en pleine production correspond à l'année 2024, tandis que l'année 2035 représente l'année d'extraction maximale vers la surface. Enfin, la figure 3 présente la combinaison des planifications minières de la mine Canadian Malartic combinée à celle du projet Odyssey.

Pour le minerai extrait par la rampe, celui-ci sera remanipulé une fois sur la halde temporaire près du portail, dans le secteur Odyssey, et livré directement au concasseur primaire. Pour celui hissé par le puits, celui-ci sera accumulé dans un silo attenant au chevalement avant d'être chargé dans les camions par la chute sous le silo et transporté directement au concasseur primaire sans autre transit. Contrairement au minerai extrait des fosses, ce minerai ne fera donc pas l'objet de remanipulation sur des piles dans le secteur du concasseur primaire et aucun préconcassage en surface ne sera requis.

La flotte d'équipements miniers souterrains, dont les émissions seront évacuées par les sorties de ventilation, variera selon les années d'exploitation. La figure 4 présente les équipements miniers souterrains principaux en fonction des années du projet. Les années 2032 et 2033 y présentent le plus grand nombre d'équipements miniers prévus en utilisation.

Les opérations prévues au projet Odyssey seront effectuées en continu. Des sautages de production sont prévus pour chaque zone d'exploitation et des sautages de développement pourront également être effectués simultanément.

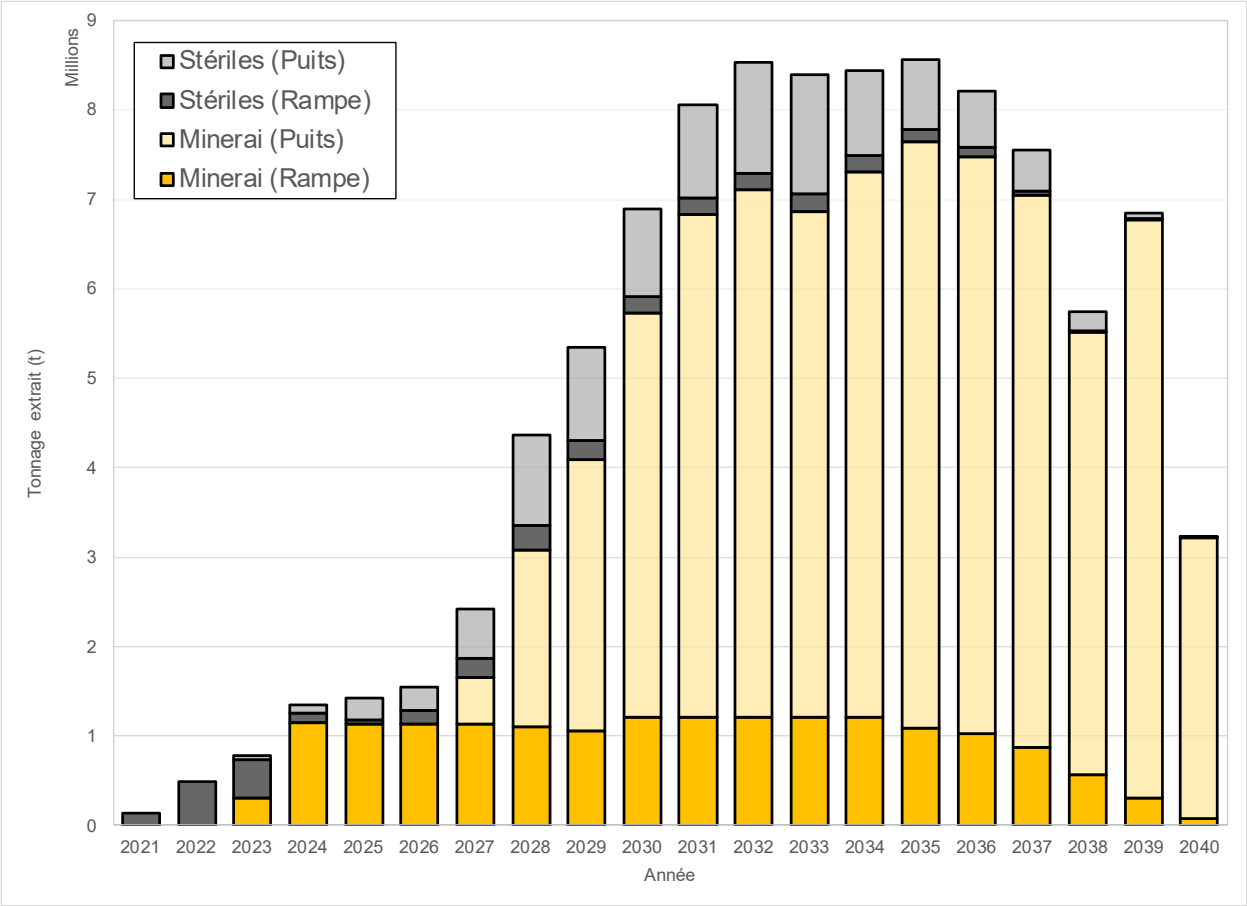



**Figure 2 : Tonnage extrait vers la surface selon la planification minière 2020 du projet Odyssey**

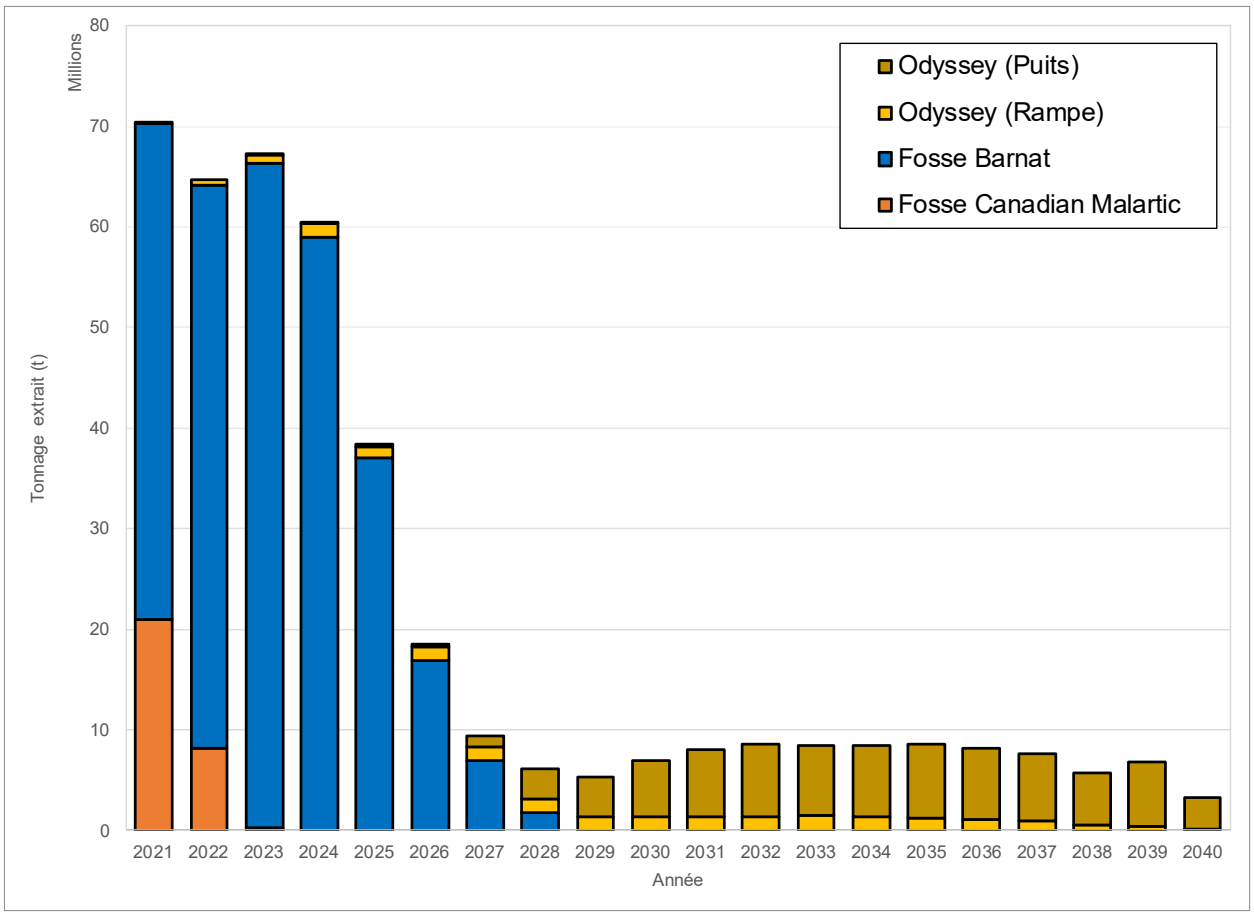



**Figure 3 : Tonnage extrait de la mine Canadian Malartic combiné au projet Odyssey selon la planification minière 2020**

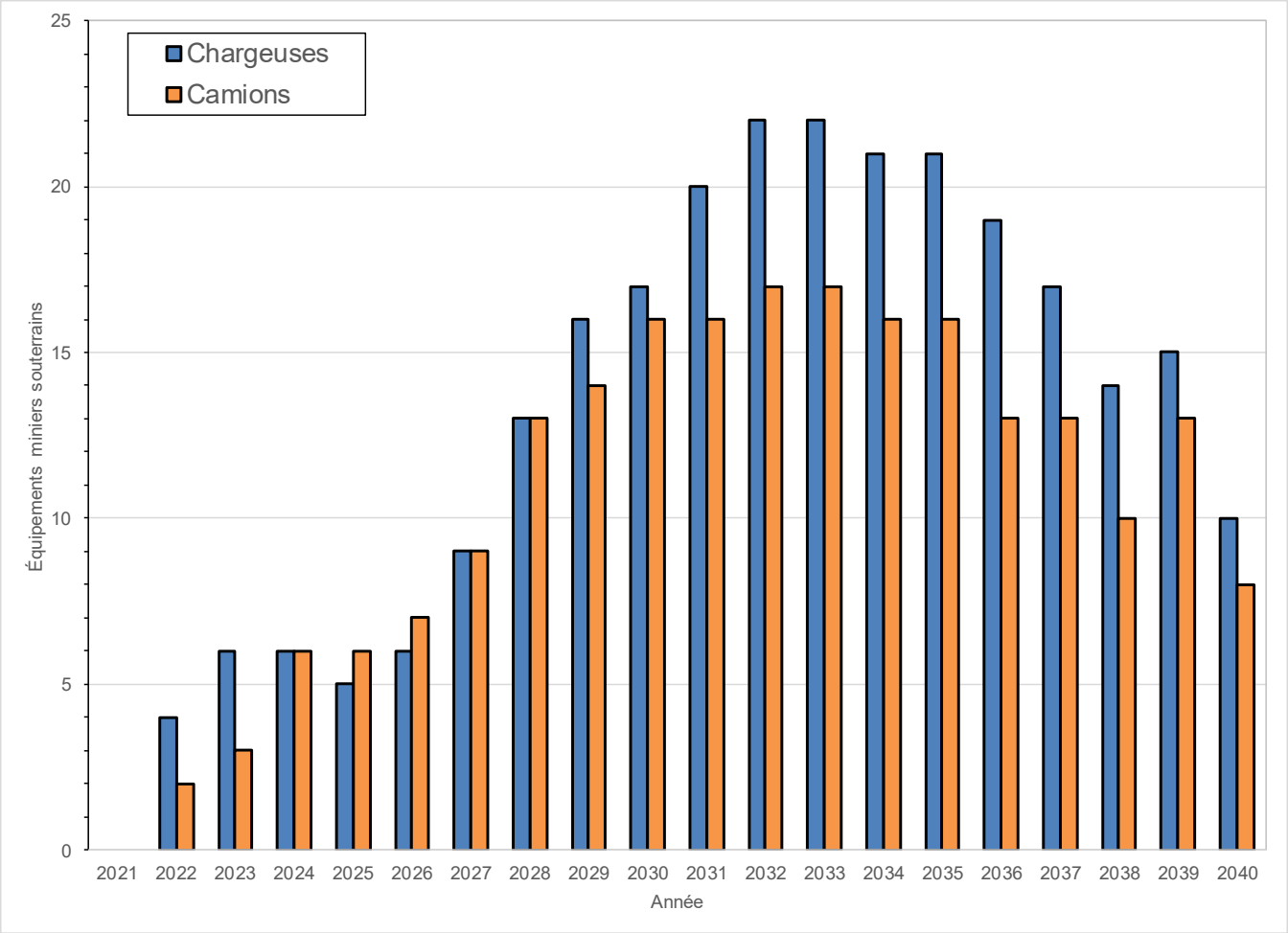



**Figure 4 : Équipements miniers souterrains principaux selon la planification minière 2020 du projet Odyssey**

## 3.3.2 *SCÉNARIOS D'OPÉRATIONS SÉLECTIONNÉS*

Suivant les pratiques actuelles en modélisation de la dispersion atmosphérique, le principal enjeu pour les sites miniers concerne les émissions de matières particulaires dont le routage est normalement le principal contributeur. Les gaz d'échappement sont également un important contributeur notamment de particules fines. La sélection du scénario modélisé est donc normalement orientée en ce sens. Le tonnage extrait est généralement un excellent indicateur pour déterminer les conditions maximales d'exploitation. En effet, les émissions liées au routage des matériaux et la quantité de machinerie requise sur le site sont généralement proportionnels au tonnage extrait. Selon les variantes des opérations décrites ci-dessus, deux scénarios ont été sélectionnés (scénario 1 et 2). En plus du scénario 1 de base, deux variantes ont été définies, soit le scénario 1 sans Odyssey et scénario 1 optimisé. Également, en plus du scénario 2 de base la variante du scénario 2 optimisé est également considérée. Le tableau 3 résume l'ensemble des scénarios modélisés. Ces scénarios et leurs variantes sont décrits ci-dessous.

**Tableau 3 : Description des scénarios modélisés et leurs variantes**

| Variante modélisée | Scénario 1 (2024) | Scénario 2 (2035) |
|---|---|---|
| Scénario de base | ✓ | ✓ |
| Scénario sans le projet Odyssey | ✓ | *Non applicable* |
| Scénario optimisé | ✓ | ✓ |

### *3.3.2.1 SCÉNARIO 1*

#### SCÉNARIO 1 DE BASE

Le scénario 1 vise à représenter l'année du projet Odyssey où la combinaison entre l'exploitation des infrastructures actuelles de la mine Canadian Malartic et du projet Odyssey présentera l'extraction maximale. Puisque les opérations de MCM seront en décroissance, cette situation surviendrait en début d'exploitation du projet Odyssey. Ainsi, l'année 2024 est choisie pour représenter cette situation. En effet, l'année 2024 correspond à la première année du projet où l'exploitation de la première zone, Odyssey Sud, est en pleine production avant la décroissance significative des fosses. Pour les années subséquentes, l'augmentation de l'intensité de l'exploitation du projet Odyssey est plus faible que la décroissance de l'exploitation de MCM.

**L'exploitation de MCM** prévoit, pour l'année 2024, l'extraction de matériaux de la fosse Barnat uniquement. Un total de 59 Mt sera extrait de la fosse, soit 13,6 Mt de minerai et 45,4 Mt de stériles. Pour cette année, les stériles seront déposés dans la fosse Canadian Malartic. L'alimentation de l'usine se fera en combinaison du minerai extrait de la fosse et du minerai prélevé à la pile de minerai acheminé au concasseur primaire et, également, du minerai préconcassé ajouté via la trémie.

Pour fins de modélisations, deux sautages par jour ont été considérés dans la fosse Barnat à condition que les directions de vents soient favorables (le vent ne doit pas souffler en direction de la ville de Malartic) conformément à la méthode d'exploitation de MCM.

Enfin, l'opération de l'usine de traitement du minerai s'effectuera en continu.

**L'exploitation du projet Odyssey**, pour l'année 2024, prévoit l'extraction d'un total de 1,35 Mt, soit 1,15 Mt de minerai et 0,2 Mt de stériles. Lors de cette année, seule la zone Odyssey Sud sera en production. Le minerai sera acheminé au concasseur primaire. Les stériles extraits seront déposés dans la fosse Canadian Malartic.

De plus, des sautages de production ont été considérés dans la mine souterraine chaque jour.

Enfin, il a été considéré que l'opération de l'usine de remblai en pâte et la ventilation de la mine souterraine fonctionneraient en continu.

#### SCÉNARIO 1 SANS ODYSSEY

Pour cette variante, le scénario 1 est repris en conservant uniquement les sources liées à l'exploitation des infrastructures actuelles de MCM; les sources liées au projet Odyssey ne sont donc pas considérées. Cette variante a pour but d'offrir un comparatif au scénario 1 afin de mettre en évidence l'effet du projet Odyssey.

#### SCÉNARIO 1 OPTIMISÉ

Cette variante correspond à la même période d'exploitation que le scénario 1 de base. Ce scénario consiste en une fluctuation des activités de manipulation de stériles et du minerai et à l'arrêt occasionnel du sautage et du forage. Les activités de manipulation de stériles et du minerai comprennent les chargements et déchargements dans les fosses, le transport de stériles et du minerai et le boutage. Cette fluctuation des activités concerne uniquement les opérations effectuées en surface et ne concerne pas les activités souterraines et la ventilation de la mine du projet Odyssey, lesquelles sont toujours considérées en continu.

Cette variante a été retenue afin de déterminer par modélisation un mode d'exploitation qui permet de respecter les normes et critères du MELCC lorsque les conditions de dispersions sont défavorables. Ceci correspond à

l'application par MCM du programme de gestion adaptative des opérations supporté par le suivi de la qualité de l'air. Ainsi, lorsque par modélisation des conditions de dispersion favorables sont obtenues, le mode d'opération est selon le scénario 1 de base (mode d'exploitation normal) alors qu'une variation des opérations est modélisée lorsque les conditions de dispersion sont défavorables. La fluctuation des tonnages manipulés et l'arrêt de certaines opérations étant directement reliés aux concentrations maximales modélisées à la limite d'application.

#### *3.3.2.2 SCÉNARIO 2*

##### SCÉNARIO 2 DE BASE

Cette variante correspond à la période d'exploitation 2035.

Le scénario 2 vise à représenter l'année du projet Odyssey où les opérations présenteront l'extraction maximale, et ce, indépendamment des opérations actuelles de MCM. L'année 2035 est choisie pour représenter cette situation. En effet, l'année 2035 correspond à l'année du projet où l'exploitation sera la plus importante.

Il est prévu que **l'exploitation de MCM** soit terminée en 2035. Ainsi, aucune émission n'est attribuable à MCM pour ce scénario.

**L'exploitation du projet Odyssey**, pour l'année 2035, prévoit l'extraction de 7,6 Mt de minerai et 0,9 Mt de stériles. Lors de cette année, trois zones seront en production, soit les zones East-Gouldie, Odyssey Nord et East-Malartic. Le minerai sera alors acheminé au concasseur primaire. Les stériles extraits seront déposés dans les fosses Canadian Malartic et Barnat. L'opération de l'usine de traitement du minerai sera effectuée en continu. Bien que la capacité de l'usine de traitement sera réduite pour cette année, les émissions des sources ponctuelles sont tout de même considérées au maximum de leur capacité par conservatisme.

De plus, en fonction de la planification minière, la flotte d'équipements souterrains sera maximale pour les années 2032 et 2033 (voir la figure 4). Dans le but de représenter un scénario « pire cas », la flotte d'équipements pour l'année 2033 est considérée pour ce scénario, bien qu'il ne s'agisse pas directement de l'année de modélisation.

De plus, des sautages de production ont été considérés dans la mine souterraine chaque jour.

Enfin, l'opération de l'usine de remblai en pâte et la ventilation de la mine souterraine fonctionneraient en continu.

Pour ce scénario, puisqu'aucune émission n'est attribuable à MCM, la variante du **scénario 2 sans Odyssey** n'est pas applicable et n'est donc pas modélisée.

##### SCÉNARIO 2 OPTIMISÉ

Cette variante correspond à la même période d'exploitation que le scénario 2 de base. Ce scénario consiste en une fluctuation des activités de manipulation de stériles et du minerai en surface selon la même méthodologie que le scénario 1 optimisé. Les activités de manipulation de stériles et du minerai comprennent les chargements et déchargements de camions, le transport de stériles et du minerai et le boutage. Cette fluctuation des activités concerne uniquement les opérations effectuées en surface et ne concerne pas les activités souterraines et la ventilation de la mine du projet Odyssey, lesquelles sont toujours considérées en continu.

### 3.3.3 *CONFIGURATION DES SCÉNARIOS EN FONCTION DES PÉRIODES*

Les substances modélisées possèdent des normes définies sur différentes périodes (4 minutes, 1 heure, 8 heures, 24 heures et 1 an). Dans la mesure du possible, les scénarios modélisés tentent de maximiser les émissions en fonction de ces périodes, pour chacun des types de sources.

Par exemple, des sautages ne sont pas effectués tous les jours. Cependant, afin de modéliser le pire cas 24 heures relativement aux matières particulaires et le pire cas 1 heure pour les composés gazeux, le scénario avec deux sautages dans la fosse et des sautages souterrains de production sont considérés tous les jours dans les modélisations. De façon conservatrice, ce scénario d'émission est ainsi testé sur l'ensemble de l'échantillon météorologique à la recherche des pires conditions de dispersion.

# 4 CARACTÉRISATION DES SOURCES D'ÉMISSIONS

Les sections suivantes présentent la description et les caractéristiques des sources d'émissions considérées dans cette étude.

Les informations générales, les hypothèses et la description des scénarios modélisés sont présentées sous forme de tableaux dans la présente section en support au texte. Pour leur part, la description des sources utilisées dans le modèle est fournie sous forme de tableaux à l'annexe A afin de simplifier la lecture de la présente section. De plus, sauf indication contraire, les taux d'émissions fournis sont présentés sans atténuation.

## 4.1 SCÉNARIO 1

La localisation des sources d'émissions considérées pour le scénario 1 est présentée aux cartes B-2-1, B-2-1a et B-2-1b, tandis que les trajets de transport sont présentés sur les cartes B-2-2a à f. L'annexe A-1 regroupe quant à elle les tableaux présentant les descriptions, les caractéristiques physiques et les taux d'émissions de chacune des sources. Enfin, les sous-sections suivantes décrivent les sources par type d'opération. Pour ce scénario, une portion des émissions est attribuable aux installations actuelles de MCM tandis qu'une autre portion est attribuable au projet Odyssey.

### 4.1.1 *MINE CANADIAN MALARTIC*

#### *4.1.1.1 SAUTAGE*

Le tonnage de matériaux sauté annuellement pour le scénario 1 est de 59 027 099 tonnes. Deux sautages par jour sont considérés dans le modèle vers 11h et 15h. Pour le scénario modélisé, ceux-ci sont positionnés dans la fosse Barnat. Les paramètres utilisés pour la modélisation des sautages sont détaillés au tableau 4.

Il importe de rappeler que ces sautages sont conditionnels à la direction du vent puisque ce dernier ne doit pas souffler en direction de la ville de Malartic. Dans le cas où à l'heure prévue du sautage, la direction du vent favoriserait la dispersion des émissions de sautage vers Malartic, le sautage serait alors annulé, et donc non modélisé. Les angles de restrictions considérés dépendent directement de la position des sautages. Pour le scénario modélisé, ces angles varient de 94 à 185 degrés pour la position de la source « saut1 » et de 105 à 178 degrés pour la position de la source « saut2 ». À ce sujet, il faut spécifier qu'une procédure interne a été mise en place par MCM. Il s'agit d'une rose des vents dynamique qui détermine en fonction de la position de chaque sautage dans la fosse, les angles de restriction réellement effectifs.

La superficie de la surface sautée modélisée est de 5 092 $m^2$, pour un total de 10 184 $m^2$ par jour lorsque les deux sautages journaliers auraient lieu, ce qui représente le pire cas. La hauteur du souffle est estimée à environ 20 m. Les taux d'émission pour les matières particulaires (PMT, $PM_{10}$, $PM_{2,5}$) ont été établis à partir de l'AP-42 de l'U.S. EPA (US-EPA, 1995). Ce document consiste en une compilation de facteurs d'émission à l'atmosphère pour divers secteurs d'activité industrielle. Plus spécifiquement, ils ont été estimés suivant la section 11.9 de l'AP-42. Les taux d'émission pour le monoxyde de carbone (CO), les oxydes d'azote ($NO_x$) et le dioxyde de soufre ($SO_2$), quant à eux, ont été estimés suivant le *NPI - Emission Estimation Technique Manual for Explosives Detonation and Firing Ranges* (DSEWPaC, 2012a) pour des explosifs composés d'émulsion à 70 % et d'ANFO à 30 %.

Ces émissions sont représentées dans la modélisation à l'aide d'une source volumique. Les caractéristiques et les taux d'émissions de cette source sont présentés en annexe au tableau A-1-1.

**Tableau 4 : Paramètres décrivant les activités de forage et de sautage de production – MCM**

| Paramètres de forage/sautage | Unité | Variable | Valeur | Référence |
|---|---|---|---|---|
| Tonnage extrait par année | tonne/an | T | 59 027 099 | Planification minière 2020, année 2024 |
| Facteur de poudre | kg/tonne | PWD | 0,291 | Moyenne entre les patrons de forage de minerai et stérile, 350KG-9.0-M/S-P |
| Densité de l'explosif | tonne/$m^3$ | Erho | 1,2 | Valeur moyenne, Orica, Fiche technique 2018-08-27 |
| Quantité d'explosif requis par année | tonne/an | EQy | 17 164 | t · PWD / 1000 |
| Volume d'explosif requis par année | $m^3$/an | EVy | 14 304 | EQy / Erho |
| Diamètre du trou foré | m | D | 0,229 | Patron minerai et stérile, 350KG-9.0-M/S-P |
| Hauteur de banc | m | BH | 10 | Patron minerai et stérile, 350KG-9.0-M/S-P |
| Hauteur de bourre | m | SL | 4,768 | Hypothèse, selon la quantité d'explosif requis |
| Sous forage | m | SD | 0,9 | Patron minerai et stérile, 350KG-9.0-M/S-P |
| Hauteur de forage | m | HL | 10,9 | BH + SD |
| Hauteur de la colonne d'explosif | m | C | 6,132 | HL - SL |
| Volume d'explosif par forage | $m^3$/trou | EVh | 0,252 | Pi · $(D/2)^2$ · C |
| Quantité d'explosif par forage | tonne/trou | EQh | 0,302 | EVh · Erho |
| Nombre de forages par sautage | trous/saut. | NHb | 137 | NHy / NBy |
| Nombre de forages requis par année | trous/an | NHy | 56 836 | EVy / EVh |
| Nombre de sautages par année | saut./an | NBy | 416 | Basé sur 4 jours de sautage par semaine et 2 sautages par jour |
| Quantité d'explosif par sautage | tonne/saut. | EQb | 41.3 | EQh · NHb |
| Fardeau | m | B | 6,1 | Moyenne entre les patrons de forage de minerai et stérile, 350KG-9.0-M/S-P |
| Espacement | m | S | 6,1 | Moyenne entre les patrons de forage de minerai et stérile, 350KG-9.0-M/S-P |
| Surface de sautage par forage | $m^2$/trou | BAh | 37,27 | B · S |
| Surface de sautage totale | $m^2$/saut. | BA | 5 092 | BAh · NHb |
| Ratio d'ANFO de l'explosif | % | Ra | 30% | Orica, Fiche technique 2018-08-27 |
| Ratio d'émulsion de l'explosif | % | Re | 70% | 100% - Ra |

#### *4.1.1.2 FORAGE*

Les opérations de forage ont été considérées dans la modélisation. Pour le scénario 1, huit foreuses de production à une cadence combinée de forage d'environ 190 trous par jour est estimée selon la description des opérations. En plus de celles de la production, quatre foreuses supplémentaires pour le prédécoupage sont utilisées. Une cadence de forage de 16 trous par jour est estimée selon la description des opérations. Pour estimer ces cadences de forage, un facteur de 10 % de reforage a été supposé.

Les taux d'émission pour les matières particulaires (PMT, $PM_{10}$, $PM_{2,5}$) ont été estimés à l'aide du tableau 11.9-4 de la section 11.9 *Western Surface Coal Mining* de l'AP-42. Des facteurs d'échelle de 0,9 et 0,5 ont été considérés respectivement pour les $PM_{10}$ et $PM_{2,5}$. Un facteur d'atténuation de 70 % des poussières de forage (DSEWPaC, 2012b) est également considéré afin de tenir compte du système de forage à l'eau installé sur les foreuses.

Les opérations de forage sont représentées dans les modélisations à l'aide d'une source volumique. Les paramètres physiques et le taux d'émissions utilisés dans le modèle sont présentés en annexe au tableau A-1-2. Les foreuses ont

été positionnées dans la fosse Barnat conformément à la description du scénario de modélisation. La caractérisation de la source a été établie en fonction des caractéristiques physiques des foreuses, soit des foreuses A. Copco Pit Viper 235 pour la production et des foreuses Cubez QXR-920 pour le prédécoupage.

#### 4.1.1.3 CHARGEMENTS ET DÉCHARGEMENT

La manutention des divers matériaux représente une source fugitive de matière particulaire. Les opérations de chargements et de déchargement ont donc été considérées dans la modélisation et elles ont été modélisées à l'aide de sources volumiques.

Les opérations de chargement se produiront principalement dans la fosse Barnat, mais surviendront également au concasseur mobile, au concasseur saisonnier et à la pile de minerai. Le minerai sera en majorité déchargé au concasseur. Une fraction sera déchargée au concasseur mobile et sur la pile de minerai. Les stériles seront déposés dans la fosse Canadian Malartic. Finalement, une quantité de stériles sera également déposée au concasseur saisonnier afin de préparer le matériel pour l'entretien des routes. En somme, un point de chargement et de déchargement a été considéré pour chacun des trajets décrits au tableau 6.

Les taux d'émission pour chacune des sources liées aux chargements et déchargements du minerai et des stériles ont été estimés suivant la section 13.2.4 *Aggregate Handling and Storage Piles* de l'AP-42. Les quantités de matériel chargées et déchargées sont distribuées également sur les 24 heures de la journée. L'humidité des différentes matières a été fixée à 5,4 % suivant les valeurs données à la section 13.2.4 de l'AP-42, tableau 13.2.4-1. Enfin, les facteurs d'émissions ont été déterminés heure par heure, en fonction de la vitesse du vent, et les taux d'émission ont été obtenus en multipliant le facteur d'émission par le tonnage manipulé.

Au concasseur primaire, des systèmes de dépoussiérage seront présents, un facteur d'atténuation de 90 % a donc été considéré.

Les pelles hydrauliques Terex RH340, Hitachi EX5600-6 et Caterpillar 6050 ont été considérées dans la fosse alors que les chargeuses Létourneau L-1850-2 ont été considérées sur la pile de minerai. Les chargeuses Caterpillar 988K, 990K et 982M ont été considérées aux concasseurs mobile et saisonnier. La largeur des pelles a été utilisée afin de caractériser la dispersion initiale horizontale. La hauteur de relâche et la dispersion initiale verticale ont pour leur part été caractérisées suivant les caractéristiques des camions de transports associés. Pour les sources liées au déchargement, ces trois paramètres ont été caractérisés en fonction des caractéristiques des camions de transports. Les paramètres physiques utilisés dans le modèle sont présentés en annexe au tableau A-1-3. Ce tableau présente également le tonnage manipulé par heure pour chacune des sources et une estimation des taux d'émission calculée spécifiquement pour la présentation dans ce rapport avec la vitesse moyenne du vent de l'échantillon météorologique modélisé.

#### 4.1.1.4 BOUTAGE

Un total de cinq bouteurs sur chenille de type Caterpillar D10T et trois bouteurs sur roues de type Caterpillar 854H seront utilisés pour le placement des matériaux : quatre bouteurs sont associés au placement des stériles dans la fosse Canadian Malartic, un bouteur est considéré à l'aire du concasseur primaire et trois bouteurs sont considérés dans la fosse Barnat.

Les taux d'émission ont été estimés pour ces opérations suivant la section 11.9 *Western Surface Coal Mining* de l'AP-42 alors que, dans le cadre de la présente étude, le facteur d'émission proposé pour le mort-terrain a été jugé plus représentatif que le facteur d'émission proposé pour le charbon. Le facteur d'émission proposé dépend du taux d'humidité et du taux de silt du matériel manipulé. Ces derniers ont été fixés à 5,4 % et 3,9 %, respectivement, suivant les valeurs données à la section 13.2.4 de l'AP -42, tableau 13.2.4-1.

Les opérations de boutage sont représentées dans les modélisations à l'aide de sources volumiques. Les paramètres physiques et les taux d'émissions utilisés dans le modèle sont présentés en annexe au tableau A-1-4. La caractérisation de cette source a été ajustée en fonction du modèle et des caractéristiques physiques des équipements. Enfin, une atténuation de 50 % a été appliquée afin de représenter le taux d'utilisation et le caractère intermittent de ce type d'opération.

### 4.1.1.5 CONCASSEUR MOBILE PERMANENT

Le concasseur mobile, utilisé pour le préconcassage de minerai, est modélisé. La quantité de minerai préconcassé prévu est de 4 Mt par année, ce qui correspond à un taux moyen de 458 t/h de minerai. Or, le concasseur prévoit deux lignes d'une capacité nominale d'alimentation de 600 t/h chacune. La première ligne prévoit un ensemble de cinq équipements (concasseurs et tamis) et la seconde ligne prévoit quatre équipements. Pour les besoins de la modélisation, ces équipements sont considérés actifs en continu selon leurs capacités nominales respectives. En réalité, la disponibilité annuelle ciblée de chacune des lignes est située entre 55 % et 65 %.

Les taux d'émission ont été estimés suivant la section 11.19.2 *Crushed Stone Processing and Pulverized Mineral Processing* de l'AP-42. De façon conservatrice pour les concasseurs, le facteur d'émission proposé pour le concassage tertiaire a été utilisé. Dans tous les cas, les facteurs d'émission contrôlés ont été considérés en raison de l'utilisation d'un système d'arrosage avec abat poussière sur chacune des lignes de concassage.

Un déchargement à partir des convoyeurs des concasseurs de chacune des lignes sur les piles temporaires d'entreposage est également modélisé. Cette source a été considérée parmi les *chargements et déchargements* décrits à la section 4.1.1.3.

L'opération de concassage et de tamisage des matières est représentée dans les modélisations à l'aide de sources volumiques. Les caractéristiques physiques et les taux d'émission pour ces sources volumiques sont présentés au tableau A-1-5.

### 4.1.1.6 CONCASSEUR SAISONNIER

Le concasseur saisonnier, utilisé pour la préparation de bourre de sautage et d'abrasif pour les routes, est modélisé. La quantité de stériles revalorisés prévue est d'environ 1 Mt par année, ce qui correspond à un taux moyen de 114 t/h.

Or, le concasseur saisonnier prévoit une ligne d'une capacité nominale d'alimentation de 600 t/h. Cette ligne prévoit un ensemble de six équipements (concasseurs et tamis). Pour les besoins de la modélisation, ces équipements sont considérés actifs 24h par jour selon leurs capacités nominales respectives. Annuellement, ce concasseur est utilisé de cinq à six mois par année. Ces sources sont donc considérées actives de mai à octobre dans la modélisation.

La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.5. De façon similaire, les facteurs d'émission contrôlés ont été considérés en raison de l'utilisation d'un système de gicleurs pour le contrôle des poussières.

Un déchargement à partir du convoyeur du concasseur sur la pile temporaire d'entreposage est également modélisé. Cette source a été considérée parmi les *chargements et déchargements* décrits à la section 4.1.1.3.

L'opération de concassage des matières est représentée dans les modélisations à l'aide de sources volumiques. Les caractéristiques physiques et les taux d'émission pour ces sources volumiques sont présentés au tableau A-1-6.

### 4.1.1.7 ROUTAGE

Le soulèvement de la poussière lors du transport des différentes matières sur le réseau de routes non pavées est habituellement le principal contributeur parmi les sources fugitives d'un complexe minier. Or, puisque l'intensité des émissions est directement proportionnelle à la quantité de matériel transporté, au type de véhicule utilisé et à la teneur en limon (silt) contenue dans les matériaux utilisés pour la construction et l'entretien des surfaces de roulement, les différents trajets empruntés sur le réseau routier du complexe minier (fosse vers concasseurs, fosse vers halde à stériles, etc.) doivent donc être suffisamment détaillés pour permettre d'établir un taux d'émissions spécifique à chacun des tronçons de route.

La description des opérations ainsi que les caractéristiques physiques des routes, telles que l'emplacement et les dimensions (longueur et largeur), ont été compilées à partir des informations fournies par MCM. Les caractéristiques des camions considérés sont détaillées au tableau 5.

**Tableau 5 : Description des camions de transport considérés – MCM**

| Véhicule | Hauteur (m) | Largeur (m) | Poids du véhicule (t) | Charge utile (t) | Utilisation |
|---|---|---|---|---|---|
| Caterpillar 793F | 6,6 | 7,6 | 159,2 | 226,8 | Production minière |
| Komatsu HD325-8 | 4,2 | 3,7 | 34,2 | 36,6 | Concasseur mobile permanent |
| Komatsu HD785-8 | 5,1 | 5,5 | 73,8 | 92,2 | |
| Komatsu HD785-7 | 5,1 | 5,5 | 72,1 | 91,7 | Concasseur saisonnier |

Le scénario de routage est présenté au tableau 6. Ce scénario comprend 19 trajets décrivant la gestion du transport du minerai et du stériles sur le site de MCM. Les camions hors route Caterpillar 793F sont attitrés au transport du minerai et du stérile. Tandis que les camions Komatsu sont attitrés à la manipulation des matériaux sur les sites des concasseurs mobile permanent et saisonnier. Un total de 13,6 Mt de minerai sera extrait depuis la fosse Barnat. Pour ce qui est du stérile, un total de 45,4 Mt sera extrait de la fosse Barnat. Pour les besoins de la modélisation, deux positions d'extraction sont considérées dans la fosse Barnat et deux positions de déposition des stériles sont considérées dans la fosse Canadian Malartic. Sur les sites des concasseurs mobile permanent et saisonnier, la manipulation des matériaux est considérée selon la capacité nominale d'alimentation de ceux-ci.

Ces trajets ont été subdivisés en 25 segments, formant un réseau d'environ 11,9 km. Ces segments sont détaillés au tableau A-1-7. Les trajets et segments sont identifiés par leur point de départ et d'arrivée et peuvent être localisés sur les cartes B-2-2a, B-2-2b, B-2-2e et B-2-2f. Dans la modélisation, chacun de ces segments est représenté par une série de sources volumiques alternées. Les coordonnées de chacune de ces sources sont données au tableau A-1-8. Pour chacun des segments, le poids moyen et la hauteur moyenne des camions ainsi que la distance parcourue (VKT) ont été déterminés en fonction du nombre de déplacements. La hauteur de relâche et la dispersion initiale verticale ont été estimées en fonction de la hauteur moyenne des camions sur le segment tandis que la dispersion initiale horizontale a été estimée en fonction de la largeur des routes. La largeur des routes est identifiée à environ 30 m sur l'ensemble du site. Dans les modélisations, trois mètres additionnels sont considérés de chaque côté de la route afin de tenir compte des émissions de poussières susceptibles de se produire par turbulence. Une largeur totale de 36 m est donc utilisée. Ces différents paramètres sont les mêmes pour chacune des sources d'un même segment et sont également donnés au tableau A-1-7.

Les taux d'émissions de particules associées à chacun des segments ont finalement été estimés de façon conservatrice à partir des facteurs d'émission proposés dans la section 13.2.2 *Unpaved Roads* de l'AP-42. Les différentes informations utilisées pour le calcul des taux d'émissions sont regroupées au tableau A-1-7. En l'absence de donnée spécifique au site à l'étude, une teneur en silt de 8,3 % a été sélectionnée, correspondant à la valeur moyenne tabulée à la section 13.2.2 de l'AP-42 pour la catégorie *Stone quarrying and processing, Haul road to/from pit*.

Il est également important de préciser qu'une atténuation de 86 % a été considérée sur le segment non pavé, découlant d'une atténuation par arrosage régulier des routes (eau et abats poussières) de 75 % (MDDELCC, 2017a) combinée à une atténuation de 44 % reliée à une limitation de la vitesse à 40 km/h de tous les camions de transport impliqués dans la manutention des stériles et du minerai.

En ce qui concerne l'atténuation découlant de la vitesse des véhicules, le facteur de 44 % provient du WRAP Fugitive Dust Handbook (WRAP, 2006). Or, bien que la section 13.2.2 de l'AP-42 mentionne que la plage d'application de l'équation de détermination des taux d'émission sur route non pavée correspond à des véhicules circulant à des vitesses entre 8 et 69 km/h, et donc que la formule d'estimation des émissions du routage tient déjà compte de la vitesse des véhicules, le WRAP a spécifiquement sélectionné des mesures afin d'ajuster la corrélation pour des vitesses limitées à 40 km/h. Ainsi, lorsque la plage d'application est entre 8 et 40 km/h, les émissions seraient plus faibles de 44 %.

Concernant le facteur d'atténuation associé au routage, prendre note que ce dernier est supérieur à l'atténuation maximale suggérée dans le *Guide d'instruction – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers* (MDDELCC, 2017a). Ce facteur est tout de même modélisé puisqu'il a été démontré dans le cadre de la phase de recevabilité de l'étude d'impact de 2016 (modélisation de 2015), que le

programme de gestion par arrosage de MCM permet d'atteindre un tel taux d'atténuation. De plus, l'utilisation de ce facteur permet une base de comparaison valable avec les résultats des modélisations antérieures.

Le choix de conserver ce taux d'atténuation se justifie également par le fait que CMGP s'engage à maintenir minimalement une intensité d'arrosage de la même envergure que pour ses opérations actuelles, et ce, pour la durée complète du projet Odyssey. En cas de dépassement appréhendé des normes de particules, l'intensité d'arrosage sera augmentée ou encore il y aura application de mesures d'atténuation additionnelles, telles qu'actuellement pratiquées aux opérations minières (réduction de la vitesse de la machinerie, ciblage des opérations, arrêt des équipements de production).

**Tableau 6 : Description du scénario de routage considéré – MCM**

| Trajets | Description | Longueur du trajet (aller-retour) (m) | Camions de transport | Quantité de matériel déplacé (tm/an) | Nombre de déplacements[1] (déplacements/jour) |
|---|---|---|---|---|---|
| P01_P10 | Minerai: Barnat #1 vers Pile Minerai LG | 13 695 | Caterpillar 793F | 2 039 760 | 49 |
| P01_P08 | Minerai: Barnat #1 vers Concasseur Primaire | 13 221 | | 2 753 961 | 67 |
| P01_P14 | Minerai: Barnat #1 vers Concasseur mobile permanent | 12 918 | | 2 005 479 | 48 |
| P03_P10 | Minerai: Barnat #2 vers Pile Minerai LG | 13 218 | | 2 039 760 | 49 |
| P03_P08 | Minerai: Barnat #2 vers Concasseur Primaire | 12 743 | | 2 753 961 | 67 |
| P03_P14 | Minerai: Barnat #2 vers Concasseur mobile permanent | 12 440 | | 2 005 479 | 48 |
| P10_P08 | Minerai: Pile Minerai LG vers Concasseur primaire | 2 186 | | 10 194 623 | 246 |
| P24_P13 | Minerai: Empilement 2H du concasseur mobile permanent vers dépôt H2 | 777 | Komatsu HD785-8 | 4 010 959 | 238 |
| P01_P26 | Stériles: Barnat #1 vers Dépôt dans la Fosse #1 | 3 722 | Caterpillar 793F | 11 107 175 | 268 |
| P03_P26 | Stériles: Barnat #2 vers Dépôt dans la Fosse #1 | 3 244 | | 11 107 175 | 268 |
| P01_P27 | Stériles: Barnat #1 vers Dépôt dans la Fosse #2 | 4 131 | | 11 107 175 | 268 |
| P03_P27 | Stériles: Barnat #2 vers Dépôt dans la Fosse #2 | 3 653 | | 11 107 175 | 268 |
| P01_P35 | Stériles: Barnat #1 vers Concasseur saisonnier | 7 491 | | 500 000 | 12 |
| P03_P35 | Stériles: Barnat #2 vers Concasseur saisonnier | 7 013 | | 500 000 | 12 |
| P28_P29 | Minerai: Pile brut vers alimentation du concasseur mobile permanent | 292 | Komatsu HD325-8 | 10 512 000 | 1575 |
| P31_P24 | Minerai: Ligne 1 du concasseur mobile permanent vers empilement 2H | 779 | Komatsu HD785-8 | 5 256 000 | 312 |
| P30_P24 | Minerai: Ligne 2 du concasseur mobile permanent vers empilement 2H | 836 | | 5 256 000 | 312 |
| P36_P37 | Stériles: Pile brut vers alimentation du concasseur saisonnier | 227 | Komatsu HD785-7 | 2 628 000[2] | 314[2] |
| P38_P39 | Stériles: Ligne du concasseur saisonnier vers pile de matériaux concassés | 353 | | 2 628 000[2] | 314[2] |

[1] Un aller-retour correspond à 2 déplacements.
[2] Selon l'horaire du concasseur saisonnier, actif six mois par année.

### 4.1.1.8 GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS MINIERS

Les émissions provenant des gaz d'échappement (PMT, $PM_{2,5}$, $NO_x$, $SO_2$ et CO) des différents véhicules actifs sur le site minier ont été prises en compte lors de la modélisation. Les équipements considérés ont été déterminés à partir des informations transmises par MCM.

Pour des véhicules hors route, les facteurs d'émissions (g/hp.hr) ont été estimés suivant la méthode proposée dans le document *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition* (US-EPA, 2010). Les taux d'émission pour chacun des modèles de véhicule ont ensuite été calculés en considérant la puissance des moteurs (hp), la certification des moteurs (*tier*) ainsi que le facteur de chargement en fonction du type d'équipement. Ces différents paramètres sont donnés avec les taux d'émission calculés pour chacun des véhicules au tableau 7.

Pour la présente étude, la teneur en soufre dans le diesel a été fixée à 15 ppm, soit la limite prescrite par le *Règlement sur le soufre dans le carburant diesel* (Canada, 2020) pour les carburants diesel pour les moteurs hors route. Il est important de préciser que suivant la méthode utilisée, toutes les particules émises par les systèmes d'échappement sont assumées inférieures à 10 microns ($PM_{10}$) de sorte que les taux d'émission pour les PMT et les $PM_{10}$ sont égaux. De plus, la fraction de particules fines ($PM_{2,5}$) sur l'ensemble des particules émises est estimée à 97 %. Finalement, puisque l'âge spécifique de la flotte de véhicules est inconnu, l'augmentation des émissions due à la dégradation des moteurs a été maximisée afin de considérer le scénario « pire cas ».

Basés sur la description des activités d'exploitation, les équipements considérés sont détaillés au tableau 8. Ce tableau, incluant le nombre d'équipements et le positionnement de ceux-ci, définit le scénario modélisé pour les gaz d'échappement. Il est important de noter que certaines excavatrices dans la fosse sont électriques et ne présentent donc pas d'émission de gaz d'échappement.

Afin de caractériser ces sources d'émission, la méthode de modélisation prévoit de séparer les machines présentes sur le site en trois catégories distinctes : les équipements de transport, les équipements de support (camion d'arrosage, etc.) et les équipements localisés (excavatrices, bouteurs, etc.). Cette catégorisation est donnée au tableau 8 pour chaque équipement du présent scénario.

**Équipements localisés**

En ce qui concerne les équipements localisés, la dispersion des émissions n'est pas influencée de façon importante par le mouvement des véhicules puisque les déplacements ont lieu à de faibles vitesses et que les émissions sont propulsées vers le haut à des vitesses relativement grandes. Les caractéristiques physiques réelles (tels que la vitesse et la température des émissions, la hauteur et le diamètre du point d'émission) ont toutes été utilisées pour ces types de véhicules. Celles-ci ont été déterminées en fonction du numéro de modèle de l'équipement considéré. Ceux-ci sont donc modélisés comme des sources ponctuelles. La caractérisation des sources utilisées pour représenter les gaz d'échappement des équipements localisés est donnée en annexe au tableau A-1-9. Les taux d'émission utilisés y sont également présentés.

**Équipements de transport**

Dans le cas des véhicules de transport, les tuyaux d'échappement sont parfois positionnés horizontalement et/ou sur le côté des véhicules. La dispersion des émissions sera ainsi affectée de façon plus importante par le mouvement et la turbulence créée par les camions. De façon conservatrice, l'effet de flottabilité est négligé et les émissions des gaz d'échappement pour les camions de transport sont représentées dans la modélisation à l'aide de sources volumiques. Ces émissions ont été réparties sur les différents segments en fonction du temps moyen passé sur chacun d'eux (tableau 9). Ces proportions ont été estimées à partir du type d'opération associé à chaque segment (chargement, déchargement), de la longueur et de la topographie du segment (terrain plat ou en pente) et du nombre de déplacements requis pour transporter le tonnage prévu entre les différents points. Afin d'éviter d'alourdir inutilement le modèle, les sources associées au routage (voir section 4.1.1.7) ont été utilisées pour la modélisation de ces gaz d'échappement.

**Équipements de support minier**

Pour la modélisation des gaz d'échappement des véhicules de support, les sources associées au routage ont également été utilisées. Les taux d'émissions calculés pour les véhicules de support ont été répartis sur les segments de routage dans la même proportion que les véhicules de transport.

La répartition du temps passé sur chacun des segments par les véhicules de transport est présentée au tableau 9. Les taux d'émissions sont finalement calculés en fonction du nombre d'équipements et du temps passé sur chacun des segments. Les taux d'émissions par segment y sont également présentés.

**Tableau 7 : Description et taux d'émissions calculés pour les véhicules hors route – MCM**

| Véhicule | Type | Puissance (hp) | Tier | Facteur de chargement [1] | Taux d'émission par véhicule (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $PM_{10}$ [2] | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Équipements de production : | | | | | | | | | |
| A. Copco PV 235 | Foreuse | 800 | T2 | 0,43 | 1,36E-02 | 1,31E-02 | 8,04E-02 | 3,95E-01 | 4,66E-04 |
| Cubex QXR-920 | Foreuse | 540 | T3 | 0,43 | 1,09E-02 | 1,06E-02 | 6,25E-02 | 1,63E-01 | 3,15E-04 |
| Terex RH340 | Excavatrice | *Électrique, aucune émission* | | | | | | | |
| Caterpillar 6050 | Excavatrice | 2520 | T2 | 0,59 | 7,68E-02 | 7,45E-02 | 5,32E-01 | 1,62E+00 | 2,03E-03 |
| Hitachi EX5600-6 | Excavatrice | 3000 | T2 | 0,59 | 9,14E-02 | 8,87E-02 | 6,33E-01 | 1,93E+00 | 2,42E-03 |
| Létourneau L-1850-2 | Chargeuse sur roues | 2000 | T1 | 0,59 | 8,64E-02 | 8,38E-02 | 4,22E-01 | 1,96E+00 | 1,61E-03 |
| Caterpillar 793F | Camion de transport hors route | 2478 | T2 | 0,59 | 7,55E-02 | 7,32E-02 | 5,23E-01 | 1,60E+00 | 2,00E-03 |
| Caterpillar 16M | Niveleuse | 332 | T3 | 0,59 | 1,48E-02 | 1,44E-02 | 8,07E-02 | 1,43E-01 | 2,68E-04 |
| Caterpillar 14M | Niveleuse | 294 | T3 | 0,59 | 1,31E-02 | 1,27E-02 | 6,34E-02 | 1,26E-01 | 2,37E-04 |
| Caterpillar 777D | Camion de transport hors route | 938 | T1 | 0,59 | 4,05E-02 | 3,93E-02 | 1,98E-01 | 9,20E-01 | 7,57E-04 |
| Caterpillar 854K | Bouteur sur roues | 801 | T2 | 0,59 | 2,44E-02 | 2,37E-02 | 1,69E-01 | 5,16E-01 | 6,47E-04 |
| Caterpillar D10T | Bouteur à chenilles | 603 | T3 | 0,59 | 2,69E-02 | 2,61E-02 | 2,31E-01 | 2,59E-01 | 4,87E-04 |
| Équipements de support : | | | | | | | | | |
| A. Copco Mustang 5-P4D | Foreuse | 150 | T2 | 0,43 | 3,82E-03 | 3,70E-03 | 1,71E-02 | 7,41E-02 | 8,73E-05 |
| Caterpillar 345C-L | Excavatrice | 345 | T3 | 0,59 | 1,54E-02 | 1,49E-02 | 8,39E-02 | 1,48E-01 | 2,78E-04 |
| Caterpillar 374D-L | Excavatrice | 476 | T3 | 0,59 | 2,12E-02 | 2,06E-02 | 1,16E-01 | 2,04E-01 | 3,84E-04 |
| Caterpillar 980K | Chargeuse sur roues | 369 | T4i | 0,59 | 8,20E-04 | 7,95E-04 | 5,85E-03 | 1,52E-01 | 2,11E-04 |
| Caterpillar IT62H | Chargeuse sur roues | 211 | T3 | 0,59 | 9,42E-03 | 9,13E-03 | 4,55E-02 | 9,06E-02 | 1,70E-04 |
| Caterpillar 914K | Chargeuse sur roues | 92 | T4i | 0,59 | 2,04E-04 | 1,98E-04 | 4,11E-03 | 4,56E-02 | 5,85E-05 |
| Caterpillar 972M | Chargeuse sur roues | 299 | T4N | 0,59 | 6,64E-04 | 6,44E-04 | 4,23E-03 | 1,36E-02 | 1,71E-04 |
| Caterpillar IT62H | Chargeuse sur roues | 211 | T3 | 0,59 | 9,42E-03 | 9,13E-03 | 4,55E-02 | 9,06E-02 | 1,70E-04 |
| Komatsu WA250-6 | Chargeuse sur roues | 138 | T3 | 0,59 | 9,59E-03 | 9,30E-03 | 3,45E-02 | 5,93E-02 | 1,11E-04 |
| Komatsu WA900-3 | Chargeuse sur roues | 856 | T2 | 0,59 | 2,61E-02 | 2,53E-02 | 1,81E-01 | 5,51E-01 | 6,91E-04 |
| Caterpillar 740 | Camion de transport hors route | 458 | T3 | 0,59 | 2,04E-02 | 1,98E-02 | 1,11E-01 | 1,97E-01 | 3,70E-04 |
| Caterpillar 745C | Camion de transport hors route | 504 | T4N | 0,59 | 1,12E-03 | 1,09E-03 | 7,99E-03 | 2,30E-02 | 2,88E-04 |
| Caterpillar D6 | Bouteur à chenilles | 254 | T4N | 0,59 | 5,64E-04 | 5,47E-04 | 3,59E-03 | 1,16E-02 | 1,45E-04 |

[1] Appendix A, (US-EPA, 2004)
[2] Toutes les émissions de particules sont considérées plus petites que 10 µm, et donc PMT = $PM_{10}$.

**Tableau 7 : Description et taux d'émissions calculés pour les véhicules hors route – MCM (suite)**

| Véhicule | Type | Puissance (hp) | Tier | Facteur de chargement [1] | Taux d'émission par véhicule (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $PM_{10}$ [2] | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Équipements dédiés aux concasseurs mobiles permanents et saisonnier : | | | | | | | | | |
| Komatsu HD325-8 | Camion de transport hors route | 514 | T4N | 0.59 | 1.14E-03 | 1.11E-03 | 8.14E-03 | 2.34E-02 | 2.94E-04 |
| Komatsu HD785-8 | Camion de transport hors route | 1140 | T4N | 0.59 | 7.60E-03 | 7.37E-03 | 1.63E-02 | 4.50E-01 | 6.52E-04 |
| Caterpillar 793F | Camion de transport hors route | 2478 | T2 | 0.59 | 7.55E-02 | 7.32E-02 | 5.23E-01 | 1.60E+00 | 2.00E-03 |
| Caterpillar 990K | Chargeuse sur roues | 699 | T4N | 0.59 | 1.55E-03 | 1.51E-03 | 1.75E-02 | 3.19E-02 | 4.00E-04 |
| Caterpillar 988K | Chargeuse sur roues | 541 | T4N | 0.59 | 1.20E-03 | 1.17E-03 | 8.57E-03 | 2.47E-02 | 3.10E-04 |
| Caterpillar 992K | Chargeuse sur roues | 814 | T2 | 0.59 | 2.48E-02 | 2.41E-02 | 1.72E-01 | 5.24E-01 | 6.57E-04 |
| Komatsu HD785-7 | Camion de transport hors route | 1200 | T2 | 0.59 | 3.66E-02 | 3.55E-02 | 2.53E-01 | 7.73E-01 | 9.69E-04 |
| Caterpillar 982M | Chargeuse sur roues | 398 | T4N | 0.59 | 8.84E-04 | 8.57E-04 | 6.31E-03 | 1.81E-02 | 2.28E-04 |

[1] Appendix A, (US-EPA, 2004)
[2] Toutes les émissions de particules sont considérées plus petites que 10 µm, et donc PMT = $PM_{10}$.

**Tableau 8 : Description du scénario modélisé pour les gaz d'échappement – MCM**

| Équipement | Disponibilité mécanique (%) | Nombre d'équipement | | Catégorie | Source(s) associée(s) pour le positionnement |
|---|---|---|---|---|---|
| | | Total dans la flotte | Total considéré | | |
| A. Copco PV 235 | 76% | 8 | 8 | Localisé | drill1x, drill2x, drill3x, drill4x, drill5x, drill6x, drill7x, drill8x |
| Cubex QXR-920 | 68% | 4 | 4 | Localisé | drill9x, drill10x, drill11x, drill12x |
| Caterpillar 6050 | 63% | 1 | 1 | Localisé | ldp03bx |
| Hitachi EX5600-6 | 71% | 2 | 2 | Localisé | ldp03ax |
| Létourneau L-1850-2 | 72% | 3 | 3 | Localisé | ldp10x |
| Caterpillar 793F | 84% | 25 | 21 | Transport | Sources de routage |
| Caterpillar 16M | 78% | 4 | 4 | Support | Sources de routage |
| Caterpillar 14M | 78% | 1 | 1 | Support | Sources de routage |
| Caterpillar 777D | 78% | 2 | 2 | Support | Sources de routage |
| Caterpillar 854K | 78% | 3 | 3 | Localisé | wdoz01x, wdoz02x, wdoz03x |
| Caterpillar D10T | 78% | 5 | 5 | Localisé | tdoz01x, tdoz02x, tdoz03x, tdoz04x, tdoz05x |
| A. Copco Mustang 5-P4D | 78% | 2 | 2 | Support | Sources de routage |
| Caterpillar 345C-L | 78% | 2 | 2 | Support | Sources de routage |
| Caterpillar 374D-L | 78% | 3 | 3 | Support | Sources de routage |
| Caterpillar 980K | 78% | 2 | 2 | Support | Sources de routage |
| Caterpillar IT62H | 78% | 1 | 1 | Support | Sources de routage |
| Caterpillar 914K | 78% | 1 | 1 | Support | Sources de routage |
| Caterpillar 972M | 78% | 1 | 1 | Support | Sources de routage |
| Caterpillar IT62H | 78% | 2 | 2 | Support | Sources de routage |
| Komatsu WA250-6 | 78% | 4 | 4 | Support | Sources de routage |
| Komatsu WA900-3 | 78% | 1 | 1 | Support | Sources de routage |
| Caterpillar 740 | 78% | 3 | 3 | Support | Sources de routage |
| Caterpillar 745C | 78% | 3 | 3 | Support | Sources de routage |
| Caterpillar D6 | 78% | 2 | 2 | Support | Sources de routage |
| Komatsu HD325-8 | 100% | 2 | 2 | Transport | Sources de routage |
| Komatsu HD785-8 | 100% | 4 | 4 | Transport | Sources de routage |
| Caterpillar 793F | 100% | 1 | 1 | Support | Sources de routage |
| Caterpillar 990K | 100% | 1 | 1 | Localisé | ldp31x, ldp30x |
| Caterpillar 988K | 100% | 2 | 2 | Localisé | ldp28x, ldp36x |
| Caterpillar 992K | 100% | 1 | 1 | Localisé | ldp24x |
| Komatsu HD785-7 | 100% | 2 | 2 | Transport | Sources de routage |
| Caterpillar 982M | 100% | 1 | 1 | Localisé | ldp38x |

**Tableau 9 : Répartition des taux d'émission des gaz d'échappement – MCM**

| Nom du segment | Temps passé sur chaque segment (%) | | Taux d'émission (transport + support) (g/s) | | | | |
|---|---|---|---|---|---|---|---|
| | Caterpillar 793F | Véhicules de Support | $PM_{10}$ [1] | $PM_{2,5}$ | CO | NOx | $SO_2$ |
| P01_P02 | 10.2 | 6.7 | 1.94E-01 | 1.88E-01 | 1.30E+00 | 3.89E+00 | 5.02E-03 |
| P02_P04 | 24.9 | 16.3 | 4.75E-01 | 4.61E-01 | 3.17E+00 | 9.53E+00 | 1.23E-02 |
| P03_P02 | 7.5 | 4.9 | 1.42E-01 | 1.38E-01 | 9.51E-01 | 2.86E+00 | 3.69E-03 |
| P04_P05 | 2.3 | 1.5 | 4.30E-02 | 4.17E-02 | 2.87E-01 | 8.63E-01 | 1.11E-03 |
| P04_P06 | 10.2 | 6.7 | 1.95E-01 | 1.89E-01 | 1.30E+00 | 3.92E+00 | 5.05E-03 |
| P05_P26 | 6.5 | 4.3 | 1.24E-01 | 1.20E-01 | 8.30E-01 | 2.49E+00 | 3.22E-03 |
| P05_P27 | 8.1 | 5.3 | 1.54E-01 | 1.50E-01 | 1.03E+00 | 3.09E+00 | 3.99E-03 |
| P06_P11 | 12.5 | 8.2 | 2.39E-01 | 2.32E-01 | 1.60E+00 | 4.80E+00 | 6.19E-03 |
| P07_P08 | 4.6 | 3.0 | 8.75E-02 | 8.49E-02 | 5.85E-01 | 1.76E+00 | 2.27E-03 |
| P09_P07 | 0.7 | 0.5 | 1.32E-02 | 1.28E-02 | 8.83E-02 | 2.65E-01 | 3.42E-04 |
| P10_P09 | 5.9 | 3.9 | 1.14E-01 | 1.10E-01 | 7.59E-01 | 2.28E+00 | 2.94E-03 |
| P11_P09 | 3.6 | 2.3 | 6.79E-02 | 6.58E-02 | 4.53E-01 | 1.36E+00 | 1.76E-03 |
| P11_P12 | 0.9 | 0.6 | 1.77E-02 | 1.72E-02 | 1.18E-01 | 3.55E-01 | 4.58E-04 |
| P12_P25 | 0.9 | 0.6 | 1.64E-02 | 1.59E-02 | 1.10E-01 | 3.30E-01 | 4.25E-04 |
| P13_P33 | 0 | 1.8 | 1.38E-02 | 1.34E-02 | 5.94E-02 | 4.24E-01 | 6.27E-04 |
| P25_P14 | 0.9 | 0.6 | 1.65E-02 | 1.60E-02 | 1.10E-01 | 3.32E-01 | 4.28E-04 |
| P28_P29 | 0 | 16.3 | 8.27E-02 | 8.02E-02 | 4.56E-01 | 1.24E+00 | 2.43E-03 |
| P30_P32 | 0 | 1.9 | 1.48E-02 | 1.43E-02 | 6.34E-02 | 4.52E-01 | 6.68E-04 |
| P31_P32 | 0 | 1.8 | 1.41E-02 | 1.36E-02 | 6.04E-02 | 4.31E-01 | 6.37E-04 |
| P32_P33 | 0 | 0.7 | 5.45E-03 | 5.29E-03 | 2.34E-02 | 1.67E-01 | 2.47E-04 |
| P33_P24 | 0 | 4.9 | 3.74E-02 | 3.62E-02 | 1.60E-01 | 1.14E+00 | 1.69E-03 |
| P34_P06 | 0.2 | 0.1 | 3.89E-03 | 3.78E-03 | 2.60E-02 | 7.81E-02 | 1.01E-04 |
| P34_P35 | 0.3 | 0.2 | 5.28E-03 | 5.12E-03 | 3.52E-02 | 1.06E-01 | 1.37E-04 |
| P36_P37 | 0 | 3.2 | 5.11E-02 | 4.96E-02 | 3.31E-01 | 9.80E-01 | 1.30E-03 |
| P38_P39 | 0 | 3.5 | 5.53E-02 | 5.36E-02 | 3.58E-01 | 1.06E+00 | 1.40E-03 |

[1] Toutes les particules émises sont supposées être plus petites que 10 microns donc PMT = $PM_{10}$.

### *4.1.1.9 USINE DE TRAITEMENT DU MINERAI*

#### DÉPOUSSIÉREURS

En tout, quatre dépoussiéreurs sont considérés lors du traitement du minerai et leurs émissions sont constituées de particules uniquement. Leurs taux d'émissions sont calculés à partir des capacités nominales des équipements extraites des demandes de certificat d'autorisation d'exploitation de l'usine.

Le premier dépoussiéreur [**CONCA1**] considéré est un épurateur à venturi associé au concasseur giratoire. Le second dépoussiéreur [**DOME**] est un filtre à manches situé sous le dôme lors de la récupération du minerai. Bien qu'il y ait trois dépoussiéreurs situés dans le dôme, il est considéré dans la modélisation qu'un seul dépoussiéreur fonctionne à la fois. Le troisième [**FOUR_IND**] et le quatrième [**RES_CU**] sont des épurateurs à voie humide situés à la sortie d'un des deux fours à induction et dans le réservoir de sulfate de cuivre. Pour ce qui est des fours à induction, un seul des deux fours est considéré actif dans le scénario de modélisation. En effet, ces équipements ne fonctionnent pas en continu et, typiquement, il n'y a pas plus d'un four actif au même moment. Un autre dépoussiéreur est situé dans le silo d'entreposage de la chaux, mais celui-ci n'a pas été considéré dans la modélisation, car les émissions de poussières associées ont été estimées négligeables.

Pour les deux premiers cas, les émissions de poussières sont estimées à partir des émissions fugitives provenant des manipulations de minerai. À celles-ci, une efficacité typique de filtration des dépoussiéreurs, tirée de l'AP-42, a été appliquée. Les efficacités sont fournies pour chaque tranche de taille de particule, ce qui permet d'estimer les émissions pour chaque taille de particules considérée (PMT, $PM_{10}$ et $PM_{2,5}$).

Pour les trois autres cas, les taux d'émissions des composés particulaires ont été fixés à 30 mg/m$^3$R. Les taux d'efficacité de filtration des dépoussiéreurs ont été utilisés afin d'estimer les ratios de $PM_{10}$/PMT et $PM_{2,5}$/PMT.

Ces sources ont été modélisées comme des sources ponctuelles. Les caractéristiques physiques des points d'émissions, telles que l'emplacement (coordonnées et élévation), les dimensions (hauteur et diamètre), la température et la vitesse de sortie des gaz ont été compilées à partir des informations contenues dans les demandes de certificat d'autorisation d'exploitation de l'usine. Celles-ci sont présentées au tableau A-1-10.

#### CHAUDIÈRES ET FOURS DE RÉACTIVATION DU CHARBON

À l'usine de traitement du minerai, deux chaudières et deux fours à réactivation du charbon sont en opération. Ceux-ci utilisent le gaz naturel comme combustible et sont donc considérés comme des sources de particules et de gaz de combustion (CO, $NO_x$ et $SO_2$). Les taux d'émissions sont calculés à partir des capacités nominales et des données fournies dans les demandes de certificat d'autorisation d'exploitation de l'usine.

Pour le cas des chaudières, les taux d'émission de particules, de CO et de $NO_x$ sont calculés à partir des données du fabricant et de leur puissance nominale. Pour les fours à réactivation, les taux d'émissions de particules, de CO et de $NO_x$ qui ont été fournis dans les demandes de certificat d'autorisation pour l'exploitation de l'usine sont utilisés. Pour chaque source, le taux d'émission en $SO_2$ est calculé par un bilan de masse à partir de la capacité nominale de chaque source et de la teneur en soufre du gaz naturel de fournisseurs canadiens.

Ces sources ont été modélisées comme des sources ponctuelles. Les caractéristiques physiques des points d'émissions, telles que l'emplacement (coordonnées et élévation), les dimensions (hauteur et diamètre), la température et la vitesse de sortie des gaz ont été compilées à partir des informations contenues dans les demandes de certificat d'autorisation pour l'exploitation de l'usine. Celles-ci sont également présentées tableau A-1-10.

### *4.1.1.10 ÉROSION ÉOLIENNE*

Dans la modélisation du présent scénario, l'érosion éolienne des aires de dépôt du stériles, de la pile de minerai, de l'aire de stockage du minerai préconcassé (empilement 2H) et des diverses piles de matériaux bruts et concassés liées aux concasseurs mobile permanent et saisonnier a été prise en compte.

Afin de quantifier les émissions de matière particulaire dues à l'érosion éolienne, l'équation (8.11) du *Guide pour les carrières et sablières* de l'Inventaire national des rejets de polluants (INRP, 2016) a été utilisée sur une base horaire, comme prescrit par le MELCC. Pour ce faire, la vitesse du vent chaque heure a été utilisée et comparée à la vitesse seuil de 19,3 km/h à partir de laquelle l'érosion éolienne apparaît. Le taux d'émission est alors effectif lorsque la vitesse du vent est supérieure à cette vitesse seuil et nul lorsque la vitesse du vent est inférieure à celle-ci.

De plus, comme l'équation est considérée sur une base horaire, le facteur d'atténuation dû aux précipitations n'est pas pris en compte. Il est également important de mentionner que, outre l'omission du facteur d'atténuation lié aux précipitations, le total des émissions annuelles calculées suivant la formulation horaire est identique au total calculé suivant la formulation traditionnelle de l'équation de l'INRP. Seule la répartition des émissions est affectée.

Dans le secteur de la mine, pour les années météorologiques de modélisation choisies, la vitesse du vent est supérieure au seuil d'émission pour environ 14 % du temps, ce qui correspond au temps où l'érosion éolienne sera active sur le site, selon la méthodologie exigée par le MELCC.

Par ailleurs, certaines infrastructures d'entreposage considérées sont de grandes dimensions; toutefois, seule une fraction de leur surface est véritablement « active », ce terme étant utilisé pour signifier que des opérations de déchargement y sont effectuées et engendrent l'émission de particules dans l'air, et ce, autant lors de sa construction que de son opération. En effet, de telles opérations ont lieu dans des secteurs bien précis et celles-ci sont en grande partie complétées ou ne font l'objet d'aucune opération de déchargement pendant de longues périodes. Par conséquent, une fois le potentiel d'érosion éolienne devenu inexistant à la suite de forts vents, la portion de l'infrastructure sur laquelle les opérations sont terminées ou interrompues à long terme n'émettra plus de poussières. D'autre part, les précipitations et l'humidité contribuent au lavage des surfaces et à la cimentation des particules fines. Il s'avère donc irréaliste de considérer toute la surface de ces infrastructures comme active et émettant sans arrêt des particules dans l'air. Ainsi, pour chacune des zones de déchargement lors du dépôt du stériles dans la fosse et à la pile de minerai, la surface où s'effectuent des opérations de déchargement au cours d'un mois d'activité a été estimée et utilisée comme surface active.

Ces sources ont été considérées comme des sources surfaciques. Les caractéristiques physiques des différentes sources surfaciques ont été compilées à partir des informations fournies sur les infrastructures prévues par MCM et sont présentées au tableau A-1-11, avec les taux d'émission calculés.

## 4.1.2 *PROJET ODYSSEY*

### *4.1.2.1 CHARGEMENTS ET DÉCHARGEMENT*

La manutention des divers matériaux du projet Odyssey acheminés à la surface représente une source fugitive de matière particulaire. Les opérations de chargements et de déchargement ont donc été considérées dans la modélisation et elles ont été modélisées à l'aide de sources volumiques.

Les opérations de chargement de minerai et de stériles se produiront aux aires de chargement des camions miniers de surface dans le secteur Odyssey. Les matériaux extraits par la rampe seront déchargés par les camions souterrains sur des haldes temporaires en surface pour ensuite être chargés dans les camions miniers par une excavatrice. Les matériaux extraits par le chevalement seront, quant à eux, chargés dans les camions miniers directement à partir d'un silo, pour le minerai et pour les stériles. Ensuite, le minerai sera déchargé au concasseur primaire et les stériles seront déposés dans la fosse Canadian Malartic. En somme, un point de chargement et de déchargement a été considéré pour chacun des trajets décrits au tableau 11.

La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.3.

Les chargeuses Létourneau L-1850-2 ont été considérées pour le chargement des matériaux. La largeur des pelles et les dimensions du chargement par le silo ont été utilisées afin de caractériser la dispersion initiale horizontale. La hauteur de relâche et la dispersion initiale verticale ont pour leur part été caractérisées suivant les caractéristiques des camions de transports associés. Pour les sources liées au déchargement, ces trois paramètres ont été caractérisés en fonction des caractéristiques des camions de transports. Les paramètres physiques utilisés dans le modèle sont présentés au tableau A-1-12. Ce tableau présente également le tonnage manipulé par heure pour chacune des sources et une estimation des taux d'émission calculée spécifiquement pour la présentation dans ce rapport avec la vitesse moyenne du vent de l'échantillon météorologique modélisé.

### *4.1.2.2 ROUTAGE*

Le transport en surface des matériaux du projet Odyssey est considéré dans la modélisation. Les véhicules utilisés pour le transport des différentes matières ainsi que leurs principales caractéristiques sont présentés au tableau 10.

**Tableau 10 : Description des camions de transport considérés – Odyssey**

| Véhicule | Hauteur (m) | Largeur (m) | Poids du véhicule (t) | Charge utile (t) |
|---|---|---|---|---|
| Caterpillar 793F | 6,6 | 7,6 | 159,2 | 226,8 |
| Sandvik TH663 | 2,9 | 3,2 | 43,0 | 63,0 |

Le scénario de routage considéré est présenté au tableau 11. Ce scénario comprend cinq trajets décrivant la gestion du transport en surface du minerai et du stériles acheminé à la surface par la rampe et par le chevalement. Les camions hors route Caterpillar 793F sont considérés pour le transport du minerai et du stérile sur le site de la mine. Un total de 1,15 Mt de minerai sera extrait par la rampe et acheminé au concasseur. Pour ce qui est du stérile, un total de 0,2 Mt sera extrait par la rampe et le chevalement. Ces stériles seront déposés dans la fosse Canadian Malartic.

Ces trajets ont été subdivisés en 15 segments, formant un réseau d'environ 8,6 km, dont 1,9 km est utilisé exclusivement par le projet Odyssey. Ces segments sont détaillés au tableau A-2-3. Les trajets et segments sont identifiés par leur point de départ et d'arrivée et peuvent être localisés sur les cartes B-4-2a et B-4-2b. Les coordonnées de chacune de ces sources additionnelles associées aux nouveaux segments sont données au tableau A-1-14.

Le nombre de passages par segment a été estimé à partir des quantités de matière transportées sur chacun des trajets et de la charge utile des camions utilisés. Ces informations ont également permis de déterminer le poids moyen et la hauteur moyenne des camions sur chaque segment. Enfin, la méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.7. Les différentes informations utilisées pour le calcul des taux d'émissions sont regroupées au tableau A-1-13.

**Tableau 11 : Description du scénario de routage considéré – Odyssey**

| Trajets | Description | Longueur du trajet (aller-retour) (m) | Quantité de matériel déplacé (tm/an) | | Nombre de déplacements[1] (déplacements/jour) | |
|---|---|---|---|---|---|---|
| | | | Caterpillar 793F | Sandvik TH663 | Caterpillar 793F | Sandvik TH663 |
| P16_P19 | Minerai : Rampe vers Halde Minerai Temporaire | 613 | 0 | 1 148 497 | 0 | 100 |
| P16_P23 | Stériles : Rampe vers Halde Stériles Temporaire | 781 | 0 | 102 619 | 0 | 9 |
| P22_P08 | Minerai : Halde Minerai Temporaire vers Concasseur Primaire | 11 169 | 1 148 497 | 0 | 28 | 0 |
| P22_P26 | Stériles : Halde Stériles Temporaire vers Dépôt dans la Fosse #1 | 7 551 | 102 619 | 0 | 2 | 0 |
| P21_P27 | Stériles : Silo du Chevalement vers Dépôt dans la Fosse #2 | 7 999 | 100 281 | 0 | 2 | 0 |

[1] Un aller-retour correspond à 2 déplacements.

### *4.1.2.3 GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS MINIERS*

Les émissions provenant des gaz d'échappement des différents véhicules actifs en surface pour le projet Odyssey ont été prises en compte lors de la modélisation. La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.8. Les taux d'émission moyens estimés pour chacun des véhicules considérés à la surface sont présentés au tableau 12. La puissance des moteurs, les tiers et les facteurs de chargement moyens y sont également présentés. Le nombre de véhicules et la classification sont regroupés au tableau 13.

La portion du temps passé sur chacun des segments par les véhicules de transport est présentée au tableau 14. Les paramètres physiques et les taux d'émission par segment y sont également présentés. Les paramètres physiques et les taux d'émission pour les équipements localisés sont, quant à eux, donnés au tableau A-1-15.

**Tableau 12 : Description et taux d'émissions calculés pour les véhicules hors route – Odyssey**

| Véhicule | Type | Puissance (hp) | Tier | Facteur de chargement [1] | Taux d'émission par véhicule (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $PM_{10}$ [2] | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Létourneau L-1850-2 | Chargeuse sur roues | 2000 | T1 | 0,59 | 8,64E-02 | 8,38E-02 | 4,22E-01 | 1,96E+00 | 1,61E-03 |
| Caterpillar 793F | Camion de transport hors route | 2478 | T2 | 0,59 | 7,55E-02 | 7,32E-02 | 5,23E-01 | 1,60E+00 | 2,00E-03 |
| Sandvik TH663i (option T4) | Camion de transport hors route | 810 | T4N | 0,59 | 5,40E-03 | 5,24E-03 | 1,16E-02 | 3,20E-01 | 4,64E-04 |

[1] Appendix A, (US-EPA, 2004)
[2] Toutes les émissions de particules sont considérées plus petites que 10 µm, et donc PMT = $PM_{10}$.

**Tableau 13 : Description du scénario modélisé pour les gaz d'échappement – Odyssey**

| Équipement | Disponibilité mécanique (%) | Nombre d'équipement | | Catégorie | Source(s) associée(s) pour le positionnement |
|---|---|---|---|---|---|
| | | Total dans la flotte | Total considéré | | |
| Létourneau L-1850-2 | 70% | 1 | 1 | Localisé | ldop22x |
| Caterpillar 793F | 84% | 1 | 1 | Transport | Sources de routage |
| Sandvik TH663i | 83% | 1 | 1 | Transport | Sources de routage |

**Tableau 14 : Répartition des taux d'émission des gaz d'échappement – Odyssey**

| Nom du segment | Temps passé sur chaque segment (%) | | Taux d'émission (transport) (g/s) | | | | |
|---|---|---|---|---|---|---|---|
| | Caterpillar 793F | Sandvik TH663i | $PM_{10}$ [1] | $PM_{2,5}$ | CO | NOx | $SO_2$ |
| P04_P05 | 0,3 | 0 | 2,39E-04 | 2,32E-04 | 1,65E-03 | 5,05E-03 | 6,33E-06 |
| P04_P06 | 3,0 | 0 | 2,29E-03 | 2,23E-03 | 1,59E-02 | 4,85E-02 | 6,08E-05 |
| P05_P26 | 0,9 | 0 | 6,98E-04 | 6,77E-04 | 4,83E-03 | 1,48E-02 | 1,85E-05 |
| P05_P27 | 1,1 | 0 | 8,46E-04 | 8,21E-04 | 5,86E-03 | 1,79E-02 | 2,24E-05 |
| P06_P11 | 32,5 | 0 | 2,46E-02 | 2,38E-02 | 1,70E-01 | 5,19E-01 | 6,51E-04 |
| P07_P08 | 10,3 | 0 | 7,79E-03 | 7,55E-03 | 5,39E-02 | 1,65E-01 | 2,06E-04 |
| P09_P07 | 1,6 | 0 | 1,18E-03 | 1,14E-03 | 8,14E-03 | 2,49E-02 | 3,12E-05 |
| P11_P09 | 13,1 | 0 | 9,89E-03 | 9,59E-03 | 6,85E-02 | 2,09E-01 | 2,62E-04 |
| P15_P34 | 20,1 | 0 | 1,51E-02 | 1,47E-02 | 1,05E-01 | 3,20E-01 | 4,01E-04 |
| P16_P18 | 0 | 35,3 | 1,90E-03 | 1,85E-03 | 4,09E-03 | 1,13E-01 | 1,63E-04 |
| P17_P15 | 0,1 | 0 | 8,95E-05 | 8,68E-05 | 6,20E-04 | 1,89E-03 | 2,37E-06 |
| P18_P19 | 0 | 58,7 | 3,17E-03 | 3,07E-03 | 6,82E-03 | 1,88E-01 | 2,72E-04 |
| P18_P23 | 0 | 6,0 | 3,26E-04 | 3,16E-04 | 7,01E-04 | 1,93E-02 | 2,80E-05 |
| P21_P17 | 0,6 | 0 | 4,34E-04 | 4,21E-04 | 3,01E-03 | 9,18E-03 | 1,15E-05 |
| P22_P15 | 7,9 | 0 | 5,94E-03 | 5,76E-03 | 4,11E-02 | 1,25E-01 | 1,57E-04 |
| P34_P06 | 8,5 | 0 | 6,40E-03 | 6,21E-03 | 4,43E-02 | 1,35E-01 | 1,70E-04 |

[1] Toutes les particules émises sont supposées être plus petites que 10 microns donc PMT = $PM_{10}$.

### *4.1.2.4 VENTILATION DE LA MINE SOUTERRAINE*

Pour le projet Odyssey, la ventilation de la mine souterraine sera effectuée à l'aide de ventilateurs axiaux souterrains. Au total, pour la durée du projet, cinq points de sorties d'air vicié sont identifiés incluant une sortie via la rampe d'accès du projet Odyssey. Les débits prévus de chacune des sorties varient de 148 kcfm à 546 kcfm, pour un total de 2 295 kcfm pour l'ensemble des points d'émissions. Ces sorties sont identifiées comme des sources d'émissions de matières particulaires et de gaz de combustion.

Lors de l'année 2024, uniquement deux points de sorties seront actifs, correspondant à un débit maximal d'environ 1 063 kcfm. Les caractéristiques physiques des sources sont présentées au tableau A-1-16. Les émissions ont également été caractérisées spécifiquement pour la phase d'exploitation associée à ce scénario.

Les émissions sont liées à **l'utilisation d'équipements miniers**, à la **manipulation de matériaux**, à l'**utilisation d'explosif** dans la mine souterraine et au **chauffage de l'air** frais entrant dans la mine. Les taux d'émission ont donc été estimés en quatre étapes décrites ci-dessous. Les émissions totales sont ensuite réparties sur chacune des sorties d'émission proportionnellement au débit des sorties.

#### GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS MINIERS

L'utilisation de machineries fonctionnant au diesel constitue une source d'émissions de gaz d'échappement (PMT, $PM_{2,5}$, $NO_x$, $SO_2$ et CO). La flotte prévue pour l'année 2024 du projet Odyssey a été considérée.

La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.8 pour les gaz d'échappement des équipements miniers. Les taux d'émissions ainsi estimés pour chacun des véhicules sont présentés au tableau A-1-17. De plus, en raison du mélange des gaz d'échappement et de l'air avant d'atteindre les sorties de ventilation, les facteurs d'utilisation des machineries ont été considérés dans l'évaluation des taux. Les taux d'émissions moyens considérés pour l'ensemble des véhicules considérés pour ce scénario sont présentés au tableau A-1-18.

Les taux d'émission estimés ainsi correspondent à une concentration en $PM_{2,5}$ à la sortie de 0,18 mg/Nm$^3$. Cette concentration est relativement faible en comparaison avec les concentrations estimées lors de la modélisation 2018, bien que celle-ci ait été estimée selon la même méthodologie. L'écart entre les deux études peut s'expliquer par le fait que le débit de ventilation est maintenant plus élevé et que les principaux équipements de production souterrains additionnels présentent maintenant une certification Tier 4. La somme de ces émissions considérées est présentée au tableau A-1-21 pour la catégorie *gaz d'échappement*.

### MANIPULATION DE MATÉRIAUX

L'estimation des émissions de matières particulaires liées à la manipulation de matériaux dans une mine souterraine est très complexe. En effet, l'humidité élevée des matériaux manipulés et des parois de la mine contribue à la déposition et à l'atténuation des émissions lorsque ces dernières sont acheminées vers les sorties de ventilation. Malgré tout, les émissions de matières particulaires liées à la manipulation de matériaux ont pu être estimées.

La méthode de calcul employé est la même que celle utilisée lors de la modélisation 2018. L'estimation est alors basée sur une étude (McDonald et coll., 2003) qui présente des échantillonnages d'air ambiant pour des mines d'or souterraines. Dans cette étude, le ratio des $PM_{2,5}$ associées aux gaz d'échappement est estimé à 80 %. Or, selon ce ratio et la concentration en $PM_{2,5}$ estimée pour les gaz d'échappement, une concentration de 0,05 mg/Nm$^3$ directement associée aux émissions de matières particulaires découlant de la manipulation de matériaux a donc été calculée. Encore une fois, cette concentration est relativement faible en comparaison avec les concentrations estimées lors de la modélisation 2018. Ceci s'explique par les mêmes raisons que pour les gaz d'échappement.

Les émissions en PMT et $PM_{10}$ ont ensuite été calculées à partir des distributions de tailles des particules de la catégorie 3 (*Unprocessed Ore*) de l'annexe B.2 de l'AP-42. Les émissions ainsi estimées sont présentées au tableau A-1-21 pour la catégorie *manipulation de matériaux*.

### SAUTAGE

Les émissions de matières particulaires et de composés gazeux liés au sautage ont été estimées à partir des sautages prévus. Dans le scénario de modélisation, les sautages sont considérés à 17h. Pour le scénario de l'année 2024, un sautage de production dans la zone Odyssey Sud est considéré, soit la seule zone qui sera en production. Pour ce sautage d'un tonnage de 25 kt, la quantité d'explosif typique utilisé sera de 20,4 tonnes et la surface est estimée à 400 m$^2$. Les explosifs seront composés d'émulsion à 100 %. La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.1. Les caractéristiques des sautages considérées ainsi que les émissions estimées sont présentées au tableau A-1-19. De plus, ceux-ci sont également présentés au tableau A-1-21 pour la catégorie *sautage*. Un événement de sautage est considéré dans le modèle tous les jours de la modélisation.

La durée d'évacuation des émissions liées au sautage par la ventilation dépend de la configuration de la mine, du réseau de ventilation, des débits de ventilation et des zones en exploitation. Des simulations de ventilation effectuées par MCM ont permis de conclure qu'un délai d'évacuation d'une heure est approprié pour l'exploitation de la zone Odyssey Sud en 2024. Les émissions de sautage sont donc réparties sur une durée d'une heure dans le modèle.

### CHAUFFAGE

Les émissions liées au chauffage de l'air frais entrant dans la mine ont été considérées dans la modélisation. En effet, le chauffage de l'air frais en hiver est effectué à l'aide de gaz naturel. La consommation en gaz naturel a été estimée pour chacun des mois, en fonction des températures moyennes. Ce chauffage est alors considéré actif pour les mois de novembre à avril.

Les taux d'émission liée à cette combustion ont été estimés à partir de la consommation en gaz naturel et à partir de la section 1.4 de l'AP 42. Les taux d'émission pour de petites bouilloires (< 100 MMBTU/h) et un brûleur à faible émission de $NO_x$ ont été utilisés. Les taux d'émission estimés sont présentés au tableau A-1-20, et ce, pour chacun

des mois. Les émissions sont également présentées au tableau A-1-21 pour la catégorie *chauffage* pour la situation maximale, soit le mois de janvier. Enfin, ces émissions sont considérées en continu lors de chacun des mois estimés.

#### 4.1.2.5 USINE DE REMBLAI EN PÂTE

Pour les infrastructures du projet Odyssey, les dépoussiéreurs de la phase I de l'usine de remblai en pâte de la mine souterraine sont considérés. Cette phase prévoit l'utilisation d'une ligne de procédé comptant deux dépoussiéreurs. L'utilisation prévue du second dépoussiéreur est d'au plus 7,5 heures par jour selon les arrivages des livraisons par camions et celui-ci est alors considéré actif 8 heures par jour dans la modélisation. Leurs émissions sont constituées uniquement de particules.

Les taux d'émissions des composés particulaires ont été fixés à 30 mg/m$^3$R, soit la limite prescrite à l'article 10 du RAA. Des taux d'efficacité de filtration des dépoussiéreurs ont été utilisés afin d'estimer les ratios de $PM_{10}$/PMT et $PM_{2,5}$/PMT.

Ces sources ont été modélisées comme des sources ponctuelles. Les caractéristiques physiques des points d'émission, telles que l'emplacement (coordonnées et élévation), les dimensions (hauteur et diamètre), la température et la vitesse de sortie des gaz ont été estimés à partir de l'information fournie par l'ingénierie de CMGP et WSP. De plus, puisque la conception finale n'est pas arrêtée à ce stade-ci, ces informations ont été complétées par des hypothèses. Les caractéristiques et les taux d'émission de ces sources sont présentés au tableau A-1-22.

#### 4.1.2.6 ÉROSION ÉOLIENNE

Les émissions de particules dues à l'érosion éolienne des haldes temporaires liées au projet Odyssey ont été considérées dans la modélisation. Deux haldes temporaires (pour le minerai et les stériles) sont considérées pour les matériaux extraits par la rampe. Puisqu'il s'agit de piles de petite surface, les surfaces totales des piles ont été considérées comme actives.

Ces deux sources ont été modélisées comme des sources surfaciques. Les caractéristiques physiques des différentes sources surfaciques ont été compilées à partir des informations fournies pour le projet Odyssey et sont présentées au tableau A-1-23, avec les taux d'émission calculés.

La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.10.

## 4.2 SCÉNARIO 2

La localisation des sources d'émissions considérées pour le scénario 2 est présentée aux cartes B-4-1 et B-4-1a, tandis que les trajets de transport sont présentés sur les cartes B-4-2a à b. L'annexe A-2 regroupe quant à elle les tableaux présentant les descriptions, les caractéristiques physiques et les taux d'émissions de chacune des sources. Enfin, les sous-sections suivantes décrivent les sources par type d'opération. Pour ce scénario, l'ensemble des émissions sont seulement attribuables au projet Odyssey.

### 4.2.1 PROJET ODYSSEY

#### 4.2.1.1 CHARGEMENTS ET DÉCHARGEMENT

De manière similaire à la section 4.1.2.1, la manutention des divers matériaux du projet Odyssey acheminés à la surface représente une source fugitive de matière particulaire et ces opérations ont donc été considérées dans la modélisation. Les opérations de chargement et de déchargement considéré pour le présent scénario sont également similaires à celle considérée pour le scénario 1. Un point de chargement et de déchargement a été considéré pour chacun des trajets décrits au tableau 15.

La méthode utilisée pour déterminer les taux d'émission et les caractéristiques physiques est la même que celle présentée à la section 4.1.2.1. Ceux-ci sont présentés au tableau A-2-1. Ce tableau présente également le tonnage manipulé par heure pour chacune des sources et une estimation des taux d'émission calculée spécifiquement pour la présentation dans ce rapport avec la vitesse moyenne du vent de l'échantillon météorologique modélisé.

### 4.2.1.2 BOUTAGE

Pour le scénario 2, un seul bouteur sur chenille de type Caterpillar D10T a été considéré. Celui-ci est positionné à l'aire du concasseur primaire.

La méthode utilisée pour déterminer les taux d'émission et les caractéristiques physiques est la même que celle présentée à la section 4.1.1.4. Ceux-ci sont présentés au tableau A-2-2.

### 4.2.1.3 ROUTAGE

Le transport en surface des matériaux du projet Odyssey est considéré dans la modélisation. Les véhicules utilisés pour le transport des différentes matières sont les mêmes que pour le scénario 1 et sont présentés au tableau 10.

Le scénario de routage est présenté au tableau 15. Ce scénario comprend huit trajets décrivant la gestion du transport en surface du minerai et du stériles acheminé à la surface par la rampe et par le chevalement. Les camions hors route Caterpillar 793F sont attitrés au transport du minerai et du stérile sur le site de la mine. Un total de 8,57 Mt de minerai sera extrait par la rampe et par le chevalement. De ce total, 6,84 Mt de minerai seront acheminés au concasseur primaire et 0,80 Mt de minerai sera acheminé à la pile de minerai. Pour ce qui est du stérile, un total de 0,9 Mt sera extrait par la rampe et le chevalement. Ces stériles seront déposés dans la fosse Canadian Malartic ou la fosse Barnat.

Ces trajets ont été subdivisés en 13 segments, formant un réseau d'environ 8,3 km. Ces segments sont détaillés au tableau A-2-3. Les trajets et segments sont identifiés par leur point de départ et d'arrivée et peuvent être localisés sur les cartes B-2-2c et B-2-2d. Les coordonnées de chacune de ces sources associées aux segments sont données au tableau A-2-4.

Le nombre de passages par segment a été estimé à partir des quantités de matière transportées sur chacun des trajets et de la charge utile des camions utilisés. Ces informations ont également permis de déterminer le poids moyen et la hauteur moyenne des camions sur chaque segment. Enfin, la méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.7. Les différentes informations utilisées pour le calcul des taux d'émissions sont regroupées au tableau A-2-3.

**Tableau 15 : Description du scénario de routage considéré – Odyssey**

| Trajets | Description | Longueur du trajet (aller-retour) (m) | Quantité de matériel déplacé (tm/an) | | Nombre de déplacements[1] (déplacements/jour) | |
|---|---|---|---|---|---|---|
| | | | Caterpillar 793F | Sandvik TH663 | Caterpillar 793F | Sandvik TH663 |
| P16_P19 | Minerai : Rampe vers Halde Minerai Temporaire | 613 | 0 | 1 088 496 | 0 | 95 |
| P16_P23 | Stériles : Rampe vers Halde Stériles Temporaire | 781 | 0 | 130 360 | 0 | 11 |
| P22_P10 | Minerai :Halde Minerai Temporaire vers Pile Minerai HG | 11643 | 114 511 | 0 | 3 | 0 |
| P22_P08 | Minerai :Halde Minerai Temporaire vers Concasseur Primaire | 11169 | 973 986 | 0 | 24 | 0 |
| P22_P04 | Stériles :Halde Stériles Temporaire vers Dépôt dans la Fosse | 6741 | 130 360 | 0 | 3 | 0 |
| P20_P10 | Minerai :Silo chevalement vers Pile Minerai HG | 11678 | 690 192 | 0 | 17 | 0 |
| P20_P08 | Minerai :Silo chevalement vers Concasseur Primaire | 11204 | 5 870 514 | 0 | 142 | 0 |
| P20_P04 | Stériles : Silo chevalement vers Dépôt dans la Fosse | 6776 | 787 902 | 0 | 19 | 0 |

[1] Un aller-retour correspond à 2 déplacements.

### 4.2.1.4 GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS MINIERS

Les émissions provenant des gaz d'échappement des différents véhicules actifs en surface pour le projet Odyssey ont été prises en compte lors de la modélisation. La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.8. Les taux d'émission moyens estimés pour chacun des véhicules considérés à la surface sont présentés au tableau 16. La puissance des moteurs, les tiers et les facteurs de chargement moyens y sont également présentés. Le nombre de véhicules et la classification sont regroupés au tableau 17. Des hypothèses ont été posées pour les équipements de support et d'entretien des routes.

La portion du temps passé sur chacun des segments par les véhicules de transport est présentée au tableau 18. Les paramètres physiques et les taux d'émission par segment y sont également présentés. Les paramètres physiques et les taux d'émission pour les équipements localisés sont, quant à eux, donnés au tableau A-2-5.

**Tableau 16 : Description et taux d'émissions calculés pour les véhicules hors route – Odyssey**

| Véhicule | Type | Puissance (hp) | Tier | Facteur de chargement [1] | Taux d'émission par véhicule (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $PM_{10}$ [2] | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Létourneau L-1850-2 | Chargeuse sur roues | 2000 | T1 | 0,59 | 8,64E-02 | 8,38E-02 | 4,22E-01 | 1,96E+00 | 1,61E-03 |
| Caterpillar 793F | Camion de transport hors route | 2478 | T2 | 0,59 | 7,55E-02 | 7,32E-02 | 5,23E-01 | 1,60E+00 | 2,00E-03 |
| Sandvik TH663i (option T4) | Camion de transport hors route | 810 | T4N | 0,59 | 5,40E-03 | 5,24E-03 | 1,16E-02 | 3,20E-01 | 4,64E-04 |
| Caterpillar 16M | Niveleuse | 332 | T3 | 0.59 | 1.48E-02 | 1.44E-02 | 8.07E-02 | 1.43E-01 | 2.68E-04 |
| Caterpillar 777D | Camion de transport hors route | 938 | T1 | 0.59 | 4.05E-02 | 3.93E-02 | 1.98E-01 | 9.20E-01 | 7.57E-04 |
| Caterpillar D10T | Bouteur à chenilles | 603 | T3 | 0.59 | 2.69E-02 | 2.61E-02 | 2.31E-01 | 2.59E-01 | 4.87E-04 |

[1] Appendix A, (US-EPA, 2004)
[2] Toutes les émissions de particules sont considérées plus petites que 10 µm, et donc PMT = $PM_{10}$.

**Tableau 17 : Description du scénario modélisé pour les gaz d'échappement – Odyssey**

| Équipement | Disponibilité mécanique (%) | Nombre d'équipement | | Catégorie | Source(s) associée(s) pour le positionnement |
|---|---|---|---|---|---|
| | | Total dans la flotte | Total considéré | | |
| Létourneau L-1850-2 | 70% | 2 | 2 | Localisé | ldop22x |
| Caterpillar 793F | 84% | 4 | 4 | Transport | Sources de routage |
| Sandvik TH663i | 83% | 1 | 1 | Transport | Sources de routage |
| Caterpillar 16M | 78% | 1 | 1 | Support | Sources de routage |
| Caterpillar 777D | 78% | 1 | 1 | Support | Sources de routage |
| Caterpillar D10T | 78% | 1 | 1 | Localisé | tdoz01x |

**Tableau 18 : Répartition des taux d'émission des gaz d'échappement – Odyssey**

| Nom du segment | Temps passé sur chaque segment (%) | | | Taux d'émission (transport + support) (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|
| | Caterpillar 793F | Sandvik TH663i | Véhicules de Support | $PM_{10}$ [1] | $PM_{2,5}$ | CO | NOx | $SO_2$ |
| P04_P06 | 2.9 | 0 | 2.8 | 1.04E-02 | 1.00E-02 | 6.88E-02 | 2.16E-01 | 2.62E-04 |
| P06_P11 | 33.7 | 0 | 31.8 | 1.19E-01 | 1.16E-01 | 7.93E-01 | 2.49E+00 | 3.02E-03 |
| P07_P08 | 9.6 | 0 | 9.0 | 3.38E-02 | 3.28E-02 | 2.25E-01 | 7.06E-01 | 8.57E-04 |
| P09_P07 | 1.4 | 0 | 1.4 | 5.11E-03 | 4.96E-03 | 3.40E-02 | 1.07E-01 | 1.29E-04 |
| P10_P09 | 1.6 | 0 | 1.5 | 5.79E-03 | 5.62E-03 | 3.85E-02 | 1.21E-01 | 1.47E-04 |
| P11_P09 | 13.6 | 0 | 12.8 | 4.80E-02 | 4.66E-02 | 3.19E-01 | 1.00E+00 | 1.22E-03 |
| P15_P06 | 28.1 | 0 | 26.5 | 9.96E-02 | 9.67E-02 | 6.62E-01 | 2.08E+00 | 2.52E-03 |
| P16_P18 | 0 | 35.2 | 2.0 | 3.01E-03 | 2.92E-03 | 9.66E-03 | 1.34E-01 | 1.84E-04 |
| P17_P15 | 1.4 | 0 | 1.3 | 4.78E-03 | 4.64E-03 | 3.18E-02 | 9.97E-02 | 1.21E-04 |
| P18_P19 | 0 | 57.0 | 3.2 | 4.87E-03 | 4.72E-03 | 1.56E-02 | 2.17E-01 | 2.97E-04 |
| P18_P23 | 0 | 7.9 | 0.4 | 6.71E-04 | 6.51E-04 | 2.16E-03 | 2.99E-02 | 4.10E-05 |
| P20_P17 | 6.5 | 0 | 6.2 | 2.31E-02 | 2.24E-02 | 1.54E-01 | 4.82E-01 | 5.85E-04 |
| P22_P15 | 1.2 | 0 | 1.1 | 4.22E-03 | 4.09E-03 | 2.80E-02 | 8.79E-02 | 1.07E-04 |
| [1] Toutes les particules émises sont supposées être plus petites que 10 microns donc PMT = $PM_{10}$. | | | | | | | | |

### *4.2.1.5 VENTILATION DE LA MINE SOUTERRAINE*

Pour le scénario 2, toutes les cinq sorties de ventilation de la mine souterraine ont été considérées actives. Les caractéristiques physiques des sources sont présentées au tableau A-2-6. Les émissions ont également été caractérisées spécifiquement pour l'année du scénario de modélisation.

Les émissions sont liées à **l'utilisation d'équipements miniers**, à la **manipulation de matériaux**, à l'**utilisation d'explosif** dans la mine souterraine et au **chauffage de l'air** frais entrant dans la mine. Les taux d'émission ont donc été estimés en quatre étapes décrites ci-dessous. Les émissions totales sont ensuite réparties sur chacune des sorties d'émission proportionnellement au débit des sorties.

#### GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS MINIERS

L'utilisation de machineries fonctionnant au diesel constitue une source d'émissions de gaz d'échappement (PMT, $PM_{2,5}$, $NO_x$, $SO_2$ et CO). La flotte prévue pour l'année 2033 du projet Odyssey a été considérée. En effet, dans l'objectif de caractériser une situation « pire cas », la flotte d'équipement maximale est considérée, celle-ci survenant pour les années 2032 et 2033.

La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.8 pour les gaz d'échappement des équipements miniers. Les taux d'émissions ainsi estimés pour chacun des véhicules sont les mêmes que pour le scénario 1 et ils sont présentés au tableau A-1-17. De plus, en raison du mélange des gaz d'échappement et de l'air avant d'atteindre les sorties de ventilation, les facteurs d'utilisation des machineries ont été considérés dans l'évaluation des taux. Les taux d'émissions moyens considérés pour l'ensemble des véhicules considérés pour ce scénario sont présentés au tableau A-2-7.

Les taux d'émission estimés ainsi correspondent à une concentration en $PM_{2,5}$ à la sortie de 0,38 mg/Nm$^3$. Cette concentration est relativement faible en comparaison avec les concentrations estimées lors de la modélisation 2018. L'écart entre les deux études peut s'expliquer par le fait que le débit de ventilation est maintenant beaucoup plus

élevé et que les principaux équipements de production souterrains additionnels présentent maintenant une certification Tier 4. Cependant, le taux d'émission (évalué à 4.11E-01 g/s) est, quant à lui, du même ordre de grandeur, et même supérieur, à celui estimé lors de la modélisation 2018. Or, ces émissions ont été estimées selon la même méthodologie. La somme de ces émissions considérées est présentée au tableau A-2-10 pour la catégorie *gaz d'échappement*.

#### MANIPULATION DE MATÉRIAUX

L'estimation des émissions de matières particulaires liées à la manipulation de matériaux est évaluée selon la même méthode que la section 4.1.2.4.

Une concentration d'émission en $PM_{2,5}$ est alors estimée à 0,09 mg/Nm$^3$. La concentration totale des émissions de $PM_{2,5}$ se sommant alors de 0,47 mg/Nm$^3$. Encore une fois, cette concentration est faible en comparaison avec les concentrations estimées lors de la modélisation 2018, ce qui peut s'expliquer pour les mêmes raisons que les gaz d'échappement. Cependant, le taux d'émission est, quant à lui, du même ordre de grandeur, et même supérieur, à celui estimé lors de la modélisation 2018.

Les émissions en PMT et $PM_{10}$ ont ensuite été calculées à partir des distributions de tailles des particules de la catégorie 3 (*Unprocessed Ore*) de l'annexe B.2 de l'AP-42. Les émissions ainsi estimées sont présentées au tableau A-2-10 pour la catégorie *manipulation de matériaux*.

#### SAUTAGE

Les émissions de matières particulaires et de composés gazeux liés au sautage ont été estimées à partir des sautages prévus. Dans le scénario de modélisation, les sautages sont considérés à 17h. Pour le scénario de l'année 2035, un sautage de production dans chacune des zones actives est considéré. Un total de quatre sautages sont donc considérés lors de cette situation « pire cas ». La méthode utilisée pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.1.1. Les caractéristiques des sautages considérées ainsi que les émissions estimées sont présentées au tableau A-2-8. De plus, celles-ci sont également présentées au tableau A-2-10 pour la catégorie *sautage*. Un événement de sautage est considéré dans le modèle tous les jours de la modélisation.

De manière similaire au scénario 1, des simulations de ventilation effectuées par MCM, de même que l'analyse de la configuration de la mine, ont permis de conclure que le délai pourrait atteindre quatre heures pour l'évacuation des gaz de certains chantiers des zones actives lors de l'année 2035. Néanmoins, les émissions de sautage ont été réparties, par conservatisme, sur une durée de deux heures dans le modèle.

#### CHAUFFAGE

Les émissions liées au chauffage de l'air frais entrant dans la mine ont été considérées dans la modélisation. La méthode utilisée pour déterminer la consommation en gaz naturel et pour déterminer les taux d'émission est la même que celle présentée à la section 4.1.2.4. La consommation en gaz naturel a néanmoins été estimée spécifiquement pour le scénario de l'année 2035.

Les taux d'émission estimés sont présentés au tableau A-2-9, et ce, pour chacun des mois. Les émissions sont également présentées au tableau A-2-10 pour la catégorie *chauffage* pour la situation maximale, soit le mois de janvier. Enfin, ces émissions sont considérées en continu lors de chacun des mois estimés.

### *4.2.1.6 USINE DE REMBLAI EN PÂTE*

Pour les infrastructures du projet Odyssey, les dépoussiéreurs des phases I et II de l'usine de remblai en pâte de la mine souterraine sont considérés. Ces phases prévoient l'utilisation de quatre lignes identiques de procédé, chacune comptant deux dépoussiéreurs. La caractérisation de ces sources est donc la même qu'à la section 4.1.2.5, mais un total de huit dépoussiéreurs est maintenant considéré. Les caractéristiques et les taux d'émission de cette source sont présentés au tableau A-2-11.

### *4.2.1.7 USINE DE TRAITEMENT DU MINERAI*

Bien que la capacité de l'usine de traitement du minerai soit réduite pour cette année, les émissions des sources ponctuelles sont tout de même considérées à pleine capacité par conservatisme. Ainsi, les sources d'émissions du scénario 1, présentées au tableau A-1-10, sont donc reprises de façon identique.

#### 4.2.1.8 ÉROSION ÉOLIENNE

Les émissions de particules dues à l'érosion éolienne des haldes temporaires liées au projet Odyssey ont été considérées dans la modélisation. Les mêmes sources qu'à la section 4.1.2.6 sont donc considérées également dans ce scénario. De plus, deux surfaces supplémentaires, correspondantes au dépôt du minerai sur la pile de minerai et au dépôt du stériles dans la fosse, ont été considérées. La méthode utilisée pour déterminer les taux d'émission et les caractéristiques est la même que celle présentée à la section 4.1.1.10.

Ces quatre sources ont été modélisées comme des sources surfaciques. Les caractéristiques physiques des différentes sources surfaciques sont présentées au tableau A-2-12, avec les taux d'émission calculés.

## 4.3 AUTRES SOURCES

Les sources d'émissions occasionnelles ou présentant une contribution marginale aux émissions totales n'ont pas été prises en compte pour la modélisation de la dispersion atmosphérique, par exemple les déplacements pour la manutention de faibles volumes (camionnette, etc.), et ce, pour chacun des scénarios de modélisation.

## 4.4 BILAN DES ÉMISSIONS

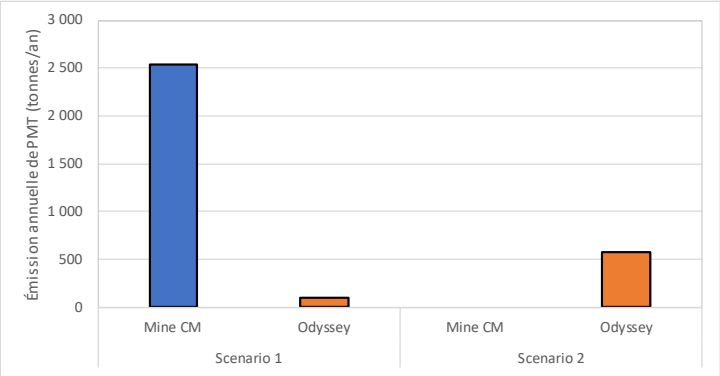
Une analyse du bilan annuel des émissions des scénarios 1 et 2 est présentée ci-dessous, et ce, pour les principaux composés d'intérêt, soit les particules totales, les particules fines et le dioxyde d'azote.

Ces bilans d'émissions correspondent directement à l'annualisation des scénarios tels qu'ils sont configurés dans les sections précédentes. Or, ces scénarios sont typiquement configurés de manière à représenter une situation « pire cas » selon les périodes des normes d'intérêt, soit une situation journalière pour les particules et une situation horaire pour les composés gazeux. Par conséquent, certaines configurations ont pour effet de surestimer les émissions annuelles. Par exemple, l'effet des précipitations n'est pas pris en compte sur les émissions des sources fugitives; leur effet réduirait potentiellement les émissions annuelles. Aussi, les sautages (surface et souterrain) sont considérés tous les jours de la modélisation. Or, les fréquences réelles de sautage sont plus faibles. Ainsi, ces bilans ne correspondent pas directement aux émissions annuelles réelles attendues. Néanmoins, leur analyse permet la comparaison entre les scénarios et l'identification des sources principales.

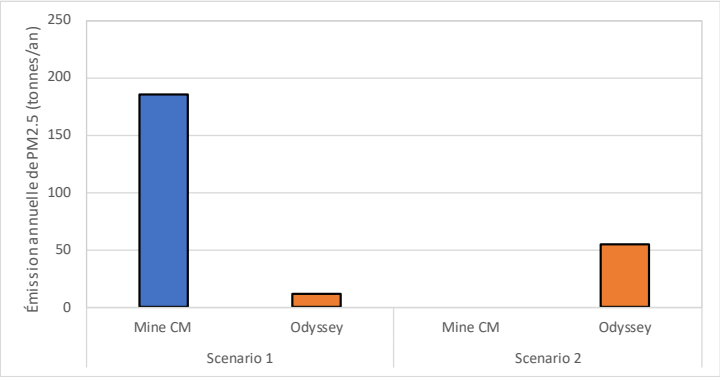
D'abord, la figure 5 montre les bilans d'émissions totales pour chacun des scénarios, et ce, distinctivement selon les émissions attribuables à MCM et au projet Odyssey. Pour le scénario 1, le projet Odyssey contribue faiblement aux émissions totales. En effet, celui-ci contribue alors à 4 %, 6 % et 9 % des émissions totales annuelles attribuables à MCM, et ce, pour les PMT, $PM_{2,5}$ et $NO_2$, respectivement. Pour le scénario 2, représentant l'année du projet Odyssey où les émissions sont maximales, aucune émission n'est attribuable à MCM. En comparaison aux émissions attribuables à MCM lors du scénario 1, le projet Odyssey contribue alors à 22 %, 29 % et 34 %, et ce, pour les PMT, $PM_{2,5}$ et $NO_x$, respectivement. Ainsi, même lors de l'exploitation maximale, il est prévu que les émissions du projet Odyssey soient plus faibles que celles de MCM attendues à l'année 2024.

Ensuite, la répartition à la source des émissions lors du scénario 2 est présentée à la figure 6. Pour les PMT, le routage est identifié comme la source principale alors que la ventilation de la mine souterraine contribue à 7 % des émissions totales. Pour les $PM_{2,5}$ et les $NO_2$, les gaz d'échappement en surface sont identifiés comme les sources principales alors que la ventilation de la mine souterraine contribue à 32 % et 44 % des émissions totales, respectivement. Pour ces derniers composés, les gaz d'échappement souterrains représentent la portion majoritaire des émissions de la ventilation de la mine souterraine.

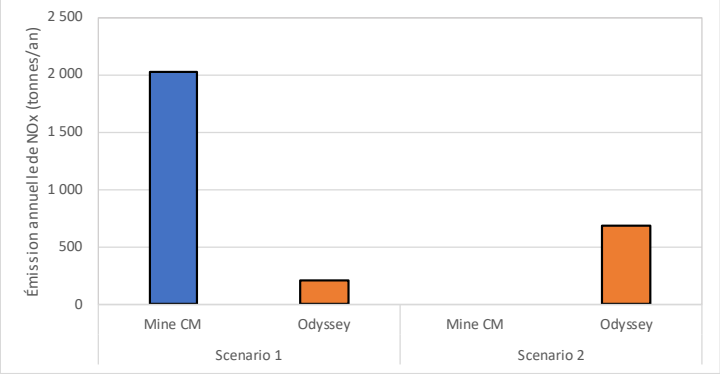
Les gaz d'échappement en surface représentent donc une portion importante des émissions malgré que le nombre d'équipements en surface soit plus faible que le nombre des équipements souterrains. Leur plus grande contribution s'explique en partie parce que les équipements de surface sont considérés de type Tier 1 et Tier 2, alors que plusieurs équipements souterrains sont considérés de type Tier 4, lesquels présentent typiquement des émissions plus faibles pour une même puissance.




**(a) Particules totales (PMT)**

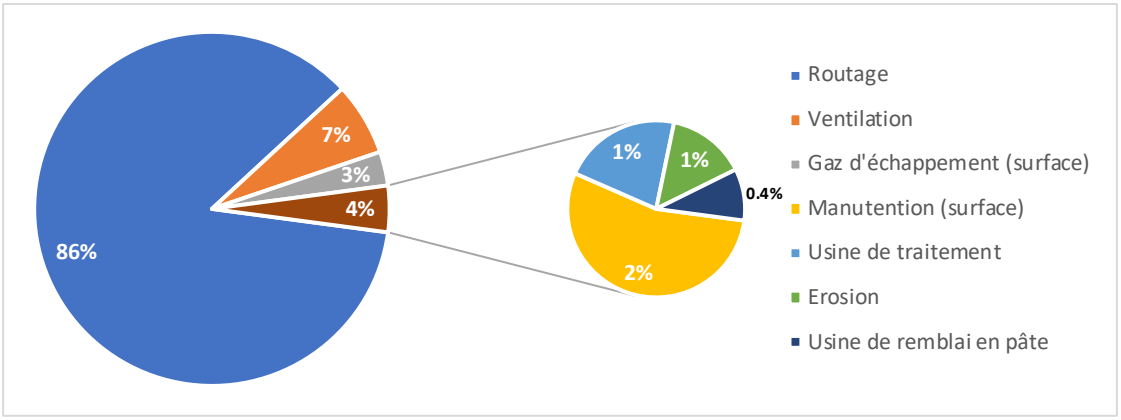



**(b) Particules fines ($PM_{2,5}$)**

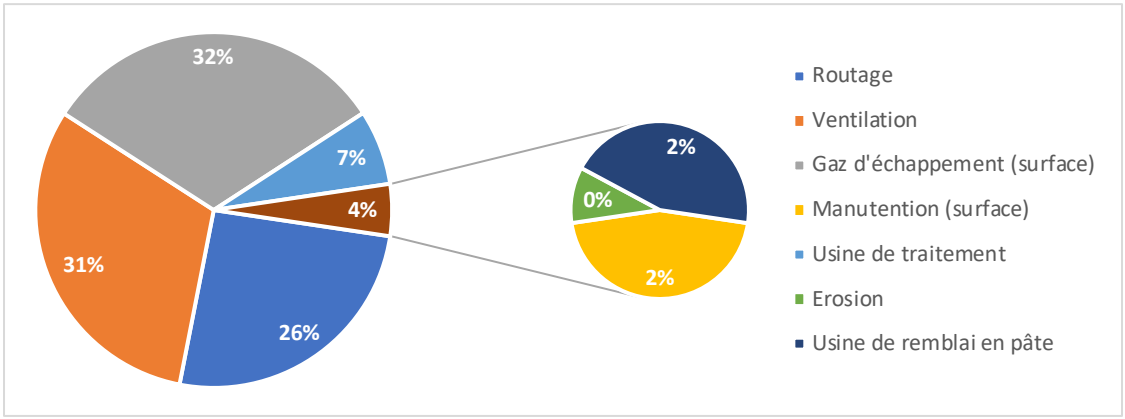



**(c) Dioxyde d'azote ($NO_2$)**

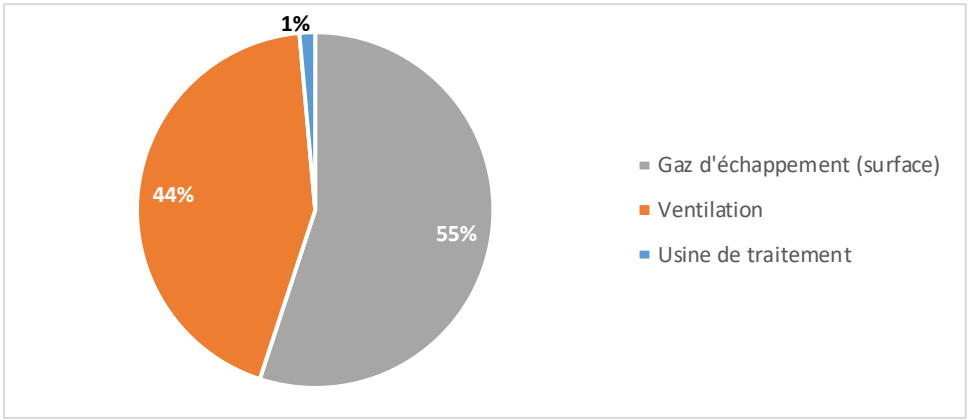
**Figure 5 : Bilan annuel des émissions à la source des principaux composés pour chacun des scénarios de base**




**(a) Particules totales (PMT)**




**(b) Particules fines ($PM_{2,5}$)**




**(c) Dioxyde d'azote ($NO_2$)**

**Figure 6 : Répartition des émissions à la source des principaux composés pour le scénario 2 de base**

# 5 MÉTHODOLOGIE

La démarche de modélisation préconisée dans la présente étude s'appuie sur la méthodologie proposée par le MELCC dans le *Guide de modélisation de la dispersion atmosphérique* (MDDEP, 2005) et le *Guide d'instruction – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers* (MDDELCC, 2017a). Lorsque pertinent, les recommandations additionnelles publiées par d'autres provinces canadiennes telles que l'Ontario (MOECC, 2017), l'Alberta (ESRD, 2013) et la Colombie-Britannique (BCMOE, 2015) ainsi que par l'U.S. EPA (US-EPA, 2017) ont été considérées.

## 5.1 CHOIX DU MODÈLE DE DISPERSION

La modélisation vise à documenter la portée et l'ampleur des rejets atmosphériques du projet, et à vérifier la conformité des concentrations potentielles avec la réglementation québécoise applicable.

L'approche de modélisation choisie est basée sur l'utilisation du logiciel météorologique diagnostique AERMET version 19191 (US-EPA, 2019a) et du modèle de dispersion AERMOD version 19191 (US-EPA, 2019b; US-EPA, 2019c), deux programmes informatiques recommandés par le MELCC (MDDEP, 2005, section 8.2.3).

## 5.2 DESCRIPTION DU MODÈLE DE DISPERSION AERMOD

Le programme AERMOD permet de réaliser des études de 2$^{e}$ niveau (MDDEP, 2005). Ce type d'étude est exigé lorsque l'une des conditions suivantes est rencontrée :

- projet situé dans un parc industriel;
- présence de sources émettrices multiples;
- somme des concentrations simulées et ambiantes (bruit de fond) égale ou supérieure à 80 % de la norme applicable;
- projet situé en bordure d'un plan d'eau;
- sources émettant des polluants toxiques ou dangereux.

Le programme AERMOD est un modèle gaussien de dispersion permettant de calculer les concentrations de composés gazeux ou de matières particulaires résultant des émissions de sources ponctuelles, surfaciques ou volumiques en milieu urbain ou rural. Le programme comporte les caractéristiques suivantes :

- utilisation de données météorologiques horaires;
- création de profils de température, de vent et de turbulence afin de déterminer une hauteur de mélange mécanique et convective;
- fonction de distribution des probabilités s'adaptant aux conditions de stabilité de l'atmosphère (gaussienne ou non);
- intégration de caractéristiques de surface du terrain telles que la rugosité, l'albédo et le ratio de Bowen;
- grille de points-calcul (récepteurs) flexible;
- incorporation de termes d'ajustement permettant de tenir compte des propriétés physico-chimiques pouvant affecter le comportement de certains composés.

Le programme utilise des données météorologiques horaires afin d'estimer les concentrations de particules ou substances gazeuses dans l'air ambiant à différents points-calcul pour différentes périodes (ex. : horaire, 8 heures, 24 heures, annuelle, etc.). Il intègre également le module BPIP-PRIME (*Building Profile Input Program*) (US-EPA, 1993) permettant de tenir compte de l'effet de sillage (turbulence) induit par la présence de bâtiments. Cette option est particulièrement importante dans le cas où des édifices susceptibles de modifier l'écoulement de l'air se retrouvent à proximité des sources d'émissions ponctuelles.

## 5.3 DOMAINE DE MODÉLISATION

Le domaine de modélisation détermine les limites géographiques dans lesquelles s'insère la modélisation de la dispersion atmosphérique.

Dans le cadre de la présente étude, le domaine de modélisation est situé dans la zone UTM 17 de l'hémisphère nord et s'étend de part et d'autre des installations du promoteur sur une distance de 10 km par 10 km. Le coin sud-ouest du domaine est situé au point X = 710 500 m; Y = 5 330 250 m dans la projection Mercator (UTM) avec le Datum de référence NAD83. Le domaine couvre ainsi une superficie suffisante afin d'inclure l'ensemble des premières zones d'utilisation du territoire susceptibles d'être exposées aux émissions atmosphériques. Ce domaine est présenté à la carte B-1-2.

## 5.4 TOPOGRAPHIE

La topographie future à l'intérieur du domaine de modélisation a été générée pour chacun des scénarios étudiés, soit les années 2024 et 2035. En ordre de priorité, les trois sources de données suivantes ont été utilisées pour générer une topographie spécifique de la mine :

- les dessins techniques des infrastructures pour l'année du scénario étudié (fosses, haldes, piles de minerai, etc.);
- le LIDAR, en date de juin 2020, couvrant les infrastructures principales actuelles et le voisinage immédiat des futures installations;
- le modèle numérique de terrain (MNT) 1:20 000 produit par Direction générale de l'information géospatiale du ministère de l'Énergie et des Ressources naturelles (MERN) du Québec, offrant une résolution de 0,324 seconde d'arc en coordonnées géographiques, soit environ 10 mètres sur le terrain. Cette base topographique couvre la totalité de la portion restante du domaine de modélisation.

La topographie générée est utilisée pour le positionnement des récepteurs et des sources d'émission. De plus, celle-ci est intégrée dans le modèle de dispersion à l'aide du préprocesseur AERMAP. Le tout de manière spécifique à chacun des scénarios modélisés.

## 5.5 PRÉPARATION DES DONNÉES MÉTÉOROLOGIQUES

L'échantillon météorologique utilisé pour la modélisation avec le programme AERMOD (version 19191) a été préparé à l'aide du module AERMET (version 19191) de l'U.S. EPA. Le module AERMET permet de créer un format de fichier météorologique horaire compatible avec l'exécution du programme AERMOD en combinant les données météorologiques avec la caractérisation de l'utilisation du sol.

### 5.5.1 *DONNÉES MÉTÉOROLOGIQUES DE SURFACE*

Les données météorologiques de surface utilisées dans le cadre de cette étude proviennent des stations météorologiques Val-d'Or (CGVO, WMO #71725) et Val-d'Or A (CYVO, WMO #71941) ), tous deux situées sur le site de l'aéroport de Val-d'Or et opérées, respectivement, par Environnement et Changement Climatique Canada – Service météorologique du Canada (ECCC - SMC) et NAV Canada (NAVCAN) (EC, 2020). Les coordonnées et l'élévation des deux stations sont données au tableau 19. Situées à environ 25 km au sud-est du site du projet visé par cette étude, ces stations sont les plus proches et plus représentatives du site à l'étude.

Plus spécifiquement, les variables météorologiques horaires des stations de surface fournies à AERMET sont la direction et la vitesse du vent, la température et la pression atmosphérique.

**Tableau 19 : Stations météorologiques de surface considérées**

| Nom | Coordonnées UTM (NAD83) | | | Élévation (m) | ID Climat | WMO | ID TC |
|---|---|---|---|---|---|---|---|
| | Zone | X (m) | Y (m) | | | | |
| Val-d'Or | 18 | 292 383 | 5 326 324 | 338,9 | 7098603 | 71725 | GVO |
| Val-d'Or A | 18 | 292 640 | 5 325 974 | 337,4 | 7098605 | 71941 | YVO |

## 5.5.2 *DONNÉES MÉTÉOROLOGIQUES AÉROLOGIQUES, RADIATION ET COUVERTURE NUAGEUSE*

Dans le cadre de la présente modélisation, les données météorologiques aérologiques ainsi que les données de rayonnement net et de couverture nuageuse requises pour l'exécution d'AERMET ont été extraites des réanalyses météorologiques ERA5, produites par le *European Centre for Medium-Range Weather Forecasts* (ECMWF).

Les réanalyses ERA5 sont réputées pour produire les champs météorologiques sur grille les plus précis à ce jour et sont utilisées dans plusieurs sciences et industries telles que la climatologie, l'agronomie, les énergies renouvelables, l'hydrologie, la qualité de l'air, l'océanographie, etc. Celles-ci sont produites à partir d'un modèle météorologique qui combine plusieurs types d'observations météorologiques, tels que des stations de surfaces, des radiosondages, des avions et des satellites, et ce, avec une fréquence temporelle d'une heure. Ce modèle calcule l'état de l'atmosphère même sur les régions où les stations météorologiques ne sont pas disponibles. Les données téléchargées à partir du magasin de données (data store) du Copernicus[3] offre une résolution spatiale (latitude, longitude) de 0,25° × 0,25°, ce qui correspond à une résolution de 27,8 km × 27,8 km à l'équateur et d'environ 18 km × 27,8 km au Québec.

Les variables météorologiques en altitude ayant été considérées pour la modélisation sont l'élévation à partir du sol, la pression atmosphérique ainsi que la température. De plus, les paramètres de turbulence de la couche limite planétaire sont calculés par le module AERMET à partir du rayonnement net durant les conditions de couche limite convective (généralement le jour) et de la couverture nuageuse durant les conditions de couche limite stable (généralement la nuit) (US-EPA, 2019a).

Les données ont été extraites au point de grille le plus proche du site minier, soit à environ 15 km au sud-est du projet Odyssey et à environ 17 km à l'est des stations de l'aéroport de Val-d'Or. Cette approche offre un échantillon de données complet ainsi qu'une bonne représentativité du site à l'étude.

## 5.5.3 *CLASSIFICATION DU TERRITOIRE ET UTILISATION DU SOL*

Le module AERMET utilise trois paramètres d'entrée liés aux caractéristiques du sol : le ratio de Bowen, l'albédo et la rugosité. Le ratio de Bowen est une mesure de l'humidité disponible pour l'évaporation, alors que l'albédo représente la portion de luminosité qui est reflétée du sol. La rugosité du sol est associée au frottement et à la variation, à petite échelle, du relief du terrain.

Comme recommandé dans le guide d'implémentation d'AERMOD (US-EPA, 2019c), l'évaluation de la rugosité est basée sur une moyenne géométrique pondérée par l'inverse de la distance, et ce, pour une zone de 1 km de rayon définie autour du site de mesure. Cette zone est découpée en plusieurs secteurs, dont la largeur n'est jamais inférieure à 30 degrés. La rugosité varie donc d'un secteur à un autre pour tenir compte des variations de la couverture terrestre. L'évaluation du ratio de Bowen et de l'albédo est effectuée sur un domaine de 10 km par

[3] https://cds.climate.copernicus.eu/
Copernicus est le programme d'observation de la Terre de l'Union européenne. Le programme est coordonné et géré par la Commission européenne. Il est mis en œuvre en partenariat avec les États membres, l'Agence spatiale européenne (ESA), l'Organisation européenne pour l'exploitation de satellites météorologiques (EUMETSAT), le Centre européen de prévisions météorologiques à moyen terme (ECMWF), les agences de l'UE et Mercator Océan.

10 km, centré sur le site de mesure. Une moyenne géométrique non pondérée (indépendante de la direction ou de la distance) est utilisée pour le ratio de Bowen alors qu'une moyenne arithmétique est utilisée pour l'albédo. Pour chacune des saisons et chacun des types de couvertures, les valeurs de rugosité, d'albédo et de ratio de Bowen sont tirées du guide de AERSURFACE (US-EPA, 2020).

Suivant les recommandations du MELCC, quatre saisons ont été considérées pour l'évaluation des caractéristiques de surface soit l'hiver (décembre à mars inclusivement), le printemps (avril et mai), l'été (juin à septembre inclusivement) et l'automne tardif (octobre et novembre).

Les valeurs estimées pour les différents paramètres sont présentées pour chacune des saisons au tableau 20 pour les stations de l'aéroport de Val-d'Or. Les catégories d'utilisation du sol définies dans un rayon de 1 km autour du site de mesure sont pour leur part illustrées à la carte B-1-5.

**Tableau 20 : Paramètres d'utilisation du sol considérés pour les stations de l'aéroport de Val-d'Or**

| Saison | Albédo | Bowen | Rugosité (m) par secteur | | | | |
|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E |
| | | | (349° - 23°) | (23° - 147°) | (147° - 177°) | (177° - 264°) | (264° - 349°) |
| Été<br>(Juin, Juillet, Août, Septembre) | 0,142 | 0,378 | 0,026 | 0,158 | 0,029 | 0,424 | 0,362 |
| Automne tardif<br>(Octobre, Novembre) | 0,145 | 0,784 | 0,015 | 0,115 | 0,017 | 0,248 | 0,243 |
| Hiver<br>(Janvier, Février, Mars, Décembre) | 0,411 | 0,500 | 0,008 | 0,076 | 0,010 | 0,202 | 0,193 |
| Printemps<br>(Avril, Mai) | 0,142 | 0,638 | 0,020 | 0,139 | 0,023 | 0,350 | 0,307 |

### 5.5.4 *CONFIGURATION D'AERMET*

L'ensemble des paramètres par défaut du modèle AERMET sont utilisés. Depuis la version 16216 d'AERMET, l'option du modèle *ADJ_U** n'est plus une option bêta et a donc été intégrée dans la présente étude. Cette option ajuste la vitesse de friction de surface (u*) lors de faibles vents sous les conditions stables.

De plus, l'option UASELECT est activée pour traiter les données aérologiques horaires, ce qui permet à AERMET de choisir le profil vertical optimal suivant l'heure locale du lever de soleil.

### 5.5.5 *ÉCHANTILLON MÉTÉOROLOGIQUE*

Conformément aux demandes du MELCC dans le cadre d'une modélisation de la dispersion atmosphérique de 2e niveau (MDDEP, 2005), un échantillon météorologique couvrant les cinq années les plus récentes et représentatif de la région a été considéré. Suite à l'analyse des données disponibles, les années météorologiques 2015 à 2019 ont été sélectionnées.

Les données météorologiques manquantes à la station Val-d'Or, pour chaque paramètre et chaque année, sont illustrées au tableau 21. Les données sont complètes à plus de 99,7 % pour chacune des années individuellement alors que le pourcentage de données manquantes est inférieur à 0,26 % sur l'ensemble des cinq années. Les données météorologiques manquantes à la station Val-d'Or A, pour chaque paramètre et chaque année, sont quant à eux illustrées au tableau 22. Cette station présente un pourcentage de données manquantes de 1,13 % sur l'ensemble des cinq années. Finalement, AERMET est configuré de façon à utiliser les données de surface de la station Val-d'Or A en complément aux données de la station Val d'Or.

Il est important de rappeler que les données de rayonnement net et de couverture nuageuse ainsi que les données aérologiques (ERA5) sont pour leur part complètes à 100 %.

Les roses des vents de l'échantillon météorologique sont présentées par année à la figure 7. Les vents dominants à la station considérée soufflent majoritairement en provenance de deux secteurs : soit du nord-ouest et du sud au sud-sud-ouest. Les données de vitesse des vents sont également décrites au tableau 23.

Finalement, il faut souligner que la topographie n'est pas prise en compte par le modèle météorologique AERMET et que les paramètres météorologiques sont considérés comme identiques en tout point à l'intérieur du domaine de modélisation.

**Tableau 21 : Analyse des données météorologiques manquantes par année (station Val-d'Or)**

| Paramètres | | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|
| Nombre de données manquantes | Vitesse du vent | 42 | 22 | 15 | 16 | 14 |
| | Direction du vent | 42 | 22 | 15 | 16 | 14 |
| | Température (dry) | 63 | 25 | 15 | 17 | 14 |
| | Pression | 42 | 22 | 15 | 17 | 14 |
| Nombre total de données manquantes | | 189 | 91 | 60 | 66 | 56 |
| Pourcentage de données manquantes (%) | | 0,54% | 0,26% | 0,17% | 0,19% | 0,16% |

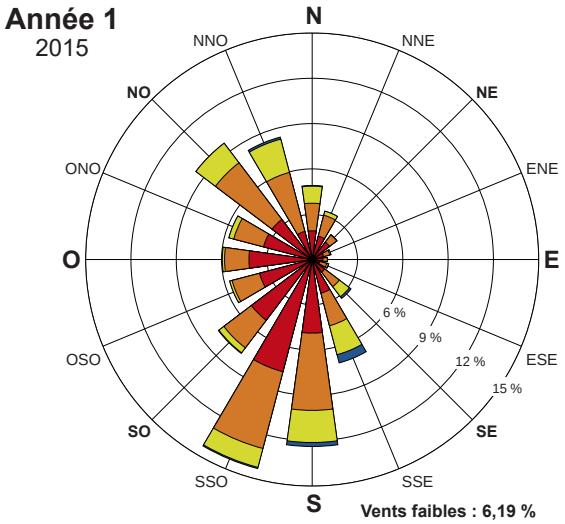
**Tableau 22 : Analyse des données météorologiques manquantes par année (station Val-d'Or A)**

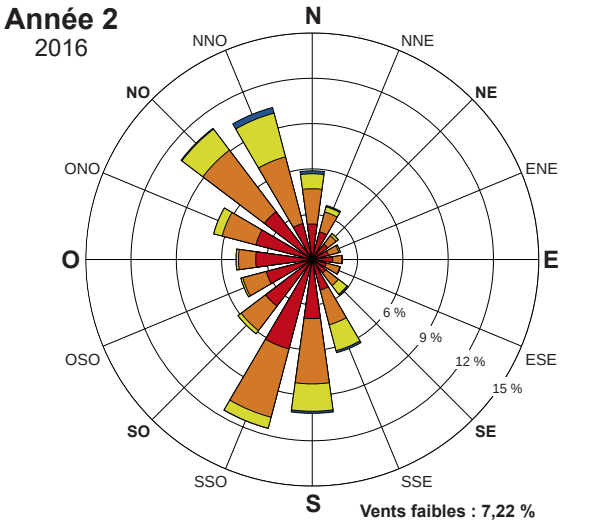
| Paramètres | | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|
| Nombre de données manquantes | Vitesse du vent | 26 | 31 | 19 | 45 | 45 |
| | Direction du vent | 279 | 313 | 329 | 301 | 342 |
| | Température (dry) | 27 | 18 | 17 | 36 | 24 |
| | Pression | 27 | 18 | 17 | 43 | 25 |
| Nombre total de données manquantes | | 359 | 380 | 382 | 425 | 436 |
| Pourcentage de données manquantes (%) | | 1,02% | 1,08% | 1,09% | 1,21% | 1,24% |

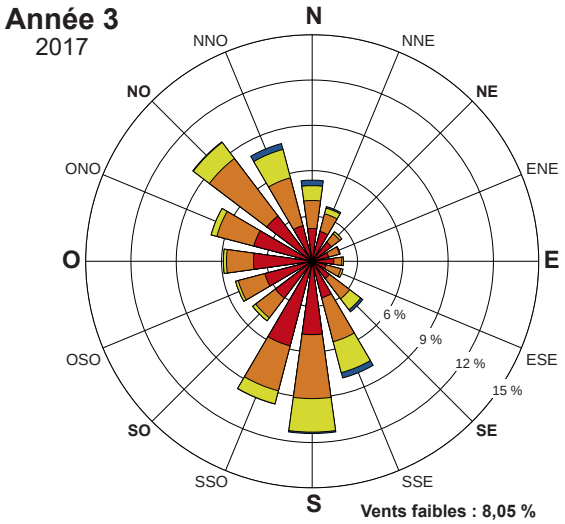
**Tableau 23 : Description de la vitesse des vents de l'échantillon météorologique**

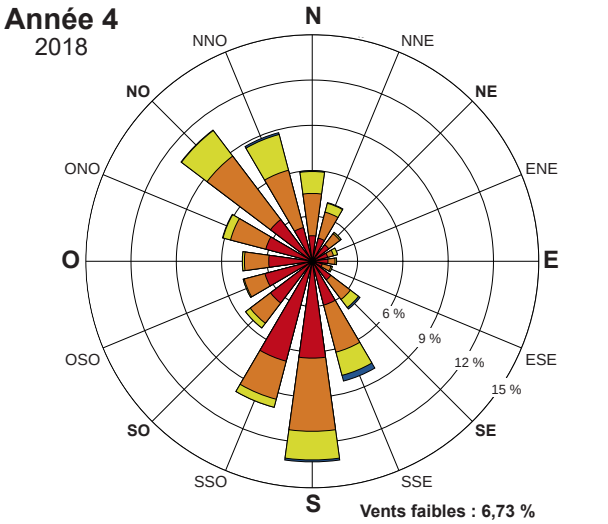
| Paramètre | Valeur |
|---|---|
| Fréquence de vents faibles[4] | 6,89 % |
| Fréquence de vents calmes | 1,58 % |
| Vitesse moyenne | 12,2 km/h (3,40 m/s) |
| Vitesse enregistrée la plus faible (différente de zéro) | 1 km/h (0,28 m/s) |
| Vitesse enregistrée la plus élevée | 50 km/h (13,9 m/s) |

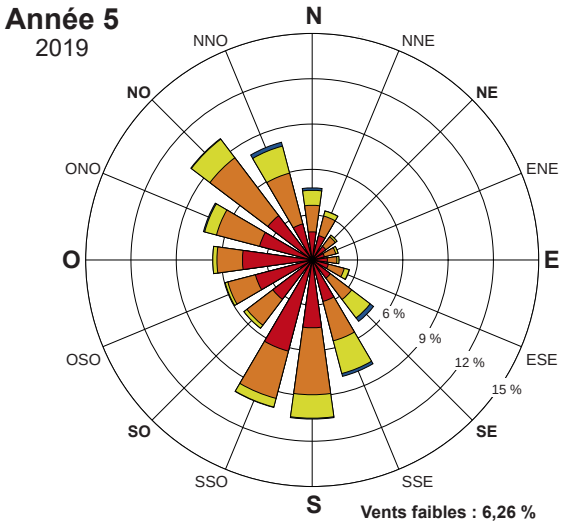
[4] Le seuil utilisé ici pour définir les vents faibles est de 3,5 km/h, ou 0,97 m/s. Ce choix est d'abord justifié par le fait que les vitesses de vent fournies pour les stations d'Environnement Canada sont données en valeur entière de km/h. De plus, le seuil de vent calme, en deçà duquel une vitesse de 0 km/h est rapportée, varie entre 1 et 4 km/h en fonction des stations et des équipements en place. L'utilisation ici d'un seuil de 3,5 km/h permet donc d'uniformiser la comparaison entre des stations présentant des seuils différents et/ou des données pronostiques. Enfin, la terminologie de « vent calme » est réservée pour les valeurs de vents explicitement rapportés comme égales à zéros dans les données d'origines et qui ne sont notamment pas traités par les modèles de dispersion.



***Note :***
*Diagramme de la fréquence de provenance du vent, par exemple, le vent souffle du nord 6,5 % du temps.*

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Figure 7**
**Rose des vents**

*Source :*
*Données AERMET v19191 (.SFC) d'après la station VAL-D'OR (GVO, 7098603) de Environnement Canada*

**Novembre 2021**

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_f2_wspT009_roses_211103.ai*

wsp

# 5.6 RÉCEPTEURS

Les récepteurs (points de calculs) sont séparés en trois catégories, soit la grille de récepteurs, les récepteurs de la limite d'application et les récepteurs sensibles. Ceux-ci sont décrits dans les sous-sections suivantes et leur position est présentée aux cartes B-1-3 et B-1-4. L'élévation des récepteurs a été établie en tenant compte de la topographie du terrain (voir section 5.4) à l'aide du préprocesseur AERMAP, et ce, pour chacun des scénarios.

## 5.6.1 *GRILLE DE RÉCEPTEURS*

La grille de récepteurs est constituée de 3 715 points de calcul (récepteurs) dont la résolution varie de 100 m, 250 m et 500 m selon la proximité du site et le type de secteur. Les densités de récepteur suivantes ont été en fonction de la distance par rapport au centre du domaine :

- une résolution de 200 m est utilisée à l'intérieur de la limite d'application
- une résolution de 100 m est utilisée jusqu'à une distance de 500 m à l'extérieur de la limite d'application;
- une résolution de 200 m est utilisée pour l'ensemble restant du domaine.

De plus, un secteur résidentiel dans la ville de Malartic, à proximité des infrastructures minières, fait l'objet d'une attention particulière et une grille de résolution au 100 mètres a été utilisée afin de raffiner les résultats dans ce secteur. Ce secteur est considéré comme sensible et est décrit plus en détail à la section 5.6.3.

La densité de la grille de récepteurs utilisée permet de générer suffisamment de valeurs modélisées de manière à obtenir une bonne représentativité des concentrations estimées (répartition spatiale) dans l'air ambiant. La grille de récepteurs est présentée à la carte B-1-3.

## 5.6.2 *RÉCEPTEURS À LA LIMITE D'APPLICATION*

Afin de satisfaire les exigences du MELCC, une séquence de récepteurs ponctuels, espacés au 50 m, a été placée le long des limites d'application définies à la section 2.3. Un total de 522 récepteurs a ainsi été ajouté.

Les récepteurs sur la limite d'application sont illustrés à carte B-1-3.

## 5.6.3 *RÉCEPTEURS SENSIBLES*

Cinq récepteurs ont été ajoutés afin de représenter divers milieux sensibles tels que des établissements d'enseignement (primaire, secondaire et éducation pour adultes), des établissements de soins de santé et des services de garde.

Un secteur résidentiel relativement dense a également été identifié comme récepteur sensible. Le secteur visé est la portion de la ville de Malartic située à proximité des infrastructures minières, soit le « secteur résidentiel au nord » du site minier. Une grille de récepteurs y est considérée, pour un total de 220 récepteurs. Ce secteur regroupe diverses utilisations du territoire, incluant entre autres des résidences, des parcs et des terrains de jeux.

En plus de ce secteur résidentiel, un total de 11 récepteurs sensibles discrets a été ajouté pour représenter des résidences isolées situées au sud du site minier, et ce, dans le but d'avoir une bonne représentation dans toutes les directions autour du projet. Ces résidences sont situées sur le chemin des Merles.

Finalement, un ensemble de 15 baux de location du territoire public pour un usage récréatif est identifié à l'intérieur du domaine de modélisation. Ceux-ci ont été identifiés comme récepteurs sensibles. Parmi ceux-ci, 13 consistent en un usage pour fins d'abris sommaires en forêt et deux consistent en un usage récréatif communautaire sans but lucratif.

Le tableau 24 présente ces récepteurs sensibles de même que leurs coordonnées respectives. Ces récepteurs sont illustrés à carte B-1-4.

## Tableau 24 : Coordonnées des récepteurs sensibles

| Description | Identifiant | X (m) | Y (m) | Élévation (m) | Distance de la limite (m) | Catégorie |
|---|---|---|---|---|---|---|
| CPE Bambins et Câlin | CPE1 | 714 060 | 5 335 717 | 319,7 | 338 | Établissement d'enseignement et service de garde |
| École des Explorateurs | ECO1 | 714 043 | 5 336 512 | 328,7 | 764 | |
| École Secondaire Le Tremplin | ECO2 | 714 162 | 5 335 998 | 320,3 | 521 | |
| Centre Le Trait d'Union | ECO3 | 713 902 | 5 336 491 | 329,8 | 621 | |
| CLSC Malartic (GMF) / CHSLD de Malartic / Hôpital psychiatrique | SAN1 | 713 607 | 5 336 004 | 320,1 | 257 | Établissement de soin de santé |
| Résidence sud | RESS01 | 712 895 | 5 330 290 | 318,1 | 842 | Résidence au sud |
| Résidence sud | RESS02 | 713 256 | 5 330 261 | 317,7 | 885 | |
| Résidence sud | RESS03 | 713 493 | 5 330 376 | 319,6 | 778 | |
| Résidence sud | RESS04 | 713 691 | 5 330 404 | 320,5 | 757 | |
| Résidence sud | RESS05 | 714 241 | 5 330 338 | 319,9 | 844 | |
| Résidence sud | RESS06 | 715 014 | 5 330 377 | 316,3 | 833 | |
| Résidence sud | RESS07 | 715 128 | 5 330 381 | 315,4 | 834 | |
| Résidence sud | RESS08 | 715 245 | 5 330 389 | 314,4 | 830 | |
| Résidence sud | RESS09 | 715 486 | 5 330 446 | 314,1 | 782 | |
| Résidence sud | RESS10 | 715 642 | 5 330 472 | 314,4 | 762 | |
| Résidence sud | RESS11 | 716 173 | 5 330 473 | 311,2 | 780 | |
| Fins d'abri sommaire en forêt | BAUX001 | 711 515 | 5 334 945 | 328,0 | 1 039 | Bail de location de terre publique |
| Fins d'abri sommaire en forêt | BAUX009 | 716 609 | 5 337 504 | 309,9 | 2 080 | |
| Fins d'abri sommaire en forêt | BAUX010 | 717 376 | 5 339 364 | 308,3 | 4 089 | |
| Fins d'abri sommaire en forêt | BAUX013 | 719 261 | 5 338 843 | 320,9 | 3 879 | |
| Fins d'abri sommaire en forêt | BAUX016 | 711 134 | 5 332 935 | 346,7 | 1 632 | |
| Fins d'abri sommaire en forêt | BAUX017 | 720 030 | 5 333 539 | 309,8 | 254 | |
| Fins d'abri sommaire en forêt | BAUX018 | 711 334 | 5 331 335 | 339,8 | 1 491 | |
| Fins d'activités de camping pour un usage communautaire sans but lucratif | BAUX019 | 716 928 | 5 329 732 | 304,1 | 1 549 | |
| Fins d'abri sommaire en forêt | BAUX020 | 718 762 | 5 337 221 | 319,5 | 2 228 | |
| Fins d'activités récréatives, sportives ou éducatives pour un usage communautaire sans but lucratif | BAUX021 | 712 697 | 5 337 207 | 324,0 | 876 | |
| Fins d'abri sommaire en forêt | BAUX023 | 719 195 | 5 330 351 | 314,2 | 1 022 | |
| Fins d'abri sommaire en forêt | BAUX027 | 716 220 | 5 338 609 | 302,0 | 3 011 | |
| Fins d'abri sommaire en forêt | BAUX030 | 718 007 | 5 329 986 | 304,6 | 1 335 | |
| Fins d'abri sommaire en forêt | BAUX036 | 710 542 | 5 334 084 | 354,0 | 2 079 | |
| Fins d'abri sommaire en forêt | BAUX040 | 720 131 | 5 329 838 | 307,8 | 1 876 | |

### 5.6.4 *RÉCEPTEURS DU DOMAINE D'APPLICATION*

Les récepteurs du domaine d'application sont les récepteurs de la grille (section 5.6.1) situés à l'extérieur de la limite d'application, ceux situés sur cette même limite (section 5.6.2) ainsi que les récepteurs sensibles (section 5.6.3).

Les autres récepteurs, soit les récepteurs de la grille à l'intérieur de la limite d'application, n'ont, quant à eux, pas été pris en compte pour évaluer la conformité des concentrations modélisées aux normes et critères de qualité de l'air.

## 5.7 EFFET DES BÂTIMENTS

Étant donné la proximité de certaines sources ponctuelles par rapport aux différents bâtiments, l'effet de rabattement du panache de dispersion a été calculé. Pour ce faire, le programme « *Building Profile Input Program* » [BPIP] (US-EPA, 1993) a été utilisé afin de déterminer l'effet des bâtiments. Les résultats du calcul ont par la suite été incorporés au modèle AERMOD qui applique les corrections requises pour l'estimation des concentrations dans l'air ambiant à l'aide du module PRIME.

Pour calculer l'effet de rabattement du panache, les infrastructures du site ont été tracées. Les coordonnées géographiques, l'élévation des bâtiments et la position des sources d'émissions ont été déterminées à partir des plans techniques fournis par MCM.

## 5.8 CONFIGURATION D'AERMOD

Les sources ponctuelles horizontales ont été exécutées à l'aide de l'option POINTHOR. Enfin, pour la modélisation des matières particulaires, les options de déposition sèches sont utilisées (DRYDPLT, NOWETDPLT).

Toutes les autres options par défaut du modèle AERMOD ont été considérées pour son exécution en conformité avec les exigences indiquées dans le guide de modélisation du MELCC.

## 5.9 MÉTHODES SPÉCIFIQUES

Cette section décrit les méthodologies spécifiques adoptées pour la modélisation de certains composés.

### 5.9.1 *ESTIMATION DE LA DÉPOSITION DES MATIÈRES PARTICULAIRES*

Il est d'abord important de souligner que la déposition n'a pas été considérée pour les particules émises dans les gaz de combustion (par exemple, gaz d'échappement des véhicules mobiles). En effet, le diamètre aérodynamique de ces particules est très petit (majoritairement inférieur à 1 µm) et ces particules se déposent que très peu.

Afin de modéliser la déposition sèche avec le modèle AERMOD, le mot clé « DDEP » doit être ajouté aux options du modèle. Cette option active à la fois la déposition sèche (DRYDPLT) et humide (WETDPLT). L'option NOWETDPLT doit être également ajoutée afin de ne pas considérer la déposition humide.

La granulométrie et la densité des particules émises par chacune des sources doivent être spécifiées. Afin de décrire cette granulométrie, celle-ci doit être divisée en catégories de taille de particule à l'aide du diamètre aérodynamique des particules et de la fraction de la masse correspondante. La densité de chacune des catégories doit également être spécifiée.

La méthode choisie afin de modéliser la déposition sèche des particules est tirée du *Guideline for Plume Dispersion Modelling* du gouvernement de Terre-Neuve et du Labrador (NLDEC, 2012). Ce guide propose de séparer les particules en trois fractions (P1, P2 et P3) représentant des tailles aérodynamiques spécifiques : la fraction P1

représentant les particules de diamètre inférieur à 2,5 µm, la fraction P2 représentant les particules de diamètre situé entre 2,5 et 10 µm et la fraction P3 représentant les particules de diamètre supérieur à 10 µm. Les taux d'émission de chacune de ces fractions sont établis, pour chacune des sources d'émissions, à partir des taux d'émission de PMT, $PM_{10}$ et $PM_{2,5}$ selon les équations suivantes :

$$P1 = PM_{2,5}$$
$$P2 = PM_{10} - PM_{2,5}$$
$$P3 = PMT - PM_{10}$$

Les résultats de modélisation pour P1, P2 et P3 sont finalement recombinés afin d'estimer les concentrations et les flux de déposition pour chacune des tailles de particules :

$$\text{PMT avec déposition} = P1 + P2 + P3$$
$$\text{PM10 avec déposition} = P1 + P2$$
$$\text{PM2,5 avec déposition} = P1$$

Le guide propose également une distribution de la granulométrie pour chacune de ces trois fractions. Celles-ci sont présentées au tableau 2.6.1 du guide et ont été utilisées dans la présente modélisation afin de décrire P1, P2 et P3.

La densité utilisée est de 2,77 g/cm$^3$ et est basée sur les caractéristiques du minerai et des stériles spécifiques au site de la mine. Cette densité a été utilisée pour toutes les sources de matières particulaires (à l'exception des matières particulaires de combustion) et toutes les tailles de particules. Bien que la densité puisse être ajustée en fonction des sources, il s'agit d'une hypothèse jugée acceptable puisque la majorité des particules totales émises dans les scénarios considérés proviennent d'opérations de manipulation et transformation de matériaux, telles que les chargements et déchargements, le forage, le sautage et le transport sur des routes non pavées.

Finalement, bien que les paramètres de granulométrie et que la densité de chacune des fractions P1, P2 et P3 sont identiques pour toutes les sources, il est important de rappeler que la proportion de chacune de ces fractions est spécifique à chaque source puisque leurs taux d'émissions sont basés sur les taux de PMT, $PM_{10}$ et $PM_{2,5}$, qui sont eux, spécifiques à chaque source.

### 5.9.2 *ESTIMATION DES TAUX D'ÉMISSIONS DE $PM_4$*

L'évaluation du critère de qualité de l'air sur une période annuelle de la silice cristalline doit être effectuée sur particule de taille inférieure à 4 µm ($PM_4$). Or, les taux d'émission en particules utilisées pour la présente étude sont uniquement disponibles pour les tailles de particules PMT, $PM_{10}$ et $PM_{2,5}$. Pour les émissions en particules de $PM_4$, étant donné qu'aucun taux n'est disponible, ceux-ci sont estimés à partir d'une régression linéaire entre les taux d'émission de $PM_{2,5}$ et $PM_{10}$, selon la formule suivante :

$$ER_{PM4} = ER_{PM2,5} + \frac{(4\ \mu m - 2{,}5\ \mu m)}{(10\ \mu m - 2{,}5\ \mu m)} \times \left(ER_{PM10} - ER_{PM2,5}\right) = 0{,}8\ ER_{PM2,5} + 0{,}2\ ER_{PM10}$$

Ces émissions de particules de $PM_4$ sont ensuite combinées aux teneurs en silice cristalline afin d'évaluer le critère de qualité de l'air sur une période annuelle.

### 5.9.3 *ESTIMATION DES CONCENTRATIONS POUR UNE PÉRIODE INFÉRIEURE À UNE HEURE*

L'annexe H du RAA prévoit que dans le cas d'un contaminant pour lequel la valeur limite est établie sur une période inférieure à 1 heure, la concentration est calculée sur cette période à l'aide de la formule suivante :

$$C(T) = C_{MAX-H} \times 0{,}97 \times T^{-0{,}25}$$

où $T$ est la période exprimée en heure et $C_{MAX-H}$ est la concentration maximale sur 1 heure.

Ainsi, cette équation est utilisée dans la présente étude afin d'estimer les concentrations 4 minutes de dioxyde de soufre ($SO_2$) et d'en permettre la comparaison avec les normes associées. Dans le cas présent, les maximums sur une période d'une heure de chacun des récepteurs du domaine sont donc multipliés par un facteur 1,91 pour obtenir leur équivalent 4 minutes.

### 5.9.4 *ESTIMATION DES CONCENTRATIONS EN $NO_2$*

Concernant l'estimation des concentrations de $NO_2$ dans l'air ambiant la méthode OLM (*Ozone Limiting Method*) a été appliquée selon les recommandations du MELCC (MDDEP, 2008). Cette méthode permet de calculer la conversion du NO en $NO_2$, en fonction du ratio $NO_2/NO_x$ à la source et de l'ozone disponible dans l'air ambiant. Pour ce faire, des concentrations d'ozone représentatives de la région ont été fournies par le MELCC[5]. Il s'agit de 80 ppb (horaire), de 60 ppb (quotidienne) et de 30 ppb (annuelle). La méthode a été appliquée pour tous les scénarios et pour les périodes 1 heure et 24 heures. Pour la période annuelle, une conversion totale du $NO_x$ en $NO_2$ a été utilisée.

En ce qui concerne le ratio $NO_2/NO_x$, les différentes sources de $NO_x$ présentent des ratios à la source de $NO_2/NO_x$ (*in-stack ratio*) différents. Pour les moteurs diesel, une valeur de 20 % est normalement suggérée (NLDEC, 2012). Pour les sautages par contre, une valeur autour de 4 % est plutôt attendue (Attalla et coll., 2008). Or, le ratio de 20 % a été sélectionné puisqu'il est représentatif des émissions provenant des gaz d'échappement de la machinerie, et conservateur par rapport aux émissions lors des sautages.

### 5.9.5 *ÉVALUATION DES ÉMISSIONS DE MÉTAUX ET DE MÉTALLOÏDES (AUTRE QUE LA SILICE CRISTALLINE)*

Les émissions de métaux et métalloïdes ont été déterminées à partir des émissions de particules modélisées et de la caractérisation géochimique des lithologies rencontrées sur le site. Il est alors assumé que la teneur en métaux dans les matières particulaires émises est semblable à la teneur en métaux dans les matériaux excavés. Bien que cette hypothèse présente une grande incertitude, elle permet néanmoins d'estimer les métaux émis à l'atmosphère liés aux matières particulaires en suspension.

Afin de déterminer la teneur en métaux dans les matières particulaires émises, les sources d'émissions sont d'abord regroupées en fonction des types d'opérations et des lithologies impliquées. Ceux-ci sont décrits brièvement aux tableaux 25 et 26 pour chacun des scénarios et des exemples de sources y sont donnés. La teneur en métaux dans les particules émises pour chacun de ces groupes est ensuite estimée en fonction de la proportion annuelle des lithologies associées à ces groupes et de leurs teneurs en métaux respectives.

Le calcul de la teneur en métaux effectué dépend de la période étudiée. En fait, deux calculs différents sont utilisés, soit pour une période de 1 an et pour une période inférieure à 1 an.

- Lorsque la période de référence est **égale à 1 an**, l'utilisation des émissions moyennes d'un groupe est justifiée. Ainsi, la teneur en métaux d'un groupe est obtenue par **la moyenne des teneurs en métaux de chaque lithologie associée** pondérée par la proportion annuelle des lithologiques.
- Lorsque la période de référence est **inférieure à 1 an**, il n'est plus justifié de considérer les émissions moyennes, car sur une courte période, les activités d'un groupe pourraient être associées aux lithologies concernées dans des proportions différentes. Ainsi, par conservatisme, pour chacun des métaux indépendamment, **la teneur en métaux maximale des lithologies associées** est considérée.

Pour chacun des métaux et des périodes, le taux d'émission de chacune des sources est finalement obtenu en multipliant la teneur déterminée par le taux d'émission de particules. Comme prescrit par le MELCC (voir section 2), les concentrations de métaux sont calculées sur les PMT, à l'exception du manganèse, du nickel, de la silice cristalline et du titane, où les $PM_{10}$ et les $PM_4$ sont plutôt utilisées.

[5] MDDEFP, Communication par courriel, 5 avril 2012.

La teneur moyenne en métaux des différentes lithologies est basée sur la caractérisation géochimique réalisée par Golder (Golder Associés, 2013) pour le secteur Barnat et, pour le projet Odyssey, sur la caractérisation géochimique des différents secteurs de la mine souterraine, soit les zones Odyssey et East Malartic (EcoMetrix, 2017; EcoMetrix, 2019) et de la zone East Gouldie (CMGP, 2020). Dans un premier temps, le pourcentage de chaque lithologie pour chaque secteur a été déterminé, et ce, à la fois pour le minerai et pour les stériles. Ensuite, à partir des teneurs moyennes des lithologies et des distributions dans chaque secteur pour les différentes lithologies, teneurs effectives pour le minerai et les stériles sont estimées pour chacun des secteurs, celles-ci sont présentées au tableau 27.

Enfin, la proportion annuelle des lithologies associées à chacun des groupes de sources est donnée aux tableaux 28 et 29. Ces proportions, propres à chacun des scénarios de modélisation considérés, sont utilisées afin d'effectuer le calcul des émissions en métaux pour chacune des sources, selon la méthode décrite précédemment.

**Tableau 25 : Description des regroupements de sources utilisés pour l'estimation des concentrations de métaux – Scénario 1**

| Groupe | Description | Exemple de sources |
|---|---|---|
| Concasseur mobile | Manipulation de matériaux liée au concasseur mobile | Concassage et déposition de matériaux concassés |
| Routage | Ressupension des routes liées au transport | Routage en surface |
| Barnat - Tout matériaux | Opérations de la fosse Barnat pour tous les matériaux | Boutage, forage et sautage dans la fosse Barnat |
| Barnat - Minerai | Opérations de la fosse Barnat liées à la manipulation de minerai | Boutage, chargement et déchargement et érosion des aires d'entreposage de minerai |
| Barnat - Stériles | Opérations de la fosse Barnat liées à la manipulation de stériles | Boutage, chargement et déchargement et érosion des aires d'entreposage de stériles |
| Odyssey - Tout matériaux | Opérations du projet Odyssey pour tous les matériaux | Émission par la ventilation de particules liée à la manipulation souterraine de matériaux |
| Odyssey - Minerai | Opérations du projet Odyssey pour le minerai | Chargement et déchargement et érosion des aires d'entreposage temporaire de minerai |
| Odyssey - Stériles | Opérations du projet Odyssey pour les stériles acheminé à la surface | Chargement et déchargement et érosion des aires d'entreposage temporaire de stériles |
| Minerai | Manipulation de minerai, peu importe la provenance | Sources de particules liées au traitement du minerai |
| Sans métaux | Opération sans émission de métaux | Gaz d'échappement des équipements miniers |

**Tableau 26 : Description des regroupements de sources utilisés pour l'estimation des concentrations de métaux – Scénario 2**

| Groupe | Description | Exemple de sources |
|---|---|---|
| Routage | Ressupension des routes liées au transport | Routage en surface |
| Odyssey - Tout matériaux | Opérations du projet Odyssey pour tous les matériaux | Émission par la ventilation de particules liée à la manipulation souterraine de matériaux |
| Odyssey - Minerai | Opérations du projet Odyssey pour le minerai | Boutage, chargement et déchargement et sources de particules liées au traitement du minerai |
| Odyssey - Stériles | Opérations du projet Odyssey pour les stériles acheminé à la surface | Chargement et déchargement et érosion des aires d'entreposage temporaire de stériles |
| Sans métaux | Opération sans émission de métaux | Gaz d'échappement des équipements miniers |

**Tableau 27 : Teneur en métaux par type de roche pour chacun des secteurs**

| Métaux | Teneur par lithologie (mg/mg) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Barnat | | Odyssey Nord | | Odyssey Sud | | East Malartic | | East Gouldie | |
| | Minerai | Stériles | Minerai | Stériles | Minerai | Stériles | Minerai | Stériles | Minerai | Stériles |
| Antimoine (Sb) | 1.20E-07 | 1.41E-07 | 4.00E-07 | 5.93E-07 | 4.82E-07 | 4.00E-07 | 4.00E-07 | 4.00E-07 | 5.35E-08 | 5.43E-08 |
| Argent (Ag) | 1.04E-06 | 5.08E-07 | 5.50E-07 | 3.13E-07 | 8.47E-07 | 4.61E-07 | 1.39E-06 | 2.08E-07 | 1.36E-06 | 4.33E-07 |
| Arsenic (As) | 2.28E-06 | 2.59E-06 | 1.30E-06 | 9.17E-07 | 2.27E-06 | 3.34E-06 | 7.95E-07 | 1.92E-06 | 1.52E-06 | 1.25E-06 |
| Baryum (Ba) | 2.22E-04 | 1.65E-04 | 1.85E-04 | 2.35E-04 | 9.35E-05 | 1.81E-04 | 1.37E-04 | 3.24E-04 | 1.70E-04 | 4.03E-04 |
| Béryllium (Be) | 3.67E-07 | 2.47E-07 | 5.61E-07 | 6.83E-07 | 3.17E-07 | 3.42E-07 | 1.29E-06 | 3.55E-07 | 5.54E-07 | 2.52E-07 |
| Cadmium (Cd) | 2.63E-07 | 1.60E-07 | 1.28E-07 | 1.15E-07 | 1.18E-07 | 1.06E-07 | 1.40E-07 | 4.60E-08 | 7.54E-08 | 7.83E-08 |
| Chrome (Crt) | 3.34E-04 | 3.42E-04 | 6.77E-05 | 6.16E-04 | 3.89E-05 | 9.28E-05 | 3.94E-04 | 5.43E-04 | 1.69E-04 | 1.90E-04 |
| Cobalt (Cob) | 3.02E-05 | 2.94E-05 | 8.13E-06 | 2.97E-05 | 8.97E-06 | 1.91E-05 | 2.74E-05 | 3.88E-05 | 2.08E-05 | 2.53E-05 |
| Cuivre (Cu) | 4.66E-05 | 4.53E-05 | 1.12E-05 | 3.50E-05 | 1.48E-05 | 3.91E-05 | 3.82E-05 | 5.94E-05 | 4.79E-05 | 4.87E-05 |
| Manganèse (Mn) | 5.72E-04 | 4.49E-04 | 2.91E-04 | 6.98E-04 | 2.79E-04 | 4.47E-04 | 6.23E-04 | 6.36E-04 | 6.05E-04 | 5.79E-04 |
| Mercure (Hg) | 3.30E-08 | 1.47E-08 | 2.50E-08 | 2.50E-08 | 2.50E-08 | 2.50E-08 | 2.50E-08 | 2.50E-08 | 6.08E-09 | 5.96E-09 |
| Nickel (Ni) | 1.27E-04 | 1.72E-04 | 3.12E-05 | 2.31E-04 | 2.51E-05 | 6.79E-05 | 1.69E-04 | 2.78E-04 | 7.59E-05 | 9.23E-05 |
| Plomb (Pb) | 9.57E-06 | 5.54E-06 | 2.85E-05 | 2.76E-05 | 1.84E-05 | 1.32E-05 | 2.24E-05 | 4.94E-06 | 7.45E-06 | 1.41E-05 |
| Sélénium (Se) | 5.40E-07 | 6.09E-07 | 3.50E-07 | 3.50E-07 | 3.50E-07 | 3.50E-07 | 3.50E-07 | 3.50E-07 | 4.78E-07 | 6.33E-07 |
| Thallium (Tl) | 4.13E-07 | 2.65E-07 | 1.49E-07 | 3.23E-07 | 7.21E-08 | 3.44E-07 | 2.90E-07 | 3.43E-07 | 3.94E-07 | 5.23E-07 |
| Titane (Ti) | 1.27E-03 | 9.09E-04 | 7.20E-04 | 1.09E-03 | 3.51E-04 | 1.31E-03 | 1.40E-03 | 2.08E-03 | 2.07E-03 | 2.16E-03 |
| Vanadium (V) | 6.28E-05 | 5.29E-05 | 4.78E-05 | 1.00E-04 | 1.95E-05 | 4.59E-05 | 9.18E-05 | 8.54E-05 | 9.68E-05 | 1.03E-04 |
| Zinc (Zn) | 4.96E-05 | 4.03E-05 | 5.05E-05 | 6.93E-05 | 5.12E-05 | 6.64E-05 | 7.03E-05 | 7.64E-05 | 7.19E-05 | 8.23E-05 |

**Tableau 28 : Proportions annuelles des lithologies associées aux groupes de sources utilisés pour l'estimation des métaux et métalloïdes – Scénario 1**

| Groupe | Barnat | | Odyssey Sud | | East Gouldie | |
|---|---|---|---|---|---|---|
| | Minerai | Stériles | Minerai | Stériles | Minerai | Stériles |
| Concasseur mobile | 38% | 62% | - | - | - | - |
| Routage | - | 100% | - | - | - | - |
| Barnat - Tout matériaux | 23% | 77% | - | - | - | - |
| Barnat - Minerai | 100% | - | - | - | - | - |
| Barnat - Stériles | - | 100% | - | - | - | - |
| Odyssey - Tout matériaux | - | - | 85% | 8% | - | 7% |
| Odyssey - Minerai | - | - | 100% | - | - | - |
| Odyssey - Stériles | - | - | - | 51% | - | 49% |
| Minerai | 94% | - | 6% | - | - | - |
| Sans métaux | - | - | - | - | - | - |

**Tableau 29 : Proportions annuelles des lithologies associées aux groupes de sources utilisés pour l'estimation des métaux et métalloïdes – Scénario 2**

| Groupe | Odyssey Nord | | East Malartic | | East Gouldie | |
|---|---|---|---|---|---|---|
| | Minerai | Stériles | Minerai | Stériles | Minerai | Stériles |
| Routage | - | 33% | - | 24% | - | 42% |
| Odyssey - Tout matériaux | 22% | 5% | 12% | 3% | 51% | 6% |
| Odyssey - Minerai | 26% | - | 14% | - | 60% | - |
| Odyssey - Stériles | - | 33% | - | 24% | - | 42% |
| Sans métaux | - | - | - | - | - | - |

### 5.9.6 ÉVALUATION DES ÉMISSIONS DE SILICE CRISTALLINE

Les émissions de silice cristalline ont été déterminées à partir des émissions de particules modélisées et de la teneur en silice cristalline des lithologies rencontrées sur le site de manière similaire à l'évaluation des métaux (voir section 5.9.5).

La méthode de détermination des teneurs en silice cristalline utilisée dans la présente étude est la même que celle utilisée dans la modélisation 2015 et 2018 et qui a présentée dans deux mémos techniques (WSP, 2016, 2018b). Dans ces mémos, les teneurs en silice cristalline *in situ* des lithologies ne correspondaient pas au teneur de silice cristalline observée dans le suivi de la qualité de l'air dans les $PM_4$. En effet, il a été démontré que la silice cristalline est présente en plus faible quantité dans les particules plus fines que globalement dans les matériaux. Il est alors supposé que la silice soit présente en plus faible quantité dans les tailles de particules plus fines (poussière), parce qu'il s'agit d'un matériau d'une grande dureté (7 sur l'échelle de Mohs) et peu friable (index d'abrasion faible). La méthode d'évaluation des teneurs est présentée dans les sous-sections suivantes.

#### 5.9.6.1 MÉTHODOLOGIE D'ÉCHANTILLONNAGE ET ANALYSE DES ÉCHANTILLONS

Une campagne d'échantillonnage des poussières au sol a été réalisée en 2016 sur différents sites de la mine dans le but d'obtenir un portrait des teneurs en silice cristalline, en fonction de la taille des particules, et ce, dans les poussières générées par les principales sources de la mine. La caractérisation a donc visé les activités suivantes :

- Sites de forage;
- Sites de sautage;
- Sites de déchargement sur une halde active;
- Routes non pavées sur le site de la mine.

Au total, 10 sites ont été analysés. Pour chaque site, trois échantillons de surface ont été prélevés à l'aide d'une méthode de prélèvement basée sur celle de Appendix C.1 de l'AP-42. Enfin, leur teneur en silice cristalline en fonction de la granulométrie a été analysée par le laboratoire RJ Lee Group, laboratoire qui détient l'accréditation de l'American Industrial Hygiene Association – Laboratory Accreditation Program (AIHA-LAP, LLC) pour l'analyse de la silice cristalline. La silice cristalline respirable a été quantifiée par diffraction des rayons X (XRD) et par microscopie électronique assistée par ordinateur (CCSEM). Les proportions de silice cristalline respirables ont ainsi été déterminées sur les différentes fractions suivantes :

- Particules de taille inférieure à 45 µm;
- Particules de taille inférieure à 10 µm;
- Particules de taille inférieure à 4 µm;
- Particules de taille inférieure à 2,5 µm.

Le tableau 30 présente les teneurs en silice cristalline pour chaque site analysé. Les valeurs indiquées correspondent à la moyenne des valeurs mesurées pour chaque site (trois échantillons par site).

De manière générale, la teneur en silice cristalline diminue avec la taille de particules. Par exemple, la teneur en silice cristalline moyenne de tous les échantillons analysés passe de 19,86 % au total à 5,92 % sur les $PM_4$, soit environ le tiers.

**Tableau 30 : Teneurs en silice cristalline selon la taille des particules pour chaque site échantillonné**

| Échantillon | Description | Moyenne par site<br>Teneur en $SiO_2$ (en %) pour chaque taille de particule (en µm) | | | | |
|---|---|---|---|---|---|---|
| | | < 2,5 µm | < 4 µm | < 10 µm | < 45 µm | Ensemble de l'échantillon |
| SIL1 | Halde à stériles | 2,99 | 4,26 | 6,85 | 15,01 | 24,30 |
| SIL2 | Forage 220-666 | 2,70 | 4,54 | 7,29 | 8,71 | 12,97 |
| SIL3 | Forage 220-621 | 6,39 | 10,48 | 19,17 | 13,50 | 22,30 |
| SIL4 | Sautage | 1,32 | 3,14 | 8,71 | 9,42 | 12,47 |
| SIL5 | Route non pavée : route 117 | 1,32 | 2,48 | 5,96 | 14,41 | 21,33 |
| SIL6 | Route non pavée : route 640 | 1,03 | 2,03 | 3,68 | 8,70 | 23,40 |
| SIL7 | Forage 210-751 | 3,97 | 6,05 | 7,59 | 12,12 | 19,90 |
| SIL8 | Forage 210-750 | 10,21 | 16,37 | 25,16 | 21,71 | 18,93 |
| SIL9 | Sautage 210-034 CGR | 1,76 | 2,87 | 6,19 | 23,89 | 16,97 |
| SIL10 | Sautage 210-034 AGR | 4,77 | 6,99 | 14,75 | 20,36 | 26,03 |
| **Moyenne sur tous les échantillons** | | **3,65** | **5,92** | **10,53** | **14,78** | **19,86** |

### *5.9.6.2 TENEURS EN SILICE UTILISÉES POUR LA MODÉLISATION*

La méthodologie employée pour intégrer ces teneurs en silice dans la modélisation est la même que celle utilisée dans les mémos 2016 et 2018; elle a cependant été actualisée pour les sources des scénarios de la présente étude.

Étant donné que les teneurs en silice cristalline découlant de la campagne d'échantillonnage sont obtenues par type de source plutôt que par lithologie, une méthodologie différente de celle présentée pour les métaux (voir section 5.9.5) doit être utilisée afin de déterminer une teneur pour chacune des sources d'émission de la modélisation.

Les sources doivent d'abord être regroupées par type d'activité. Les groupes de sources suivants ont été établis :

- Mine Canadian Malartic :
  - Érosion éolienne : les haldes actives et les piles d'entreposage;
  - Manutention : les déchargements, les chargements et les concasseurs mobile et saisonnier;
  - Routage : la resuspension liées à la circulation minière;
  - Sautage : les sautages;
  - Forage : les forages;
  - Boutage : les boutages;
  - Usine : les sources ponctuelles du traitement du minerai (par exemple : dépoussiéreur du concasseur);
  - Gaz de combustion : les chaudières et les gaz d'échappement des équipements miniers mobiles et localisés.
- Projet Odyssey :
  - Érosion éolienne : les piles d'entreposage à la surface;
  - Manutention : les déchargements et les chargements en surface;

- Routage : la resuspension liées à la circulation minière à la surface;
- Ventilation de la mine souterraine : les trois sorties d'air de ventilation de la mine souterraine dont les émissions sont estimées selon trois catégories :
  - Manutention : la manutention souterraine de matériau;
  - Gaz de combustion : gaz d'échappement des équipements miniers souterrains et le chauffage au gaz naturel.
  - Sautage : les sautages souterrains;
- Gaz de combustion : gaz d'échappement des équipements miniers mobiles et localisés utilisées en surface.

Puis, différents échantillons sont associés à chacun de ces groupes de sources en fonction de la localisation des échantillons et du type d'opération qu'ils représentent. Les tableaux 31 et 32 présentent cette association pour les sources de la mine Canadian Malartic et du projet Odyssey, respectivement.

Ensuite, la teneur de chaque groupe de sources est déterminée pour chaque taille de particule en combinant les échantillons qui lui sont associés. Pour les sources de la mine Canadian Malartic, ces teneurs sont présentées aux tableaux 33 et 34 pour les teneurs moyennes et maximales, respectivement.

Pour les sources du projet Odyssey, ces teneurs sont présentées aux tableaux 35 et 36 pour les teneurs moyennes et maximales, respectivement. Pour les particules totales, l'utilisation de la teneur pour les particules inférieures à 45 µm est utilisée.

La même méthode que pour les métaux (voir section 5.9.5) est utilisée pour le calcul des taux d'émission en silice cristalline. Le choix de l'utilisation des valeurs moyennes ou maximales dépend alors de la période du critère de qualité de l'air.

Les valeurs en gras représentent celles qui sont associées à un critère de qualité de l'air.

**Tableau 31 : Description des échantillons associés à chacun des groupes de sources d'émission modélisées – Mine Canadian Malartic**

| Échantillon | Description | Groupes de sources modélisées | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Érosion éolienne | Manutention | Routage | Sautage | Forage | Boutage | Usine | Gaz de combustion |
| SIL1 | Halde à stériles | x | x | | | | x | | Aucune émission de $SiO_2$ considérée |
| SIL2 | Forage 220-666 | | | | | x | | | |
| SIL3 | Forage 220-621 | | | | | x | | | |
| SIL4 | Sautage | | x | | x | | x | x | |
| SIL5 | Route non pavée : route 117 | | | x | | | | | |
| SIL6 | Route non pavée : route 640 | | | x | | | | | |
| SIL7 | Forage 210-751 | | | | | x | | | |
| SIL8 | Forage 210-750 | | | | | x | | | |
| SIL9 | Sautage 210-034 CGR | | x | | x | | x | x | |
| SIL10 | Sautage 210-034 AGR | | x | | x | | x | x | |

**Tableau 32 : Description des échantillons associés à chacun des groupes de sources d'émission modélisées – Projet Odyssey**

| Échantillon | Description | Groupes de sources modélisées | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Érosion éolienne | Manutention | Routage | Ventilation de la mine | | | Gaz de combustion |
| | | | | | Manutention | Gaz de combustion | Sautage | |
| SIL1 | Halde à stériles | x | x | | x | Aucune émission de $SiO_2$ considérée | | Aucune émission de $SiO_2$ considérée |
| SIL2 | Forage 220-666 | | | | x | | | |
| SIL3 | Forage 220-621 | | | | x | | | |
| SIL4 | Sautage | | x | | x | | x | |
| SIL5 | Route non pavée : route 117 | | | x | x | | | |
| SIL6 | Route non pavée : route 640 | | | x | x | | | |
| SIL7 | Forage 210-751 | | | | x | | | |
| SIL8 | Forage 210-750 | | | | x | | | |
| SIL9 | Sautage 210-034 CGR | | x | | x | | x | |
| SIL10 | Sautage 210-034 AGR | | x | | x | | x | |

**Tableau 33 : Teneur moyenne en silice cristalline en fonction de la taille de particules considérée pour chaque groupe de sources d'émission modélisées – Mine Canadian Malartic**

| Groupe de sources | Teneur moyenne en $SiO_2$ (en %) pour chaque taille de particule | | | |
|---|---|---|---|---|
| | < 2,5 µm | **< 4 µm** | < 10 µm | < 45 µm - PMT |
| Érosion éolienne | 2,99 | **4,26** | 6,85 | 15,01 |
| Manutention | 2,71 | **4,32** | 9,12 | 17,17 |
| Routage | 1,18 | **2,26** | 4,82 | 11,56 |
| Sautage | 2,62 | **4,34** | 9,88 | 17,89 |
| Forage | 5,82 | **9,36** | 14,80 | 14,01 |
| Bouteur | 2,71 | **4,32** | 9,12 | 17,17 |
| Usine | 2,62 | **4,34** | 9,88 | 17,89 |

**Tableau 34 : Teneur maximale en silice cristalline en fonction de la taille de particules considérée pour chaque groupe de sources d'émission modélisées – Mine Canadian Malartic**

| Groupe de sources | Teneur maximale en $SiO_2$ (en %) pour chaque taille de particule | | | |
|---|---|---|---|---|
| | < 2,5 µm | < 4 µm | **< 10 µm** | < 45 µm - PMT |
| Érosion éolienne | 2,99 | 4,26 | **6,85** | 15,01 |
| Manutention | 4,77 | 6,99 | **14,75** | 23,89 |
| Routage | 1,32 | 2,48 | **5,96** | 14,41 |
| Sautage | 4,77 | 6,99 | **14,75** | 23,89 |
| Forage | 10,21 | 16,37 | **25,16** | 21,71 |
| Bouteur | 4,77 | 6,99 | **14,75** | 23,89 |
| Usine | 4,77 | 6,99 | **14,75** | 23,89 |

**Tableau 35 : Teneur moyenne en silice cristalline en fonction de la taille de particules considérée pour chaque groupe de sources d'émission modélisées – Projet Odyssey**

| Groupe de sources | Teneur moyenne en $SiO_2$ (en %) pour chaque taille de particule | | | |
|---|---|---|---|---|
| | < 2,5 µm | **< 4 µm** | < 10 µm | < 45 µm - PMT |
| Érosion éolienne | 2,99 | **4,26** | 6,85 | 15,01 |
| Manutention | 2,71 | **4,32** | 9,12 | 17,17 |
| Routage | 1,18 | **2,26** | 4,82 | 11,56 |
| Ventilation : Manutention | 3,65 | **5,92** | 10,53 | 14,78 |
| Ventilation : Sautage | 2,62 | **4,34** | 9,88 | 17,89 |

**Tableau 36 : Teneur maximale en silice cristalline en fonction de la taille de particules considérée pour chaque groupe de sources d'émission modélisées – Projet Odyssey**

| Groupe de sources | Teneur maximale en $SiO_2$ (en %) pour chaque taille de particule | | | |
|---|---|---|---|---|
| | < 2,5 µm | < 4 µm | **< 10 µm** | < 45 µm – PMT |
| Érosion éolienne | 2,99 | 4,26 | **6,85** | 15,01 |
| Manutention | 4,77 | 6,99 | **14,75** | 23,89 |
| Routage | 1,32 | 2,48 | **5,96** | 14,41 |
| Ventilation : Manutention | 10,21 | 16,37 | **25,16** | 23,89 |
| Ventilation : Sautage | 4,77 | 6,99 | **14,75** | 23,89 |

# 6 RÉSULTATS DE MODÉLISATION

Les sections qui suivent présentent les résultats de la modélisation réalisée pour les scénarios de modélisation et leurs variantes. Afin de comparer les concentrations modélisées aux normes et critères en vigueur pour chacune des substances, celles-ci sont additionnées aux concentrations initiales applicables dans le secteur. **Il est important de prendre note que les concentrations totales présentées dans cette section ne représentent pas des concentrations réelles mesurées, mais plutôt des concentrations obtenues par la simulation des activités planifiées par MCM et le projet Odyssey.** Ces concentrations modélisées doivent être interprétées selon le conservatisme et les limitations de la méthode de modélisation, lesquels sont décrits à la section 7.

Les cartes illustrent les courbes d'isoconcentration associées aux résultats. Les données chiffrées apparaissant sur ces cartes correspondent à la contribution des opérations du complexe minier seulement. La couleur des courbes indique si les concentrations totales, incluant les concentrations initiales, dépassent ou non les normes et critères de qualité de l'atmosphère. Les courbes présentées illustrent la concentration maximale calculée à chaque récepteur pour la période et l'ensemble des années météorologiques modélisés. Ainsi, il faut noter que ces maximums présentés pour chacun des points de calcul considérés ne se produisent pas nécessairement au cours de la même heure, de la même journée ou de la même année.

En somme, **les courbes d'isoconcentration présentent des situations hypothétiques où les conditions de dispersion les plus défavorables sont combinées simultanément sur la même carte**. Ces courbes, exigées par le MELCC, permettent néanmoins de bien visualiser pour une zone donnée du domaine de modélisation la concentration maximale des cinq années météorologiques considérées.

Les tableaux de résultats de la modélisation sont présentés à l'annexe A-3. Pour chacun des scénarios et des variantes, les résultats sont présentés en deux volets, soit pour les valeurs maximales dans le domaine d'application des normes et critères pour les valeurs maximales aux récepteurs sensibles. Les cartes de résultats sont, quant à elles, présentées à l'annexe B.

## 6.1 SCÉNARIO 1

### 6.1.1 *SCÉNARIO 1 DE BASE*

Les tableaux de résultats de la modélisation pour le scénario 1 de base sont présentés au tableau A-3-1 pour le domaine d'application des normes et critères et au tableau A-3-2 pour les récepteurs sensibles, alors que les cartes de résultats sont à l'annexe B-2. De plus, afin de mettre ces résultats en perspective, les résultats pour la variante du scénario 1 sans Odyssey sont également présentés pour certains composés d'importance.

#### *6.1.1.1 PARTICULES TOTALES*

Les concentrations de particules totales modélisées dépassent la norme 24 heures pour le scénario modélisé à la fois dans le domaine d'application et aux récepteurs sensibles.

La concentration totale maximale de particules totales modélisées dans le domaine d'application est de 227 µg/m$^3$, en considérant la concentration initiale, soit 189 % de la norme 24 heures. Ce maximum survient dans le secteur à l'ouest du concasseur primaire. Des dépassements sont également modélisés au nord des fosses. Néanmoins, aucun dépassement n'est modélisé directement au nord du secteur Odyssey. Aux récepteurs sensibles, la concentration totale maximale de particules totales modélisées est de 174 µg/m$^3$, soit 145 % de la norme. Ce maximum se produit dans le secteur résidentiel au nord du site, soit dans la ville de Malartic. Pour les autres catégories de récepteurs sensibles, les résultats montrent un respect de la norme en tout temps. Les courbes d'isoconcentration sont illustrées à la carte B-2-3.

Ces concentrations modélisées ne découlent que partiellement des activités du projet Odyssey. Afin de mettre ces résultats en perspective, les concentrations de particules totales ont été compilées pour la variante du scénario 1 sans

Odyssey. Pour cette variante, les concentrations modélisées montrent un portrait similaire au précédent et il est identifié que les opérations du projet Odyssey contribuent à une augmentation de moins de 4 % de la concentration maximale à la limite d'application. Aux récepteurs sensibles, les opérations du projet Odyssey contribuent seulement à une augmentation de moins de 1 % des concentrations maximales. Les courbes d'isoconcentration sont illustrées à la carte B-2-4.

Dans le secteur résidentiel au nord du site, les dépassements de la norme représentent au plus 4 jours par année, et ce, autant pour les scénarios avec et sans Odyssey. Le projet Odyssey ne contribue donc pas à l'augmentation des fréquences de dépassements aux récepteurs sensibles.

En raison des dépassements modélisés, les concentrations modélisées de particules totales sont présentées à la section 6.1.2 selon l'application du scénario 1 optimisé.

#### 6.1.1.2 PARTICULES FINES

Les concentrations de particules fines modélisées dépassent la norme 24 heures pour le scénario modélisé dans le domaine d'application. La norme est cependant respectée pour l'ensemble des récepteurs sensibles.

La concentration totale maximale de particules fines modélisées dans le domaine d'application est de 51,6 µg/m$^3$, en considérant la concentration initiale, soit 172 % de la norme 24 heures. Ce maximum survient dans le secteur à l'ouest du concasseur primaire. Un dépassement de faible ampleur survient également au nord du concasseur saisonnier. Il est important de noter qu'il s'agit de secteurs en territoire public. Aux récepteurs sensibles, la concentration totale maximale de particules fines modélisées est de 26,5 µg/m$^3$, en considérant la concentration initiale. Ce qui représente 88 % de la norme. Ce maximum se produit dans le secteur résidentiel au nord du site, soit dans la ville de Malartic. Les courbes d'isoconcentration sont illustrées à la carte B-2-5.

Pour la variante du scénario 1 sans Odyssey, les concentrations modélisées montrent un portrait similaire au précédent et il est identifié que les opérations du projet Odyssey contribuent à une augmentation d'environ 4 % de la concentration maximale à la limite d'application. Aux récepteurs sensibles, les opérations du projet Odyssey contribuent seulement à une augmentation d'environ 1 % des concentrations maximales. Les courbes d'isoconcentration sont illustrées à la carte B-2-6.

En raison des dépassements modélisés, bien que ceux-ci soient limités à des territoires publics sans atteindre de récepteurs sensibles, les concentrations modélisées de particules fines sont présentées à la section 6.1.2 selon l'application du scénario 1 optimisé.

#### 6.1.1.3 MONOXYDE DE CARBONE

Les concentrations de monoxyde de carbone modélisées sont conformes aux normes 1 heure et 8 heures pour le scénario modélisé.

La concentration totale maximale de monoxyde de carbone modélisée dans le domaine d'application représente 30 % et 21 % des normes 1 heure et 8 heures, respectivement. Aux récepteurs sensibles, les concentrations modélisées représentent 10 % et 14 % des normes 1 heure et 8 heures, respectivement. En raison des faibles concentrations modélisées pour le monoxyde de carbone, les courbes d'isoconcentration n'ont pas été cartographiées.

#### 6.1.1.4 DIOXYDE D'AZOTE

Les concentrations de dioxyde d'azote modélisées présentent des dépassements dans le domaine d'application des normes 1 heure et 24 heures établies par le MELCC, mais sont conformes à la norme annuelle. Les normes sont cependant respectées pour l'ensemble des récepteurs sensibles, et ce, pour toutes les périodes.

En raison des dépassements modélisés, bien que ceux-ci soient limités à des territoires publics sans atteindre de récepteurs sensibles, les concentrations modélisées de dioxyde d'azote sont présentées à la section 6.1.2 selon l'application du scénario 1 optimisé.

#### PÉRIODE DE 1 HEURE

Dans le domaine d'application, la concentration totale maximale de dioxyde d'azote modélisée sur une période de 1 heure est de 621 µg/m$^3$, en considérant la concentration initiale, soit 150 % de la norme. Ce maximum survient à la limite d'application au nord du secteur Odyssey. Aux récepteurs sensibles, la concentration maximale modélisée est de 271 µg/m$^3$, en considérant la concentration initiale. Ce qui représente 65 % de la norme. Les courbes d'isoconcentration pour la période 1 heure sont illustrées à la carte B-2-7.

Pour la variante du scénario 1 sans Odyssey, les résultats montrent un respect de la norme 1 heure pour tout le domaine d'application. Les dépassements modélisés précédemment à la limite d'application au nord du secteur Odyssey sont donc principalement causés par les opérations du projet Odyssey. Il s'agit néanmoins de dépassements de faible ampleur limités à moins de 300 m de la limite d'application. De plus, il convient de rappeler qu'il s'agit d'un secteur en territoire public où aucun récepteur sensible n'est localisé. Aux récepteurs sensibles, il est identifié que les opérations du projet Odyssey contribuent à une augmentation d'environ 4 % des concentrations maximales. Les courbes d'isoconcentration sont illustrées à la carte B-2-8.

#### PÉRIODE DE 24 HEURES

Dans le domaine d'application, la concentration totale maximale de dioxyde d'azote modélisée sur une période de 24 heures est de 216 µg/m$^3$, en considérant la concentration initiale, soit 105 % de la norme. Ce dépassement survient dans le secteur à l'ouest du concasseur primaire et celui-ci se produit uniquement une journée pour l'ensemble des cinq années de modélisation. Aux récepteurs sensibles, la concentration maximale modélisée est de 140 µg/m$^3$, en considérant la concentration initiale. Ce qui représente 68 % de la norme. Les courbes d'isoconcentration pour la période 24 heures sont illustrées à la carte B-2-9.

Pour la variante du scénario 1 sans Odyssey, les concentrations modélisées montrent un portrait similaire au précédent et il est identifié que les opérations du projet Odyssey contribuent à une augmentation d'environ 3 % de la concentration maximale. Il s'agit néanmoins d'un dépassement de faible ampleur limité à environ 75 m de la limite d'application. De plus, il convient de rappeler qu'il s'agit d'un secteur en territoire public où aucun récepteur sensible n'est localisé. Aux récepteurs sensibles, il est identifié que les opérations du projet Odyssey contribuent donc à une augmentation d'environ 3 % des concentrations maximales. Les courbes d'isoconcentration sont illustrées à la carte B-2-10.

#### PÉRIODE ANNUELLE

Les concentrations totales maximales de dioxyde d'azote modélisées sur une période annuelle représentent, respectivement, 39 % et 32 % de la norme pour le domaine d'application et les récepteurs sensibles.

En raison des faibles concentrations modélisées, les courbes d'isoconcentration pour la période annuelle n'ont pas été cartographiées.

### *6.1.1.5 DIOXYDE DE SOUFRE*

Les concentrations de dioxyde de soufre modélisées respectent les normes établies par le MELCC pour toutes les périodes dans le domaine d'application et aux récepteurs sensibles. Les concentrations maximales représentent 15%, 39 %, 20 % et 39 % des normes 4 minutes (1$^{er}$ maximum et 99,5$^{e}$ centile), 24 heures et annuelle, respectivement. En raison des faibles concentrations modélisées pour le dioxyde de soufre, les courbes d'isoconcentration n'ont pas été cartographiées.

### *6.1.1.6 MÉTAUX ET MÉTALLOÏDES*

Les concentrations modélisées de tous les métaux et métalloïdes considérés respectent les normes et critères établis par le MELCC à l'exception du critère annuel sur le manganèse, de la norme 24 heures sur le nickel et des critères 1 heure et annuel de la silice cristalline. Les résultats de ces composés sont donc discutés plus en détail ci-dessous.

De plus, en raison des dépassements modélisés, les concentrations modélisées pour ces composés sont présentées à la section 6.1.2 selon l'application du scénario 1 optimisé.

## MANGANÈSE

Dans le domaine d'application, la concentration totale maximale de manganèse modélisée sur une période annuelle est de 0,0254 µg/m$^3$, soit 101 % du critère. Ces dépassements sont modélisés au nord des fosses. Aux récepteurs sensibles, la concentration maximale modélisée représente 98 % du critère. Ce maximum se produit au secteur résidentiel au nord du site, dans la ville de Malartic. Pour les autres catégories de récepteurs sensibles, les résultats montrent un respect du critère. Les courbes d'isoconcentration pour la période annuelle sont illustrées à la carte B-2-11.

Pour la variante du scénario 1 sans Odyssey, les concentrations modélisées montrent un portrait similaire au précédent et il est identifié que les opérations du projet Odyssey contribuent à une augmentation d'environ 1 % des concentrations maximales. Les courbes d'isoconcentration sont illustrées à la carte B-2-12.

Il est important de noter que la concentration initiale considérée (0,02 µg/m$^3$) représente à elle seule 80 % du critère. Celle-ci provient du document du MELCC applicable à tout le territoire québécois (MELCC, 2018). Or, dans le guide d'instruction minier (MDDELCC, 2017a), le MELCC suggère des concentrations initiales pour les projets miniers nordiques éloignés des autres sources d'émission. Cette concentration suggérée pour le manganèse est de 0,005 µg/m$^3$, ce qui porterait les concentrations modélisées à 41% et 38 % du critère au domaine d'application et aux récepteurs sensibles, respectivement, assurant ainsi le respect du critère pour tout le domaine d'application.

## NICKEL

Dans le domaine d'application, la concentration totale maximale de nickel modélisée sur une période 24 heures est de 0,0237 µg/m$^3$, soit 169 % de la norme. Ce maximum survient dans le secteur à l'ouest du concasseur primaire. Il s'agit d'ailleurs du seul secteur où des dépassements sont modélisés. Il convient de rappeler qu'il s'agit d'un secteur en territoire public. Aux récepteurs sensibles, la concentration maximale modélisée représente 73 % de la norme. Les résultats montrent donc un respect de la norme en tout temps aux récepteurs sensibles. Les courbes d'isoconcentration pour la période 24 heures sont illustrées à la carte B-2-13.

Pour la variante du scénario 1 sans Odyssey, les concentrations modélisées montrent un portrait similaire au précédent et il est identifié que les opérations du projet Odyssey contribuent à une augmentation d'environ 6 % des concentrations maximales. Les courbes d'isoconcentration sont illustrées à la carte B-2-14.

## SILICE CRISTALLINE

Les résultats de la modélisation montrent que les concentrations susceptibles d'être rencontrées dans l'air ambiant dans le domaine d'application dépassent les deux critères du MELCC pour la silice cristalline.

Pour le critère horaire, des dépassements sont modélisés dans les secteurs à l'ouest du concasseur primaire, au nord des fosses et au nord du secteur Odyssey. La concentration totale maximale, modélisée au nord du concasseur saisonnier, représente 242 % du critère horaire. La principale source contributrice à cette concentration maximale est l'opération des différents équipements du concasseur saisonnier. La contribution des sources du projet Odyssey est inférieure à 1 % pour ces événements. Au nord du secteur Odyssey, un dépassement de faible ampleur est modélisé et la principale source contributrice est alors la ventilation de la mine souterraine, dont les sautages souterrains. Ces résultats doivent donc être interprétés selon l'incertitude et le conservatisme discutés à la section 7.2.2. Aux récepteurs sensibles, les résultats montrent un respect du critère en tout temps et la concentration maximale y représente 76 % du critère. Les courbes d'isoconcentration sont illustrées à la carte B-2-15.

Pour la variante du scénario 1 sans Odyssey, les concentrations modélisées montrent un portrait similaire au précédent et il est alors identifié que les opérations du projet Odyssey contribuent faiblement à l'augmentation des concentrations maximales pour les secteurs à l'ouest du concasseur primaire, au nord des fosses et du concasseur saisonnier. Cependant, pour le secteur au nord du secteur Odyssey, les opérations du projet Odyssey contribuent majoritairement aux dépassements. Il convient de rappeler qu'il s'agit d'un secteur en territoire public. Les courbes d'isoconcentration sont illustrées à la carte B-2-16.

Pour le critère annuel, des dépassements sont modélisés dans plusieurs secteurs aux alentours du site minier. Aux récepteurs sensibles, les résultats montrent des dépassements pour les récepteurs situés dans la ville de Malartic. Pour les autres récepteurs sensibles, les résultats montrent un respect du critère. Les courbes d'isoconcentration sont illustrées à la carte B-2-17.

Pour la variante du scénario 1 sans Odyssey, les concentrations modélisées montrent un portrait similaire au précédent et il est identifié que les opérations du projet Odyssey contribuent à une augmentation d'environ 4 % de la concentration maximale. Pour le secteur directement au nord du secteur Odyssey, des dépassements supplémentaires sont observés. Les opérations du projet Odyssey y contribuent majoritairement. Les courbes d'isoconcentration sont illustrées à la carte B-2-16.

#### *6.1.1.7 CONTRIBUTION ODYSSEY*

Les résultats de modélisation du scénario 1 de base présentés précédemment correspondent à l'opération prévue du projet Odyssey et de la mine Canadian Malartic simultanément. À la limite d'application, les résultats présentent un respect de l'ensemble des normes et critères considéré à l'exception des particules totales, des particules fines, du dioxyde d'azote (1 heure et 24 heures), du manganèse, du nickel et de la silice cristalline.

Comme discuté précédemment, ces concentrations modélisées ne proviennent pas uniquement de l'opération du projet Odyssey, mais proviennent également de l'opération de la mine Canadian Malartic et les résultats de la variante du scénario sans Odyssey ont alors été présentés pour ces composés d'importance. Or, afin de mettre en évidence la contribution du projet Odyssey, les résultats de modélisation sont repris et présentés d'une nouvelle façon pour ces composés.

Ainsi, l'augmentation des maximums modélisés par l'ajout des opérations du projet Odyssey est présentée aux cartes B-2-19 à B-2-22 pour les particules totales, les particules fines et le dioxyde d'azote. Cette augmentation est obtenue par la différence des maximums modélisés pour le scénario 1 avec et sans Odyssey, et ce, à chacun des récepteurs. C'est-à-dire que pour quantifier l'augmentation de la concentration maximale à un récepteur donné, le maximum de chacun des deux scénarios est comparé et ceux-ci peuvent survenir à des heures ou des journées différentes.

Il est important de mentionner que cette méthode de présentation des résultats ne constitue pas une exigence réglementaire. En fait, les concentrations présentées sur les cartes ne peuvent être directement comparées aux normes de qualité de l'atmosphère dans un contexte de conformité. Néanmoins, cette méthode permet de mettre en perspective les résultats de modélisation liés à l'opération prévue du projet Odyssey.

Ceci dit, ces cartes mettent en évidence que l'augmentation des concentrations liées aux opérations du projet Odyssey est principalement située au nord du secteur Odyssey. Ce secteur correspond à un territoire public où aucun récepteur sensible n'a été identifié.

### 6.1.2 *SCÉNARIO 1 OPTIMISÉ*

Dans le but de présenter un scénario alternatif d'opération permettant de s'assurer au maximum le respect des normes et critères du MELCC, une fluctuation des activités de manipulation de stériles et de minerai et un arrêt occasionnel du forage et du boutage ont été appliqués. Aucune fluctuation n'est considérée pour les opérations souterraines du projet Odyssey.

Les résultats de la modélisation indiquent que pour éliminer au maximum les dépassements de particules, il faut réduire le tonnage manipulé sur l'ensemble du site 37 % du temps, arrêter les opérations de boutage et de forage 11 % du temps et également restreindre plusieurs sautages, et ce, en plus de ceux déjà annulés lorsque le vent souffle en direction de la ville de Malartic. Théoriquement, le tonnage annuel effectif découlant des résultats de la modélisation passe donc de 60 Mt à 50 Mt, soit 84 % du tonnage modélisé au scénario 1. La séquence d'opération optimisée selon la modélisation est présentée au tableau 37. Or, tel que présenté dans le cadre de la modélisation 2015, le modèle ne reflète pas adéquatement la réalité locale. Par exemple, en 2016 et en 2017, les tonnages annuels extraits ont été d'environ 63 Mt et 67 Mt respectivement, alors qu'aucun dépassement de norme directement occasionné par les opérations de MCM n'a été mesuré. Ceci démontre clairement que tout en respectant les normes de qualité de l'atmosphère, CMGP est en mesure d'opérer à des capacités plus importantes que celles prédites par le modèle de dispersion.

De plus, ces restrictions d'opération ne proviennent pas entièrement des activités du projet Odyssey. Afin de mettre ces résultats en perspective, le scénario optimisé a également été compilé pour la variante du scénario 1 sans Odyssey. En comparant la séquence de restriction, il est possible de déduire que l'ajout du projet Odyssey augmente

les arrêts requis pendant seulement 1 % du temps, soit, plus précisément, 78 heures par année. De plus, aucun arrêt supplémentaire du sautage n'est requis par l'ajout du projet Odyssey.

Les tableaux de résultats de la modélisation pour ce scénario alternatif sont présentés au tableau A-3-3 pour le domaine d'application des normes et critères et au tableau A-3-4 pour les récepteurs sensibles. Les cartes de résultats sont, quant à elles, présentées à l'annexe B-3, pour les particules totales, les particules fines, le dioxyde d'azote, le manganèse, le nickel et la silice cristalline, respectivement.

**Tableau 37 : Séquence d'opération optimale selon la modélisation – Scénario 1 optimisé**

| Pourcentage du tonnage prévu manipulé considéré (%) | Nombre heures simulées dans le modèle | | Pourcentage des heures totales simulées (%) | |
|---|---|---|---|---|
| | Pour les cinq années météorologiques de modélisation | Moyen par année | | |
| 100% (sans arrêt de manipulation du tonnage) | 27 495 | 5 496 | 63% | |
| 90% | 1 693 | 338 | 4% | 37% |
| 80% | 2 112 | 422 | 5% | |
| 70% | 2 829 | 565 | 6% | |
| 60% | 2 572 | 514 | 6% | |
| 50% | 2 085 | 417 | 5% | |
| 40% | 1 947 | 389 | 4% | |
| 30% | 1 308 | 261 | 3% | |
| 20% | 662 | 132 | 2% | |
| 10% | 237 | 47 | 1% | |
| 0% | 884 | 177 | 2% | |
| Arrêt complet forage et boutage (indépendamment du tonnage manipulé) | 4 681 | 936 | 11% | |

### 6.1.2.1 PARTICULES TOTALES

Dans l'application du scénario optimisé, les concentrations de particules totales modélisées respectent la norme 24 heures à la fois dans le domaine d'application et aux récepteurs sensibles. Les courbes d'isoconcentration sont illustrées à la carte B-3-1.

### 6.1.2.2 PARTICULES FINES

Dans l'application du scénario optimisé, les concentrations de particules fines modélisées respectent la norme 24 heures à la fois dans le domaine d'application et aux récepteurs sensibles. Les courbes d'isoconcentration sont illustrées à la carte B-3-2.

### 6.1.2.3 DIOXYDE D'AZOTE

Dans l'application du scénario optimisé, les concentrations de dioxyde d'azote modélisées respectent les normes 1 heure, 24 heures et annuelle aux récepteurs sensibles. Dans le domaine de modélisation, des dépassements sont toujours modélisés au nord du secteur Odyssey pour la norme 1 heure, mais la norme 24 heures est maintenant respectée. Il convient de rappeler qu'il s'agit néanmoins de dépassements de faible ampleur limités à moins de

300 m de la limite d'application et que celui-ci est situé dans un secteur en territoire public où aucun récepteur sensible n'est localisé. Les courbes d'isoconcentration sont illustrées aux cartes B-3-3 et B-3-4 pour les périodes 1 heure et 24 heures.

#### 6.1.2.4 MÉTAUX ET MÉTALLOÏDES

En ce qui concerne les dépassements de métaux susceptibles d'être observés en mode d'exploitation normal (scénario 1), les résultats de métaux ont été repris à partir de la même séquence d'altération des opérations nécessaires pour respecter en tout temps les normes de particules.

Pour le cas du manganèse et du nickel, la séquence d'altération des opérations permet indirectement d'éliminer tous les dépassements. Les normes sont alors respectées dans tout le domaine d'application et aux récepteurs sensibles. Les courbes d'isoconcentration sont illustrées aux cartes B-3-5 et B-3-6, pour le manganèse et le nickel, respectivement.

Pour le cas du critère horaire de la silice cristalline, la séquence d'altération des opérations permet indirectement d'éliminer les dépassements dans le secteur à l'ouest du concasseur primaire. Pour ce qui est des dépassements au nord du secteur Odyssey, ceux-ci sont toujours observés. En effet, les sources de ventilation de la mine souterraine contribuent majoritairement à ces dépassements et ces sources ne sont pas altérées dans le scénario d'optimisation. Il convient néanmoins de rappeler qu'il s'agit d'un secteur en territoire public où aucun récepteur sensible n'est localisé. Les courbes d'isoconcentration sont illustrées à la carte B-3-7 pour le critère horaire de la silice cristalline.

Pour le cas du critère annuel de la silice cristalline, la séquence d'altération des opérations permet indirectement de réduire de façon importante les concentrations modélisées. La réduction des concentrations totales maximales représente plus de 20 %, et ce, autant à la limite d'application qu'aux récepteurs sensibles. Néanmoins, les dépassements sont toujours modélisés. Les courbes d'isoconcentration sont illustrées à la carte B-3-8 pour le critère annuel de la silice cristalline.

À titre indicatif, les courbes d'isoconcentration pour le scénario 1 optimisé sans Odyssey sont illustrées à la carte B-3-9 pour le critère annuel. Les concentrations modélisées montrent alors un portrait similaire au scénario avec Odyssey et il est alors identifié que les opérations du projet Odyssey contribuent faiblement à l'augmentation des concentrations maximales, et ce, en particulier pour les récepteurs sensibles. Par exemple, au secteur résidentiel au nord du site, il est identifié que les opérations du projet Odyssey contribuent à une augmentation d'environ 0,4 % des concentrations maximales.

## 6.2 SCÉNARIO 2

### 6.2.1 SCÉNARIO 2 DE BASE

Les tableaux de résultats de la modélisation pour le scénario 2 de base sont présentés au tableau A-3-5 pour le domaine d'application des normes et critères et au tableau A-3-6 pour les récepteurs sensibles. Les cartes de résultats sont, quant à elles, présentées à l'annexe B-4.

#### 6.2.1.1 PARTICULES TOTALES

Les concentrations de particules totales modélisées dépassent la norme 24 heures pour le scénario modélisé dans le domaine d'application. La norme est cependant respectée pour l'ensemble des récepteurs sensibles.

La concentration totale maximale de particules totales modélisées dans le domaine d'application est de 120 µg/m$^3$, soit 100 % de la norme 24 heures. Ce maximum survient dans le secteur à l'ouest du concasseur primaire et celui-ci se produit uniquement pendant une journée pour l'ensemble des cinq années de modélisation. Il s'agit d'ailleurs du seul secteur où un dépassement est modélisé et ce dépassement de faible ampleur se retrouve à moins de 50 m de la limite d'application. De plus, il est important de rappeler qu'il s'agit d'un secteur en territoire public.

Aux récepteurs sensibles, la concentration totale maximale de particules totales modélisées est de 64 µg/m$^3$, soit 53 % de la norme. Ce maximum se produit au secteur résidentiel au nord du site, dans la ville de Malartic. Les résultats montrent donc un respect de la norme en tout temps pour tous les récepteurs sensibles. Les courbes d'isoconcentration sont illustrées à la carte B-4-3.

Afin de mettre ces résultats en perspective, les concentrations de particules totales ont été comparées aux résultats de la modélisation pour le scénario 1 sans Odyssey. En effet, ce scénario peut être interprété comme un scénario de référence montrant une situation avant la mise en exploitation du projet Odyssey. La comparaison des résultats montre que les concentrations de particules totales attendues lors de l'exploitation maximale du projet Odyssey seront inférieures aux concentrations attendues en 2024. En particulier, au secteur résidentiel au nord du site, les concentrations totales maximales modélisées seraient réduites de près de 65% par rapport au scénario de référence.

En raison du dépassement modélisé, bien que celui-ci soit limité à des territoires publics sans atteindre de récepteurs sensibles, les concentrations modélisées de particules totales sont présentées à la section 6.2.2 selon l'application du scénario 2 optimisé.

#### *6.2.1.2 PARTICULES FINES*

Les concentrations de particules fines modélisées dépassent la norme 24 heures pour le scénario modélisé dans le domaine d'application. La norme est cependant respectée pour l'ensemble des récepteurs sensibles.

La concentration totale maximale de particules fines modélisées dans le domaine d'application est de 37,2 µg/m$^3$ soit 124 % de la norme 24 heures. Ce maximum survient au nord du secteur Odyssey. En comparaison avec le scénario 1, ce secteur présente une augmentation des concentrations de particules fines. Néanmoins, les dépassements se retrouvent à moins de 200 m de la limite d'application et n'atteignent aucun récepteur sensible. Des dépassements de faible ampleur sont également modélisés au secteur à l'ouest du concasseur primaire.

Aux récepteurs sensibles, la concentration totale maximale de particules fines modélisées est de 18,4 µg/m$^3$, en considérant la concentration initiale. Ce qui représente 61 % de la norme. Ce maximum se produit au secteur résidentiel au nord du site, soit dans la ville de Malartic. Les courbes d'isoconcentration sont illustrées à la carte B-4-4.

En comparaison avec le scénario de référence (scénario 1 sans Odyssey), les résultats montrent que les concentrations de particules fines attendues lors de l'exploitation maximale du projet Odyssey seront inférieures aux concentrations attendues en 2024. En particulier, au secteur résidentiel au nord du site, les concentrations totales maximales modélisées seraient réduites d'environ 31% par rapport au scénario de référence.

En raison des dépassements modélisés, bien que ceux-ci soient limités à des territoires publics sans atteindre de récepteurs sensibles, les concentrations modélisées de particules totales sont présentées à la section 6.2.2 selon l'application du scénario 2 optimisé.

#### *6.2.1.3 MONOXYDE DE CARBONE*

Les concentrations de monoxyde de carbone modélisées sont conformes aux normes 1 heure et 8 heures pour le scénario modélisé.

La concentration totale maximale de monoxyde de carbone modélisée dans le domaine d'application représente 33 % et 22 % des normes 1 heure et 8 heures, respectivement. Les concentrations maximales sont modélisées au nord du secteur Odyssey. Aux récepteurs sensibles, les concentrations modélisées représentent 9 % et 14 % des normes 1 heure et 8 heures, respectivement. En raison des faibles concentrations modélisées pour le monoxyde de carbone, les courbes d'isoconcentration n'ont pas été cartographiées.

#### *6.2.1.4 DIOXYDE D'AZOTE*

Les concentrations de dioxyde d'azote modélisées présentent des dépassements dans le domaine d'application des normes 1 heure et 24 heures établies par le MELCC, mais sont conformes à la norme annuelle. Les normes sont cependant respectées pour l'ensemble des récepteurs sensibles, et ce, pour toutes les périodes.

En raison des dépassements modélisés, bien que ceux-ci soient limités à des territoires publics sans atteindre de récepteurs sensibles, les concentrations modélisées de dioxyde d'azote sont présentées à la section 6.2.2 selon l'application du scénario 2 optimisé.

#### PÉRIODE DE 1 HEURE

Dans le domaine d'application, la concentration totale maximale de dioxyde d'azote modélisée sur une période de 1 heure est de 1 022 µg/m$^3$, soit 247 % de la norme. Ce maximum survient à la limite d'application au nord du secteur Odyssey. Il s'agit d'une augmentation des concentrations modélisées pour ce secteur. Néanmoins, les dépassements modélisés demeurent à proximité du site sans atteindre les récepteurs sensibles. Aux récepteurs sensibles, la concentration maximale modélisée est de 265 µg/m$^3$, soit 64 % de la norme. Les courbes d'isoconcentration pour la période 1 heure sont illustrées à la carte B-4-5.

#### PÉRIODE DE 24 HEURES

Dans le domaine d'application, la concentration totale maximale de dioxyde d'azote modélisée sur une période de 24 heures est de 221 µg/m$^3$, soit 107 % de la norme. Ce dépassement survient au nord du secteur Odyssey celui-ci se produit aux plus deux journées par année. Aux récepteurs sensibles, la concentration maximale modélisée est de 64 µg/m$^3$, soit 31 % de la norme. Les courbes d'isoconcentration pour la période 24 heures sont illustrées à la carte B-4-6.

#### PÉRIODE ANNUELLE

Les concentrations totales maximales de dioxyde d'azote modélisées sur une période annuelle représentent, respectivement, 50 % et 16 % de la norme pour le domaine d'application et les récepteurs sensibles.

En raison des faibles concentrations modélisées, les courbes d'isoconcentration pour la période annuelle n'ont pas été cartographiées.

### *6.2.1.5 DIOXYDE DE SOUFRE*

Les concentrations de dioxyde de soufre modélisées respectent les normes établies par le MELCC pour toutes les périodes dans le domaine d'application et aux récepteurs sensibles. Les concentrations maximales représentent 15%, 42 %, 21 % et 39 % des normes 4 minutes (1$^{er}$ maximum et 99,5$^{e}$ centile), 24 heures et annuelle, respectivement. En raison des faibles concentrations modélisées pour le dioxyde de soufre, les courbes d'isoconcentration n'ont pas été cartographiées.

### *6.2.1.6 MÉTAUX ET MÉTALLOÏDES*

Les concentrations modélisées de tous les métaux et métalloïdes considérés respectent les normes et critères établis par le MELCC à l'exception de la norme 24 heures sur le nickel et des critères 1 heure et annuel de la silice cristalline. Contrairement aux résultats du scénario 1, les résultats du scénario 2 montrent un respect du critère de manganèse. Les résultats de ces composés sont donc discutés plus en détail ci-dessous.

De plus, en raison des dépassements modélisés, les concentrations modélisées pour ces composés sont présentées à la section 6.2.2 selon l'application du scénario 2 optimisé.

#### MANGANÈSE

Dans le domaine d'application, la concentration totale maximale de manganèse modélisée sur une période annuelle est de 0,0246 µg/m$^3$, soit 98 % du critère. Aux récepteurs sensibles, la concentration maximale modélisée représente 88 % du critère. Les courbes d'isoconcentration pour la période annuelle sont illustrées à la carte B-4-7.

En comparaison avec le scénario de référence (scénario 1 sans Odyssey), les résultats montrent que les concentrations de manganèse attendues lors de l'exploitation maximale du projet Odyssey seront inférieures aux concentrations attendues en 2024. En particulier, au secteur résidentiel au nord du site, les concentrations totales maximales modélisées seraient réduites d'environ 10 % par rapport au scénario de référence.

Il convient de rappeler, comme discuté à la section 6.1.1.6, que la concentration initiale considérée représente à elle seule 80 % du critère. L'utilisation de la concentration initiale recommandée par le MELCC pour les projets miniers

nordiques éloignés des autres sources d'émission porterait les concentrations modélisées à 38% et 28 % du critère au domaine d'application et aux récepteurs sensibles, respectivement.

#### NICKEL

Dans le domaine d'application, la concentration totale maximale de nickel modélisée sur une période 24 heures est de 0,0169 µg/m$^3$, soit 121 % de la norme. Ce maximum survient dans le secteur à l'ouest du concasseur primaire. Il s'agit d'ailleurs du seul secteur où des dépassements sont modélisés et que ceux-ci surviennent uniquement deux journées pour l'ensemble des cinq années de modélisation. Il faut également rappeler qu'il s'agit d'un secteur en territoire public. Aux récepteurs sensibles, la concentration maximale modélisée représente 45 % de la norme. Les résultats montrent donc un respect de la norme en tout temps aux récepteurs sensibles. Les courbes d'isoconcentration pour la période 24 heures sont illustrées à la carte B-4-8.

En comparaison avec le scénario de référence (scénario 1 sans Odyssey), les résultats montrent que les concentrations de nickel attendues lors de l'exploitation maximale du projet Odyssey seront inférieures aux concentrations attendues en 2024. En particulier, au secteur résidentiel au nord du site, les concentrations totales maximales modélisées seraient réduites d'environ 40 % par rapport au scénario de référence.

#### SILICE CRISTALLINE

Les résultats de la modélisation montrent que les concentrations susceptibles d'être rencontrées dans l'air ambiant dans le domaine d'application dépassent les deux critères du MELCC pour la silice cristalline. Les critères sont cependant respectés pour l'ensemble des récepteurs sensibles, et ce, pour les deux périodes.

Pour le critère horaire, des dépassements sont modélisés au nord du secteur Odyssey. La concentration totale maximale représente 251 % du critère horaire. La principale source contributrice à cette concentration maximale est la ventilation de la mine souterraine, dont les sautages souterrains. Ces résultats doivent donc être interprétés selon l'incertitude et le conservatisme discutés à la section 7.2.2. Ces dépassements sont circonscrits sur des territoires publics sans atteindre de récepteurs sensibles et ceux-ci sont limités à moins de 500 m de la limite d'application. Aux récepteurs sensibles, les résultats montrent un respect du critère en tout temps et la concentration maximale y représente 47 % du critère. Les courbes d'isoconcentration sont illustrées à la carte B-4-9.

Pour le critère annuel, des dépassements sont modélisés au nord du secteur Odyssey. Aux récepteurs sensibles, les résultats montrent un respect du critère. Les courbes d'isoconcentration sont illustrées à la carte B-4-10.

En comparaison avec le scénario de référence (scénario 1 sans Odyssey), les résultats montrent que les concentrations de silice cristalline attendues au secteur résidentiel au nord du site lors de l'exploitation maximale du projet Odyssey seront inférieures aux concentrations attendues en 2024. En particulier, les concentrations totales maximales modélisées seraient réduites de près de 40% et 50 % par rapport au scénario de référence, et ce, pour le critère horaire et annuel, respectivement.

### *6.2.1.7 CONTRIBUTION ODYSSEY*

Les résultats de modélisation du scénario 2 de base présentée précédemment correspondent à l'opération prévue du projet Odyssey lors de l'exploitation maximale. Afin de mettre ces résultats en perspective, les résultats peuvent être comparés aux résultats de la modélisation pour le scénario 1 sans Odyssey. En effet, ce scénario peut être interprété comme un scénario de référence montrant une situation avant la mise en exploitation du projet Odyssey.

Ainsi, afin de mettre en évidence la contribution du projet Odyssey, la variation des maximums modélisés par la simulation des opérations du projet Odyssey est présentée aux cartes B-4-11 à B-4-14 pour les particules totales, les particules fines et le dioxyde d'azote. Cette variation est obtenue par la différence des maximums modélisés pour le scénario 2 et le scénario 1 sans Odyssey, et ce, à chacun des récepteurs. C'est-à-dire que pour quantifier la variation de la concentration maximale à un récepteur donné, le maximum de chacun des deux scénarios est comparé et ceux-ci peuvent survenir à des heures ou des journées différentes. Une variation positive représente une augmentation, tandis qu'une variation négative représente une diminution par rapport à la situation de référence.

Il est important de mentionner que cette méthode de présentation des résultats ne constitue pas une exigence réglementaire. En fait, les concentrations présentées sur les cartes ne peuvent être directement comparées aux normes de qualité de l'atmosphère. Néanmoins, cette méthode permet de mettre en perspective les résultats de modélisation liés à l'opération prévue du projet Odyssey lors de l'exploitation maximale.

Ceci dit, ces cartes mettent en évidence qu'une augmentation des concentrations maximales pour les particules totales et fines est observée au nord du secteur Odyssey, sans atteindre de récepteurs sensibles. Pour tous les récepteurs sensibles, il y a une diminution des concentrations modélisées. Pour le dioxyde d'azote, des augmentations et des diminutions sont observées à travers tout le domaine de modélisation. Les augmentations le plus importantes sont observées au nord du secteur Odyssey. Les augmentations au niveau des récepteurs sensibles sont quant à elles bien inférieures à la concentration initiale, à l'exception des augmentations au niveau de certains baux de location en terre publique.

### 6.2.2 *SCÉNARIO 2 OPTIMISÉ*

Bien qu'aucun dépassement ne soit modélisé aux récepteurs sensibles pour le scénario 2 de base et que les dépassements modélisés dans le domaine d'application se trouvent en territoires publics, la modélisation du scénario 2 est reprise en appliquant la même méthode d'altération des opérations que celle présentée pour le scénario 1 (section 6.1.2). Ce scénario 2 optimisé a pour but d'offrir un comparatif équivalent au scénario 1 optimisé.

Ainsi, dans le but de présenter un scénario alternatif d'opération permettant de s'assurer au maximum le respect des normes et critères du MELCC, une fluctuation des activités de manipulation en surface de stériles et de minerai et un arrêt occasionnel du boutage ont été appliqués. Aucune fluctuation n'est considérée pour les opérations souterraines du projet Odyssey.

Les résultats de la modélisation indiquent que pour éliminer au maximum les dépassements de particules, il faut réduire le tonnage manipulé sur l'ensemble du site 8 % du temps et arrêter les opérations de boutage 5 % du temps. Théoriquement, le tonnage annuel effectif découlant des résultats de la modélisation passe donc de 7,8 Mt à 7,5 Mt, soit 95 % du tonnage modélisé au scénario 2. La séquence d'opération optimisée selon la modélisation est présentée au tableau 38. La séquence de fluctuation des opérations obtenue par la modélisation du scénario 2 optimisé est beaucoup plus fréquente que les dépassements de particules modélisés pour le scénario de base. En effet, il s'avère que l'application de la méthode d'optimisation basée sur un critère horaire est plus restrictive que les normes journalières elles-mêmes. Ainsi, cette méthode produit des arrêts horaires des opérations lors de journée qui ne présenterait pas de dépassement.

En comparaison à la séquence d'opération obtenue pour le scénario 1 optimisé, l'altération des activités obtenue pour le scénario 2 est beaucoup moins fréquente. Ceci est un indicateur des plus faibles concentrations de particules modélisées pour ce scénario.

Les tableaux de résultats de la modélisation pour ce scénario alternatif sont présentés au tableau A-3-7 pour le domaine d'application des normes et critères et au tableau A-3-8 pour les récepteurs sensibles. Les cartes de résultats sont, quant à elles, présentées à l'annexe B-5, pour les particules totales, les particules fines, le dioxyde d'azote, le manganèse, le nickel et la silice cristalline, respectivement.

**Tableau 38 : Séquence d'opération optimale selon la modélisation – Scénario 2 optimisé**

| Pourcentage du tonnage prévu manipulé considéré (%) | Nombre heures simulées dans le modèle | | Pourcentage des heures totales simulées (%) | |
|---|---|---|---|---|
| | Pour les cinq années météorologiques de modélisation | Moyen par année | | |
| 100% (sans arrêt de manipulation du tonnage) | 40 297 | 8 056 | 92% | |
| 90% | 462 | 92 | 1.1% | 8% |
| 80% | 392 | 78 | 0.9% | |
| 70% | 369 | 74 | 0.8% | |
| 60% | 291 | 58 | 0.7% | |
| 50% | 244 | 49 | 0.6% | |
| 40% | 184 | 37 | 0.4% | |
| 30% | 95 | 19 | 0.2% | |
| 20% | 60 | 12 | 0.1% | |
| 10% | 62 | 12 | 0.1% | |
| 0% | 1 363 | 272 | 3% | |
| Arrêt complet forage et boutage (indépendamment du tonnage manipulé) | 2190 | 438 | 5% | |

#### 6.2.2.1 PARTICULES TOTALES

Dans l'application du scénario optimisé, les concentrations de particules totales modélisées respectent la norme 24 heures à la fois dans le domaine d'application et aux récepteurs sensibles. Les courbes d'isoconcentration sont illustrées à la carte B-5-1.

#### 6.2.2.2 PARTICULES FINES

Dans l'application du scénario optimisé, les concentrations de particules fines modélisées respectent la norme 24 heures dans le secteur à l'ouest du concasseur primaire. Néanmoins, les dépassements modélisés au nord du secteur Odyssey demeurent. La norme est cependant respectée pour l'ensemble des récepteurs sensibles. Les courbes d'isoconcentration sont illustrées à la carte B-5-2.

#### 6.2.2.3 DIOXYDE D'AZOTE

Dans l'application du scénario optimisé, les concentrations de dioxyde d'azote modélisées respectent les normes 1 heure, 24 heures et annuelle aux récepteurs sensibles. Dans le domaine de modélisation, des dépassements sont toujours modélisés au nord du secteur Odyssey pour les normes 1 heure et 24 heures. Le portait des résultats est donc similaire à celui du scénario de base. Les courbes d'isoconcentration sont illustrées aux cartes B-5-3 et B-5-4 pour les périodes 1 heure et 24 heures.

#### 6.2.2.4 MÉTAUX ET MÉTALLOÏDES

En ce qui concerne les dépassements de métaux susceptibles d'être observés en mode d'exploitation normal (scénario 2), les résultats de métaux ont été repris à partir de la même séquence d'altération des opérations nécessaires pour respecter en tout temps les normes de particules.

Pour le cas du manganèse et du nickel, la séquence d'altération des opérations permet indirectement de réduire les concentrations modélisées. Pour le cas du nickel, cette diminution des concentrations permet le respect de la norme

en tout temps à la fois dans le domaine d'application et aux récepteurs sensibles. Les courbes d'isoconcentration sont illustrées aux cartes B-5-5 et B-5-6, pour le manganèse et le nickel, respectivement.

Pour le cas du critère horaire de la silice cristalline, la séquence d'altération des opérations permet indirectement de réduire légèrement les concentrations modélisées. Par contre, des dépassements sont toujours observés au nord du secteur Odyssey. En effet, les ventilations de la mine souterraine contribuent majoritairement à ces dépassements et ces sources ne sont pas altérées dans le scénario d'optimisation. Il convient néanmoins de rappeler qu'il s'agit d'un secteur en territoire public. Les courbes d'isoconcentration sont illustrées à la carte B-5-7 pour le critère horaire de la silice cristalline.

Pour le cas du critère annuel de la silice cristalline, la séquence d'altération des opérations permet indirectement de réduire de façon importante les concentrations modélisées. La réduction des concentrations totales maximales représente environ 10 % à la limite d'application et environ 8 % aux récepteurs sensibles. Néanmoins, les dépassements sont toujours modélisés dans le domaine d'application dans un secteur correspondant à des territoires publics sans atteindre de récepteurs sensibles. Les courbes d'isoconcentration sont illustrées à la carte B-5-8 pour le critère annuel de la silice cristalline.

# 7 CONSERVATISME ET LIMITATION

## 7.1 CONSERVATISME DE L'APPROCHE

La modélisation de la dispersion atmosphérique strictement réalisée selon les exigences du MELCC a pour objectif d'évaluer les concentrations potentielles maximales dans l'air ambiant et de s'assurer que les normes seront respectées en tout temps. En effet, selon le *Guide de modélisation de la dispersion atmosphérique* du MELCC, les résultats présentés doivent toujours correspondre aux maximums obtenus, pour chacune des périodes, à chacun des récepteurs identifiés. Il s'agit donc d'une approche très conservatrice puisqu'aucune valeur modélisée n'est retirée de l'analyse et qu'aucun traitement par centiles n'est effectué, à l'exception de certaines normes bien spécifiques.

De plus, pour évaluer les impacts d'un projet à l'aide de la modélisation, des scénarios conservateurs doivent être considérés. Par conséquent, des « scénarios pires cas » doivent être modélisés afin de bien représenter les maximums pouvant survenir pendant toute la durée de vie du projet, et ce, même si une fluctuation importante des opérations est planifiée.

Finalement, des concentrations initiales conservatrices sont ajoutées aux résultats de modélisation. Les valeurs utilisées sont des valeurs fixes alors que les concentrations initiales réelles varient dans le temps et sont en moyenne plus basses que les valeurs utilisées.

## 7.2 INCERTITUDES ET LIMITATION DU MODÈLE

### 7.2.1 *FACTEURS D'ÉMISSIONS*

Les taux d'émission utilisés pour représenter les différentes sources fugitives sont estimés à l'aide d'équations empiriques visant à donner un ordre de grandeur des émissions plutôt qu'un chiffre exact. De plus, l'efficacité de l'atténuation appliquée dans le but de contrôler ces émissions ne peut qu'être estimée grossièrement. En effet, les principaux contributeurs d'une mine sont des sources fugitives dont la caractérisation demeure un exercice difficile puisque leurs émissions varient, entre autres, en fonction des conditions météorologiques, de l'heure de la journée et de la variation des opérations.

L'estimation des taux d'émissions est d'ailleurs majoritairement basée sur des facteurs d'émissions provenant de l'AP-42, souvent déterminés à partir d'ensembles relativement petits de mesures et entachés de grandes incertitudes. Ces équations ont également été développées à l'aide de mesures effectuées dans des contextes et des climats variés. Par exemple, aucune de ces équations ne prend en compte les conditions hivernales et la couverture de neige, qui est pourtant une réalité importante au Québec.

À titre indicatif, Golder Associates a déterminé, suite à une campagne d'échantillonnage sur deux sites miniers canadiens, que les conditions hivernales peuvent atténuer naturellement les émissions de particules générées par le transport sur route non pavées de 94 % et 96 % (Golder Associates, 2012). L'étude a également permis de démontrer une forte dépendance entre les concentrations de particules mesurées et l'humidité relative de l'air, paramètre qui n'est pas considéré dans l'équation suggérée par l'AP-42 pour déterminer les taux d'émissions de matières particulaires de resuspension découlant du routage. Prendre note que ces atténuations en conditions hivernales n'ont pas été considérées dans la présente modélisation, mais sont données pour appuyer l'argumentaire sur les incertitudes et limitations.

### 7.2.2 *ÉMISSIONS DE LA VENTILATION DE LA MINE SOUTERRAINE*

La caractérisation des émissions de la ventilation de la mine souterraine présente une grande incertitude et plus particulièrement au niveau des émissions de matières particulaires et de métaux.

La méthode retenue pour la présente étude n'est pas basée sur des facteurs d'émissions directement associés aux activités souterraines. En effet, il n'existe pas de taux d'émission documenté pour ces activités souterraines. Par exemple, pour les activités de sautage souterrain, les émissions ont été déterminées à partir de l'AP-42 pour le cas correspondant à la description de ces activités survenant en surface. Or, ces taux d'émissions ne sont pas nécessairement valides pour les activités souterraines où le taux d'humidité est élevé. Ceci contribue généralement à réduire la mise en suspension des particules et donc à diminuer les émissions. Néanmoins, cette méthode conservatrice a été utilisée dans la modélisation.

Ensuite, les émissions caractérisées à l'intérieur de la mine souterraine sont considérées être transportées à l'atmosphère en totalité, et ce, par conservatisme. Cette hypothèse ne tient pas compte de la déposition des particules pendant leur transport vers les sorties de la ventilation. En effet, la durée d'évacuation peut s'étendre sur plusieurs heures et alors que l'humidité des parois de la mine est élevée. Ces facteurs contribuent à la déposition et à l'atténuation des émissions lorsque ces dernières sont acheminées vers les sorties de la ventilation.

### 7.2.3 *DISPERSION DES MATIÈRES PARTICULAIRES*

Il est reconnu depuis un bon nombre d'années que la modélisation des sources fugitives de particules surestime substantiellement les concentrations réelles dans l'atmosphère (AISI, 2015; Pace, 2005). Il s'avère également que les mesures prises afin de déterminer les facteurs d'émission ont généralement été effectuées près des sources, typiquement entre 5 et 10 mètres, alors qu'en moyenne, environ 2/3 du nuage de poussière était à moins de 2 mètres du sol. Ainsi, puisque les nuages étaient turbulents et près du sol, d'importantes réductions sont susceptibles de survenir sur une distance de quelques dizaines ou centaines de mètres pour ce type d'émission.

Il s'avère en effet que la dispersion des matières particulaires est un procédé physique complexe et actuellement mal représenté par les modèles de dispersion. Il est maintenant reconnu que différents phénomènes affectent la dispersion des particules : la déposition sèche (due à la force de gravité et la masse des particules), la déposition humide (due aux précipitations), la filtration des émissions par la couverture du sol (herbe, arbres, bâtiments, etc.) lorsque les émissions sont émises près du sol, ainsi que les forces électrostatiques, la thermophorèse et l'agglomération des particules qui peuvent accroitre la déposition au sol. Des phénomènes qui s'ajoutent à la déposition sèche déjà supportée par les modèles de dispersion et prise en considération dans la présente étude.

De plus, la filtration des émissions par la couverture du sol n'est actuellement pas supportée par les modèles de dispersion. Ces phénomènes physiques contribuent à réduire de façon considérable les concentrations réelles de particules dans l'air, et particulièrement par vent faible, alors que la dispersion est faible. Lors de tests sur le terrain, il a en effet été démontré que l'effet de filtration peut être très variable, allant de très faible, de jour, dans un environnement dénudé jusqu'à un taux de 85 %, de nuit, alors que des structures étaient présentes entre la route et les équipements de mesures (Pace, 2005).

### 7.2.4 *VARIATION SPATIALE ET TEMPORELLE DU SCÉNARIO*

Les scénarios de modélisation considérés sont des scénarios statiques, c'est-à-dire que les sources d'émission ont les mêmes positions au cours de l'année. Or, la majorité des émetteurs se déplacent au fil des heures et de l'année. Les tronçons de route utilisés s'allongent et se déplacent tandis que d'autres sont abandonnés, les haldes à minerai s'étendent, les bouteurs, les chargeuses et les foreuses se déplacent, les sautages sont effectués dans diverses régions sur le site, etc. Le scénario réel d'opération est ainsi beaucoup plus complexe et variable que le scénario de modélisation.

En fait, vu la complexité et la variabilité des opérations d'un complexe minier, un scénario moyen est considéré. C'est donc dire que l'ensemble des opérations est moyenné sur chacune des heures de l'année.

### 7.2.5 *MODÈLE MÉTÉOROLOGIQUE ET MODÈLE DE DISPERSION*

Les modèles de dispersion sont conçus pour représenter le plus fidèlement possible la réalité, tout en restant conservateurs. Or, ceux-ci sont des modèles mathématiques avec leurs limites, considérant un ensemble fini de paramètres. Ces modèles seront donc toujours entachés d'une certaine incertitude.

#### 7.2.5.1 VENTS COMPLEXES

Le modèle AERMOD ne prend pas en compte les champs de vents complexes susceptibles d'être rencontrés en région accidentée ou dans une région où l'utilisation du sol n'est pas uniforme. En effet, les paramètres météorologiques utilisés par le modèle sont les mêmes en tout point du domaine de modélisation, autant horizontalement que verticalement. Le champ de vent considéré par le modèle est donc le même au creux d'une vallée, au sommet d'une montagne, en ville ainsi qu'au milieu d'un lac.

#### 7.2.5.2 TOPOGRAPHIE ET LIGNE DE MIRE

Le modèle AERMOD est un modèle gaussien qui est valide lorsque la dispersion en ligne de mire est représentative. Plus précisément, AERMOD peut calculer assez fidèlement la dispersion à l'intérieur d'une vallée, mais ne peut représenter adéquatement le transport des contaminants à l'extérieur de celle-ci. Ainsi, il n'est pas approprié lorsque des obstacles topographiques importants doivent être traversés.

Le traitement de la topographie du modèle AERMOD met justement ce phénomène en évidence. En effet, la topographie est traitée via l'utilisation du préprocesseur AERMAP, qui assigne une valeur de *zhill* à chacun des récepteurs en fonction de la topographie locale, et ce, sans tenir compte de la position des sources et donc, de la provenance des émissions. Ainsi pour un récepteur donné, AERMAP et AERMOD ne peuvent distinguer si l'obstacle se trouve devant ou derrière le récepteur, par rapport à la source. Un autre point important concernant la valeur attribuée au *zhill* est que celle-ci dépend uniquement de l'environnement local. Les obstacles topographiques rencontrés en amont n'ont donc aucun effet sur la dispersion aux récepteurs d'intérêt.

Il est important de souligner que le modèle de dispersion AERMOD n'est pas apte à représenter les concentrations susceptibles d'être observées dans l'atmosphère de l'autre côté d'obstacles topographiques importants. Dans le cadre de la présente étude, par exemple, le modèle AERMOD ne peut pas représenter adéquatement l'effet sur la dispersion des émissions de la butte-écran séparant le site minier des récepteurs sensibles de la ville de Malartic. Les concentrations modélisées à ces récepteurs sont donc susceptibles d'être surestimées.

#### 7.2.5.3 TRAITEMENT DES VENTS FAIBLES

Dans les conditions actuelles de modélisation pour les projets miniers, les concentrations maximales sont obtenues par vent faible. Ceci s'explique par les conditions de modélisation : taux d'émission indépendant du vent pour la majorité des sources, sources volumiques situées près du sol, etc. Pour cette raison, le traitement des vents calmes est primordial, d'autant plus que seules les valeurs maximales sont présentées et utilisées pour l'analyse des impacts des projets.

De par leur formulation théorique, les modèles gaussiens, pour lesquels la solution à l'état stationnaire diverge par vent faible, produisent des concentrations excessivement élevées dans de telles conditions. Les guides de dispersion atmosphérique pour ces modèles recommandent d'ailleurs de retirer les vents inférieurs à 0,5 m/s et certaines conditions de vents sont donc écartées de l'analyse.

Bien que les problèmes de performance du modèle AERMOD par vent faible soient historiquement bien connus, de nouvelles options de traitement ont été proposées et sont maintenant acceptées comme option par défaut afin de contrôler cette problématique. L'importance des conditions de vents faibles, couplée à la formulation problématique du modèle dans de telles conditions, soulève néanmoins d'importantes incertitudes sur les résultats.

### 7.2.6 AUTRES

Parmi les autres sources d'erreur qui peuvent avoir un impact sur les résultats de modélisation, il faut noter :

- La topographie, qui possède une incertitude typiquement de l'ordre d'environ plus ou moins cinq mètres. L'élévation réelle des récepteurs est ainsi approximative.
- Les paramètres de dispersion initiale et de hauteur de relâche, qui sont des paramètres approximatifs visant à représenter grossièrement le comportement typique des émissions à la source.

## 7.3 DISCUSSION ET RÉSERVES

L'article 197 du RAA prescrit l'utilisation de la modélisation de la dispersion atmosphérique dans le but d'évaluer et d'autoriser les projets. Or, il est important de réitérer au lecteur l'ampleur des différentes incertitudes et limitations connues du modèle dans la représentation de la dispersion des émissions d'un projet minier, alors que les sources fugitives de particules sont prédominantes. Dr Cowherd, contributeur important de l'AP-42 et de l'élaboration des facteurs d'émission pour les sources fugitives, prônait d'ailleurs en 2012 le développement et le raffinement des méthodes de modélisation avant d'imposer l'utilisation de la modélisation pour l'application des standards de qualité de l'air aux États-Unis (Cowherd, 2012).

Il est en fait reconnu depuis un bon nombre d'années que la modélisation des sources fugitives de particules surestime substantiellement les concentrations réelles dans l'atmosphère (AISI, 2015; Pace, 2005). Les analyses suggèrent que ces surestimations peuvent aller jusqu'à un ordre de grandeur. Dans le milieu des années 90, le U.S. EPA Office of Air Quality Planning and Standards (OAQPS) a d'ailleurs commencé à utiliser systématiquement un facteur « divide by four » afin « d'ajuster » les estimations d'émissions de particules et d'obtenir de meilleurs accords entre les modélisations et les données d'échantillonnage.

Dans ce contexte, il est important de rappeler que les maximums modélisés et présentés à la section 6 surviennent par vent faible, alors que d'expérience, les évènements de poussière d'une mine se produisent plutôt par vent fort. L'évaluation des conditions météorologiques lors de dépassements modélisés est donc contradictoire et démontre bien l'incapacité actuelle du modèle à représenter fidèlement la réalité d'un site minier.

De plus, puisque la granulométrie des émissions varie grandement d'un type de source à l'autre, la magnitude de la déposition et son effet attendu sont différents en fonction des sources d'émission. La contribution des sources d'émission modélisée est donc également faussée, ce qui peut placer l'accent sur des sources qui ne sont en réalité pas nécessairement problématiques et vice-versa.

Finalement, il faut souligner que les périodes de vents faibles sont plus fréquentes que celles de vents forts. Les occurrences de dépassements et les moyennes annuelles modélisées sont par conséquent surestimées. Ainsi, puisque les concentrations modélisées pour les différents métaux sont calculées à partir des concentrations modélisées pour les particules, la surestimation des concentrations de particules peut également engendrer une surestimation des concentrations modélisées pour les métaux.

# 8 SUIVI DE LA QUALITÉ DE L'AIR

Le programme de surveillance de la qualité de l'atmosphère de MCM prévoit la mesure de la qualité de l'air à trois stations situées dans la ville de Malartic.

La première station (station Nord A1) se trouve dans le quartier nord de Malartic, dans le parc Stoykovitch sur la rue Authier. La deuxième station (station Sud A2) se trouve au sud de la ville dans le parc Belvédère, sur la rue Frontenac. Cette station est située à proximité de la butte-écran bordant la partie nord de la propriété de Mine Canadian Malartic. La troisième station (station Est A3) se trouve à l'est de la ville dans le quadrilatère des avenues Villeneuve et Champlain et de la rue Laurier. La carte B-1-2 indique la position des stations du réseau de suivi de la qualité de l'atmosphère à Malartic. Une station météorologique est également en opération. Celle-ci permet l'interprétation des résultats du suivi de la qualité de l'air. La position de cette station est également indiquée à la carte précédente.

Les équipements de mesure et les composés suivis varient selon les stations. D'abord, des mesures en continu pour chacune des trois stations sont effectuées pour les composés suivants :

— Particules totales (PMT)
— Particules fines ($PM_{2,5}$)
— Oxydes d'azote ($NO_x$)

Ensuite, des mesures sur filtre sont effectuées aux stations A2 et A3 pour les composés suivants :

— Particules totales
— Composition en métaux
— Silice cristalline

Pour les particules totales, les mesures en continu sont effectuées à l'aide d'analyseurs en continu de type BAM, tandis que les mesures sur filtre sont effectuées à l'aide d'échantillonneur de type Hi-Vol. Pour les particules fines, les mesures en continu sont effectuées à l'aide d'analyseurs en continu de type BAM.

Les équipements utilisés pour effectuer l'échantillonnage sont basés sur l'autorisation pour l'exploitation de l'établissement industriel Mine Canadian Malartic (20 novembre 2018). Les analyseurs en continu (BAM) ne sont pas des équipements reconnus par le US-EPA pour la mesure des PMT et, de ce fait, ils ne sont pas utilisés pour le suivi de la conformité des opérations de la minière. Par contre, comme ces équipements fournissent des mesures en continu, ils servent à ajuster les activités sur le site afin de contrôler les émissions provenant de la mine.

Tous les autres équipements mentionnés dans l'autorisation pour l'exploitation de l'établissement industriel Mine Canadian Malartic (20 novembre 2018) servent également au suivi de la conformité.

Une analyse des résultats du suivi de la qualité de l'air pour la période de janvier 2019 à septembre 2020 pour les PMT et les $PM_{2,5}$ est présentée ci-dessous. Le tableau 39 présente un résumé de l'analyse statistique de ces mesures, tandis que la série temporelle des mesures est présentée aux figures de l'annexe A-4. Pour cette période, les données valides disponibles représentent environ 635 journées pour les mesures en continu (BAM) et environ 100 journées pour les mesures d'échantillonnage (Hi-Vol), et ce, pour chacune des stations.

Pour les particules totales, la station A2 est celle qui présente les concentrations les plus élevées, tandis que la station A1 présente les concentrations les plus faibles. Les données présentent un haut niveau de conformité. Par exemple, les concentrations correspondant au 99$^{e}$ centile représentent au plus 82 % de la norme, et ce, pour toutes les stations. Pour l'ensemble de la période, un seul dépassement de la valeur limite de la norme a été mesuré. Ce dépassement, mesuré à l'aide d'un équipement non réglementaire de type BAM, est survenu le 16 mars 2020 à la station A2, où une concentration moyenne de 125 µg/m$^3$ a été mesurée, soit 104 % de la valeur limite. Pour ce cas précis, selon les informations transmises par MCM, l'analyse des conditions météorologiques observées et les inspections réalisées dans la ville de Malartic a permis de conclure que les concentrations mesurées ne sont pas entièrement attribuables à MCM et que des sources provenant de la ville de Malartic ont contribué aux valeurs élevées enregistrées.

Pour les particules fines, la station A3 est celle qui présente les concentrations les plus élevées, tandis que la station A2 présente les concentrations les plus faibles. Les données présentent un haut niveau de conformité. Par exemple, les concentrations correspondant au 99e centile représentent au plus 73 % de la norme, et ce, pour toutes les stations. Pour l'ensemble de la période, un seul dépassement de la norme a été mesuré. Ce dépassement est survenu le 2 décembre 2019 à la station A3, où une concentration moyenne de 42 µg/m$^3$ a été mesurée, soit 140 % de la valeur limite. Pour ce cas précis, selon les informations transmises par MCM, les observations terrain, l'analyse des conditions météorologiques ainsi que des concentrations mesurées aux stations de qualité de l'atmosphère ont permis d'écarter les opérations de MCM comme étant la cause des valeurs horaires excédant la norme journalière.

**Tableau 39 : Analyse statistique du suivi de la qualité de l'air pour les particules totales et fines (janvier 2019 à septembre 2020)**

| Composé | Station | Equipment | Nombre de mesure | Concentration moyenne[1] (µg/m$^3$) | Concentration moyenne 24 heures (µg/m$^3$) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 50e centile | 90e centile | 98e centile | 99e centile | Maximum |
| PMT | A1 | BAM | 629 | 15,6 | 12,0 | 31,0 | 48,0 | 53,7 | 90,0 |
| | A2 | BAM | 631 | 26,3 | 21,0 | 49,0 | 79,3 | 95,1 | 125,0 |
| | | Hi-Vol | 103 | 33,5 | 27,4 | 70,0 | 96,4 | 98,9 | 100,2 |
| | A3 | BAM | 623 | 18,7 | 14,0 | 37,8 | 59,4 | 70,8 | 91,0 |
| | | Hi-Vol | 102 | 27,9 | 21,4 | 56,2 | 88,4 | 94,9 | 98,2 |
| $PM_{2,5}$ | A1 | BAM | 629 | 5,8 | 5,0 | 10,0 | 15,4 | 17,0 | 22,0 |
| | A2 | | 631 | 4,7 | 4,0 | 8,0 | 12,0 | 13,0 | 21,0 |
| | A3 | | 633 | 6,4 | 5,0 | 10,8 | 17,4 | 22,0 | 42,0 |

[1] : La concentration moyenne présentée ici correspond à la moyenne de l'ensemble des concentrations 24 heures disponibles sur la période d'intérêt, et ce, même lorsque les opérations de MCM étaient en arrêt en raison d'une directive gouvernementale provinciale pour limiter la propagation de la COVID-19 au printemps 2020.

# 9 CONCLUSION

Dans le cadre du projet Odyssey, Canadian Malartic GP (CMGP) projette d'exploiter quatre zones minéralisées, soit East Malartic, East Gouldie, Odyssey Sud et Odyssey Nord. Il est prévu que ces zones soient exploitées au moyen de galeries souterraines à proximité de la mine Canadian Malartic (MCM). Ce projet nécessitera, entre autres, l'aménagement d'un puits et d'une rampe pour accéder aux gisements.

Le projet Odyssey est situé dans l'empreinte existante du projet d'extension présenté par Canadian Malartic GP (CMGP) en 2015 au ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) dans le cadre de l'étude d'impact sur l'environnement (ÉIE) et autorisé par décret émis par le gouvernement du Québec en 2017 (décret 388-2017). Le 28 novembre 2018, le décret 1370-2018 a été adopté, modifiant le décret n° 388-2017 de la mine Canadian Malartic et autorisant CMGP à réaliser son projet Odyssey. La présente demande de modification du décret vise l'ajout de l'exploitation souterraine des zones East Malartic et East Gouldie au projet Odyssey. Cette modification de décret permettrait une production d'environ 20 000 tonnes de minerai par jour.

Dans ce contexte, la modélisation de la dispersion atmosphérique s'inscrit en tant qu'étude complémentaire à la demande de modification de décret et a pour objectif d'évaluer l'impact des émissions provenant des opérations du projet Odyssey sur la qualité de l'atmosphère, et ce, sur la base du *Règlement sur l'assainissement de l'atmosphère*.

La démarche de modélisation préconisée dans la présente étude s'appuie sur la méthodologie proposée dans le *Guide de modélisation de la dispersion atmosphérique* et le *Guide d'instruction – Préparation et réalisation d'une modélisation de la dispersion des émissions atmosphériques – Projets miniers* du MELCC. L'étude s'appuie également sur les informations techniques fournies par CMGP.

L'étude propose la caractérisation des situations maximisant l'impact sur la qualité de l'air. Deux situations ont été retenues, soit l'année où l'exploitation combinée des installations actuelles de MCM conjointement au projet Odyssey est maximale (scénario 1) et l'année où l'exploitation du projet Odyssey est maximale (scénario 2), survenant à la suite de la fin de l'exploitation des fosses à ciel ouvert actuelles.

La modélisation a été effectuée à l'aide du logiciel AERMOD (version 19191) sur cinq années de données météorologiques. Les données de la station météorologique de l'aéroport de Val-d'Or, située à environ 25 km au sud-est du site du projet visé, ont été utilisées. L'option du modèle *ADJ_U**, qui n'est plus une option bêta, a été intégrée dans la présente étude. De plus, la déposition sèche des particules a été considérée dans le modèle. Concernant le traitement des résultats, l'approche est très conservatrice puisqu'aucune valeur modélisée n'est retirée lors de l'analyse des normes.

Les substances retenues pour les modélisations sont les matières particulaires en suspension, soit les particules totales (PMT) et les particules fines ($PM_{2,5}$), ainsi que 19 métaux et métalloïdes pour lesquels une norme ou un critère de qualité de l'atmosphère a été établi par le MELCC. Trois composés gazeux, le monoxyde de carbone (CO), le dioxyde d'azote ($NO_2$) et le dioxyde de soufre ($SO_2$) ont également été modélisés.

Le tableau 40 présente la synthèse des résultats de modélisation, et ce, pour chacune des situations caractérisées. Il est important de préciser que les résultats de la présente modélisation (Révision 1) sont très similaires à ceux de la Révision 0 en ce qui concerne le projet Odyssey et que les conclusions décrites ci-après sont identiques.

Les résultats de modélisation du scénario 1 indiquent que les concentrations modélisées de PMT, de $PM_{2,5}$, de $NO_2$, de certains métaux et de la silice cristalline dépassent les normes et critères du MELCC à la limite d'application. À l'exception des PMT et de la silice cristalline, ces dépassements n'atteignent pas les récepteurs sensibles et sont limités à des territoires publics. De plus, il est démontré que ces dépassements ne surviennent pas uniquement en raison de la contribution du projet Odyssey, mais découlent principalement des opérations de la mine Canadian Malartic. En fait, les sources liées à l'exploitation d'Odyssey contribuent à augmenter les concentrations maximales modélisées au secteur résidentiel au nord du site, soit la ville de Malartic, d'au plus 2 % pour les PMT et la silice cristalline.

Dans ce contexte, un scénario d'opération alternatif a été modélisé pour identifier les conditions d'exploitation permettant de s'assurer du respect des normes et critères. Théoriquement, le tonnage annuel effectif découlant des résultats de la modélisation du scénario optimisé correspond à 84 % du tonnage prévu au plan minier actuel (année 2024). L'altération des opérations prévue par la modélisation pour le présent scénario est en fait plus faible en

fréquence et en intensité que dans tous les scénarios de modélisation présentés lors des études de dispersion de 2015 et 2018. De plus, il est démontré que le projet Odyssey n'augmente cette fréquence que de 1 % du temps.

Les résultats de modélisation du scénario 2, pour leur part, indiquent que les concentrations modélisées dépassent les normes et critères du MELCC à la limite d'application, et ce, pour les mêmes composés que ceux du scénario précédent. Par contre, ces dépassements n'atteignent pas les récepteurs sensibles et ils sont limités à des territoires publics. De plus, il est démontré en comparant avec le scénario de référence sans Odyssey qu'une diminution des concentrations est modélisée lors de la situation d'exploitation maximale du projet Odyssey, et ce, pour le secteur résidentiel au nord du site, dans la ville Malartic.

Un scénario d'opération alternatif a également été modélisé pour ce scénario. Théoriquement, le tonnage annuel effectif découlant des résultats de la modélisation de ce scénario optimisé correspond à 95 % du tonnage prévu. L'altération des activités obtenue pour le scénario 2 est cependant beaucoup moins fréquente que celle découlant de l'optimisation du scénario 1. Ceci est un indicateur important que de plus faibles concentrations de particules sont modélisées pour ce scénario. Néanmoins, même en considérant l'optimisation, des dépassements résiduels surviennent au nord du secteur Odyssey, un secteur en territoire public où aucun récepteur sensible n'est localisé.

Enfin, il est important de rappeler l'ampleur des incertitudes et limitations de la dispersion atmosphérique des émissions d'un projet minier, alors que les sources fugitives de particules sont prédominantes. En effet, tel que présenté dans le cadre de la modélisation 2015, le modèle ne reflète pas adéquatement la réalité. Par exemple, en 2016 et en 2017, les tonnages annuels extraits ont été d'environ 63 Mt et 67 Mt respectivement, alors qu'aucun dépassement de norme directement occasionné par les opérations de MCM n'a été mesuré. D'ailleurs, l'analyse détaillée du résultat du suivi de la qualité de l'air pour la période 2019-2020 témoigne de cette conformité pour les normes de particules. Ceci démontre clairement que CMGP est en mesure d'opérer à des capacités plus importantes que celles prédites par le modèle de dispersion tout en respectant les normes de qualité de l'atmosphère applicables.

**Tableau 40 : Synthèse des résultats de modélisation**

| Substance | Période | Type de seuil | Limite d'application | | | | Récepteurs sensibles | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Scénario 1 | Scénario 1 optimisé | Scénario 2 | Scénario 2 optimisé | Scénario 1 | Scénario 1 optimisé | Scénario 2 | Scénario 2 optimisé |
| Particules totales PMT | 24 heures | Norme | ✗ | ✓ | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ |
| Particules fines $PM_{2,5}$ | 24 heures | Norme | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ |
| Dioxyde d'azote $NO_2$ | 1 heure | Norme | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ |
| | 24 heures | Norme | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ |
| | 1 an | Norme | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Autres composés gazeux (CO, $SO_2$) | Variable | Normes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Manganèse | 1 an | Critère | ✗ ✓ avec la CI pour les PN[1] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Nickel | 24 heures | Norme | ✗ | ✓ | ✗ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Silice cristalline | 1 heure | Critère | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ | ✓ | ✓ |
| | 1 an | Critère | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ |
| Autres Métaux | Variable | Normes et critères | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Note :

✓ : La concentration totale est inférieure à la valeur limite.

✗ : La concentration totale est supérieure à la valeur limite.

✗ : La concentration totale est supérieure à la valeur limite uniquement pour des secteurs correspondant à des territoires publics sans récepteur sensible.

[1] : Respect de la valeur limite en considérant la concentration initiale recommandée par le MELCC pour les projets nordiques.

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# ANNEXE

# A TABLEAUX

# ANNEXE

## A-1 *CARACTÉRISATION DES SOURCES – SCÉNARIO 1*

## A-1-1 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS - SAUTAGE – MCM

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Taux d'émission (g/s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | PMT | $PM_{10}$ | $PM_{2.5}$ | CO | $NO_x$ | $SO_2$ |
| saut1 | Sautage Barnat - 137 trous – À 11h | 715 239 | 5 334 970 | 150.0 | 10.0 | 16.59 | 9.30 | 2.22E+01 | 1.15E+01 | 6.66E-01 | 1.35E+02 | 2.91E+01 | 6.88E-01 |
| saut2 | Sautage Barnat - 137 trous – À 15h | 715 418 | 5 334 607 | 170.0 | 10.0 | 16.59 | 9.30 | 2.22E+01 | 1.15E+01 | 6.66E-01 | 1.35E+02 | 2.91E+01 | 6.88E-01 |

## A-1-2 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS - FORAGE – MCM

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Méthode d'atténuation | Atténuation (%) | Taux d'émission - avec atténuation (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2.5}$ |
| drill1 | Foreuse de production #1 | 715 379 | 5 334 602 | 170.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill2 | Foreuse de production #2 | 715 418 | 5 334 586 | 170.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill3 | Foreuse de production #3 | 715 472 | 5 334 581 | 170.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill4 | Foreuse de production #4 | 715 210 | 5 335 013 | 150.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill5 | Foreuse de production #5 | 715 210 | 5 334 969 | 150.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill6 | Foreuse de production #6 | 715 228 | 5 334 933 | 150.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill7 | Foreuse de production #7 | 716 103 | 5 334 764 | 160.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill8 | Foreuse de production #8 | 716 140 | 5 334 754 | 160.0 | 3.2 | 1.49 | 2.98 | Jets d'eau | 70% | 4.87E-02 | 4.38E-02 | 2.43E-02 |
| drill9 | Foreuse de prédécoupage #1 | 715 640 | 5 334 927 | 180.0 | 1.8 | 0.81 | 1.63 | Jets d'eau | 70% | 8.19E-03 | 7.37E-03 | 4.09E-03 |
| drill10 | Foreuse de prédécoupage #2 | 715 705 | 5 334 899 | 180.0 | 1.8 | 0.81 | 1.63 | Jets d'eau | 70% | 8.19E-03 | 7.37E-03 | 4.09E-03 |
| drill11 | Foreuse de prédécoupage #3 | 715 754 | 5 334 878 | 180.0 | 1.8 | 0.81 | 1.63 | Jets d'eau | 70% | 8.19E-03 | 7.37E-03 | 4.09E-03 |
| drill12 | Foreuse de prédécoupage #4 | 715 803 | 5 334 852 | 180.0 | 1.8 | 0.81 | 1.63 | Jets d'eau | 70% | 8.19E-03 | 7.37E-03 | 4.09E-03 |

## A-1-3 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – CHARGEMENTS ET DÉCHARGEMENTS – MCM

| Identifiant | Description | Tonnage manipulé (ktm/h) | Humidité du matériel (%) | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Atténuation (%) | Taux d'émission (g/s) [1] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| ldp01o | Chargement à P01 (minerai) | 0.776 | 5.4 | 715 988 | 5 334 710 | 160.0 | 4.9 | 1.16 | 0.76 | 0 | 1.12E-01 | 5.28E-02 | 8.00E-03 |
| ldp03o | Chargement à P03 (minerai) | 0.776 | 5.4 | 715 330 | 5 334 730 | 160.0 | 4.9 | 1.12 | 0.76 | 0 | 1.12E-01 | 5.28E-02 | 8.00E-03 |
| ldp10o | Chargement à P10 (minerai) | 1.164 | 5.4 | 713 713 | 5 333 658 | 350.0 | 4.9 | 1.49 | 0.76 | 0 | 1.67E-01 | 7.92E-02 | 1.20E-02 |
| ldp24o | Chargement à P24 (minerai) | 0.458 | 5.4 | 713 244 | 5 333 443 | 337.8 | 3.4 | 1.12 | 0.43 | 0 | 6.59E-02 | 3.12E-02 | 4.72E-03 |
| ldp28o | Chargement à P28 (minerai) | 1.200 | 5.4 | 713 824 | 5 333 256 | 347.0 | 2.6 | 0.91 | 0.32 | 0 | 1.73E-01 | 8.17E-02 | 1.24E-02 |
| ldp31o | Chargement à P31 (minerai) | 0.600 | 5.4 | 713 577 | 5 333 322 | 340.0 | 3.4 | 1.07 | 0.43 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| ldp30o | Chargement à P30 (minerai) | 0.600 | 5.4 | 713 566 | 5 333 228 | 340.0 | 3.4 | 1.07 | 0.43 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| ldp01w | Chargement à P01 (stériles) | 2.593 | 5.4 | 715 988 | 5 334 710 | 160.0 | 4.9 | 1.16 | 0.76 | 0 | 3.73E-01 | 1.77E-01 | 2.67E-02 |
| ldp03w | Chargement à P03 (stériles) | 2.593 | 5.4 | 715 330 | 5 334 730 | 160.0 | 4.9 | 0.94 | 0.76 | 0 | 3.73E-01 | 1.77E-01 | 2.67E-02 |
| ldp36w | Chargement à P36 (stériles) | 0.600 | 5.4 | 716 684 | 5 334 806 | 314.0 | 3.4 | 0.91 | 0.43 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| ldp38w | Chargement à P38 (stériles) | 0.600 | 5.4 | 716 822 | 5 334 721 | 314.0 | 3.4 | 0.84 | 0.43 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| dpp10o | Déchargement à P10 (minerai) | 0.466 | 5.4 | 713 713 | 5 333 658 | 350.0 | 1.3 | 1.62 | 6.45 | 0 | 6.70E-02 | 3.17E-02 | 4.80E-03 |
| dpp08o | Déchargement à P08 (minerai) | 1.793 | 5.4 | 713 076 | 5 334 062 | 345.4 | 1.3 | 1.62 | 6.45 | 90 | 2.58E-02 | 1.22E-02 | 1.85E-03 |
| dpp14o | Déchargement à P14 (minerai) | 0.458 | 5.4 | 713 826 | 5 333 190 | 347.0 | 1.3 | 1.62 | 6.45 | 0 | 6.59E-02 | 3.12E-02 | 4.72E-03 |
| dpp13o | Déchargement à P13 (minerai) | 0.458 | 5.4 | 713 232 | 5 333 645 | 348.1 | 1.0 | 1.20 | 4.69 | 0 | 6.59E-02 | 3.12E-02 | 4.72E-03 |
| dpp29o | Déchargement à P29 (minerai) | 1.200 | 5.4 | 713 742 | 5 333 278 | 347.0 | 0.5 | 0.79 | 3.73 | 0 | 1.73E-01 | 8.17E-02 | 1.24E-02 |
| dpp24o | Déchargement à P24 (minerai) | 1.200 | 5.4 | 713 244 | 5 333 443 | 337.8 | 1.0 | 1.20 | 4.69 | 0 | 1.73E-01 | 8.17E-02 | 1.24E-02 |
| dpp26w | Déchargement à P26 (stériles) | 2.536 | 5.4 | 714 728 | 5 334 489 | 210.0 | 1.3 | 1.62 | 6.45 | 0 | 3.65E-01 | 1.73E-01 | 2.61E-02 |
| dpp27w | Déchargement à P27 (stériles) | 2.536 | 5.4 | 714 417 | 5 334 615 | 200.0 | 1.3 | 1.62 | 6.45 | 0 | 3.65E-01 | 1.73E-01 | 2.61E-02 |
| dpp35w | Déchargement à P35 (stériles) | 0.114 | 5.4 | 716 661 | 5 334 784 | 313.8 | 1.3 | 1.62 | 6.45 | 0 | 1.64E-02 | 7.77E-03 | 1.18E-03 |
| dpp37w | Déchargement à P37 (stériles) | 0.600 | 5.4 | 716 787 | 5 334 796 | 319.0 | 1.0 | 1.20 | 4.69 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| dpp39w | Déchargement à P39 (stériles) | 0.600 | 5.4 | 716 989 | 5 334 708 | 314.0 | 1.0 | 1.20 | 4.69 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| convp1 | Chute du concasseur permanent - Ligne 1 | 0.600 | 5.4 | 713 604 | 5 333 312 | 340.0 | 13.0 | 0.35 | 0.47 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| convp2 | Chute du concasseur permanent - Ligne 2 | 0.600 | 5.4 | 713 594 | 5 333 222 | 340.0 | 13.0 | 0.35 | 0.47 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |
| convs1 | Chute du concasseur saisonnier | 0.600 | 5.4 | 716 821 | 5 334 727 | 314.0 | 13.0 | 0.35 | 0.47 | 0 | 8.64E-02 | 4.08E-02 | 6.18E-03 |

[1] Taux d'émission calculés heure par heure en fonction de la vitesse du vent suivant la méthode de l'AP-42, section 13.2.4 Aggregate Handling And Storage Piles. Le taux d'émission est présenté pour un vent d'une vitesse de 3.40 m/s

## A-1-4 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – BOUTAGE – MCM

| Identifiant | Description | Équipement | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Teneur en silt (%) | Humidité du matériel (%) | Atténuation (%) | Taux d'émission avec atténuation (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| tdoz01 | Bouteur sur chenilles 1 | Caterpillar D10T | 714 715 | 5 334 536 | 210.0 | 1.1 | 1.22 | 1.05 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |
| tdoz02 | Bouteur sur chenilles 2 | Caterpillar D10T | 714 680 | 5 334 433 | 210.0 | 1.1 | 1.22 | 1.05 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |
| tdoz03 | Bouteur sur chenilles 3 | Caterpillar D10T | 712 989 | 5 334 061 | 342.0 | 1.1 | 1.22 | 1.05 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |
| tdoz04 | Bouteur sur chenilles 4 | Caterpillar D10T | 714 358 | 5 334 665 | 200.0 | 1.1 | 1.22 | 1.05 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |
| tdoz05 | Bouteur sur chenilles 5 | Caterpillar D10T | 714 511 | 5 334 607 | 200.0 | 1.1 | 1.22 | 1.05 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |
| wdoz01 | Bouteur sur roues 1 | Caterpillar 854H | 715 298 | 5 334 917 | 150.0 | 1.1 | 1.47 | 1.01 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |
| wdoz02 | Bouteur sur roues 2 | Caterpillar 854H | 715 359 | 5 334 636 | 170.0 | 1.1 | 1.47 | 1.01 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |
| wdoz03 | Bouteur sur roues 3 | Caterpillar 854H | 716 084 | 5 334 735 | 160.0 | 1.1 | 1.47 | 1.01 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |

## A-1-5 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – CONCASSEUR MOBILE PERMANENT – MCM

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Taux d'alimentation (t/h) | Référence du facteur d'émission utilisé | Atténuation (%) | Taux d'émission (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| cpl1e1 | Ligne 1<br>Concasseur à mâchoire<br>Metso C-125 | 713 730 | 5 333 287 | 340.0 | 2.0 | 2.22 | 1.86 | 600 | AP-42 11.19.2<br>Tertiary Crushing<br>(controlled) | 0 | 1.00E-01 | 4.50E-02 | 8.33E-03 |
| cpl1e2 | Ligne 1<br>Concasseur conique<br>Metso HP 6 | 713 692 | 5 333 296 | 340.0 | 2.0 | 1.87 | 1.86 | 600 | AP-42 11.19.2<br>Tertiary Crushing<br>(controlled) | 0 | 1.00E-01 | 4.50E-02 | 8.33E-03 |
| cpl1e3 | Ligne 1<br>Tamis<br>W.S. Tyler F-Class 1100 | 713 674 | 5 333 287 | 340.0 | 2.0 | 2.01 | 1.86 | 690 | AP-42 11.19.2<br>Screening<br>(controlled) | 0 | 2.11E-01 | 7.09E-02 | 4.79E-03 |
| cpl1e4 | Ligne 1<br>Concasseur conique<br>Metso HP 400 | 713 663 | 5 333 304 | 340.0 | 2.0 | 1.40 | 1.86 | 320 | AP-42 11.19.2<br>Tertiary Crushing<br>(controlled) | 0 | 5.33E-02 | 2.40E-02 | 4.44E-03 |
| cpl1e5 | Ligne 1<br>Concasseur conique<br>Sandvik CS 660 | 713 656 | 5 333 278 | 340.0 | 2.0 | 1.72 | 1.86 | 1 100 | AP-42 11.19.2<br>Tertiary Crushing<br>(controlled) | 0 | 1.83E-01 | 8.25E-02 | 1.53E-02 |
| cpl2e1 | Ligne 2<br>Concasseur à mâchoire<br>Metso C-130 | 713 729 | 5 333 260 | 340.0 | 2.0 | 2.22 | 1.86 | 600 | AP-42 11.19.2<br>Tertiary Crushing<br>(controlled) | 0 | 1.00E-01 | 4.50E-02 | 8.33E-03 |
| cpl2e2 | Ligne 2<br>Concasseur conique<br>Metso HP 400 | 713 697 | 5 333 259 | 340.0 | 2.0 | 1.40 | 1.86 | 320 | AP-42 11.19.2<br>Tertiary Crushing<br>(controlled) | 0 | 5.33E-02 | 2.40E-02 | 4.44E-03 |
| cpl2e3 | Ligne 2<br>Concasseur conique<br>Metso HP 400 | 713 719 | 5 333 246 | 340.0 | 2.0 | 1.40 | 1.86 | 600 | AP-42 11.19.2<br>Tertiary Crushing<br>(controlled) | 0 | 1.00E-01 | 4.50E-02 | 8.33E-03 |
| cpl2e4 | Ligne 2<br>Tamis<br>W.S. Tyler F-Class 1100 | 713 714 | 5 333 254 | 340.0 | 2.0 | 2.01 | 1.86 | 690 | AP-42 11.19.2<br>Screening<br>(controlled) | 0 | 2.11E-01 | 7.09E-02 | 4.79E-03 |

## A-1-6 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – CONCASSEUR SAISONNIER – MCM

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Taux d'alimentation (t/h) | Référence du facteur d'émission utilisé | Atténuation (%) | Taux d'émission (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| csl1e1 | Concasseur à mâchoire Metso C-125 | 716 788 | 5 334 782 | 314.0 | 2.0 | 2.22 | 1.86 | 600 | AP-42 11.19.2 Tertiary Crushing (controlled) | 0 | 1.00E-01 | 4.50E-02 | 8.33E-03 |
| csl1e2 | Concasseur conique Metso HP 400 | 716 787 | 5 334 756 | 314.0 | 2.0 | 1.40 | 1.86 | 320 | AP-42 11.19.2 Tertiary Crushing (controlled) | 0 | 5.33E-02 | 2.40E-02 | 4.44E-03 |
| csl1e3 | Concasseur conique Metso 1560 | 716 816 | 5 334 750 | 314.0 | 2.0 | 1.40 | 1.86 | 320 | AP-42 11.19.2 Tertiary Crushing (controlled) | 0 | 5.33E-02 | 2.40E-02 | 4.44E-03 |
| csl1e4 | Tamis Metso IS453 | 716 787 | 5 334 746 | 314.0 | 2.0 | 2.01 | 1.86 | 763 | AP-42 11.19.2 Screening (controlled) | 0 | 2.33E-01 | 7.84E-02 | 5.30E-03 |
| csl1e5 | Tamis W.S. Tyler F-Class 1100 | 716 797 | 5 334 749 | 314.0 | 2.0 | 2.01 | 1.86 | 690 | AP-42 11.19.2 Screening (controlled) | 0 | 2.11E-01 | 7.09E-02 | 4.79E-03 |
| csl1e6 | Tamis W.S. Tyler F-Class 1100 | 716 819 | 5 334 742 | 314.0 | 2.0 | 2.01 | 1.86 | 690 | AP-42 11.19.2 Screening (controlled) | 0 | 2.11E-01 | 7.09E-02 | 4.79E-03 |

## A-1-7 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – SEGMENTS DE ROUTAGE – MCM

| Segment | Longueur du segment (m) | Largeur du segment (m) | Hauteur moyenne des véhicules (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Teneur en limon (%) | Poids moyen des véhicules (tons) | Facteur d'émission (g/VKT) | | | Nombre de déplacement (jour$^{-1}$) | VKT (jour$^{-1}$) | Taux d'émission sans atténuation (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| P06_P11 | 2 328 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 328.5 | 764.8 | 7.51E+01 | 2.14E+01 | 2.14E+00 |
| P11_P09 | 967 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 231.6 | 224.0 | 2.20E+01 | 6.25E+00 | 6.25E-01 |
| P09_P07 | 91 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 379.4 | 34.4 | 3.38E+00 | 9.61E-01 | 9.61E-02 |
| P07_P08 | 337 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 379.4 | 127.9 | 1.26E+01 | 3.57E+00 | 3.57E-01 |
| P10_P09 | 665 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 344.9 | 229.4 | 2.25E+01 | 6.40E+00 | 6.40E-01 |
| P11_P12 | 603 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 96.9 | 58.4 | 5.74E+00 | 1.63E+00 | 1.63E-01 |
| P01_P02 | 474 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 713.0 | 338.0 | 3.32E+01 | 9.44E+00 | 9.44E-01 |
| P03_P02 | 235 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 713.0 | 167.6 | 1.65E+01 | 4.68E+00 | 4.68E-01 |
| P02_P04 | 943 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 1 426.1 | 1344.8 | 1.32E+02 | 3.75E+01 | 3.75E+00 |
| P04_P06 | 1 470 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 352.7 | 518.6 | 5.09E+01 | 1.45E+01 | 1.45E+00 |
| P04_P05 | 104 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 1 073.4 | 112.0 | 1.10E+01 | 3.13E+00 | 3.13E-01 |
| P12_P25 | 502 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 96.9 | 48.6 | 4.77E+00 | 1.36E+00 | 1.36E-01 |
| P05_P27 | 544 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 536.7 | 292.2 | 2.87E+01 | 8.16E+00 | 8.16E-01 |
| P05_P26 | 340 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 536.7 | 182.3 | 1.79E+01 | 5.09E+00 | 5.09E-01 |
| P13_P33 | 269 | 30.0 | 5.1 | 4.3 | 33.49 | 3.99 | 8.3 | 132.2 | 5 861.6 | 1 666.8 | 166.7 | 238.4 | 64.1 | 4.35E+00 | 1.24E+00 | 1.24E-01 |
| P33_P24 | 120 | 30.0 | 5.1 | 4.3 | 33.49 | 3.99 | 8.3 | 132.2 | 5 861.6 | 1 666.8 | 166.7 | 863.1 | 103.2 | 7.00E+00 | 1.99E+00 | 1.99E-01 |
| P32_P33 | 129 | 30.0 | 5.1 | 4.3 | 33.49 | 3.99 | 8.3 | 132.2 | 5 861.6 | 1 666.8 | 166.7 | 624.7 | 80.7 | 5.47E+00 | 1.56E+00 | 1.56E-01 |
| P28_P29 | 146 | 30.0 | 4.2 | 3.6 | 33.49 | 3.31 | 8.3 | 57.8 | 4 041.2 | 1 149.2 | 114.9 | 1 574.6 | 230.3 | 1.08E+01 | 3.06E+00 | 3.06E-01 |
| P25_P14 | 139 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 96.9 | 13.5 | 1.32E+00 | 3.76E-01 | 3.76E-02 |
| P31_P32 | 141 | 30.0 | 5.1 | 4.3 | 33.49 | 3.99 | 8.3 | 132.2 | 5 861.6 | 1 666.8 | 166.7 | 312.4 | 44.0 | 2.99E+00 | 8.49E-01 | 8.49E-02 |
| P30_P32 | 169 | 30.0 | 5.1 | 4.3 | 33.49 | 3.99 | 8.3 | 132.2 | 5 861.6 | 1 666.8 | 166.7 | 312.4 | 52.8 | 3.59E+00 | 1.02E+00 | 1.02E-01 |
| P34_P35 | 326 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 24.2 | 7.9 | 7.74E-01 | 2.20E-01 | 2.20E-02 |
| P38_P39[1] | 176 | 30.0 | 5.1 | 4.3 | 33.49 | 3.99 | 8.3 | 130.0 | 5 818.1 | 1 654.5 | 165.4 | 314.1 | 55.4 | 3.73E+00 | 1.06E+00 | 1.06E-01 |
| P36_P37[1] | 113 | 30.0 | 5.1 | 4.3 | 33.49 | 3.99 | 8.3 | 130.0 | 5 818.1 | 1 654.5 | 165.4 | 314.1 | 35.6 | 2.40E+00 | 6.82E-01 | 6.82E-02 |
| P34_P06 | 532 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 24.2 | 12.9 | 1.26E+00 | 3.59E-01 | 3.59E-02 |

[1] Selon l'horaire active du concasseur saisonnier de six mois par année.

## A-1-8 COORDONNÉES ET ÉLÉVATION DES SOURCES DE ROUTAGE – MCM

| Identifiant | X (m) | Y (m) | Élévation (m) | Identifiant | X (m) | Y (m) | Élévation (m) |
|---|---|---|---|---|---|---|---|
| P06_P11_01 | 716 263 | 5 334 319 | 324.3 | P11_P09_10 | 713 603 | 5 334 188 | 340.0 |
| P06_P11_02 | 716 191 | 5 334 315 | 324.1 | P11_P09_11 | 713 532 | 5 334 199 | 340.8 |
| P06_P11_03 | 716 120 | 5 334 321 | 325.0 | P11_P09_12 | 713 460 | 5 334 201 | 341.6 |
| P06_P11_04 | 716 048 | 5 334 327 | 325.1 | P11_P09_13 | 713 388 | 5 334 201 | 341.7 |
| P06_P11_05 | 715 976 | 5 334 328 | 325.7 | P09_P07_1 | 713 326 | 5 334 237 | 340.3 |
| P06_P11_06 | 715 905 | 5 334 318 | 329.4 | P07_P08_1 | 713 283 | 5 334 273 | 340.2 |
| P06_P11_07 | 715 837 | 5 334 296 | 334.5 | P07_P08_2 | 713 216 | 5 334 247 | 342.1 |
| P06_P11_08 | 715 770 | 5 334 269 | 338.7 | P07_P08_3 | 713 157 | 5 334 207 | 342.4 |
| P06_P11_09 | 715 704 | 5 334 242 | 339.0 | P07_P08_4 | 713 111 | 5 334 152 | 343.3 |
| P06_P11_10 | 715 634 | 5 334 222 | 338.8 | P07_P08_5 | 713 084 | 5 334 086 | 344.4 |
| P06_P11_11 | 715 565 | 5 334 203 | 337.5 | P10_P09_1 | 713 684 | 5 333 691 | 350.0 |
| P06_P11_12 | 715 496 | 5 334 181 | 335.2 | P10_P09_2 | 713 636 | 5 333 745 | 350.0 |
| P06_P11_13 | 715 429 | 5 334 155 | 334.8 | P10_P09_3 | 713 588 | 5 333 799 | 350.0 |
| P06_P11_14 | 715 363 | 5 334 127 | 334.3 | P10_P09_4 | 713 544 | 5 333 855 | 350.0 |
| P06_P11_15 | 715 298 | 5 334 097 | 332.9 | P10_P09_5 | 713 524 | 5 333 924 | 350.0 |
| P06_P11_16 | 715 232 | 5 334 067 | 333.8 | P10_P09_6 | 713 477 | 5 333 977 | 350.0 |
| P06_P11_17 | 715 172 | 5 334 029 | 334.3 | P10_P09_7 | 713 429 | 5 334 030 | 350.0 |
| P06_P11_18 | 715 159 | 5 333 961 | 334.7 | P10_P09_8 | 713 387 | 5 334 088 | 350.0 |
| P06_P11_19 | 715 149 | 5 333 891 | 334.7 | P10_P09_9 | 713 356 | 5 334 153 | 343.4 |
| P06_P11_20 | 715 087 | 5 333 859 | 335.2 | P11_P12_1 | 714 218 | 5 333 930 | 334.1 |
| P06_P11_21 | 715 018 | 5 333 839 | 334.6 | P11_P12_2 | 714 186 | 5 333 868 | 333.1 |
| P06_P11_22 | 714 946 | 5 333 836 | 334.1 | P11_P12_3 | 714 163 | 5 333 799 | 333.0 |
| P06_P11_23 | 714 874 | 5 333 839 | 333.5 | P11_P12_4 | 714 141 | 5 333 731 | 332.9 |
| P06_P11_24 | 714 803 | 5 333 832 | 333.7 | P11_P12_5 | 714 119 | 5 333 662 | 333.8 |
| P06_P11_25 | 714 735 | 5 333 809 | 333.8 | P11_P12_6 | 714 090 | 5 333 597 | 333.7 |
| P06_P11_26 | 714 668 | 5 333 784 | 336.2 | P11_P12_7 | 714 041 | 5 333 545 | 333.8 |
| P06_P11_27 | 714 596 | 5 333 783 | 338.8 | P11_P12_8 | 713 989 | 5 333 495 | 334.3 |
| P06_P11_28 | 714 524 | 5 333 783 | 338.9 | P01_P02_1 | 715 967 | 5 334 712 | 160.0 |
| P06_P11_29 | 714 454 | 5 333 793 | 339.1 | P01_P02_2 | 715 895 | 5 334 717 | 160.0 |
| P06_P11_30 | 714 394 | 5 333 831 | 338.8 | P01_P02_3 | 715 823 | 5 334 719 | 160.0 |
| P06_P11_31 | 714 342 | 5 333 881 | 337.7 | P01_P02_4 | 715 751 | 5 334 722 | 160.0 |
| P06_P11_32 | 714 290 | 5 333 931 | 334.8 | P01_P02_5 | 715 684 | 5 334 746 | 160.0 |
| P11_P09_01 | 714 220 | 5 334 001 | 334.4 | P01_P02_6 | 715 618 | 5 334 774 | 160.0 |
| P11_P09_02 | 714 158 | 5 334 035 | 334.5 | P01_P02_7 | 715 553 | 5 334 806 | 160.0 |
| P11_P09_03 | 714 089 | 5 334 056 | 334.6 | P03_P02_1 | 715 375 | 5 334 735 | 160.0 |
| P11_P09_04 | 714 019 | 5 334 073 | 335.3 | P03_P02_2 | 715 447 | 5 334 741 | 160.0 |
| P11_P09_05 | 713 950 | 5 334 092 | 337.0 | P03_P02_3 | 715 502 | 5 334 783 | 160.0 |
| P11_P09_06 | 713 881 | 5 334 112 | 337.8 | P02_P04_01 | 715 509 | 5 334 846 | 160.0 |
| P11_P09_07 | 713 812 | 5 334 132 | 337.9 | P02_P04_02 | 715 464 | 5 334 902 | 160.0 |
| P11_P09_08 | 713 743 | 5 334 152 | 338.8 | P02_P04_03 | 715 420 | 5 334 959 | 160.0 |
| P11_P09_09 | 713 673 | 5 334 171 | 339.2 | P02_P04_04 | 715 380 | 5 335 019 | 160.0 |

## A-1-8 COORDONNÉES ET ÉLÉVATION DES SOURCES DE ROUTAGE – MCM (suite)

| Identifiant | X (m) | Y (m) | Élévation (m) | Identifiant | X (m) | Y (m) | Élévation (m) |
|---|---|---|---|---|---|---|---|
| P02_P04_05 | 715 311 | 5 335 039 | 163.3 | P05_P27_5 | 714 646 | 5 334 674 | 200.0 |
| P02_P04_06 | 715 241 | 5 335 056 | 170.4 | P05_P27_6 | 714 576 | 5 334 656 | 200.0 |
| P02_P04_07 | 715 172 | 5 335 075 | 177.5 | P05_P27_7 | 714 506 | 5 334 638 | 200.0 |
| P02_P04_08 | 715 103 | 5 335 078 | 180.0 | P05_P27_8 | 714 437 | 5 334 620 | 200.0 |
| P02_P04_09 | 715 108 | 5 335 011 | 180.2 | P05_P26_1 | 714 926 | 5 334 721 | 210.4 |
| P02_P04_10 | 715 138 | 5 334 946 | 187.1 | P05_P26_2 | 714 870 | 5 334 675 | 210.0 |
| P02_P04_11 | 715 150 | 5 334 877 | 193.3 | P05_P26_3 | 714 814 | 5 334 630 | 210.0 |
| P02_P04_12 | 715 119 | 5 334 816 | 199.4 | P05_P26_4 | 714 766 | 5 334 579 | 210.0 |
| P02_P04_13 | 715 064 | 5 334 771 | 206.3 | P05_P26_5 | 714 738 | 5 334 513 | 210.0 |
| P04_P06_01 | 715 072 | 5 334 689 | 210.0 | P13_P33_1 | 713 241 | 5 333 620 | 346.9 |
| P04_P06_02 | 715 118 | 5 334 634 | 210.0 | P13_P33_2 | 713 282 | 5 333 563 | 341.5 |
| P04_P06_03 | 715 172 | 5 334 587 | 216.9 | P13_P33_3 | 713 335 | 5 333 518 | 340.3 |
| P04_P06_04 | 715 228 | 5 334 542 | 224.1 | P13_P33_4 | 713 359 | 5 333 468 | 338.3 |
| P04_P06_05 | 715 286 | 5 334 500 | 231.1 | P33_P24_1 | 713 338 | 5 333 436 | 337.5 |
| P04_P06_06 | 715 347 | 5 334 464 | 237.7 | P33_P24_2 | 713 267 | 5 333 437 | 337.7 |
| P04_P06_07 | 715 417 | 5 334 447 | 244.6 | P32_P33_1 | 713 421 | 5 333 361 | 344.6 |
| P04_P06_08 | 715 487 | 5 334 436 | 251.6 | P32_P33_2 | 713 378 | 5 333 418 | 337.9 |
| P04_P06_09 | 715 559 | 5 334 434 | 258.2 | P28_P29_1 | 713 823 | 5 333 293 | 347.0 |
| P04_P06_10 | 715 629 | 5 334 444 | 265.1 | P28_P29_2 | 713 772 | 5 333 300 | 347.0 |
| P04_P06_11 | 715 695 | 5 334 473 | 272.1 | P25_P14_1 | 713 821 | 5 333 085 | 347.0 |
| P04_P06_12 | 715 759 | 5 334 504 | 279.1 | P25_P14_2 | 713 825 | 5 333 157 | 347.0 |
| P04_P06_13 | 715 825 | 5 334 532 | 285.3 | P31_P32_1 | 713 543 | 5 333 326 | 340.0 |
| P04_P06_14 | 715 896 | 5 334 528 | 291.6 | P31_P32_2 | 713 472 | 5 333 334 | 340.0 |
| P04_P06_15 | 715 963 | 5 334 506 | 297.0 | P30_P32_1 | 713 529 | 5 333 259 | 340.0 |
| P04_P06_16 | 716 022 | 5 334 466 | 304.8 | P30_P32_2 | 713 474 | 5 333 306 | 340.0 |
| P04_P06_17 | 716 083 | 5 334 427 | 310.8 | P34_P35_1 | 716 777 | 5 334 554 | 322.3 |
| P04_P06_18 | 716 144 | 5 334 390 | 317.0 | P34_P35_2 | 716 722 | 5 334 599 | 317.1 |
| P04_P06_19 | 716 215 | 5 334 381 | 321.4 | P34_P35_3 | 716 695 | 5 334 660 | 313.0 |
| P04_P06_20 | 716 284 | 5 334 367 | 323.8 | P34_P35_4 | 716 648 | 5 334 714 | 313.1 |
| P04_P05_1 | 714 998 | 5 334 738 | 210.0 | P34_P35_5 | 716 646 | 5 334 772 | 313.7 |
| P12_P25_1 | 713 939 | 5 333 427 | 334.0 | P38_P39_1 | 716 866 | 5 334 700 | 205.0 |
| P12_P25_2 | 713 909 | 5 333 362 | 333.7 | P38_P39_2 | 716 937 | 5 334 704 | 314.0 |
| P12_P25_3 | 713 899 | 5 333 292 | 334.3 | P36_P37_1 | 716 705 | 5 334 807 | 314.0 |
| P12_P25_4 | 713 901 | 5 333 220 | 336.3 | P36_P37_2 | 716 777 | 5 334 806 | 318.3 |
| P12_P25_5 | 713 906 | 5 333 148 | 338.9 | P34_P06_1 | 716 750 | 5 334 511 | 322.7 |
| P12_P25_6 | 713 902 | 5 333 076 | 343.6 | P34_P06_2 | 716 688 | 5 334 474 | 322.7 |
| P12_P25_7 | 713 855 | 5 333 050 | 347.4 | P34_P06_3 | 716 621 | 5 334 447 | 323.0 |
| P05_P27_1 | 714 926 | 5 334 733 | 210.1 | P34_P06_4 | 716 551 | 5 334 431 | 323.0 |
| P05_P27_2 | 714 857 | 5 334 718 | 200.0 | P34_P06_5 | 716 482 | 5 334 413 | 323.2 |
| P05_P27_3 | 714 787 | 5 334 703 | 200.0 | P34_P06_6 | 716 416 | 5 334 386 | 323.9 |
| P05_P27_4 | 714 716 | 5 334 688 | 200.0 | P34_P06_7 | 716 356 | 5 334 346 | 324.3 |

## A-1-9 PARAMÈTRES PHYSIQUES ET TAUX D'ÉMISSION UTILISÉS POUR LA MODÉLISATION DES GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS LOCALISÉS – MCM

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Type de source | Taux d'émission (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | $PM_{10}$ [1] | $PM_{2.5}$ | CO | NOx | $SO_2$ |
| drill1x | Foreuse de production #1 - Exhaust (A. Copco PV 235) | 715 379 | 5 334 602 | 170.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill2x | Foreuse de production #2 - Exhaust (A. Copco PV 235) | 715 418 | 5 334 586 | 170.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill3x | Foreuse de production #3 - Exhaust (A. Copco PV 235) | 715 472 | 5 334 581 | 170.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill4x | Foreuse de production #4 - Exhaust (A. Copco PV 235) | 715 210 | 5 335 013 | 150.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill5x | Foreuse de production #5 - Exhaust (A. Copco PV 235) | 715 210 | 5 334 969 | 150.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill6x | Foreuse de production #6 - Exhaust (A. Copco PV 235) | 715 228 | 5 334 933 | 150.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill7x | Foreuse de production #7 - Exhaust (A. Copco PV 235) | 716 103 | 5 334 764 | 160.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill8x | Foreuse de production #8 - Exhaust (A. Copco PV 235) | 716 140 | 5 334 754 | 160.0 | 3.8 | 773.8 | 30.1 | 0.3 | Vertical | 1.36E-02 | 1.31E-02 | 8.04E-02 | 3.95E-01 | 4.66E-04 |
| drill9x | Foreuse de prédécoupage #1 - Exhaust (Cubex QXR-920) | 715 640 | 5 334 927 | 180.0 | 1.9 | 785.4 | 46.5 | 0.2 | Vertical | 1.09E-02 | 1.06E-02 | 6.25E-02 | 1.63E-01 | 3.15E-04 |
| drill10x | Foreuse de prédécoupage #2 - Exhaust (Cubex QXR-920) | 715 705 | 5 334 899 | 180.0 | 1.9 | 785.4 | 46.5 | 0.2 | Vertical | 1.09E-02 | 1.06E-02 | 6.25E-02 | 1.63E-01 | 3.15E-04 |
| drill11x | Foreuse de prédécoupage #3 - Exhaust (Cubex QXR-920) | 715 754 | 5 334 878 | 180.0 | 1.9 | 785.4 | 46.5 | 0.2 | Vertical | 1.09E-02 | 1.06E-02 | 6.25E-02 | 1.63E-01 | 3.15E-04 |
| drill12x | Foreuse de prédécoupage #4 - Exhaust (Cubex QXR-920) | 715 803 | 5 334 852 | 180.0 | 1.9 | 785.4 | 46.5 | 0.2 | Vertical | 1.09E-02 | 1.06E-02 | 6.25E-02 | 1.63E-01 | 3.15E-04 |
| tdoz01x | Bouteur sur chenilles 1 - Exhaust (Caterpillar D10T) | 714 715 | 5 334 536 | 210.0 | 4.5 | 755.4 | 31.2 | 0.2 | Vertical | 2.69E-02 | 2.61E-02 | 2.31E-01 | 2.59E-01 | 4.87E-04 |
| tdoz02x | Bouteur sur chenilles 2 - Exhaust (Caterpillar D10T) | 714 680 | 5 334 433 | 210.0 | 4.5 | 755.4 | 31.2 | 0.2 | Vertical | 2.69E-02 | 2.61E-02 | 2.31E-01 | 2.59E-01 | 4.87E-04 |
| tdoz03x | Bouteur sur chenilles 3 - Exhaust (Caterpillar D10T) | 712 989 | 5 334 061 | 342.0 | 4.5 | 755.4 | 31.2 | 0.2 | Vertical | 2.69E-02 | 2.61E-02 | 2.31E-01 | 2.59E-01 | 4.87E-04 |
| tdoz04x | Bouteur sur chenilles 4 - Exhaust (Caterpillar D10T) | 714 358 | 5 334 665 | 200.0 | 4.5 | 755.4 | 31.2 | 0.2 | Vertical | 2.69E-02 | 2.61E-02 | 2.31E-01 | 2.59E-01 | 4.87E-04 |
| tdoz05x | Bouteur sur chenilles 5 - Exhaust (Caterpillar D10T) | 714 511 | 5 334 607 | 200.0 | 4.5 | 755.4 | 31.2 | 0.2 | Vertical | 2.69E-02 | 2.61E-02 | 2.31E-01 | 2.59E-01 | 4.87E-04 |
| wdoz01x | Bouteur sur roues 1 - Exhaust (Caterpillar 854K) | 715 298 | 5 334 917 | 150.0 | 5.2 | 755.4 | 32.7 | 0.2 | Vertical | 2.44E-02 | 2.37E-02 | 1.69E-01 | 5.16E-01 | 6.47E-04 |
| wdoz02x | Bouteur sur roues 2 - Exhaust (Caterpillar 854K) | 715 359 | 5 334 636 | 170.0 | 5.2 | 755.4 | 32.7 | 0.2 | Vertical | 2.44E-02 | 2.37E-02 | 1.69E-01 | 5.16E-01 | 6.47E-04 |
| wdoz03x | Bouteur sur roues 3 - Exhaust (Caterpillar 854K) | 716 084 | 5 334 735 | 160.0 | 5.2 | 755.4 | 32.7 | 0.2 | Vertical | 2.44E-02 | 2.37E-02 | 1.69E-01 | 5.16E-01 | 6.47E-04 |
| ldp03ax | Chargement à P03 - Exhaust (Hitachi EX5600-6) | 715 330 | 5 334 730 | 160.0 | 8.6 | 755.4 | 25.0 | 0.5 | Vertical | 1.83E-01 | 1.77E-01 | 1.27E+00 | 3.86E+00 | 4.84E-03 |
| ldp03bx | Chargement à P03 - Exhaust (Caterpillar 6050 (Tier 2)) | 715 330 | 5 334 730 | 160.0 | 6.5 | 667.2 | 22.7 | 0.4 | Vertical | 7.68E-02 | 7.45E-02 | 5.32E-01 | 1.62E+00 | 2.03E-03 |
| ldp10x | Chargement à P10 - Exhaust (Létourneau L-1850-2) | 713 713 | 5 333 658 | 350.0 | 5.8 | 733.2 | 41.0 | 0.4 | Vertical | 2.59E-01 | 2.51E-01 | 1.27E+00 | 5.89E+00 | 4.84E-03 |

[1] Toutes les particules émises sont supposées être plus petites que 10 microns donc PMT = $PM_{10}$.

## A-1-9 PARAMÈTRES PHYSIQUES ET TAUX D'ÉMISSION UTILISÉS POUR LA MODÉLISATION DES GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS LOCALISÉS – MCM (SUITE)

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Type de source | Taux d'émission (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | $PM_{10}$ [1] | $PM_{2.5}$ | CO | NOx | $SO_2$ |
| ldp24x | Chargement à P24 - Exhaust (Caterpillar 992K) | 713 244 | 5 333 443 | 337.8 | 5.3 | 755.4 | 21.0 | 0.3 | Vertical | 2.48E-02 | 2.41E-02 | 1.72E-01 | 5.24E-01 | 6.57E-04 |
| ldp28x | Chargement à P28 - Exhaust (Caterpillar 988K) | 713 824 | 5 333 256 | 347.0 | 4.5 | 755.4 | 13.2 | 0.3 | Vertical | 1.20E-03 | 1.17E-03 | 8.57E-03 | 2.47E-02 | 3.10E-04 |
| ldp31x | Chargement à P31 - Exhaust (Caterpillar 990K) | 713 577 | 5 333 322 | 340.0 | 5.0 | 755.4 | 11.0 | 0.4 | Vertical | 7.76E-04 | 7.53E-04 | 8.77E-03 | 1.59E-02 | 2.00E-04 |
| ldp30x | Chargement à P30 - Exhaust (Caterpillar 990K) | 713 566 | 5 333 228 | 340.0 | 5.0 | 755.4 | 11.0 | 0.4 | Vertical | 7.76E-04 | 7.53E-04 | 8.77E-03 | 1.59E-02 | 2.00E-04 |
| ldp36x [2] | Chargement à P36 - Exhaust (Caterpillar 988K) | 716 684 | 5 334 806 | 314.0 | 4.5 | 755.4 | 13.2 | 0.3 | Vertical | 1.20E-03 | 1.17E-03 | 8.57E-03 | 2.47E-02 | 3.10E-04 |
| ldp38x [2] | Chargement à P38 - Exhaust (Caterpillar 982M) | 716 822 | 5 334 721 | 314.0 | 3.7 | 755.4 | 13.7 | 0.2 | Vertical | 8.84E-04 | 8.57E-04 | 6.31E-03 | 1.81E-02 | 2.28E-04 |

[1] Toutes les particules émises sont supposées être plus petites que 10 microns donc PMT = $PM_{10}$.
[2] Selon l'horaire active du concasseur saisonnier de six mois par année.

## A-1-10 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSION DES SOURCES PONCTUELLES DE L'USINE DE TRAITEMENT DU MINERAI – MCM

| Identifiant | Description | Numéro d'équipement | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Type de source | Taux d'émission (g/s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| conca1 | Dépoussièreur Concasseur giratoire | 603-575-01 | 713 041 | 5 334 047 | 342.8 | 20.2 | 285.9 | 18.3 | 0.7 | Vertical | 8.48E-02 | 7.14E-02 | 4.09E-02 | 0 | 0 | 0 |
| dome | Dépoussièreur Dome #1-2-3 | 605-575-01 / 02 / 03 | 713 140 | 5 332 864 | 350.8 | 4.6 | 294.2 | 16.9 | 0.4 | Vertical | 6.77E-03 | 5.99E-03 | 3.12E-03 | 0 | 0 | 0 |
| cha1 | Chaudière gaz naturel #1 | 625-430-001 | 713 446 | 5 332 878 | 350.8 | 18.2 | 423.2 | 1.9 | 0.6 | Vertical | 5.80E-03 | 5.80E-03 | 5.80E-03 | 8.00E-02 | 6.96E-02 | 3.91E-04 |
| cha2 | Chaudière gaz naturel #2 | 625-430-002 | 713 446 | 5 332 877 | 350.8 | 18.2 | 423.2 | 1.9 | 0.6 | Vertical | 5.80E-03 | 5.80E-03 | 5.80E-03 | 8.00E-02 | 6.96E-02 | 3.91E-04 |
| four1 | Four de réactivation combustion #1 | 625-269-001 | 713 446 | 5 332 868 | 350.8 | 18.2 | 423.2 | 4.3 | 0.4 | Vertical | 3.51E-03 | 3.51E-03 | 3.51E-03 | 1.20E-02 | 8.48E-02 | 3.14E-04 |
| four2 | Four de réactivation combustion #2 | 625-269-002 | 713 446 | 5 332 867 | 350.8 | 18.2 | 423.2 | 4.3 | 0.4 | Vertical | 3.51E-03 | 3.51E-03 | 3.51E-03 | 1.20E-02 | 8.48E-02 | 3.14E-04 |
| fourind | Four à induction (Dépoussiéreur humide) | 625-575-001 | 713 396 | 5 332 845 | 350.8 | 15.8 | 326.2 | 24.0 | 0.2 | Vertical | 2.07E-02 | 2.05E-02 | 1.96E-02 | 0 | 0 | 0 |
| rescu | Dépoussiéreur humide du réservoir de sulfate de cuivre | 630-575-001 | 713 435 | 5 332 845 | 350.8 | 15.8 | 293.2 | 37.5 | 0.2 | Vertical | 3.54E-02 | 3.54E-02 | 3.54E-02 | 0 | 0 | 0 |

## A-1-11 CARACTÉRISTIQUES ET TAUX D'ÉMISSION DES SOURCES SURFACIQUES – MCM

| Identifiant | Description | Élévation (m) | Hauteur de relâche (m) | Sigma Z (m) | Surface considérée ($m^2$) | Teneur en limon (%) | Taux d'émission ($g/s.m^2$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | PMT | $PM_{10}$ | $PM_{2.5}$ |
| pcmw1 | Dépot du stériles #1 | 210.0 | 5.0 | 2.33 | 68 300 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcmw2 | Dépot du stériles #2 | 200.0 | 5.0 | 2.33 | 68 300 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcmo | Pile de minerai | 350.0 | 5.0 | 2.33 | 23 600 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcpb1 | Concasseur permanent - Pile matériaux brut #1 | 347.0 | 1.5 | 0.70 | 13 600 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcpb2 | Concasseur permanent - Pile matériaux brut #2 | 347.0 | 1.5 | 0.70 | 3 500 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcpl1 | Concasseur permanent - Pile temporaire ligne 1 | 340.0 | 4.3 | 2.02 | 1 800 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcpl2 | Concasseur permanent - Pile temporaire ligne 2 | 340.0 | 4.3 | 2.02 | 1 800 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcph2 | Concasseur permanent - Empilement 2H | 337.0 | 5.0 | 2.33 | 52 000 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcsb1 | Concasseur saisonnier - Pile matériaux brut #1 | 314.0 | 1.5 | 0.70 | 3 400 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcsb2 | Concasseur saisonnier - Pile matériaux brut #2 | 314.0 | 1.5 | 0.70 | 2 200 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcsc1 | Concasseur saisonnier - Pile matériaux concassé #1 | 314.0 | 4.5 | 2.09 | 17 000 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcsc2 | Concasseur saisonnier - Pile matériaux concassé #2 | 314.0 | 3.3 | 1.51 | 2 750 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| pcsc3 | Concasseur saisonnier - Pile matériaux concassé #3 | 314.0 | 4.5 | 2.09 | 9 000 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| Note: Le taux d'émission est égal à zéro lorsque la vitesse du vent est inférieure à 5,36 m/s (19,3 km/h). | | | | | | | | | |

## A-1-12 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – CHARGEMENTS ET DÉCHARGEMENTS – ODYSSEY

| Identifiant | Description | Tonnage manipulé (ktm/h) | Humidité du matériel (%) | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Atténuation (%) | Taux d'émission (g/s) [1] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| ldop22o | Chargement à P22 (Minerai) | 0.131 | 5.4 | 717 782 | 5 334 419 | 308.9 | 4.9 | 1.49 | 0.76 | 0 | 1.89E-02 | 8.92E-03 | 1.35E-03 |
| ldop22w | Chargement à P22 (Stériles) | 0.012 | 5.4 | 717 782 | 5 334 419 | 308.9 | 4.9 | 1.49 | 0.76 | 0 | 1.69E-03 | 7.97E-04 | 1.21E-04 |
| ldop21w | Chargement à P21 (Stériles) | 0.011 | 5.4 | 717 909 | 5 334 291 | 309.4 | 4.9 | 0.35 | 0.76 | 0 | 1.65E-03 | 7.79E-04 | 1.18E-04 |
| dpop19o | Déchargement à P19 (Minerai) | 0.131 | 5.4 | 717 728 | 5 334 493 | 308.4 | 1.0 | 0.74 | 3.26 | 0 | 1.89E-02 | 8.92E-03 | 1.35E-03 |
| dpop08o | Déchargement à P08 (Minerai) | 0.131 | 5.4 | 713 076 | 5 334 062 | 345.4 | 1.3 | 1.62 | 6.45 | 90 | 1.89E-03 | 8.92E-04 | 1.35E-04 |
| dpop23w | Déchargement à P23 (Stériles) | 0.012 | 5.4 | 717 828 | 5 334 457 | 308.7 | 1.0 | 0.74 | 3.26 | 0 | 1.69E-03 | 7.97E-04 | 1.21E-04 |
| dpop26w | Déchargement à P26 (Stériles) | 0.012 | 5.4 | 714 728 | 5 334 489 | 210.0 | 1.3 | 1.62 | 6.45 | 0 | 1.69E-03 | 7.97E-04 | 1.21E-04 |
| dpop27w | Déchargement à P27 (Stériles) | 0.011 | 5.4 | 714 417 | 5 334 615 | 200.0 | 1.3 | 1.62 | 6.45 | 0 | 1.65E-03 | 7.79E-04 | 1.18E-04 |

[1] Taux d'émission calculés heure par heure en fonction de la vitesse du vent suivant la méthode de l'AP-42, section 13.2.4 Aggregate Handling And Storage Piles. Le taux d'émission est présenté pour un vent d'une vitesse de 3.40 m/s

## A-1-13 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – SEGMENTS DE ROUTAGE – ODYSSEY

| Segment | Longueur du segment (m) | Largeur du segment (m) | Hauteur moyenne des véhicules (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Teneur en limon (%) | Poids moyen des véhicules (tons) | Facteur d'émission (g/VKT) | | | Nombre de déplacement (jour$^{-1}$) | VKT (jour$^{-1}$) | Taux d'émission sans atténuation (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| P16_P18 | 264 | 30.0 | 2.9 | 2.5 | 33.49 | 2.30 | 8.3 | 82.1 | 4 731.7 | 1 345.5 | 134.6 | 108.8 | 28.7 | 1.57E+00 | 4.47E-01 | 4.47E-02 |
| P17_P15 | 79 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 2.4 | 0.2 | 1.88E-02 | 5.35E-03 | 5.35E-04 |
| P06_P11 | 2 328 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 27.7 | 64.6 | 6.34E+00 | 1.80E+00 | 1.80E-01 |
| P11_P09 | 967 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 27.7 | 26.8 | 2.63E+00 | 7.49E-01 | 7.49E-02 |
| P09_P07 | 91 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 27.7 | 2.5 | 2.47E-01 | 7.03E-02 | 7.03E-03 |
| P07_P08 | 337 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 27.7 | 9.4 | 9.19E-01 | 2.61E-01 | 2.61E-02 |
| P04_P06 | 1 470 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 4.9 | 7.2 | 7.08E-01 | 2.01E-01 | 2.01E-02 |
| P04_P05 | 104 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 4.9 | 0.5 | 5.02E-02 | 1.43E-02 | 1.43E-03 |
| P22_P15 | 109 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 30.2 | 3.3 | 3.22E-01 | 9.17E-02 | 9.17E-03 |
| P15_P34 | 1 221 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 32.6 | 39.9 | 3.91E+00 | 1.11E+00 | 1.11E-01 |
| P18_P23 | 127 | 30.0 | 2.9 | 2.5 | 33.49 | 2.30 | 8.3 | 82.1 | 4 731.7 | 1 345.5 | 134.6 | 8.9 | 1.1 | 6.19E-02 | 1.76E-02 | 1.76E-03 |
| P18_P19 | 43 | 30.0 | 2.9 | 2.5 | 33.49 | 2.30 | 8.3 | 82.1 | 4 731.7 | 1 345.5 | 134.6 | 99.9 | 4.3 | 2.34E-01 | 6.67E-02 | 6.67E-03 |
| P21_P17 | 49 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 2.4 | 0.1 | 1.16E-02 | 3.31E-03 | 3.31E-04 |
| P05_P27 | 544 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 2.4 | 1.3 | 1.29E-01 | 3.68E-02 | 3.68E-03 |
| P05_P26 | 340 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 2.5 | 0.8 | 8.27E-02 | 2.35E-02 | 2.35E-03 |
| P34_P06 | 532 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 32.6 | 17.4 | 1.70E+00 | 4.85E-01 | 4.85E-02 |

## A-1-14 COORDONNÉES ET ÉLÉVATION DES SOURCES DE ROUTAGE ADDITIONNELLES – ODYSSEY

| Identifiant | X (m) | Y (m) | Élévation (m) | Identifiant | X (m) | Y (m) | Élévation (m) |
|---|---|---|---|---|---|---|---|
| P16_P18_1 | 717 941 | 5 334 595 | 308.4 | P15_P34_08 | 717 437 | 5 334 569 | 319.6 |
| P16_P18_2 | 717 869 | 5 334 595 | 309.1 | P15_P34_09 | 717 380 | 5 334 612 | 319.9 |
| P16_P18_3 | 717 797 | 5 334 595 | 309.3 | P15_P34_10 | 717 309 | 5 334 616 | 320.0 |
| P16_P18_4 | 717 749 | 5 334 551 | 309.0 | P15_P34_11 | 717 237 | 5 334 616 | 320.0 |
| P17_P15_1 | 717 860 | 5 334 348 | 309.5 | P15_P34_12 | 717 165 | 5 334 616 | 320.0 |
| P22_P15_1 | 717 798 | 5 334 410 | 309.0 | P15_P34_13 | 717 093 | 5 334 614 | 320.0 |
| P22_P15_2 | 717 831 | 5 334 352 | 309.0 | P15_P34_14 | 717 021 | 5 334 610 | 320.7 |
| P15_P34_01 | 717 804 | 5 334 308 | 307.7 | P15_P34_15 | 716 950 | 5 334 607 | 321.4 |
| P15_P34_02 | 717 758 | 5 334 280 | 317.6 | P15_P34_16 | 716 879 | 5 334 597 | 321.7 |
| P15_P34_03 | 717 700 | 5 334 324 | 318.0 | P15_P34_17 | 716 817 | 5 334 560 | 322.0 |
| P15_P34_04 | 717 647 | 5 334 372 | 318.3 | P18_P23_1 | 717 760 | 5 334 516 | 308.8 |
| P15_P34_05 | 717 593 | 5 334 420 | 318.6 | P18_P23_2 | 717 821 | 5 334 478 | 308.9 |
| P15_P34_06 | 717 541 | 5 334 469 | 319.0 | P18_P19_1 | 717 725 | 5 334 513 | 308.5 |
| P15_P34_07 | 717 489 | 5 334 519 | 319.3 | P21_P17_1 | 717 896 | 5 334 310 | 309.3 |

## A-1-15 PARAMÈTRES PHYSIQUES ET TAUX D'ÉMISSION UTILISÉS POUR LA MODÉLISATION DES GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS LOCALISÉS – ODYSSEY

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Type de source | Taux d'émission (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | $PM_{10}$ [1] | $PM_{2.5}$ | CO | NOx | $SO_2$ |
| ldop22x | Chargement à P22 - Exhaust (Létourneau L-1850-2) | 717 782 | 5 334 419 | 308.9 | 5.8 | 733.2 | 41.0 | 0.4 | Vertical | 8.64E-02 | 8.38E-02 | 4.22E-01 | 1.96E+00 | 1.61E-03 |
| [1] Toutes les particules émises sont supposées être plus petites que 10 microns donc PMT = $PM_{10}$. | | | | | | | | | | | | | | |

## A-1-16 CARACTÉRISTIQUES PHYSIQUES DES SOURCES DE VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Type de source | Proportion du débit (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| vent1 | Évacuation d'air vicié - Portail | 717 871 | 5 334 595 | 309.0 | 1.0 | 288.2 | 8.3 | 6.1 | Horizontal | 49 % |
| vent2 | Évacuation d'air vicié - #1 | 717 946 | 5 334 512 | 308.5 | 1.0 | 288.2 | 8.9 | 6.1 | Vertical | 51 % |

## A-1-17 DESCRIPTION ET TAUX D'ÉMISSIONS CALCULÉS POUR LES VÉHICULES HORS ROUTE UTILISÉS DANS LA MINE SOUTERRAINE – ODYSSEY

| Véhicule | Type | Puissance (hp) | Tier | Facteur de chargement [1] | Taux d'émission par véhicule (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | $PM_{10}$ [2] | $PM_{2.5}$ | CO | $NO_x$ | $SO_2$ |
| Sandvik DD422i | Foreuse | 160 | T3 | 0.43 | 5.20E-03 | 5.04E-03 | 1.91E-02 | 4.82E-02 | 9.32E-05 |
| MacLean CS3 | Camion de transport hors-route | 138 | T3 | 0.59 | 9.59E-03 | 9.30E-03 | 3.45E-02 | 5.93E-02 | 1.11E-04 |
| MacLean BT3 | Camion de transport hors-route | 147 | T3 | 0.59 | 1.02E-02 | 9.91E-03 | 3.68E-02 | 6.31E-02 | 1.19E-04 |
| MacLean 928 | Camion de transport hors-route | 154 | T2 | 0.59 | 6.91E-03 | 6.70E-03 | 3.68E-02 | 9.92E-02 | 1.24E-04 |
| MacLean SL3 | Camion de transport hors-route | 138 | T3 | 0.59 | 9.59E-03 | 9.30E-03 | 3.45E-02 | 5.93E-02 | 1.11E-04 |
| Putzmeister PM407 | Camion de transport hors-route | 73.4 | T4i | 0.59 | 3.54E-03 | 3.44E-03 | 3.28E-02 | 3.64E-02 | 4.67E-05 |
| Sandvik DU412I | Foreuse | 173 | T3 | 0.43 | 5.62E-03 | 5.45E-03 | 2.06E-02 | 5.21E-02 | 1.01E-04 |
| Caterpillar 140M | Niveleuse | 223 | T3 | 0.59 | 9.95E-03 | 9.65E-03 | 4.81E-02 | 9.58E-02 | 1.80E-04 |
| Sandvik LH621 | Chargeuse sur roues | 475 | T2 | 0.59 | 1.45E-02 | 1.40E-02 | 1.10E-01 | 3.23E-01 | 3.83E-04 |
| Sandvik LH517 (option T4) | Chargeuse sur roues | 400 | T4i | 0.59 | 8.88E-04 | 8.62E-04 | 6.34E-03 | 1.65E-01 | 2.29E-04 |
| Sandvik TH663i (option T4) | Camion de transport hors-route | 810 | T4N | 0.59 | 5.40E-03 | 5.24E-03 | 1.16E-02 | 3.20E-01 | 4.64E-04 |
| Sandvik TH551 (option T4) | Camion de transport hors-route | 691 | T4i | 0.59 | 1.53E-03 | 1.49E-03 | 1.73E-02 | 2.85E-01 | 3.95E-04 |
| MacLean WS3 | Équipement de construction divers | 147 | T3 | 0.59 | 1.02E-02 | 9.91E-03 | 3.68E-02 | 6.31E-02 | 1.19E-04 |
| Sandvik LH307 | Chargeuse sur roues | 215 | T3 | 0.59 | 9.58E-03 | 9.29E-03 | 4.63E-02 | 9.22E-02 | 1.73E-04 |
| Sandvik DS421 | Foreuse | 148 | T3 | 0.43 | 4.81E-03 | 4.67E-03 | 1.76E-02 | 4.45E-02 | 8.62E-05 |

[1] Appendix A, (US-EPA, 2004)
[2] Toutes les émissions de particules sont considérées plus petites que 10 µm, et donc PMT = PM10.

## A-1-18 TAUX D'ÉMISSION MOYEN DES GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS MINIERS SOUTERRAINS CONSIDÉRÉS À LA SOURCE DE VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Véhicule | Nombre d'équipements | Facteur d'utilisation[1] (%) | Modèle équivalent | Taux d'émission total (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | $PM_{10}$[2] | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Jumbo | 1 | 69% | Sandvik DD422i | 3.60E-03 | 3.49E-03 | 1.32E-02 | 3.33E-02 | 6.45E-05 |
| Emulsion loader - production | 1 | 41% | MacLean CS3 | 3.97E-03 | 3.85E-03 | 1.43E-02 | 2.46E-02 | 4.62E-05 |
| Boom truck | 1 | 51% | MacLean BT3 | 5.22E-03 | 5.06E-03 | 1.88E-02 | 3.23E-02 | 6.06E-05 |
| Scissor - bolter | 2 | 48% | MacLean 928 | 6.68E-03 | 6.48E-03 | 3.56E-02 | 9.59E-02 | 1.20E-04 |
| Scissor lift | 4 | 21% | MacLean SL3 | 7.94E-03 | 7.71E-03 | 2.86E-02 | 4.91E-02 | 9.23E-05 |
| Emulsion loader dev | 1 | 21% | Putzmeister PM407 | 7.34E-04 | 7.12E-04 | 6.79E-03 | 7.54E-03 | 9.67E-06 |
| ITH drill | 2 | 73% | Sandvik DU412l | 8.18E-03 | 7.93E-03 | 3.00E-02 | 7.57E-02 | 1.47E-04 |
| Grader | 1 | 52% | Caterpillar 140M | 5.22E-03 | 5.07E-03 | 2.53E-02 | 5.03E-02 | 9.45E-05 |
| Fuel-lube cassette | 1 | 41% | MacLean CS3 | 3.97E-03 | 3.85E-03 | 1.43E-02 | 2.46E-02 | 4.62E-05 |
| LHD LH621 | 2 | 67% | Sandvik LH621 | 1.94E-02 | 1.88E-02 | 1.48E-01 | 4.34E-01 | 5.14E-04 |
| LHD LH 517 | 3 | 67% | Sandvik LH517 (option T4) | 1.79E-03 | 1.73E-03 | 1.27E-02 | 3.32E-01 | 4.60E-04 |
| Truck 663i | 5 | 70% | Sandvik TH663i (option T4) | 1.89E-02 | 1.83E-02 | 4.07E-02 | 1.12E+00 | 1.62E-03 |
| Truck 551i | 1 | 70% | Sandvik TH551 (option T4) | 1.07E-03 | 1.04E-03 | 1.21E-02 | 2.00E-01 | 2.77E-04 |
| Water canon | 1 | 24% | MacLean WS3 | 2.47E-03 | 2.40E-03 | 8.90E-03 | 1.53E-02 | 2.87E-05 |
| Sandvick LH307 | 1 | 67% | Sandvik LH307 | 6.42E-03 | 6.23E-03 | 3.10E-02 | 6.18E-02 | 1.16E-04 |
| | | | Total : | 9.56E-02 | 9.27E-02 | 4.40E-01 | 2.56E+00 | 3.70E-03 |

[1] Inclus le pourcentage d'utilisation et le pourcentage d'efficacité.
[2] Toutes les émissions de particules sont considérées comme plus petites que 10 µm, et donc PMT = $PM_{10}$.

## A-1-19 TAUX D'ÉMISSION DES SAUTAGES SOUTERRAINS CONSIDÉRÉS – VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Zones | Chantier | Tonnage (kt) | Surface ($m^2$) | Quantité d'explosif (t) | Taux d'émission total (g/s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Odyssey Sud | 50 m | 25 | 400 | 20,4 | 4.89E-01 | 2.54E-01 | 1.47E-02 | 1.31E+01 | 1.14E+00 | 3.41E-01 |

## A-1-20 TAUX D'ÉMISSION ESTIMÉS POUR LE CHAUFFAGE DE L'AIR FRAIS POUR LA VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Mois | Alimentation en gaz naturel ($m^3/h$) | Puissance (kW) | Taux de souffre (grains/$10^6$ scf) | Taux d'émission (g/s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | PMT | $PM_{10}$ | $PM_{2.5}$ | CO | $NO_x$ | $SO_2$ |
| Janvier | 1 678 | 17 662 | 2 000 | 5.67E-02 | 5.67E-02 | 5.67E-02 | 6.27E-01 | 3.73E-01 | 4.48E-03 |
| Février | 1 494 | 15 728 | 2 000 | 5.05E-02 | 5.05E-02 | 5.05E-02 | 5.58E-01 | 3.32E-01 | 3.98E-03 |
| Mars | 983 | 10 345 | 2 000 | 3.32E-02 | 3.32E-02 | 3.32E-02 | 3.67E-01 | 2.18E-01 | 2.62E-03 |
| Avril | 240 | 2 523 | 2 000 | 8.10E-03 | 8.10E-03 | 8.10E-03 | 8.95E-02 | 5.33E-02 | 6.39E-04 |
| Novembre | 583 | 6 140 | 2 000 | 1.97E-02 | 1.97E-02 | 1.97E-02 | 2.18E-01 | 1.30E-01 | 1.56E-03 |
| Décembre | 1 366 | 14 382 | 2 000 | 4.62E-02 | 4.62E-02 | 4.62E-02 | 5.10E-01 | 3.04E-01 | 3.64E-03 |

## A-1-21 TAUX D'ÉMISSION POUR CHAQUE TYPE D'ÉMISSION ESTIMÉS POUR LA VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Type d'émission | Taux d'émission (g/s) | | | | | |
|---|---|---|---|---|---|---|
| | PMT | $PM_{10}$ | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Gaz d'échappements | 9.56E-02 | 9.56E-02 | 9.27E-02 | 4.40E-01 | 2.56E+00 | 3.70E-03 |
| Manipulation de matériaux | 1.52E-01 | 7.75E-02 | 2.28E-02 | - | - | - |
| Sautage (durant 1 heure) | 4.89E-01 | 2.54E-01 | 1.47E-02 | 1.31E+01 | 1.14E+00 | 3.41E-01 |
| Chauffage (situation maximale : mois de janvier) | 5.67E-02 | 5.67E-02 | 5.67E-02 | 6.27E-01 | 3.73E-01 | 4.48E-03 |

## A-1-22 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSION POUR LE DÉPOUSSIÉREUR DE L'USINE DE REMBLAI EN PÂTE – ODYSSEY

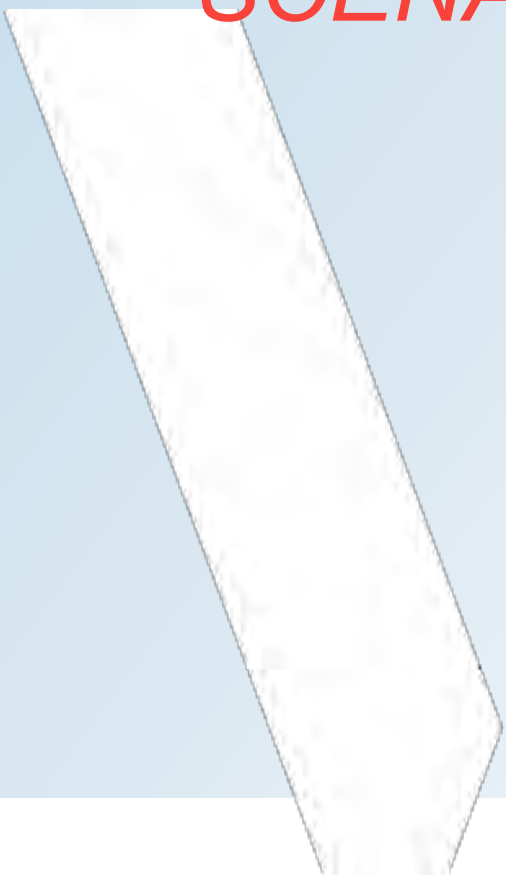
| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Débit normalisé ($Nm^3/h$) | Concentration PMT ($mg/Nm^3$) | Ratio $PM_{10}$/PMT (%) | Ratio $PM_{2,5}$/PMT (%) | Taux d'émission (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | PMT | PM10 | PM2,5 |
| dc11 | Dépoussiéreur #1 Ligne 1 | 718 183 | 5 334 557 | 307.0 | 12.0 | Ambiante | 6.7 | 0.3 | 1 699 | 30 | 95 | 50 | 1.42E-02 | 1.34E-02 | 7.06E-03 |
| dc12 [1] | Dépoussiéreur #2 Ligne 1 | 718 183 | 5 334 557 | 307.0 | 27.0 | Ambiante | 4.3 | 0.3 | 934 | 30 | 95 | 50 | 7.79E-03 | 7.37E-03 | 3.88E-03 |
| [1] Considéré actif 8 heures par jour dans la modélisation, selon l'utilisation prévue. | | | | | | | | | | | | | | | |

## A-1-23 CARACTÉRISTIQUES ET TAUX D'ÉMISSION DES SOURCES SURFACIQUES – ODYSSEY

| Identifiant | Description | Élévation (m) | Hauteur de relâche (m) | Sigma Z (m) | Surface considérée ($m^2$) | Teneur en limon (%) | Taux d'émission ($g/s.m^2$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | PMT | $PM_{10}$ | $PM_{2.5}$ |
| podo | Halde de minerai - Odyssey | 308.0 | 2.5 | 1.16 | 4 000 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| podw1 | Halde de stériles - Odyssey | 308.0 | 2.5 | 1.16 | 2 500 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| Note: Le taux d'émission est égal à zéro lorsque la vitesse du vent est inférieure à 5,36 m/s (19,3 km/h). | | | | | | | | | |

# ANNEXE

## A-2 *CARACTÉRISATION DES SOURCES – SCÉNARIO 2*



## A-2-1 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – CHARGEMENTS ET DÉCHARGEMENTS – ODYSSEY

| Identifiant | Description | Tonnage manipulé (ktm/h) | Humidité du matériel (%) | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Atténuation (%) | Taux d'émission (g/s) [1] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| ldop22o | Chargement à P22 (Minerai) | 0.124 | 5.4 | 717 782 | 5 334 419 | 308.9 | 4.9 | 1.49 | 0.76 | 0 | 1.79E-02 | 8.46E-03 | 1.28E-03 |
| ldop20o | Chargement à P20 (Minerai) | 0.749 | 5.4 | 717 925 | 5 334 298 | 309.3 | 4.9 | 0.35 | 0.76 | 0 | 1.08E-01 | 5.10E-02 | 7.72E-03 |
| ldop22w | Chargement à P22 (Stériles) | 0.015 | 5.4 | 717 782 | 5 334 419 | 308.9 | 4.9 | 1.49 | 0.76 | 0 | 2.14E-03 | 1.01E-03 | 1.53E-04 |
| ldop20w | Chargement à P20 (Stériles) | 0.090 | 5.4 | 717 925 | 5 334 298 | 309.3 | 4.9 | 0.35 | 0.76 | 0 | 1.29E-02 | 6.12E-03 | 9.27E-04 |
| dpop19o | Déchargement à P19 (Minerai) | 0.124 | 5.4 | 717 728 | 5 334 493 | 308.4 | 1.0 | 0.74 | 3.26 | 0 | 1.79E-02 | 8.46E-03 | 1.28E-03 |
| dpop10o | Déchargement à P10 (Minerai) | 0.092 | 5.4 | 713 713 | 5 333 658 | 350.0 | 1.3 | 1.62 | 6.45 | 0 | 1.32E-02 | 6.25E-03 | 9.47E-04 |
| dpop08o | Déchargement à P08 (Minerai) | 0.781 | 5.4 | 713 076 | 5 334 062 | 345.4 | 1.3 | 1.62 | 6.45 | 90 | 1.12E-02 | 5.32E-03 | 8.05E-04 |
| dpop23w | Déchargement à P23 (Stériles) | 0.015 | 5.4 | 717 828 | 5 334 457 | 308.7 | 1.0 | 0.74 | 3.26 | 0 | 2.14E-03 | 1.01E-03 | 1.53E-04 |
| dpop04w | Déchargement à P04 (Stériles) | 0.105 | 5.4 | 715 050 | 5 334 734 | 209.9 | 1.3 | 1.62 | 6.45 | 0 | 1.51E-02 | 7.14E-03 | 1.08E-03 |

[1] Taux d'émission calculés heure par heure en fonction de la vitesse du vent suivant la méthode de l'AP-42, section 13.2.4 Aggregate Handling And Storage Piles. Le taux d'émission est présenté pour un vent d'une vitesse de 3.40 m/s

## A-2-2 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – BOUTAGE – ODYSSEY

| Identifiant | Description | Équipement | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Teneur en silt (%) | Humidité du matériel (%) | Atténuation (%) | Taux d'émission avec atténuation (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| tdoz01 | Bouteur sur chenilles | Caterpillar D10T | 712 989 | 5 334 061 | 342.0 | 1.1 | 1.22 | 1.05 | 3.9 | 5.4 | 50 | 2.06E-01 | 3.41E-02 | 2.17E-02 |

## A-2-3 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSIONS – SEGMENTS DE ROUTAGE – ODYSSEY

| Segment | Longueur du segment (m) | Largeur du segment (m) | Hauteur moyenne des véhicules (m) | Hauteur de relâche (m) | Sigma Y (m) | Sigma Z (m) | Teneur en limon (%) | Poids moyen des véhicules (tons) | Facteur d'émission (g/VKT) | | | Nombre de déplacement (jour$^{-1}$) | VKT (jour$^{-1}$) | Taux d'émission sans atténuation (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ | | | PMT | $PM_{10}$ | $PM_{2,5}$ |
| P16_P18 | 264 | 30.0 | 2.9 | 2.5 | 33.49 | 2.30 | 8.3 | 82.1 | 4 731.7 | 1 345.5 | 134.6 | 106.0 | 28.0 | 1.53E+00 | 4.36E-01 | 4.36E-02 |
| P17_P15 | 79 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 177.5 | 14.0 | 1.38E+00 | 3.92E-01 | 3.92E-02 |
| P06_P11 | 2 328 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 184.8 | 430.2 | 4.22E+01 | 1.20E+01 | 1.20E+00 |
| P11_P09 | 967 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 184.8 | 178.7 | 1.75E+01 | 4.99E+00 | 4.99E-01 |
| P09_P07 | 91 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 165.4 | 15.0 | 1.47E+00 | 4.19E-01 | 4.19E-02 |
| P07_P08 | 337 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 165.4 | 55.8 | 5.48E+00 | 1.56E+00 | 1.56E-01 |
| P04_P06 | 1 509 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 22.2 | 33.5 | 3.29E+00 | 9.35E-01 | 9.35E-02 |
| P22_P15 | 109 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 29.4 | 3.2 | 3.14E-01 | 8.93E-02 | 8.93E-03 |
| P15_P06 | 1 752 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 207.0 | 362.7 | 3.56E+01 | 1.01E+01 | 1.01E+00 |
| P18_P23 | 127 | 30.0 | 2.9 | 2.5 | 33.49 | 2.30 | 8.3 | 82.1 | 4 731.7 | 1 345.5 | 134.6 | 11.3 | 1.4 | 7.86E-02 | 2.24E-02 | 2.24E-03 |
| P18_P19 | 43 | 30.0 | 2.9 | 2.5 | 33.49 | 2.30 | 8.3 | 82.1 | 4 731.7 | 1 345.5 | 134.6 | 94.7 | 4.1 | 2.22E-01 | 6.32E-02 | 6.32E-03 |
| P20_P17 | 47 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 177.5 | 8.4 | 8.26E-01 | 2.35E-01 | 2.35E-02 |
| P10_P09 | 665 | 30.0 | 6.6 | 5.6 | 33.49 | 5.22 | 8.3 | 300.5 | 8 482.8 | 2 412.2 | 241.2 | 19.4 | 12.9 | 1.27E+00 | 3.61E-01 | 3.61E-02 |

## A-2-4 COORDONNÉES ET ÉLÉVATION DES SOURCES DE ROUTAGE – ODYSSEY

| Identifiant | X (m) | Y (m) | Élévation (m) | Identifiant | X (m) | Y (m) | Élévation (m) |
|---|---|---|---|---|---|---|---|
| P16_P18_1 | 717 941 | 5 334 595 | 308.4 | P11_P09_05 | 713 950 | 5 334 092 | 337.0 |
| P16_P18_2 | 717 869 | 5 334 595 | 309.1 | P11_P09_06 | 713 881 | 5 334 112 | 337.8 |
| P16_P18_3 | 717 797 | 5 334 595 | 309.3 | P11_P09_07 | 713 812 | 5 334 132 | 337.9 |
| P16_P18_4 | 717 749 | 5 334 551 | 309.0 | P11_P09_08 | 713 743 | 5 334 152 | 338.8 |
| P17_P15_1 | 717 860 | 5 334 348 | 309.5 | P11_P09_09 | 713 673 | 5 334 171 | 339.2 |
| P06_P11_01 | 716 263 | 5 334 319 | 324.3 | P11_P09_10 | 713 603 | 5 334 188 | 340.0 |
| P06_P11_02 | 716 191 | 5 334 315 | 324.1 | P11_P09_11 | 713 532 | 5 334 199 | 340.8 |
| P06_P11_03 | 716 120 | 5 334 321 | 325.0 | P11_P09_12 | 713 460 | 5 334 201 | 341.6 |
| P06_P11_04 | 716 048 | 5 334 327 | 325.1 | P11_P09_13 | 713 388 | 5 334 201 | 341.7 |
| P06_P11_05 | 715 976 | 5 334 328 | 325.7 | P09_P07_1 | 713 326 | 5 334 237 | 340.3 |
| P06_P11_06 | 715 905 | 5 334 318 | 329.4 | P07_P08_1 | 713 283 | 5 334 273 | 340.2 |
| P06_P11_07 | 715 837 | 5 334 296 | 334.5 | P07_P08_2 | 713 216 | 5 334 247 | 342.1 |
| P06_P11_08 | 715 770 | 5 334 269 | 338.7 | P07_P08_3 | 713 157 | 5 334 207 | 342.4 |
| P06_P11_09 | 715 704 | 5 334 242 | 339.0 | P07_P08_4 | 713 111 | 5 334 152 | 343.3 |
| P06_P11_10 | 715 634 | 5 334 222 | 338.8 | P07_P08_5 | 713 084 | 5 334 086 | 344.4 |
| P06_P11_11 | 715 565 | 5 334 203 | 337.5 | P04_P06_01 | 715 063 | 5 334 703 | 210.0 |
| P06_P11_12 | 715 496 | 5 334 181 | 335.2 | P04_P06_02 | 715 106 | 5 334 645 | 210.0 |
| P06_P11_13 | 715 429 | 5 334 155 | 334.8 | P04_P06_03 | 715 160 | 5 334 598 | 215.2 |
| P06_P11_14 | 715 363 | 5 334 127 | 334.3 | P04_P06_04 | 715 215 | 5 334 552 | 222.4 |
| P06_P11_15 | 715 298 | 5 334 097 | 332.9 | P04_P06_05 | 715 272 | 5 334 509 | 229.5 |
| P06_P11_16 | 715 232 | 5 334 067 | 333.8 | P04_P06_06 | 715 331 | 5 334 469 | 236.2 |
| P06_P11_17 | 715 172 | 5 334 029 | 334.3 | P04_P06_07 | 715 400 | 5 334 450 | 242.9 |
| P06_P11_18 | 715 159 | 5 333 961 | 334.7 | P04_P06_08 | 715 471 | 5 334 438 | 250.0 |
| P06_P11_19 | 715 149 | 5 333 891 | 334.7 | P04_P06_09 | 715 542 | 5 334 432 | 256.7 |
| P06_P11_20 | 715 087 | 5 333 859 | 335.2 | P04_P06_10 | 715 613 | 5 334 441 | 263.6 |
| P06_P11_21 | 715 018 | 5 333 839 | 334.6 | P04_P06_11 | 715 680 | 5 334 465 | 270.5 |
| P06_P11_22 | 714 946 | 5 333 836 | 334.1 | P04_P06_12 | 715 745 | 5 334 497 | 277.5 |
| P06_P11_23 | 714 874 | 5 333 839 | 333.5 | P04_P06_13 | 715 809 | 5 334 528 | 284.0 |
| P06_P11_24 | 714 803 | 5 333 832 | 333.7 | P04_P06_14 | 715 880 | 5 334 532 | 290.3 |
| P06_P11_25 | 714 735 | 5 333 809 | 333.8 | P04_P06_15 | 715 950 | 5 334 515 | 295.8 |
| P06_P11_26 | 714 668 | 5 333 784 | 336.2 | P04_P06_16 | 716 009 | 5 334 475 | 301.2 |
| P06_P11_27 | 714 596 | 5 333 783 | 338.8 | P04_P06_17 | 716 069 | 5 334 436 | 306.9 |
| P06_P11_28 | 714 524 | 5 333 783 | 338.9 | P04_P06_18 | 716 128 | 5 334 399 | 310.0 |
| P06_P11_29 | 714 454 | 5 333 793 | 339.1 | P04_P06_19 | 716 186 | 5 334 383 | 317.0 |
| P06_P11_30 | 714 394 | 5 333 831 | 338.8 | P04_P06_20 | 716 232 | 5 334 380 | 322.1 |
| P06_P11_31 | 714 342 | 5 333 881 | 337.7 | P04_P06_21 | 716 296 | 5 334 356 | 323.8 |
| P06_P11_32 | 714 290 | 5 333 931 | 334.8 | P22_P15_1 | 717 798 | 5 334 410 | 309.0 |
| P11_P09_01 | 714 220 | 5 334 001 | 334.4 | P22_P15_2 | 717 831 | 5 334 352 | 309.0 |
| P11_P09_02 | 714 158 | 5 334 035 | 334.5 | P15_P06_01 | 717 795 | 5 334 297 | 309.8 |
| P11_P09_03 | 714 089 | 5 334 056 | 334.6 | P15_P06_02 | 717 747 | 5 334 289 | 317.7 |
| P11_P09_04 | 714 019 | 5 334 073 | 335.3 | P15_P06_03 | 717 690 | 5 334 333 | 318.0 |

## A-2-4 COORDONNÉES ET ÉLÉVATION DES SOURCES DE ROUTAGE – ODYSSEY (suite)

| Identifiant | X (m) | Y (m) | Élévation (m) | Identifiant | X (m) | Y (m) | Élévation (m) |
|---|---|---|---|---|---|---|---|
| P15_P06_04 | 717 637 | 5 334 381 | 318.4 | P15_P06_21 | 716 550 | 5 334 431 | 323.0 |
| P15_P06_05 | 717 583 | 5 334 429 | 318.7 | P15_P06_22 | 716 480 | 5 334 413 | 323.2 |
| P15_P06_06 | 717 531 | 5 334 479 | 319.0 | P15_P06_23 | 716 414 | 5 334 385 | 323.9 |
| P15_P06_07 | 717 479 | 5 334 529 | 319.3 | P15_P06_24 | 716 354 | 5 334 345 | 324.3 |
| P15_P06_08 | 717 427 | 5 334 579 | 319.7 | P18_P23_1 | 717 760 | 5 334 516 | 308.8 |
| P15_P06_09 | 717 367 | 5 334 616 | 319.9 | P18_P23_2 | 717 821 | 5 334 478 | 308.9 |
| P15_P06_10 | 717 295 | 5 334 616 | 320.0 | P18_P19_1 | 717 725 | 5 334 513 | 308.5 |
| P15_P06_11 | 717 223 | 5 334 616 | 320.0 | P20_P17_1 | 717 908 | 5 334 314 | 309.3 |
| P15_P06_12 | 717 151 | 5 334 616 | 320.0 | P10_P09_1 | 713 684 | 5 333 691 | 350.0 |
| P15_P06_13 | 717 079 | 5 334 613 | 320.0 | P10_P09_2 | 713 636 | 5 333 745 | 350.0 |
| P15_P06_14 | 717 008 | 5 334 610 | 321.0 | P10_P09_3 | 713 588 | 5 333 799 | 350.0 |
| P15_P06_15 | 716 936 | 5 334 606 | 321.4 | P10_P09_4 | 713 544 | 5 333 855 | 350.0 |
| P15_P06_16 | 716 865 | 5 334 593 | 321.5 | P10_P09_5 | 713 524 | 5 333 924 | 350.0 |
| P15_P06_17 | 716 806 | 5 334 552 | 322.3 | P10_P09_6 | 713 477 | 5 333 977 | 350.0 |
| P15_P06_18 | 716 748 | 5 334 510 | 322.7 | P10_P09_7 | 713 429 | 5 334 030 | 350.0 |
| P15_P06_19 | 716 686 | 5 334 474 | 322.8 | P10_P09_8 | 713 387 | 5 334 088 | 350.0 |
| P15_P06_20 | 716 620 | 5 334 446 | 323.0 | P10_P09_9 | 713 356 | 5 334 153 | 343.4 |

## A-2-5 PARAMÈTRES PHYSIQUES ET TAUX D'ÉMISSION UTILISÉS POUR LA MODÉLISATION DES GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS LOCALISÉS – ODYSSEY

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Type de source | Taux d'émission (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | $PM_{10}$ [1] | $PM_{2.5}$ | CO | NOx | $SO_2$ |
| ldop22x | Chargement à P22 - Exhaust (Létourneau L-1850-2) | 717 782 | 5 334 419 | 308.9 | 5.8 | 733.2 | 41.0 | 0.4 | Vertical | 1.73E-01 | 1.68E-01 | 8.44E-01 | 3.92E+00 | 3.23E-03 |
| tdoz01x | Bouteur sur chenilles - Exhaust (Caterpillar D10T) | 712 989 | 5 334 061 | 342.0 | 4.5 | 755.4 | 31.2 | 0.2 | Vertical | 2.69E-02 | 2.61E-02 | 2.31E-01 | 2.59E-01 | 4.87E-04 |
| [1] Toutes les particules émises sont supposées être plus petites que 10 microns donc PMT = $PM_{10}$. | | | | | | | | | | | | | | |

## A-2-6 CARACTÉRISTIQUES PHYSIQUES DES SOURCES DE VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Type de source | Proportion du débit (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| vent1 | Évacuation d'air vicié - Portail | 717 871 | 5 334 595 | 309.0 | 1.0 | 288.2 | 8.3 | 6.1 | Horizontal | 23 % |
| vent2 | Évacuation d'air vicié - #1 | 717 946 | 5 334 512 | 308.5 | 1.0 | 288.2 | 8.9 | 6.1 | Vertical | 24 % |
| vent3 | Évacuation d'air vicié - #2 | 717 680 | 5 334 515 | 308.5 | 1.0 | 288.2 | 13.1 | 6.1 | Vertical | 24 % |
| vent4 | Évacuation d'air vicié - #3 | 717 680 | 5 334 534 | 308.5 | 1.0 | 288.2 | 13.1 | 6.1 | Vertical | 24 % |
| vent5 | Évacuation d'air vicié - #4 | 716 743 | 5 334 644 | 313.3 | 1.0 | 288.2 | 9.2 | 3.0 | Vertical | 6 % |

## A-2-7 TAUX D'ÉMISSION MOYEN DES GAZ D'ÉCHAPPEMENT DES ÉQUIPEMENTS MINIERS SOUTERRAINS CONSIDÉRÉS – VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Véhicule | Nombre d'équipements | Facteur d'utilisation[1] (%) | Modèle équivalent | Taux d'émission total (g/s) | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | $PM_{10}$[2] | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Jumbo | 9 | 69% | Sandvik DD422i | 3.24E-02 | 3.14E-02 | 1.19E-01 | 3.00E-01 | 5.80E-04 |
| Emulsion loader - production | 4 | 41% | MacLean CS3 | 1.59E-02 | 1.54E-02 | 5.72E-02 | 9.82E-02 | 1.85E-04 |
| Blockhole drill | 1 | 41% | MacLean CS3 | 3.97E-03 | 3.85E-03 | 1.43E-02 | 2.46E-02 | 4.62E-05 |
| Boom truck | 4 | 51% | MacLean BT3 | 2.09E-02 | 2.02E-02 | 7.52E-02 | 1.29E-01 | 2.43E-04 |
| Scissor - bolter | 18 | 48% | MacLean 928 | 6.01E-02 | 5.83E-02 | 3.21E-01 | 8.63E-01 | 1.08E-03 |
| Scissor lift | 19 | 21% | MacLean SL3 | 3.77E-02 | 3.66E-02 | 1.36E-01 | 2.33E-01 | 4.38E-04 |
| Emulsion loader dev | 3 | 21% | Putzmeister PM407 | 2.20E-03 | 2.14E-03 | 2.04E-02 | 2.26E-02 | 2.90E-05 |
| ITH drill | 9 | 73% | Sandvik DU412I | 3.68E-02 | 3.57E-02 | 1.35E-01 | 3.41E-01 | 6.59E-04 |
| Grader | 3 | 52% | Caterpillar 140M | 1.57E-02 | 1.52E-02 | 7.58E-02 | 1.51E-01 | 2.83E-04 |
| Fuel-lube cassette | 4 | 41% | MacLean CS3 | 1.59E-02 | 1.54E-02 | 5.72E-02 | 9.82E-02 | 1.85E-04 |
| LHD LH621 | 9 | 67% | Sandvik LH621 | 8.73E-02 | 8.47E-02 | 6.66E-01 | 1.95E+00 | 2.31E-03 |
| LHD LH517 | 8 | 67% | Sandvik LH517 (option T4) | 4.76E-03 | 4.62E-03 | 3.40E-02 | 8.86E-01 | 1.23E-03 |
| Truck 663i | 13 | 70% | Sandvik TH663i (option T4) | 4.91E-02 | 4.77E-02 | 1.06E-01 | 2.91E+00 | 4.22E-03 |
| Truck 551i | 4 | 70% | Sandvik TH551 (option T4) | 4.30E-03 | 4.17E-03 | 4.86E-02 | 7.99E-01 | 1.11E-03 |
| Water canon | 1 | 24% | MacLean WS3 | 2.47E-03 | 2.40E-03 | 8.90E-03 | 1.53E-02 | 2.87E-05 |
| Sandvick LH307 | 5 | 67% | Sandvik LH307 | 3.21E-02 | 3.11E-02 | 1.55E-01 | 3.09E-01 | 5.80E-04 |
| Cable bolter | 2 | 28% | Sandvik DS421 | 2.66E-03 | 2.58E-03 | 9.74E-03 | 2.46E-02 | 4.76E-05 |
| | | | Total : | 4.24E-01 | 4.11E-01 | 2.04E+00 | 9.16E+00 | 1.33E-02 |

[1] Inclus le pourcentage d'utilisation et le pourcentage d'efficacité.
[2] Toutes les émissions de particules sont considérées comme plus petites que 10 µm, et donc PMT = $PM_{10}$.

## A-2-8 TAUX D'ÉMISSION DES SAUTAGES SOUTERRAINS CONSIDÉRÉS – VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Zones | Chantier | Tonnage (kt) | Surface ($m^2$) | Quantité d'explosif (t) | Taux d'émission total (g/s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | PMT | $PM_{10}$ | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| East Malartic (0-600m) | 40 m | 20 | 400 | 16,2 | 4.89E-01 | 2.54E-01 | 1.47E-02 | 1.03E+01 | 9.00E-01 | 2.70E-01 |
| Odyssey Nord | 50 m | 25 | 400 | 20,4 | 4.89E-01 | 2.54E-01 | 1.47E-02 | 1.31E+01 | 1.14E+00 | 3.41E-01 |
| East Gouldie | 50 m | 25 | 400 | 20,4 | 4.89E-01 | 2.54E-01 | 1.47E-02 | 1.31E+01 | 1.14E+00 | 3.41E-01 |
| | 30 m | 15 | 500 | 14,0 | 6.83E-01 | 3.55E-01 | 2.05E-02 | 8.94E+00 | 7.78E-01 | 2.33E-01 |

## A-2-9 TAUX D'ÉMISSION ESTIMÉS POUR LE CHAUFFAGE DE L'AIR FRAIS – VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Mois | Alimentation en gaz naturel ($m^3/h$) | Puissance (kW) | Taux de souffre (grains/$10^6$ scf) | Taux d'émission (g/s) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | PMT | $PM_{10}$ | $PM_{2.5}$ | CO | $NO_x$ | $SO_2$ |
| Janvier | 1 849 | 19 462 | 2 000 | 6.25E-02 | 6.25E-02 | 6.25E-02 | 6.90E-01 | 4.11E-01 | 4.93E-03 |
| Février | 1 647 | 17 331 | 2 000 | 5.56E-02 | 5.56E-02 | 5.56E-02 | 6.15E-01 | 3.66E-01 | 4.39E-03 |
| Mars | 1 083 | 11 399 | 2 000 | 3.66E-02 | 3.66E-02 | 3.66E-02 | 4.04E-01 | 2.41E-01 | 2.89E-03 |
| Avril | 264 | 2 780 | 2 000 | 8.92E-03 | 8.92E-03 | 8.92E-03 | 9.86E-02 | 5.87E-02 | 7.04E-04 |
| Novembre | 643 | 6 765 | 2 000 | 2.17E-02 | 2.17E-02 | 2.17E-02 | 2.40E-01 | 1.43E-01 | 1.71E-03 |
| Décembre | 1 506 | 15 848 | 2 000 | 5.09E-02 | 5.09E-02 | 5.09E-02 | 5.62E-01 | 3.35E-01 | 4.02E-03 |

## A-2-10 TAUX D'ÉMISSION POUR CHAQUE TYPE D'ÉMISSION ESTIMÉS – VENTILATION DE LA MINE SOUTERRAINE – ODYSSEY

| Type d'émission | Taux d'émission (g/s) | | | | | |
|---|---|---|---|---|---|---|
| | PMT | $PM_{10}$ | $PM_{2,5}$ | CO | $NO_x$ | $SO_2$ |
| Gaz d'échappements | 4.24E-01 | 4.24E-01 | 4.11E-01 | 2.04E+00 | 9.16E+00 | 1.33E-02 |
| Manipulation de matériaux | 6.75E-01 | 3.44E-01 | 1.01E-01 | - | - | - |
| Sautage (durant 2 heures) | 1.07E+00 | 5.59E-01 | 3.22E-02 | 2.27E+01 | 1.97E+00 | 5.92E-01 |
| Chauffage (situation maximale : mois de janvier) | 6.25E-02 | 6.25E-02 | 6.25E-02 | 6.90E-01 | 4.11E-01 | 4.93E-03 |

## A-2-11 CARACTÉRISTIQUES PHYSIQUES ET TAUX D'ÉMISSION POUR LES DÉPOUSSIÉREURS DE L'USINE DE REMBLAI EN PÂTE – ODYSSEY

| Identifiant | Description | X (m) | Y (m) | Élévation (m) | Hauteur de relâche (m) | Température (K) | Vitesse (m/s) | Diamètre (m) | Débit normalisé ($Nm^3/h$) | Concentration PMT ($mg/Nm^3$) | Ratio $PM_{10}$/PMT (%) | Ratio $PM_{2,5}$/PMT (%) | Taux d'émission (g/s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | PMT | PM10 | PM2,5 |
| dc11 | Dépoussiéreur #1 Ligne 1 | 718 183 | 5 334 557 | 307.0 | 12.0 | Ambiante | 6.7 | 0.3 | 1 699 | 30 | 95 | 50 | 1.42E-02 | 1.34E-02 | 7.06E-03 |
| dc12 [1] | Dépoussiéreur #2 Ligne 1 | 718 183 | 5 334 557 | 307.0 | 27.0 | Ambiante | 4.3 | 0.3 | 934 | 30 | 95 | 50 | 7.79E-03 | 7.37E-03 | 3.88E-03 |
| dc21 | Dépoussiéreur #1 Ligne 2 | 718 183 | 5 334 557 | 307.0 | 12.0 | Ambiante | 6.7 | 0.3 | 1 699 | 30 | 95 | 50 | 1.42E-02 | 1.34E-02 | 7.06E-03 |
| dc22 [1] | Dépoussiéreur #2 Ligne 2 | 718 183 | 5 334 557 | 307.0 | 27.0 | Ambiante | 4.3 | 0.3 | 934 | 30 | 95 | 50 | 7.79E-03 | 7.37E-03 | 3.88E-03 |
| dc31 | Dépoussiéreur #1 Ligne 3 | 718 116 | 5 334 557 | 307.0 | 12.0 | Ambiante | 6.7 | 0.3 | 1 699 | 30 | 95 | 50 | 1.42E-02 | 1.34E-02 | 7.06E-03 |
| dc32 [1] | Dépoussiéreur #2 Ligne 3 | 718 116 | 5 334 557 | 307.0 | 27.0 | Ambiante | 4.3 | 0.3 | 934 | 30 | 95 | 50 | 7.79E-03 | 7.37E-03 | 3.88E-03 |
| dc41 | Dépoussiéreur #1 Ligne 4 | 718 116 | 5 334 557 | 307.0 | 12.0 | Ambiante | 6.7 | 0.3 | 1 699 | 30 | 95 | 50 | 1.42E-02 | 1.34E-02 | 7.06E-03 |
| dc42 [1] | Dépoussiéreur #2 Ligne 4 | 718 116 | 5 334 557 | 307.0 | 27.0 | Ambiante | 4.3 | 0.3 | 934 | 30 | 95 | 50 | 7.79E-03 | 7.37E-03 | 3.88E-03 |

[1] Considéré actif 8 heures par jour dans la modélisation, selon l'utilisation prévue.

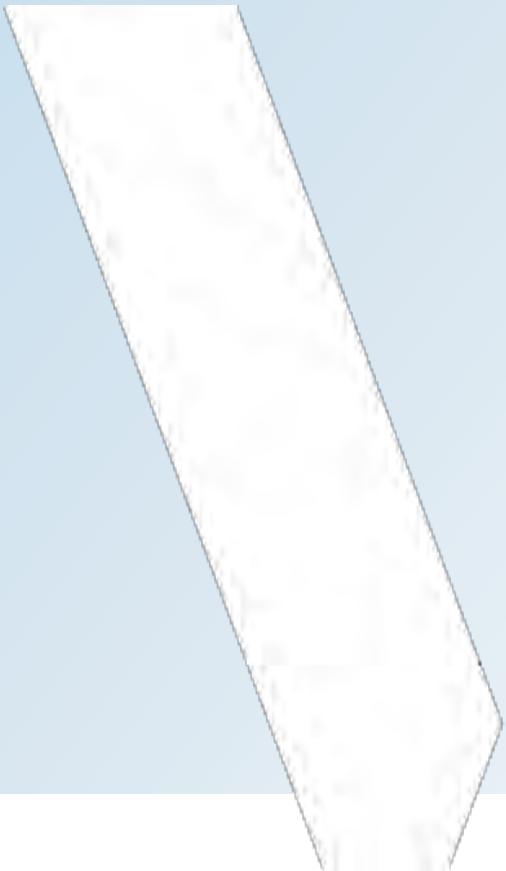
## A-2-12 CARACTÉRISTIQUES ET TAUX D'ÉMISSION DES SOURCES SURFACIQUES – ODYSSEY

| Identifiant | Description | Élévation (m) | Hauteur de relâche (m) | Sigma Z (m) | Surface considérée ($m^2$) | Teneur en limon (%) | Taux d'émission ($g/s.m^2$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | PMT | $PM_{10}$ | $PM_{2.5}$ |
| podo | Halde de minerai - Odyssey | 308.0 | 2.5 | 1.16 | 4 000 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| podw1 | Halde de stériles - Odyssey | 308.0 | 2.5 | 1.16 | 2 500 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| podhg | Pile de minerai haute teneur | 350.0 | 2.5 | 1.16 | 3 300 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |
| podhw | Dépot de stériles | 210.0 | 2.5 | 1.16 | 3 600 | 3.9 | 5.93E-05 | 2.97E-05 | 4.45E-06 |

Note: Le taux d'émission est égal à zéro lorsque la vitesse du vent est inférieure à 5,36 m/s (19,3 km/h).

# ANNEXE

## *A-3 TABLEAUX DE RÉSULTATS*



## A-3-1 RÉSULTATS DE LA MODÉLISATION DANS LE DOMAINE D'APPLICATION - SCÉNARIO 1 AVEC ET SANS ODYSSEY

| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées dans le domaine d'application des normes et critères (µg/m³) | | | | | | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum par année de l'échantillon météorologique | | | | | | | | |
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | A1 | A2 | A3 | A4 | A5 | Maximum | | | |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 1 | 187 | 178 | 153 | 139 | 124 | 187 | 227 | 82 | 189 |
| | | | | | | | 1 - Sans Odyssey | 177 | 176 | 148 | 137 | 122 | 177 | 217 | 82 | 181 |
| Particules fines | $PM_{2,5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 1 | 36.6 | 27.7 | 18.9 | 14.1 | 15.3 | 36.6 | 51.6 | 71 | 172 |
| | | | | | | | 1 - Sans Odyssey | 34.8 | 26.2 | 18.4 | 13.4 | 14.7 | 34.8 | 49.8 | 70 | 166 |
| Monoxyde de carbone | CO | Norme | 1 heure | 1er maximum | 34000 | 2650 | 1 | 1603 | 1882 | 7508 | 1397 | 1730 | 7508 | 10158 | 74 | 30 |
| | | | 8 heures | 1er maximum | 12700 | 1750 | | 248 | 253 | 944 | 184 | 244 | 944 | 2694 | 35 | 21 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 1 | 540 | 428 | 581 | 523 | 473 | 581 | 621 | 94 | 150 |
| | | | | | | | 1 - Sans Odyssey | 325 | 302 | 305 | 327 | 304 | 327 | 367 | 89 | 89 |
| | | | 24 heures | 1er maximum | 207 | 30 | 1 | 186 | 172 | 151 | 147 | 148 | 186 | 216 | 86 | 105 |
| | | | | | | | 1 - Sans Odyssey | 181 | 167 | 150 | 137 | 146 | 181 | 211 | 86 | 102 |
| | | | 1 an | 1er maximum | 103 | 10 | 1 | 30 | 26 | 27 | 28 | 27 | 30 | 40 | 75 | 39 |
| Dioxyde de soufre | $SO_2$ | Norme | 4 minutes | 99.5e percentile | 1050 | 150 | 1 | 4 | 3 | 4 | 3 | 2 | 4 | 154 | 3 | 15 |
| | | | | 1er maximum | 1310 | 150 | | 68 | 92 | 365 | 36 | 76 | 365 | 515 | 71 | 39 |
| | | | 24 heures | 1er maximum | 288 | 50 | | 2 | 2 | 8 | < 1 | 2 | 8 | 58 | 14 | 20 |
| | | | 1 an | 1er maximum | 52 | 20 | | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 20.1 | < 1 | 39 |
| Argent | Ag | Norme | 1 an | 1er maximum | 0.23 | 0.005 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.005 | < 1 | 2 |
| Arsenic | As | Norme | 1 an | 1er maximum | 0.003 | 0.002 | 1 | 0.00007 | 0.00006 | 0.00006 | 0.00006 | 0.00006 | 0.00007 | 0.00207 | 3 | 69 |
| Baryum | Ba | Norme | 1 an | 1er maximum | 0.05 | 0.025 | 1 | 0.0042 | 0.0038 | 0.0041 | 0.0039 | 0.0041 | 0.0042 | 0.0292 | 14 | 58 |
| Béryllium | Be | Norme | 1 an | 1er maximum | 0.0004 | 0 | 1 | 6.35E-06 | 5.74E-06 | 6.13E-06 | 5.94E-06 | 6.12E-06 | 6.35E-06 | 6.35E-06 | 100 | 2 |
| Cadmium | Cd | Norme | 1 an | 1er maximum | 0.0036 | 0.003 | 1 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00300 | < 1 | 83 |
| Cobalt | Co | Critère | 1 an | 1er maximum | 0.1 | 0 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 100 | < 1 |
| Chrome (composés de chrome trivalent) | Cr(III) | Norme | 1 an | 1er maximum | 0.1 | 0.01 | 1 | 0.009 | 0.008 | 0.008 | 0.008 | 0.008 | 0.009 | 0.019 | 46 | 19 |
| Cuivre | Cu | Norme | 24 heures | 1er maximum | 2.5 | 0.2 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.21 | 4 | 8 |
| Mercure | Hg | Norme | 1 an | 1er maximum | 0.005 | 0.002 | 1 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00200 | < 1 | 40 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 1 | 0.0054 | 0.0048 | 0.0051 | 0.0053 | 0.0051 | 0.0054 | 0.0254 | 21 | 101 |
| | | | | | | | 1 - Sans Odyssey | 0.0052 | 0.0046 | 0.0049 | 0.0051 | 0.0048 | 0.0052 | 0.0252 | 20 | 101 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 1 | 0.0217 | 0.0179 | 0.0160 | 0.0094 | 0.0112 | 0.0217 | 0.0237 | 92 | 169 |
| | | | | | | | 1 - Sans Odyssey | 0.0203 | 0.0168 | 0.0156 | 0.0090 | 0.0109 | 0.0203 | 0.0223 | 91 | 159 |
| Plomb | Pb | Norme | 1 an | 1er maximum | 0.1 | 0.025 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.025 | < 1 | 25 |
| Antimoine | Sb | Norme | 1 an | 1er maximum | 0.17 | 0.007 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.007 | < 1 | 4 |
| Sélénium | Se | Critère | 1 heure | 1er maximum | 2 | 0.15 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.15 | < 1 | 8 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 1 | 48.4 | 49.6 | 49.1 | 49.6 | 45.6 | 49.6 | 55.6 | 89 | 242 |
| | | | | | | | 1 - Sans Odyssey | 47.9 | 49.1 | 48.7 | 49.2 | 45.2 | 49.2 | 55.2 | 89 | 240 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 1 | 0.099 | 0.092 | 0.103 | 0.107 | 0.109 | 0.109 | 0.149 | 73 | 213 |
| | | | | | | | 1 - Sans Odyssey | 0.094 | 0.087 | 0.098 | 0.101 | 0.104 | 0.104 | 0.144 | 72 | 205 |
| Titane | Ti | Critère | 24 heures | 1er maximum | 2.5 | 0 | 1 | 0.12 | 0.10 | 0.08 | 0.05 | 0.06 | 0.12 | 0.12 | 100 | 5 |
| Thallium | Tl | Norme | 1 an | 1er maximum | 0.25 | 0.05 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.050 | < 1 | 20 |
| Vanadium | V | Norme | 1 an | 1er maximum | 1 | 0.01 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 | 12 | 1 |
| Zinc | Zn | Norme | 24 heures | 1er maximum | 2.5 | 0.1 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.11 | 7 | 4 |

## A-3-2 RÉSULTATS DE LA MODÉLISATION AUX RÉCEPTEURS SENSIBLES - SCÉNARIO 1 AVEC ET SANS ODYSSEY

| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées aux récepteurs sensibles (µg/m³) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum par catégorie | | | | | | | | |
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | Secteur résidentiel au nord (ville de Malartic) | Résidences au sud | Établissements scolaires et CPE | Établissements de santé | Baux de terre publiques | Maximum | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 1 | 134 | 35 | 52 | 40 | 39 | 134 | 174 | 77 | 145 |
| | | | | | | | 1 - Sans Odyssey | 133 | 34 | 50 | 39 | 38 | 133 | 173 | 77 | 144 |
| Particules fines | $PM_{2,5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 1 | 11.5 | 5.6 | 7.1 | 6.7 | 8.1 | 11.5 | 26.5 | 43 | 88 |
| | | | | | | | 1 - Sans Odyssey | 11.3 | 5.4 | 6.8 | 6.4 | 7.7 | 11.3 | 26.3 | 43 | 88 |
| Monoxyde de carbone | CO | Norme | 1 heure | 1er maximum | 34000 | 2650 | 1 | 508 | 636 | 252 | 184 | 329 | 636 | 3286 | 19 | 10 |
| | | | 8 heures | 1er maximum | 12700 | 1750 | | 73 | 83 | 38 | 36 | 54 | 83 | 1833 | 5 | 14 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 1 | 218 | 215 | 197 | 198 | 231 | 231 | 271 | 85 | 65 |
| | | | | | | | 1 - Sans Odyssey | 216 | 213 | 194 | 197 | 221 | 221 | 261 | 85 | 63 |
| | | | 24 heures | 1er maximum | 207 | 30 | 1 | 117 | 59 | 72 | 67 | 88 | 117 | 147 | 80 | 71 |
| | | | | | | | 1 - Sans Odyssey | 114 | 56 | 68 | 64 | 84 | 114 | 144 | 79 | 69 |
| | | | 1 an | 1er maximum | 103 | 10 | 1 | 23 | 6 | 15 | 12 | 9 | 23 | 33 | 69 | 32 |
| Dioxyde de soufre | $SO_2$ | Norme | 4 minutes | 99.5e percentile | 1050 | 150 | 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | 151 | < 1 | 14 |
| | | | | 1er maximum | 1310 | 150 | | 5 | 6 | 6 | 3 | 16 | 16 | 166 | 10 | 13 |
| | | | 24 heures | 1er maximum | 288 | 50 | | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | 50 | < 1 | 17 |
| | | | 1 an | 1er maximum | 52 | 20 | | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 20.0 | < 1 | 39 |
| Argent | Ag | Norme | 1 an | 1er maximum | 0.23 | 0.005 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.005 | < 1 | 2 |
| Arsenic | As | Norme | 1 an | 1er maximum | 0.003 | 0.002 | 1 | 0.00005 | < 0.00001 | 0.00003 | 0.00002 | 0.00001 | 0.00005 | 0.00205 | 2 | 68 |
| Baryum | Ba | Norme | 1 an | 1er maximum | 0.05 | 0.025 | 1 | 0.0033 | 0.0005 | 0.0017 | 0.0013 | 0.0008 | 0.0033 | 0.0283 | 12 | 57 |
| Béryllium | Be | Norme | 1 an | 1er maximum | 0.0004 | 0 | 1 | 4.94E-06 | 8.27E-07 | 2.53E-06 | 1.93E-06 | 1.25E-06 | 4.94E-06 | 4.94E-06 | 100 | 1 |
| Cadmium | Cd | Norme | 1 an | 1er maximum | 0.0036 | 0.003 | 1 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00300 | < 1 | 83 |
| Cobalt | Co | Critère | 1 an | 1er maximum | 0.1 | 0 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 100 | < 1 |
| Chrome (composés de chrome trivalent) | Cr(III) | Norme | 1 an | 1er maximum | 0.1 | 0.01 | 1 | 0.007 | 0.001 | 0.003 | 0.003 | 0.002 | 0.007 | 0.017 | 40 | 17 |
| Cuivre | Cu | Norme | 24 heures | 1er maximum | 2.5 | 0.2 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.21 | 3 | 8 |
| Mercure | Hg | Norme | 1 an | 1er maximum | 0.005 | 0.002 | 1 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00200 | < 1 | 40 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 1 | 0.0045 | 0.0010 | 0.0027 | 0.0022 | 0.0014 | 0.0045 | 0.0245 | 19 | 98 |
| | | | | | | | 1 - Sans Odyssey | 0.0044 | 0.0009 | 0.0025 | 0.0021 | 0.0013 | 0.0044 | 0.0244 | 18 | 97 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 1 | 0.0082 | 0.0036 | 0.0049 | 0.0044 | 0.0049 | 0.0082 | 0.0102 | 80 | 73 |
| | | | | | | | 1 - Sans Odyssey | 0.0080 | 0.0035 | 0.0046 | 0.0042 | 0.0047 | 0.0080 | 0.0100 | 80 | 72 |
| Plomb | Pb | Norme | 1 an | 1er maximum | 0.1 | 0.025 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.025 | < 1 | 25 |
| Antimoine | Sb | Norme | 1 an | 1er maximum | 0.17 | 0.007 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.007 | < 1 | 4 |
| Sélénium | Se | Critère | 1 heure | 1er maximum | 2 | 0.15 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.15 | < 1 | 8 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 1 | 11.6 | 9.7 | 5.4 | 7.6 | 8.3 | 11.6 | 17.6 | 66 | 76 |
| | | | | | | | 1 - Sans Odyssey | 11.3 | 9.6 | 5.3 | 7.4 | 7.7 | 11.3 | 17.3 | 65 | 75 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 1 | 0.083 | 0.017 | 0.046 | 0.037 | 0.024 | 0.083 | 0.123 | 67 | 175 |
| | | | | | | | 1 - Sans Odyssey | 0.080 | 0.017 | 0.045 | 0.036 | 0.023 | 0.080 | 0.120 | 67 | 171 |
| Titane | Ti | Critère | 24 heures | 1er maximum | 2.5 | 0 | 1 | 0.04 | 0.02 | 0.03 | 0.03 | 0.03 | 0.04 | 0.04 | 100 | 2 |
| Thallium | Tl | Norme | 1 an | 1er maximum | 0.25 | 0.05 | 1 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.050 | < 1 | 20 |
| Vanadium | V | Norme | 1 an | 1er maximum | 1 | 0.01 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 | 9 | 1 |
| Zinc | Zn | Norme | 24 heures | 1er maximum | 2.5 | 0.1 | 1 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.11 | 5 | 4 |

## A-3-3 RÉSULTATS DE LA MODÉLISATION DANS LE DOMAINE D'APPLICATION - SCÉNARIO 1 OPTIMISÉ

| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées dans le domaine d'application des normes et critères (µg/m³) | | | | | | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum par année de l'échantillon météorologique | | | | | | | | |
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | A1 | A2 | A3 | A4 | A5 | Maximum | | | |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 1 - Optimisé | 63 | 65 | 66 | 56 | 58 | 66 | 106 | 62 | 89 |
| Particules fines | $PM_{2,5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 1 - Optimisé | 7.5 | 6.3 | 6.6 | 7.0 | 7.5 | 7.5 | 22.5 | 33 | 75 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 1 - Optimisé | 530 | 414 | 563 | 514 | 467 | 563 | 603 | 93 | 146 |
| | | | 24 heures | 1er maximum | 207 | 30 | | 147 | 138 | 119 | 146 | 146 | 147 | 177 | 83 | 86 |
| | | | 1 an | 1er maximum | 103 | 10 | 1 - Optimisé | 20 | 18 | 18 | 20 | 17 | 20 | 30 | 67 | 29 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 1 - Optimisé | 0.0035 | 0.0031 | 0.0032 | 0.0033 | 0.0032 | 0.0035 | 0.0235 | 15 | 94 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 1 - Optimisé | 0.0049 | 0.0045 | 0.0056 | 0.0046 | 0.0046 | 0.0056 | 0.0076 | 74 | 54 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 1 - Optimisé | 12.8 | 9.3 | 27.8 | 12.1 | 11.0 | 27.8 | 33.8 | 82 | 147 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 1 - Optimisé | 0.063 | 0.056 | 0.061 | 0.058 | 0.060 | 0.063 | 0.103 | 61 | 147 |

## A-3-4 RÉSULTATS DE LA MODÉLISATION AUX RÉCEPTEURS SENSIBLES - SCÉNARIO 1 OPTIMISÉ

| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées aux récepteurs sensibles (µg/m³) | | | | | | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum par catégorie | | | | | | | | |
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | Secteur résidentiel au nord (ville de Malartic) | Résidences au sud | Établissements scolaires et CPE | Établissements de santé | Baux de terre publiques | Maximum | | | |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 1 - Optimisé | 65 | 28 | 29 | 23 | 22 | 65 | 105 | 62 | 88 |
| Particules fines | $PM_{2,5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 1 - Optimisé | 6.0 | 4.3 | 4.4 | 3.8 | 4.2 | 6.0 | 21.0 | 29 | 70 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 1 - Optimisé | 141 | 130 | 106 | 106 | 154 | 154 | 194 | 79 | 47 |
| | | | 24 heures | 1er maximum | 207 | 30 | | 63 | 44 | 44 | 40 | 44 | 63 | 93 | 68 | 45 |
| | | | 1 an | 1er maximum | 103 | 10 | 1 - Optimisé | 14 | 4 | 9 | 7 | 6 | 14 | 24 | 58 | 23 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 1 - Optimisé | 0.0029 | 0.0008 | 0.0016 | 0.0012 | 0.0009 | 0.0029 | 0.0229 | 13 | 92 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 1 - Optimisé | 0.0055 | 0.0028 | 0.0028 | 0.0025 | 0.0025 | 0.0055 | 0.0075 | 73 | 54 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 1 - Optimisé | 4.9 | 6.7 | 2.7 | 3.2 | 4.3 | 6.7 | 12.7 | 53 | 55 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 1 - Optimisé | 0.0567 | 0.0137 | 0.0302 | 0.0224 | 0.0172 | 0.0567 | 0.0967 | 59 | 138 |

## A-3-5 RÉSULTATS DE LA MODÉLISATION DANS LE DOMAINE D'APPLICATION - SCÉNARIO 2

| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées dans le domaine d'application des normes et critères (µg/m³) | | | | | | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | Maximum par année de l'échantillon météorologique | | | | | Maximum | | | |
| | | | | | | | | A1 | A2 | A3 | A4 | A5 | | | | |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 2 | 80 | 76 | 63 | 55 | 60 | 80 | 120 | 67 | 100 |
| Particules fines | $PM_{2.5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 2 | 19.7 | 17.9 | 18.9 | 22.2 | 21.4 | 22.2 | 37.2 | 60 | 124 |
| Monoxyde de carbone | CO | Norme | 1 heure | 1er maximum | 34000 | 2650 | 2 | 1954 | 2222 | 8662 | 6131 | 1870 | 8662 | 11312 | 77 | 33 |
| | | | 8 heures | 1er maximum | 12700 | 1750 | | 320 | 308 | 1096 | 804 | 311 | 1096 | 2846 | 39 | 22 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 2 | 805 | 789 | 982 | 889 | 881 | 982 | 1022 | 96 | 247 |
| | | | 24 heures | 1er maximum | 207 | 30 | | 183 | 177 | 181 | 191 | 190 | 191 | 221 | 86 | 107 |
| | | | 1 an | 1er maximum | 103 | 10 | 2 | 35 | 32 | 35 | 42 | 32 | 42 | 52 | 81 | 50 |
| Dioxyde de soufre | $SO_2$ | Norme | 4 minutes | 99.5e percentile | 1050 | 150 | 2 | 9 | 9 | 9 | 7 | 6 | 9 | 159 | 6 | 15 |
| | | | | 1er maximum | 1310 | 150 | | 91 | 103 | 403 | 285 | 87 | 403 | 553 | 73 | 42 |
| | | | 24 heures | 1er maximum | 288 | 50 | | 3 | 2 | 9 | 8 | 2 | 9 | 59 | 16 | 21 |
| | | | 1 an | 1er maximum | 52 | 20 | | 0.1 | 0.1 | 0.2 | 0.1 | < 0.1 | 0.2 | 20.2 | < 1 | 39 |
| Argent | Ag | Norme | 1 an | 1er maximum | 0.23 | 0.005 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.005 | < 1 | 2 |
| Arsenic | As | Norme | 1 an | 1er maximum | 0.003 | 0.002 | 2 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | 0.00002 | 0.00202 | < 1 | 67 |
| Baryum | Ba | Norme | 1 an | 1er maximum | 0.05 | 0.025 | 2 | 0.0041 | 0.0038 | 0.0043 | 0.0044 | 0.0041 | 0.0044 | 0.0294 | 15 | 59 |
| Béryllium | Be | Norme | 1 an | 1er maximum | 0.0004 | 0 | 2 | 5.51E-06 | 5.02E-06 | 5.68E-06 | 5.80E-06 | 5.54E-06 | 5.80E-06 | 5.80E-06 | 100 | 1 |
| Cadmium | Cd | Norme | 1 an | 1er maximum | 0.0036 | 0.003 | 2 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00300 | < 1 | 83 |
| Cobalt | Co | Critère | 1 an | 1er maximum | 0.1 | 0 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 100 | < 1 |
| Chrome (composés de chrome trivalent) | Cr(III) | Norme | 1 an | 1er maximum | 0.1 | 0.01 | 2 | 0.005 | 0.005 | 0.005 | 0.006 | 0.005 | 0.006 | 0.016 | 36 | 16 |
| Cuivre | Cu | Norme | 24 heures | 1er maximum | 2.5 | 0.2 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.20 | 2 | 8 |
| Mercure | Hg | Norme | 1 an | 1er maximum | 0.005 | 0.002 | 2 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00200 | < 1 | 40 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 2 | 0.0043 | 0.0040 | 0.0045 | 0.0046 | 0.0043 | 0.0046 | 0.0246 | 19 | 98 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 2 | 0.0149 | 0.0124 | 0.0090 | 0.0081 | 0.0085 | 0.0149 | 0.0169 | 88 | 121 |
| Plomb | Pb | Norme | 1 an | 1er maximum | 0.1 | 0.025 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.025 | < 1 | 25 |
| Antimoine | Sb | Norme | 1 an | 1er maximum | 0.17 | 0.007 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.007 | < 1 | 4 |
| Sélénium | Se | Critère | 1 heure | 1er maximum | 2 | 0.15 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.15 | < 1 | 8 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 2 | 29.4 | 29.1 | 51.8 | 40.8 | 31.9 | 51.8 | 57.8 | 90 | 251 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 2 | 0.0555 | 0.0503 | 0.0577 | 0.0632 | 0.0548 | 0.0632 | 0.1032 | 61 | 147 |
| Titane | Ti | Critère | 24 heures | 1er maximum | 2.5 | 0 | 2 | 0.12 | 0.10 | 0.07 | 0.06 | 0.07 | 0.12 | 0.12 | 100 | 5 |
| Thallium | Tl | Norme | 1 an | 1er maximum | 0.25 | 0.05 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.050 | < 1 | 20 |
| Vanadium | V | Norme | 1 an | 1er maximum | 1 | 0.01 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 | 12 | 1 |
| Zinc | Zn | Norme | 24 heures | 1er maximum | 2.5 | 0.1 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.11 | 6 | 4 |

## A-3-6 RÉSULTATS DE LA MODÉLISATION AUX RÉCEPTEURS SENSIBLES - SCÉNARIO 2

| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées aux récepteurs sensibles (µg/m³) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum par catégorie | | | | | | | | |
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | Secteur résidentiel au nord (ville de Malartic) | Résidences au sud | Établissements scolaires et CPE | Établissements de santé | Baux de terre publiques | Maximum | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 2 | 24 | 8 | 15 | 13 | 14 | 24 | 64 | 37 | 53 |
| Particules fines | $PM_{2,5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 2 | 3.4 | 1.5 | 2.4 | 2.1 | 2.9 | 3.4 | 18.4 | 18 | 61 |
| Monoxyde de carbone | CO | Norme | 1 heure | 1er maximum | 34000 | 2650 | 2 | 338 | 207 | 360 | 266 | 545 | 545 | 3195 | 17 | 9 |
| | | | 8 heures | 1er maximum | 12700 | 1750 | | 54 | 31 | 72 | 55 | 75 | 75 | 1825 | 4 | 14 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 2 | 210 | 199 | 207 | 213 | 225 | 225 | 265 | 85 | 64 |
| | | | 24 heures | 1er maximum | 207 | 30 | | 34 | 23 | 20 | 18 | 32 | 34 | 64 | 53 | 31 |
| | | | 1 an | 1er maximum | 103 | 10 | 2 | 6 | 2 | 4 | 3 | 4 | 6 | 16 | 38 | 16 |
| Dioxyde de soufre | $SO_2$ | Norme | 4 minutes | 99.5e percentile | 1050 | 150 | 2 | < 1 | < 1 | < 1 | < 1 | 1 | 1 | 151 | < 1 | 14 |
| | | | | 1er maximum | 1310 | 150 | | 15 | 9 | 16 | 12 | 25 | 25 | 175 | 14 | 13 |
| | | | 24 heures | 1er maximum | 288 | 50 | | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | 51 | 1 | 18 |
| | | | 1 an | 1er maximum | 52 | 20 | | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | < 0.1 | 20.0 | < 1 | 38 |
| Argent | Ag | Norme | 1 an | 1er maximum | 0.23 | 0.005 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.005 | < 1 | 2 |
| Arsenic | As | Norme | 1 an | 1er maximum | 0.003 | 0.002 | 2 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00201 | < 1 | 67 |
| Baryum | Ba | Norme | 1 an | 1er maximum | 0.05 | 0.025 | 2 | 0.0016 | 0.0003 | 0.0009 | 0.0007 | 0.0005 | 0.0016 | 0.0266 | 6 | 53 |
| Béryllium | Be | Norme | 1 an | 1er maximum | 0.0004 | 0 | 2 | 2.11E-06 | 3.76E-07 | 1.22E-06 | 9.93E-07 | 7.49E-07 | 2.11E-06 | 2.11E-06 | 100 | < 1 |
| Cadmium | Cd | Norme | 1 an | 1er maximum | 0.0036 | 0.003 | 2 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00300 | < 1 | 83 |
| Cobalt | Co | Critère | 1 an | 1er maximum | 0.1 | 0 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 100 | < 1 |
| Chrome (composés de chrome trivalent) | Cr(III) | Norme | 1 an | 1er maximum | 0.1 | 0.01 | 2 | 0.002 | < 0.001 | 0.001 | < 0.001 | < 0.001 | 0.002 | 0.012 | 17 | 12 |
| Cuivre | Cu | Norme | 24 heures | 1er maximum | 2.5 | 0.2 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.20 | < 1 | 8 |
| Mercure | Hg | Norme | 1 an | 1er maximum | 0.005 | 0.002 | 2 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | 0.00200 | < 1 | 40 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 2 | 0.0019 | 0.0004 | 0.0012 | 0.0010 | 0.0008 | 0.0019 | 0.0219 | 9 | 88 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 2 | 0.0043 | 0.0015 | 0.0028 | 0.0024 | 0.0029 | 0.0043 | 0.0063 | 68 | 45 |
| Plomb | Pb | Norme | 1 an | 1er maximum | 0.1 | 0.025 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.025 | < 1 | 25 |
| Antimoine | Sb | Norme | 1 an | 1er maximum | 0.17 | 0.007 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.007 | < 1 | 4 |
| Sélénium | Se | Critère | 1 heure | 1er maximum | 2 | 0.15 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.15 | < 1 | 8 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 2 | 4.3 | 2.4 | 3.5 | 2.8 | 4.9 | 4.9 | 10.9 | 45 | 47 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 2 | 0.0219 | 0.0049 | 0.0138 | 0.0117 | 0.0095 | 0.0219 | 0.0619 | 35 | 88 |
| Titane | Ti | Critère | 24 heures | 1er maximum | 2.5 | 0 | 2 | 0.03 | 0.01 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 | 100 | 1 |
| Thallium | Tl | Norme | 1 an | 1er maximum | 0.25 | 0.05 | 2 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | < 0.001 | 0.050 | < 1 | 20 |
| Vanadium | V | Norme | 1 an | 1er maximum | 1 | 0.01 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.01 | 5 | 1 |
| Zinc | Zn | Norme | 24 heures | 1er maximum | 2.5 | 0.1 | 2 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | < 0.01 | 0.10 | 2 | 4 |

## A-3-7 RÉSULTATS DE LA MODÉLISATION DANS LE DOMAINE D'APPLICATION - SCÉNARIO 2 OPTIMISÉ

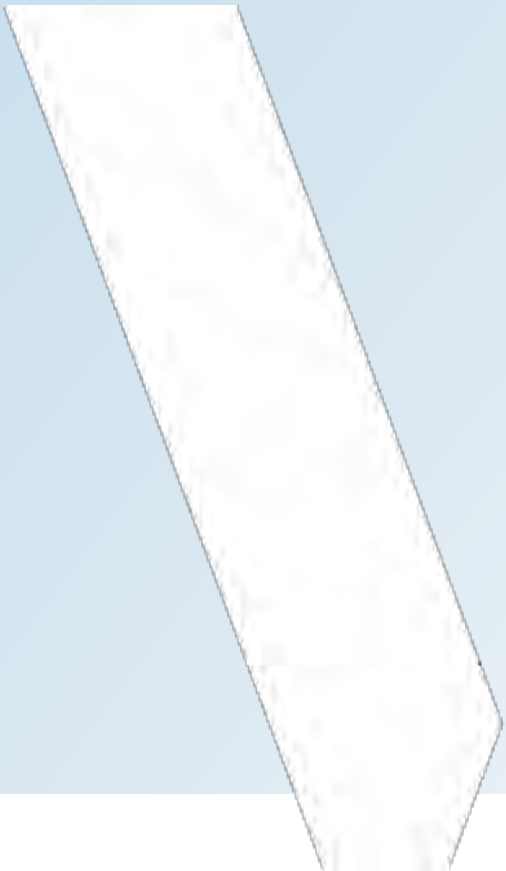
| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées dans le domaine d'application des normes et critères (µg/m³) | | | | | | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum par année de l'échantillon météorologique | | | | | | | | |
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | A1 | A2 | A3 | A4 | A5 | Maximum | | | |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 2 - Optimisé | 45 | 43 | 46 | 47 | 44 | 47 | 87 | 54 | 72 |
| Particules fines | $PM_{2,5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 2 - Optimisé | 17.6 | 16.0 | 16.9 | 19.8 | 19.4 | 19.8 | 34.8 | 57 | 116 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 2 - Optimisé | 785 | 759 | 927 | 856 | 840 | 927 | 967 | 96 | 234 |
| | | | 24 heures | 1er maximum | 207 | 30 | | 177 | 172 | 175 | 185 | 184 | 185 | 215 | 86 | 104 |
| | | | 1 an | 1er maximum | 103 | 10 | 2 - Optimisé | 32 | 29 | 31 | 37 | 29 | 37 | 47 | 79 | 46 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 2 - Optimisé | 0.0038 | 0.0035 | 0.0039 | 0.0039 | 0.0038 | 0.0039 | 0.0239 | 16 | 96 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 2 - Optimisé | 0.0071 | 0.0063 | 0.0069 | 0.0068 | 0.0063 | 0.0071 | 0.0091 | 78 | 65 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 2 - Optimisé | 27 | 26 | 47 | 38 | 28 | 47 | 53 | 89 | 231 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 2 - Optimisé | 0.0473 | 0.0431 | 0.0474 | 0.0514 | 0.0452 | 0.0514 | 0.0914 | 56 | 131 |

## A-3-8 RÉSULTATS DE LA MODÉLISATION AUX RÉCEPTEURS SENSIBLES - SCÉNARIO 2 OPTIMISÉ

| Description de la norme ou du critère | | | | | | | Description des valeurs modélisées | Concentrations modélisées aux récepteurs sensibles (µg/m³) | | | | | | Concentration totale modélisée (µg/m³) | Contribution de la concentration maximale à la concentration totale (%) | Pourcentage de la valeur limite (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum par catégorie | | | | | | | | |
| Substance | Acronyme | Type de seuil | Période | Statistique | Valeur limite (µg/m³) | Concentration initiale (µg/m³) | Scénario | Secteur résidentiel au nord (ville de Malartic) | Résidences au sud | Établissements scolaires et CPE | Établissements de santé | Baux de terre publiques | Maximum | | | |
| Particules totales | PMT | Norme | 24 heures | 1er maximum | 120 | 40 | 2 - Optimisé | 18 | 8 | 11 | 10 | 14 | 18 | 58 | 31 | 48 |
| Particules fines | $PM_{2,5}$ | Norme | 24 heures | 1er maximum | 30 | 15 | 2 - Optimisé | 2.4 | 1.5 | 1.8 | 1.6 | 2.7 | 2.7 | 17.7 | 15 | 59 |
| Dioxyde d'azote | $NO_2$ | Norme | 1 heure | 1er maximum | 414 | 40 | 2 - Optimisé | 200 | 179 | 196 | 202 | 216 | 216 | 256 | 84 | 62 |
| | | | 24 heures | 1er maximum | 207 | 30 | | 27 | 18 | 19 | 15 | 32 | 32 | 62 | 51 | 30 |
| | | | 1 an | 1er maximum | 103 | 10 | 2 - Optimisé | 5 | 2 | 3 | 3 | 4 | 5 | 15 | 32 | 14 |
| Manganèse | Mn | Critère | 1 an | 1er maximum | 0.025 | 0.02 | 2 - Optimisé | 0.0015 | 0.0004 | 0.0010 | 0.0008 | 0.0006 | 0.0015 | 0.0215 | 7 | 86 |
| Nickel | Ni | Norme | 24 heures | 1er maximum | 0.014 | 0.002 | 2 - Optimisé | 0.0030 | 0.0015 | 0.0020 | 0.0017 | 0.0025 | 0.0030 | 0.0050 | 60 | 36 |
| Silice cristalline | $SiO_2$ | Critère | 1 heure | 1er maximum | 23 | 6 | 2 - Optimisé | 3.4 | 2.3 | 2.6 | 2.0 | 4.2 | 4.2 | 10.2 | 41 | 44 |
| | | | 1 an | 1er maximum | 0.07 | 0.04 | 2 - Optimisé | 0.0167 | 0.0046 | 0.0106 | 0.0087 | 0.0071 | 0.0167 | 0.0567 | 29 | 81 |

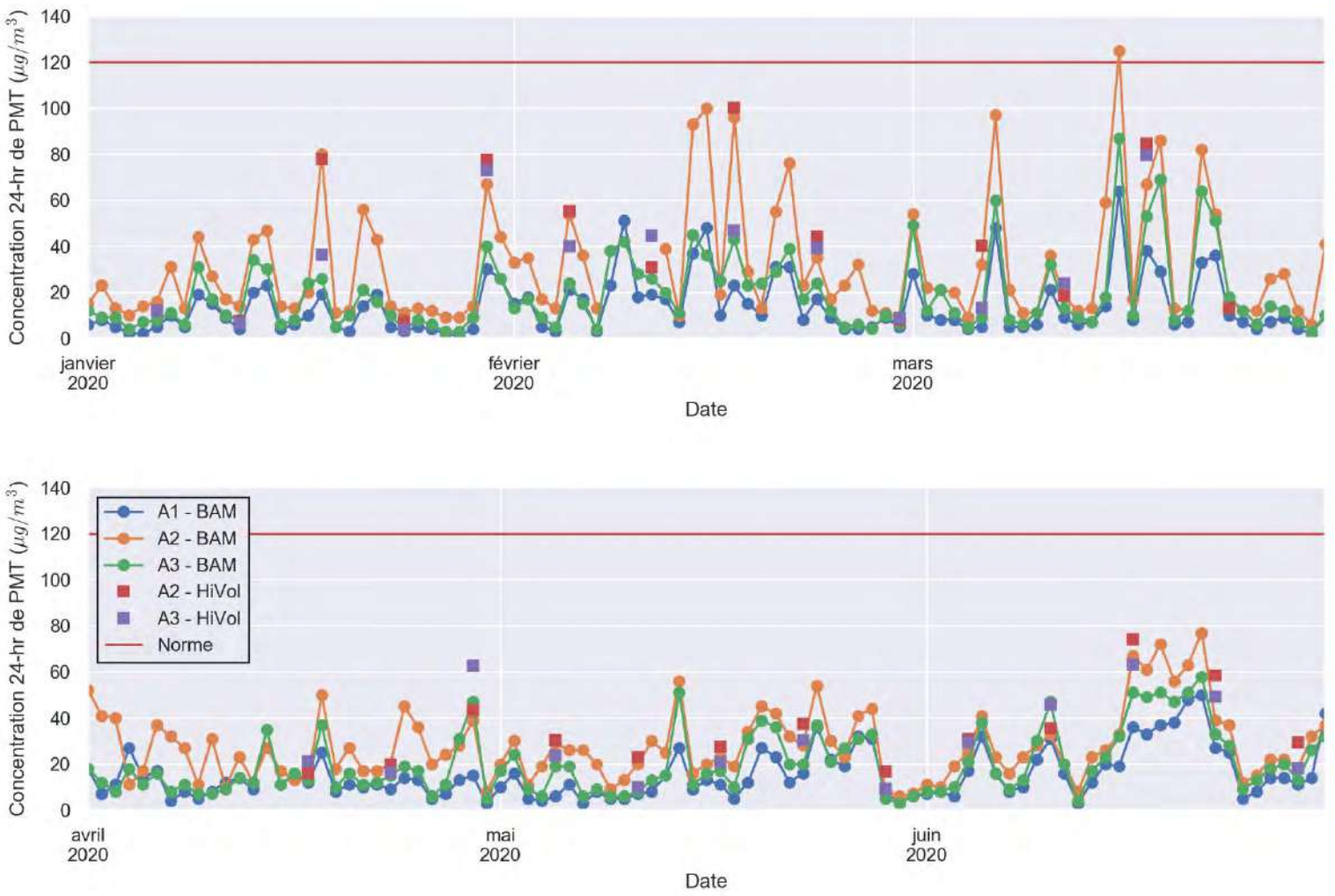
# ANNEXE

## *A-4 SUIVI DE LA QUALITÉ DE L'AIR*

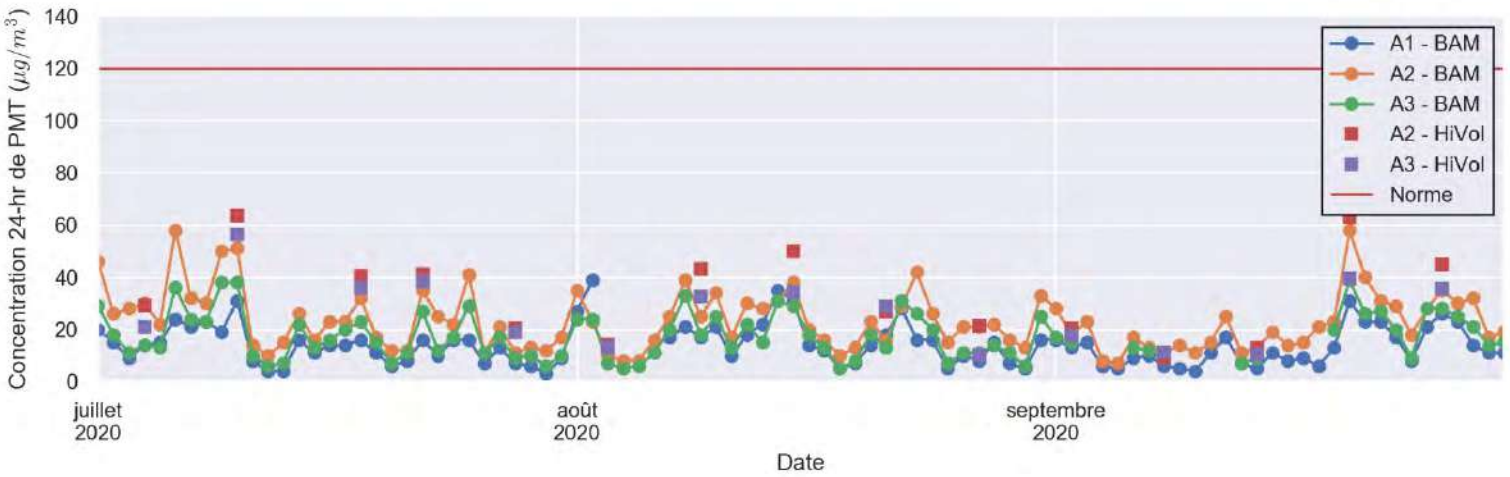


A-4-1 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES TOTALES

A-4-1 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES TOTALES (SUITE)




A-4-1 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES TOTALES (SUITE)

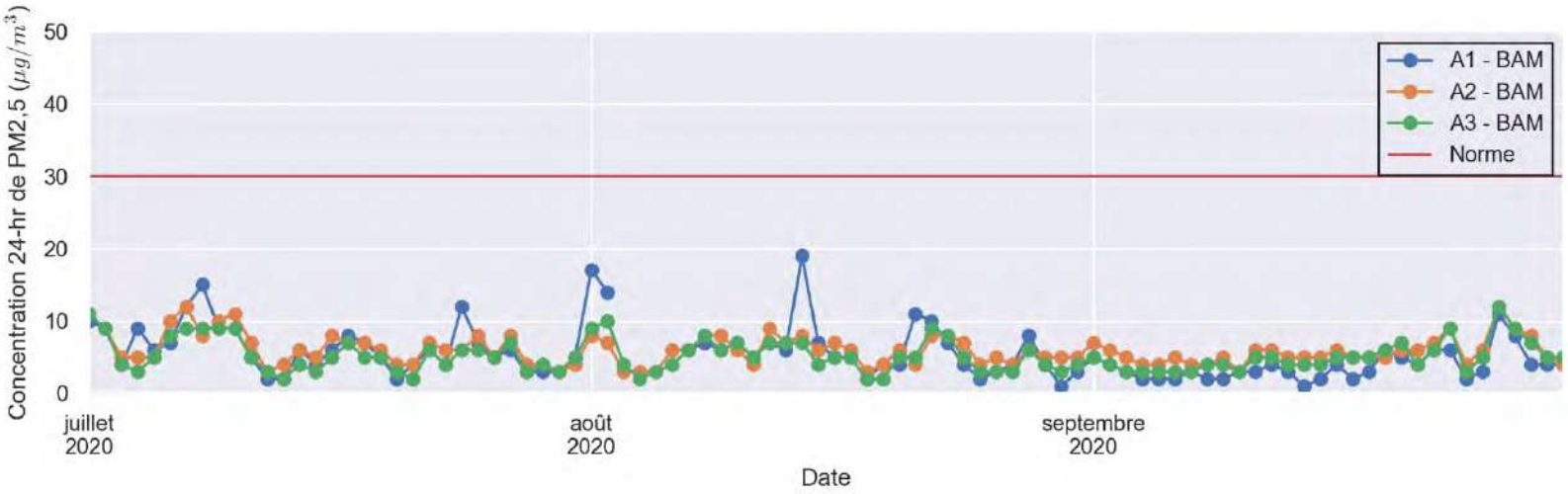



A-4-1 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES TOTALES (SUITE)

## A-4-2 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES FINES

## A-4-2 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES FINES (SUITE)

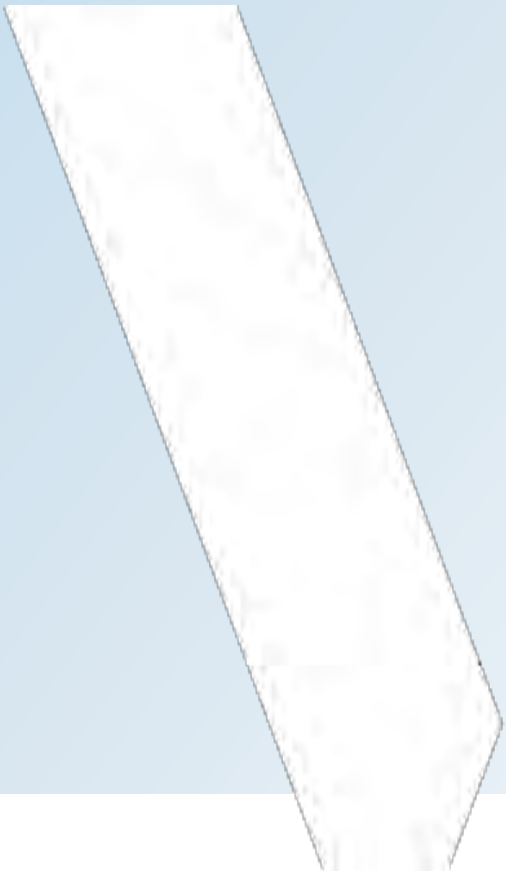
## A-4-2 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES FINES (SUITE)




A-4-2 RÉSULTATS DU SUIVI DE LA QUALITÉ DE L'AIR DES PARTICULES FINES (SUITE)

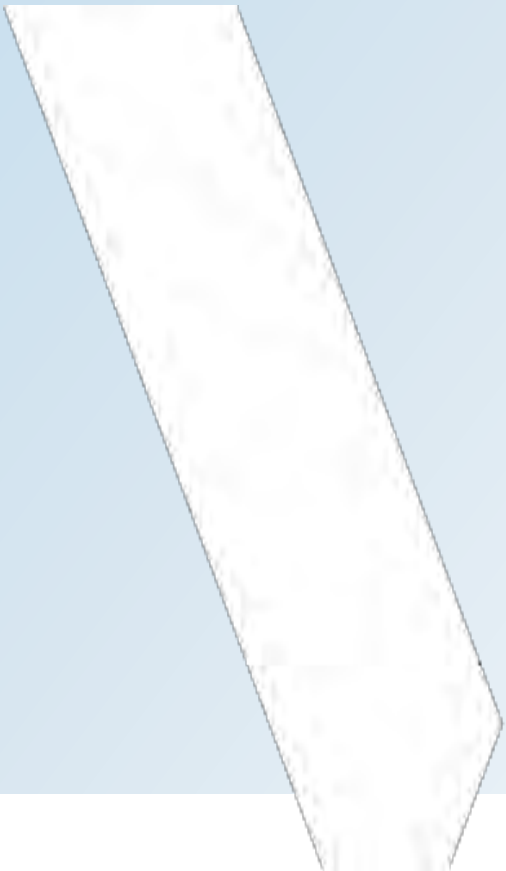
# ANNEXE

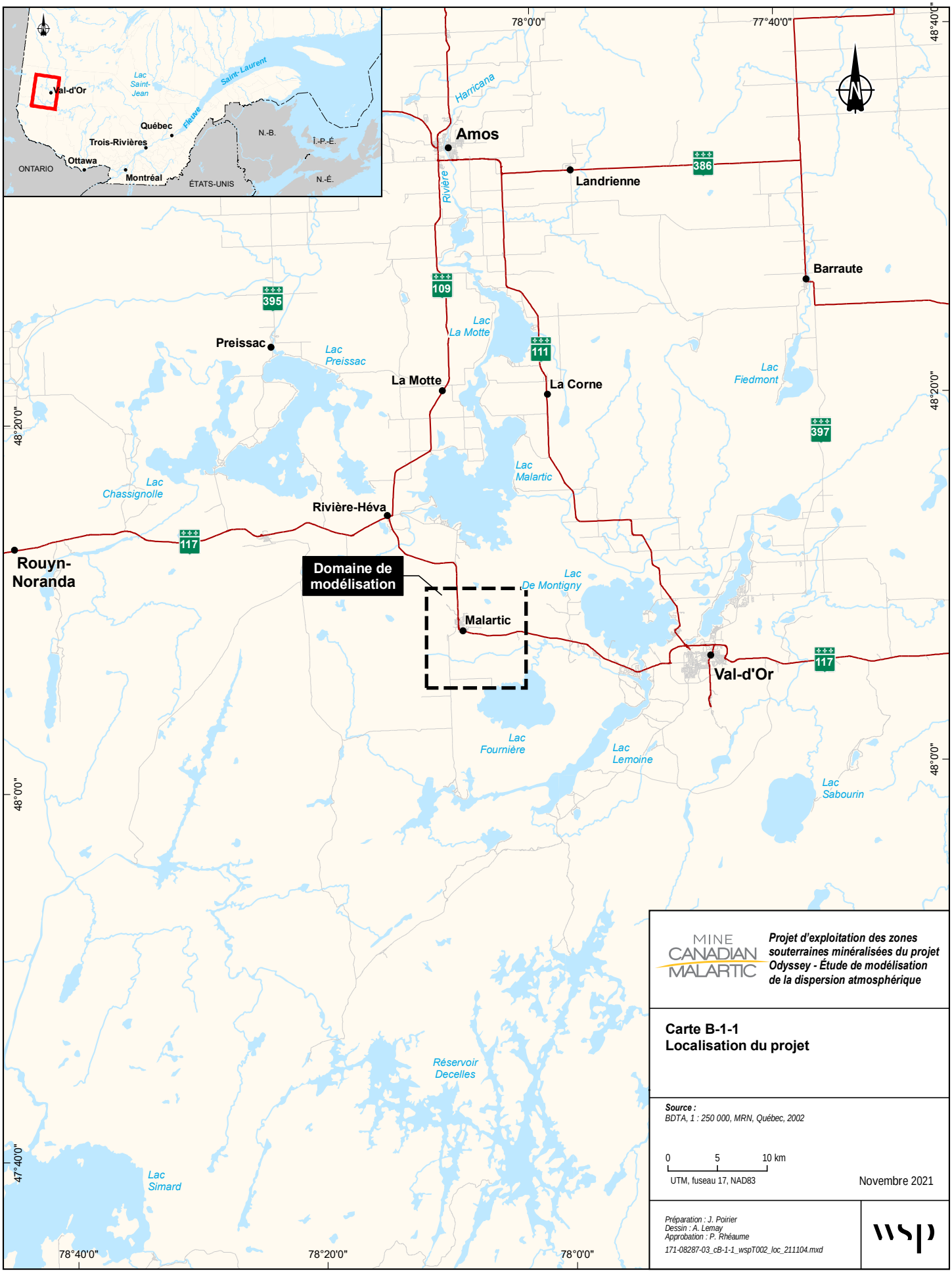
# B CARTES



# ANNEXE

## B-1 *GÉNÉRALES*






MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique***

**Carte B-1-1**
**Localisation du projet**

***Source :***
*BDTA, 1 : 250 000, MRN, Québec, 2002*

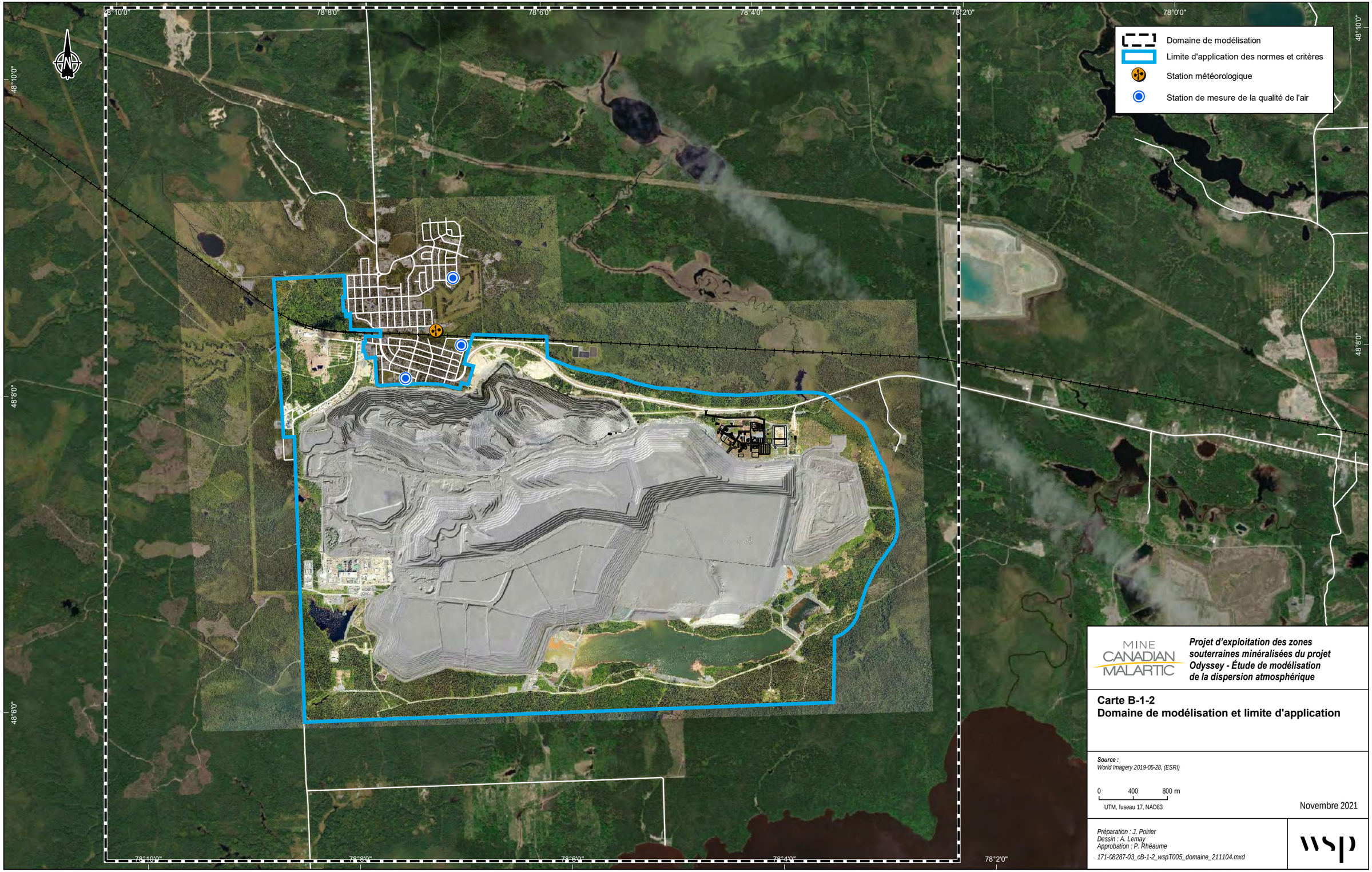
0 5 10 km

UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-1-1_wspT002_loc_211104.mxd*

wsp




MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique***

**Carte B-1-2**
**Domaine de modélisation et limite d'application**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-1-2_wspT005_domaine_211104.mxd*

wsp

78°10'0"
78°8'0"
78°6'0"
78°4'0"
78°2'0"
78°0'0"
48°10'0"
48°8'0"
48°6'0"

A

Domaine de modélisation
Limite d'application des normes et critères
Station météorologique
Station de mesure de la qualité de l'air
Grille de récepteurs
Récepteurs sur la limite d'application des normes et critères

MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique***

**Carte B-1-3**
**Grille de récepteurs**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-1-3_wspT006_grille_211104.mxd*

wsp

78°10'0"
78°8'0"
78°6'0"
78°4'0"
78°2'0"
78°0'0"
48°10'0"
48°8'0"
48°6'0"

BAUX010
BAUX013
BAUX027
BAUX009
BAUX020
BAUX021
BAUX001
BAUX036
BAUX016
BAUX018
BAUX017
BAUX023
BAUX030
BAUX040
BAUX019

ECO1
ECO3
SAN1
ECO2
CPE1

RESS01
RESS02
RESS03
RESS04
RESS05
RESS06
RESS07
RESS08
RESS09
RESS10
RESS11

A

Station A1
Station A2
Station A3

Échelle : 1 : 15 000
0 150 300 m

Domaine de modélisation
Limite d'application des normes et critères
Station météorologique
Station de mesure de la qualité de l'air

**Récepteurs sensibles**
Bail de location de terre publique
Centre de la petite enfance
Établissement d'enseignement
Établissement de soin de santé
Résidence au sud
Secteur résidentiel nord

MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique***

**Carte B-1-4**
**Récepteurs sensibles**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

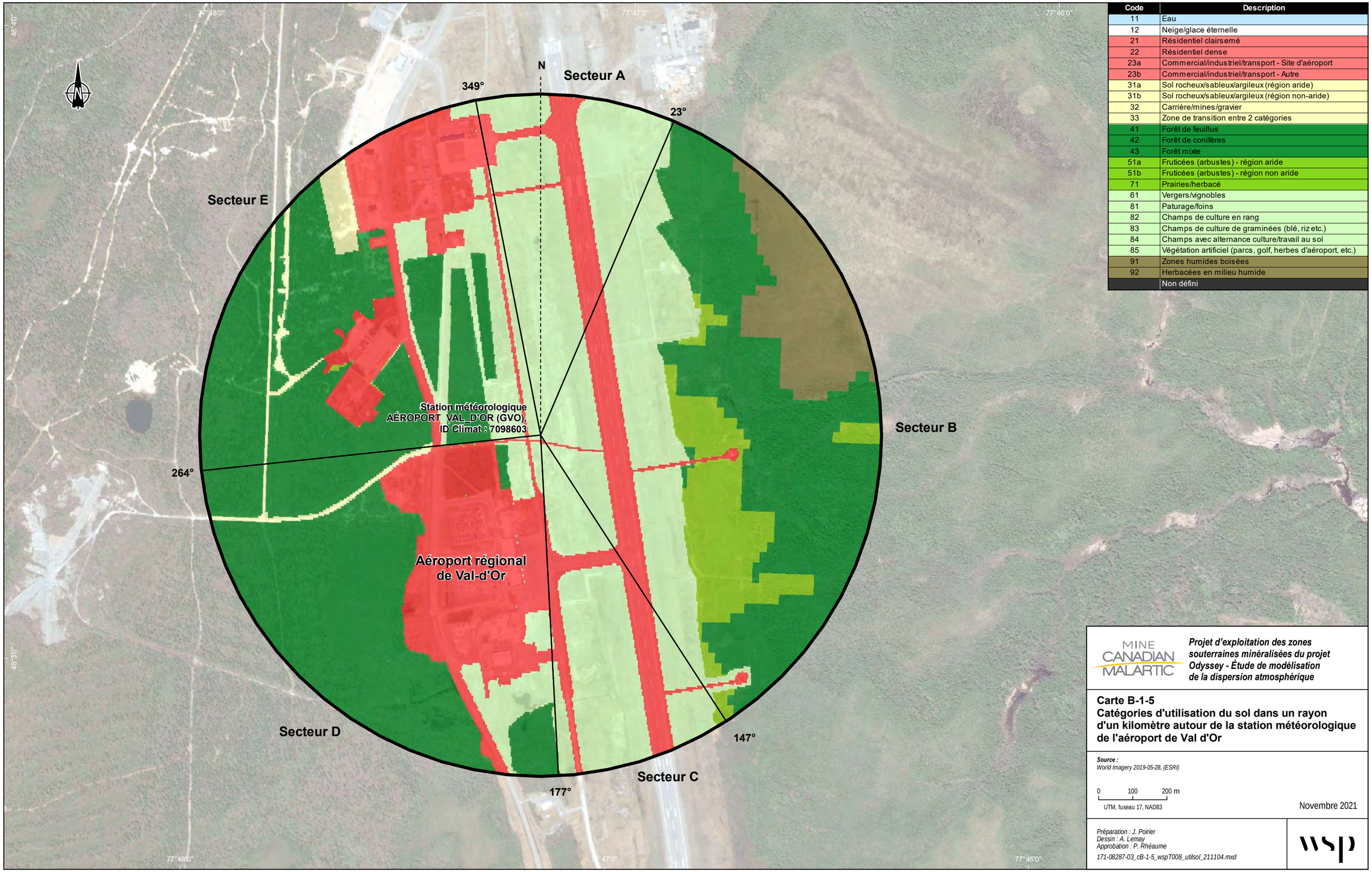
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-1-4_wspT007_sensible_211104.mxd*

wsp




| Code | Description |
|---|---|
| 11 | Eau |
| 12 | Neige/glace éternelle |
| 21 | Résidentiel clairsemé |
| 22 | Résidentiel dense |
| 23a | Commercial/industriel/transport - Site d'aéroport |
| 23b | Commercial/industriel/transport - Autre |
| 31a | Sol rocheux/sableux/argileux (région aride) |
| 31b | Sol rocheux/sableux/argileux (région non-aride) |
| 32 | Carrière/mines/gravier |
| 33 | Zone de transition entre 2 catégories |
| 41 | Forêt de feuillus |
| 42 | Forêt de conifères |
| 43 | Forêt mixte |
| 51a | Fruticées (arbustes) - région aride |
| 51b | Fruticées (arbustes) - région non aride |
| 71 | Prairies/herbacé |
| 61 | Vergers/vignobles |
| 81 | Paturage/foins |
| 82 | Champs de culture en rang |
| 83 | Champs de culture de graminées (blé, riz etc.) |
| 84 | Champs avec alternance culture/travail au sol |
| 85 | Végétation artificiel (parcs, golf, herbes d'aéroport, etc.) |
| 91 | Zones humides boisées |
| 92 | Herbacées en milieu humide |
| | Non défini |

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-1-5**
**Catégories d'utilisation du sol dans un rayon d'un kilomètre autour de la station météorologique de l'aéroport de Val d'Or**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 100 200 m
UTM, fuseau 17, NAD83

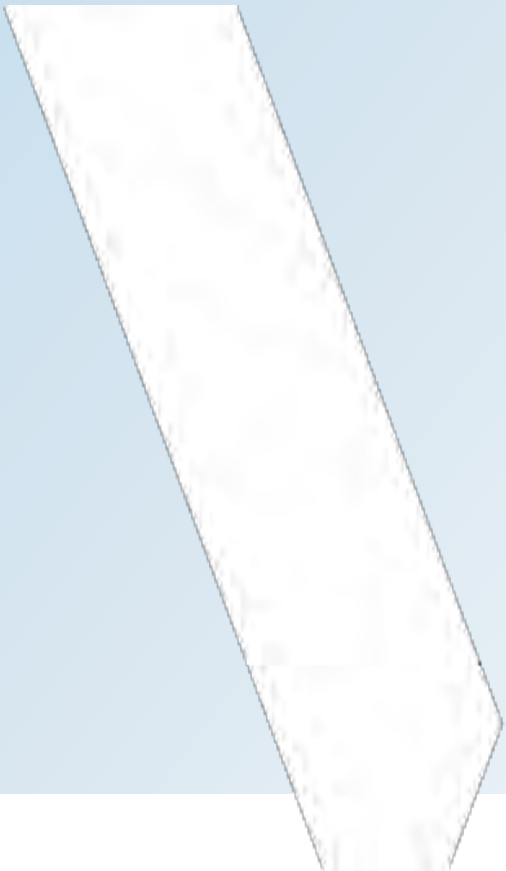
Novembre 2021

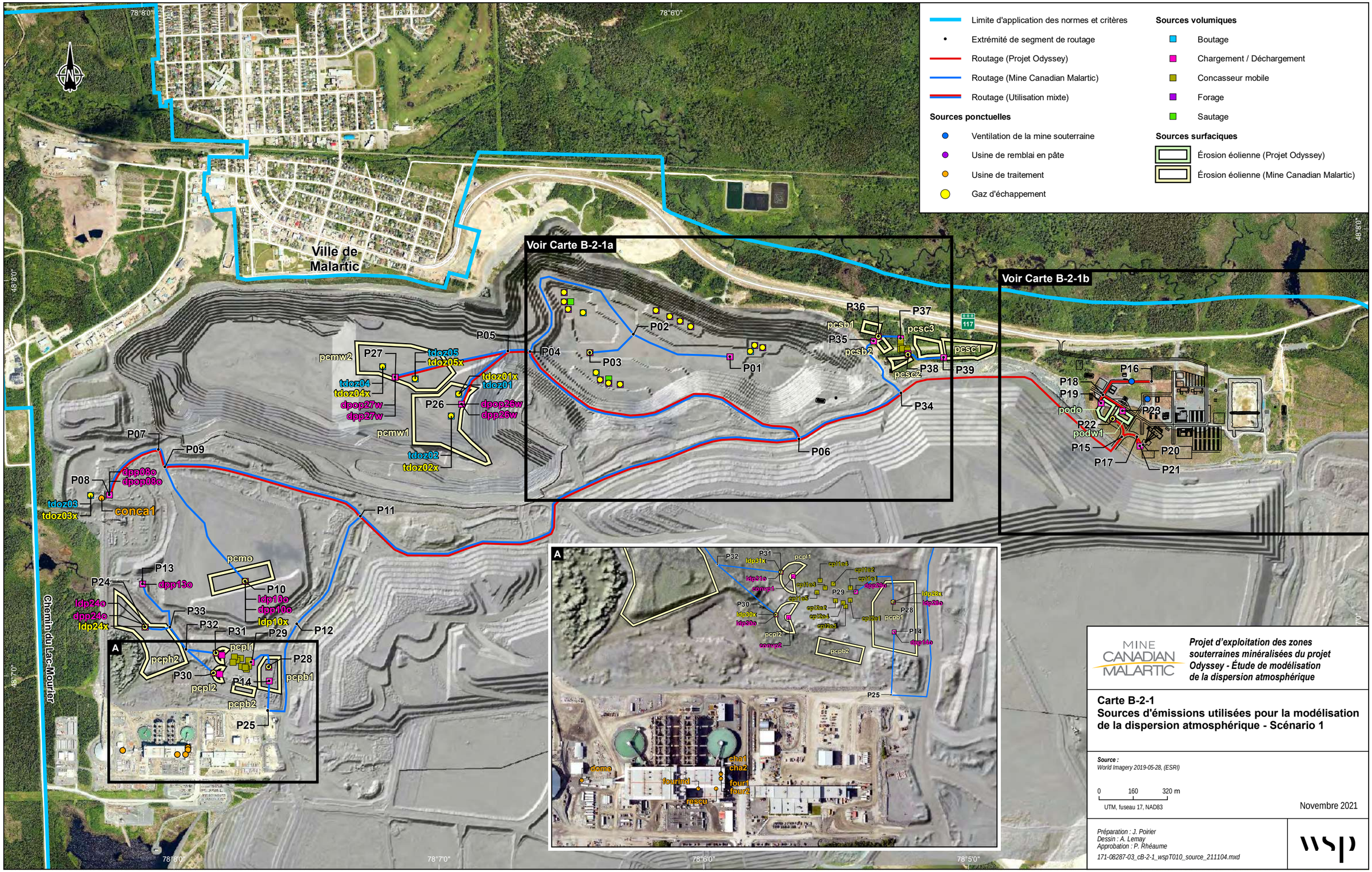
*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-1-5_wspT008_utilsol_211104.mxd*

wsp

# ANNEXE

## B-2 *SCÉNARIO 1*






MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-1**
**Sources d'émissions utilisées pour la modélisation de la dispersion atmosphérique - Scénario 1**

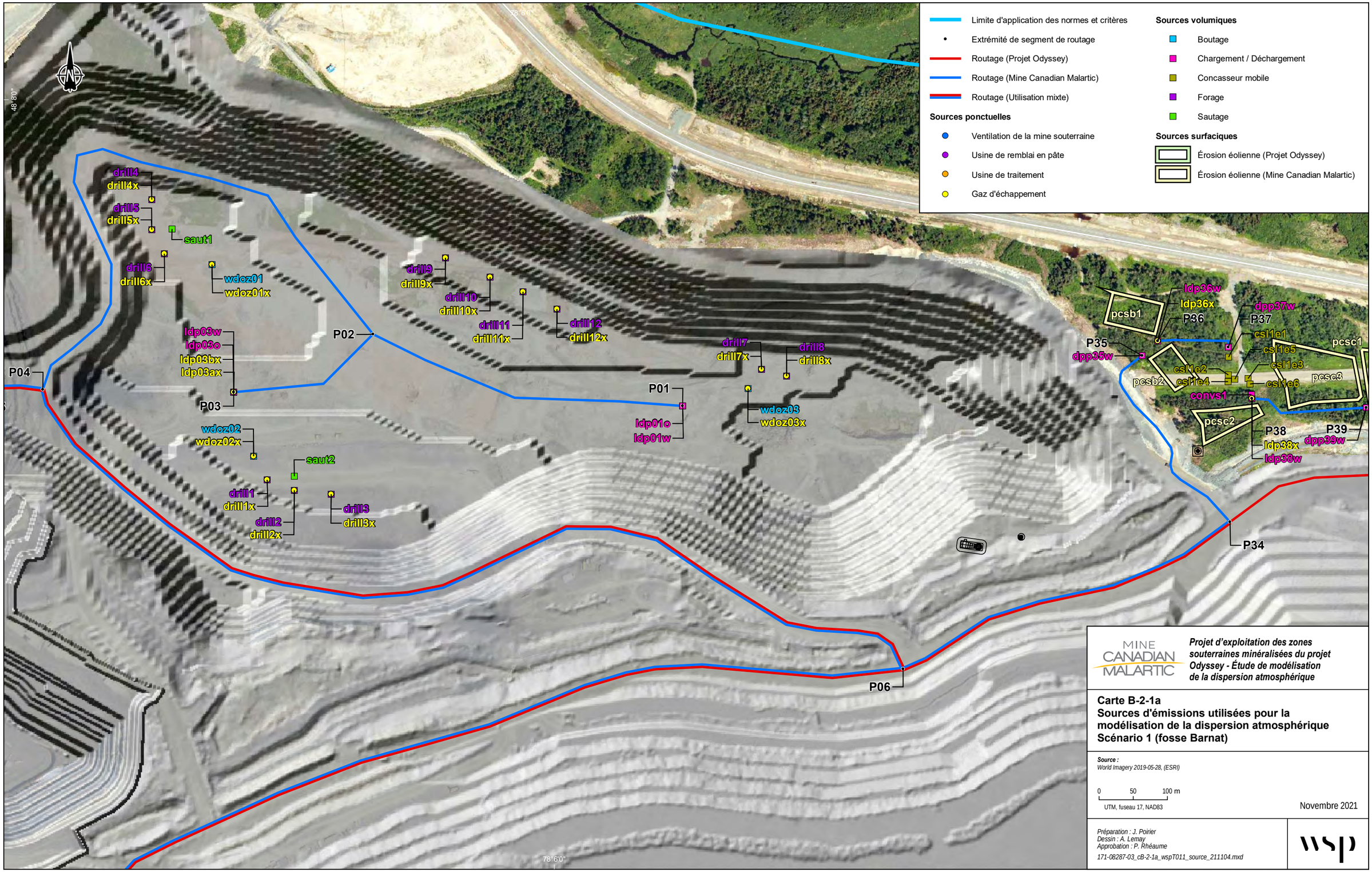
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-1_wspT010_source_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-1a**
**Sources d'émissions utilisées pour la modélisation de la dispersion atmosphérique**
**Scénario 1 (fosse Barnat)**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 50 100 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-1a_wspT011_source_211104.mxd*

wsp

78°4'0"

Limite d'application des normes et critères
Extrémité de segment de routage
Routage (Projet Odyssey)
Routage (Mine Canadian Malartic)
Routage (Utilisation mixte)

**Sources ponctuelles**

Ventilation de la mine souterraine
Usine de remblai en pâte
Usine de traitement
Gaz d'échappement

**Sources volumiques**

Boutage
Chargement / Déchargement
Concasseur mobile
Forage
Sautage

**Sources surfaciques**

Érosion éolienne (Projet Odyssey)
Érosion éolienne (Mine Canadian Malartic)

P16
vent1
vent2
P18
dc11
dc12
dpop19o
P19
P23
dpop23w
podo
podw1
P22
ldop22o
ldop22w
ldop22x
P17
ldop21w
ldop21x
P15
P21
P20

78°4'0"

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-1b**
**Sources d'émissions utilisées pour la modélisation de la dispersion atmosphérique**
**Scénario 1 (secteur Odyssey)**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 50 100 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-1b_wspT012_source_211104.mxd*

wsp

78°8'0"
78°7'0"
78°6'0"
78°5'0"
78°4'0"
48°8'0"
48°7'0"

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P01_P08 et P03_P08

P01_P10 et P03_P10

P01_P14 et P03_P14

P10_P08

P24_P13

P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P25 P26 P27 P28 P29 P30 P31 P32 P33 P34 P35 P36 P37 P38 P39

Chemin du Lac-Mourier

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-2a**
**Trajets de transport - Scénario 1**
**Transport du minerai - Mine Canadian Malartic**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m

UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-2a_wspT013_trajets_211104.mxd*

wsp

78°8'0" 78°7'0" 78°6'0" 78°5'0" 78°4'0"

48°8'0"

48°7'0"

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P01_P35 et P03_P35

P01_P27 et P03_P27

P01_P26 et P03_P26

P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P25 P26 P27 P28 P29 P30 P31 P32 P33 P34 P35 P36 P37 P38 P39

Chemin du Lac-Mourier

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-2b**
**Trajets de transport - Scénario 1**
**Transport du stériles - Mine Canadian Malartic**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m

UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-2b_wspT014_trajets_211104.mxd*

wsp

78°8'0"
78°7'0"
78°6'0"
78°5'0"
78°4'0"
48°8'0"
48°7'0"

N

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P16_P19

P22_P08

P01
P02
P03
P04
P05
P06
P07
P08
P09
P10
P11
P12
P13
P14
P15
P16
P17
P18
P19
P20
P21
P22
P23
P24
P25
P26
P27
P28
P29
P30
P31
P32
P33
P34
P35
P36
P37
P38
P39

A

Chemin du Lac-Mourier

0 80 160 m

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-2c**
**Trajets de transport - Scénario 1**
**Transport du minerai - Projet Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-2c_wspT015_trajets_211104.mxd*

wsp

78°8'0"
78°7'0"
78°6'0"
78°5'0"
78°4'0"
48°8'0"
48°7'0"

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P16_P23

P21_P27

P22_P26

P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P25 P26 P27 P28 P29 P30 P31 P32 P33 P34 P35 P36 P37 P38 P39

Chemin du Lac-Mourier

A

A

0 80 160 m

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-2d**
**Trajets de transport - Scénario 1**
**Transport du stériles - Projet Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-2d_wspT016_trajets_211104.mxd*

wsp

78°8'0"
78°7'0"
78°6'0"
78°5'0"
78°4'0"
48°8'0"
48°7'0"

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P28_P29

P30_P24

P31_P24

P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P25 P26 P27 P28 P29 P30 P31 P32 P33 P34 P35 P36 P37 P38 P39

Chemin du Lac-Mourier

MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique***

**Carte B-2-2e**
**Trajets de transport - Scénario 1**
**Transport du minerai -**
**Concasseur mobile permanent**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m

UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-2e_wspT024_trajets_211104.mxd*

wsp

78°8'0" 78°7'0" 78°6'0" 78°5'0" 78°4'0"

48°8'0"

48°7'0"

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P36_P37

P38_P39

P01 P02 P03 P04 P05 P06 P07 P08 P09 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P24 P25 P26 P27 P28 P29 P30 P31 P32 P33 P34 P35 P36 P37 P38 P39

Chemin du Lac-Mourier

78°8'0" 78°7'0" 78°6'0" 78°5'0"

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-2f**
**Trajets de transport - Scénario 1**
**Transport du stériles - Concasseur saisonnier**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m

UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-2f_wspT025_trajets_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
- Supérieure à la valeur limite
- Inférieure à la valeur limite
- (considérant la concentration initiale
- Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 120 µg/m$^3$
Concentration initiale : 40 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-3**
**Concentrations maximales modélisées**
**Substance : Particules totales (PMT)**
**Période : 24 heures**
**Scénario : 1**

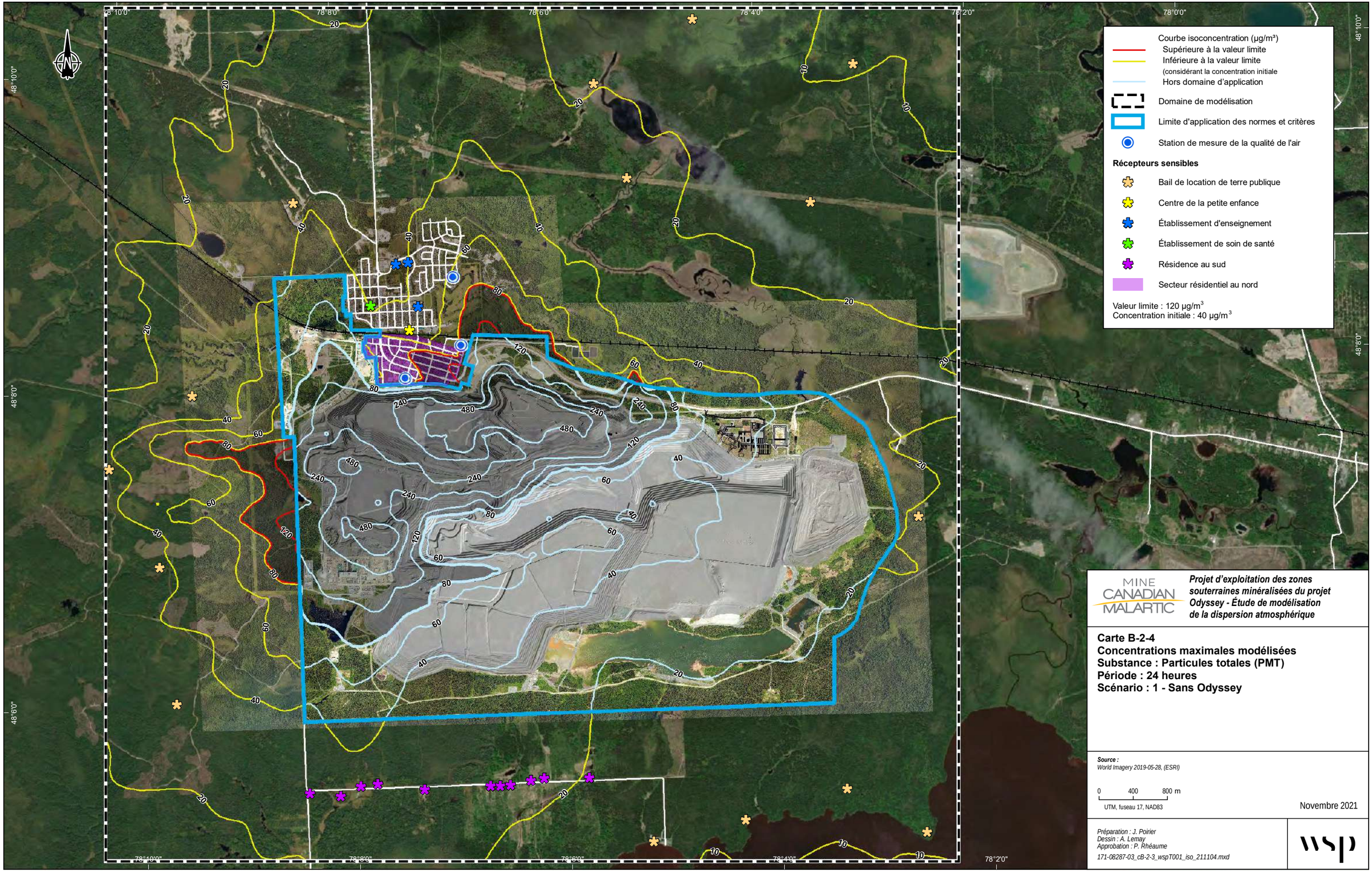
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-4**
**Concentrations maximales modélisées**
**Substance : Particules totales (PMT)**
**Période : 24 heures**
**Scénario : 1 - Sans Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 30 µg/m$^3$
Concentration initiale : 15 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-5**
**Concentrations maximales modélisées**
**Substance : Particules fines ($PM_{2,5}$)**
**Période : 24 heures**
**Scénario : 1**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
- Supérieure à la valeur limite
- Inférieure à la valeur limite
- (considérant la concentration initiale
- Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 30 µg/m$^3$
Concentration initiale : 15 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-6**
**Concentrations maximales modélisées**
**Substance : Particules fines ($PM_{2,5}$)**
**Période : 24 heures**
**Scénario : 1 - Sans Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

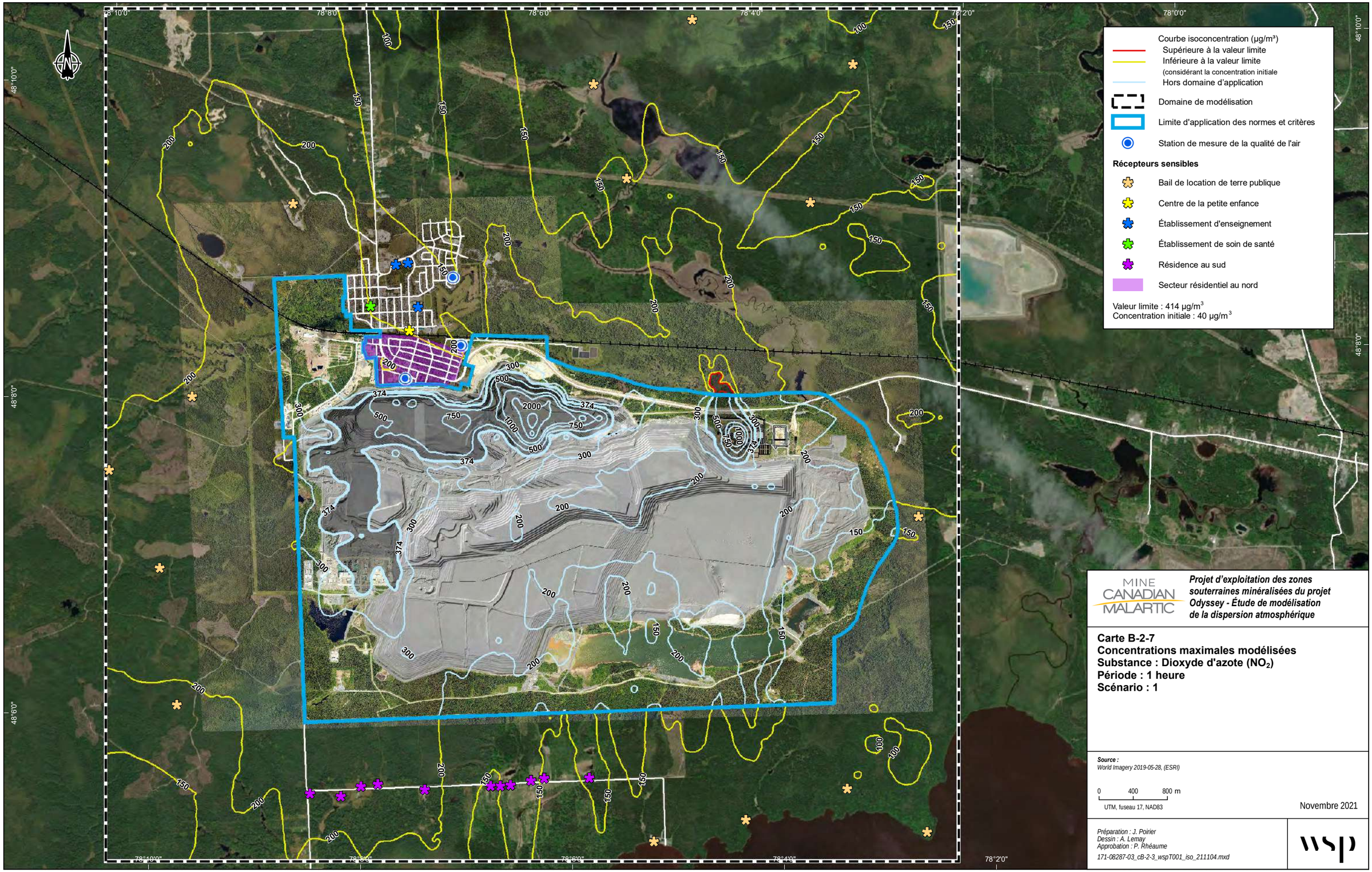
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-7**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 1 heure**
**Scénario : 1**

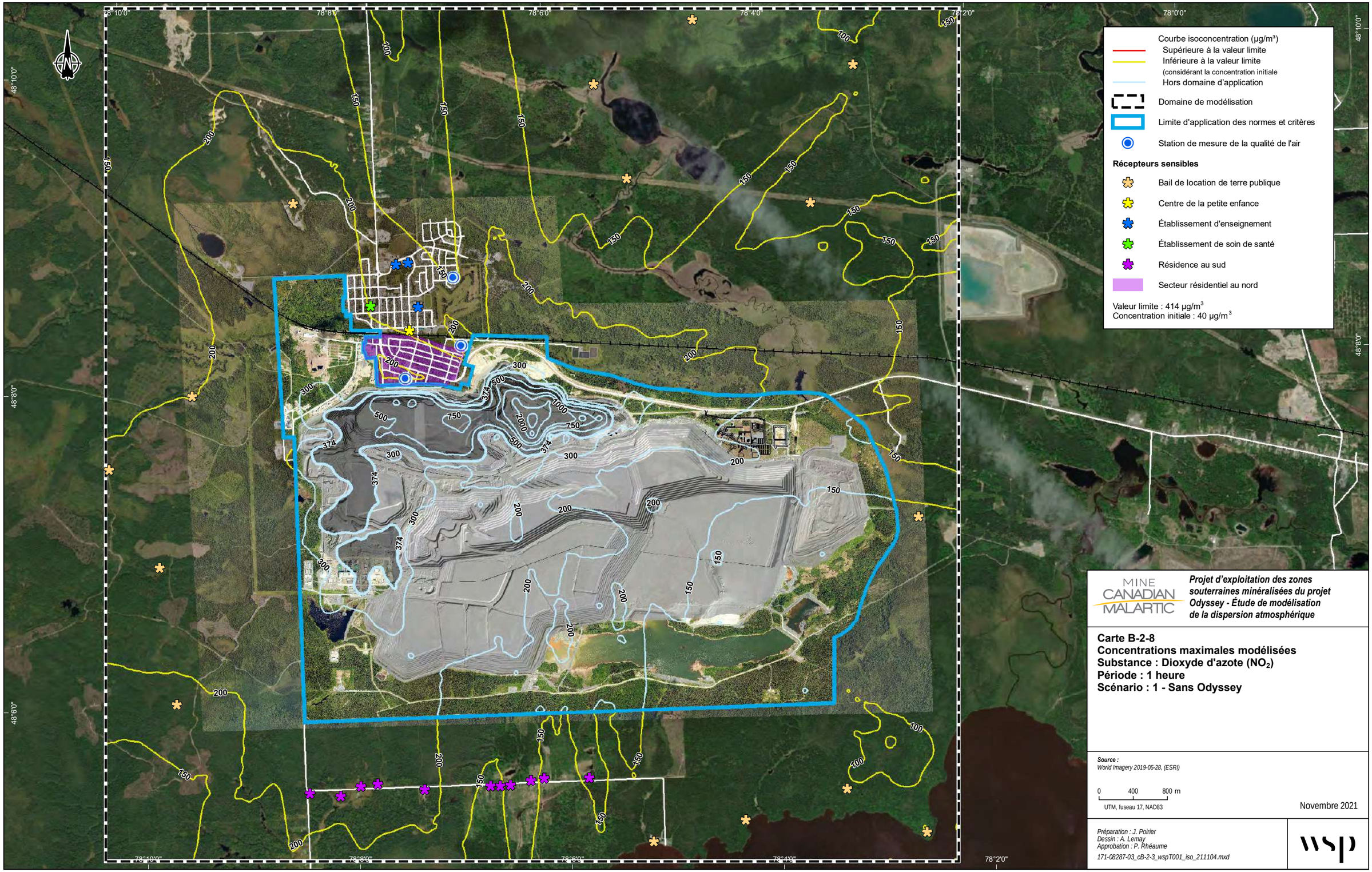
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-8**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 1 heure**
**Scénario : 1 - Sans Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

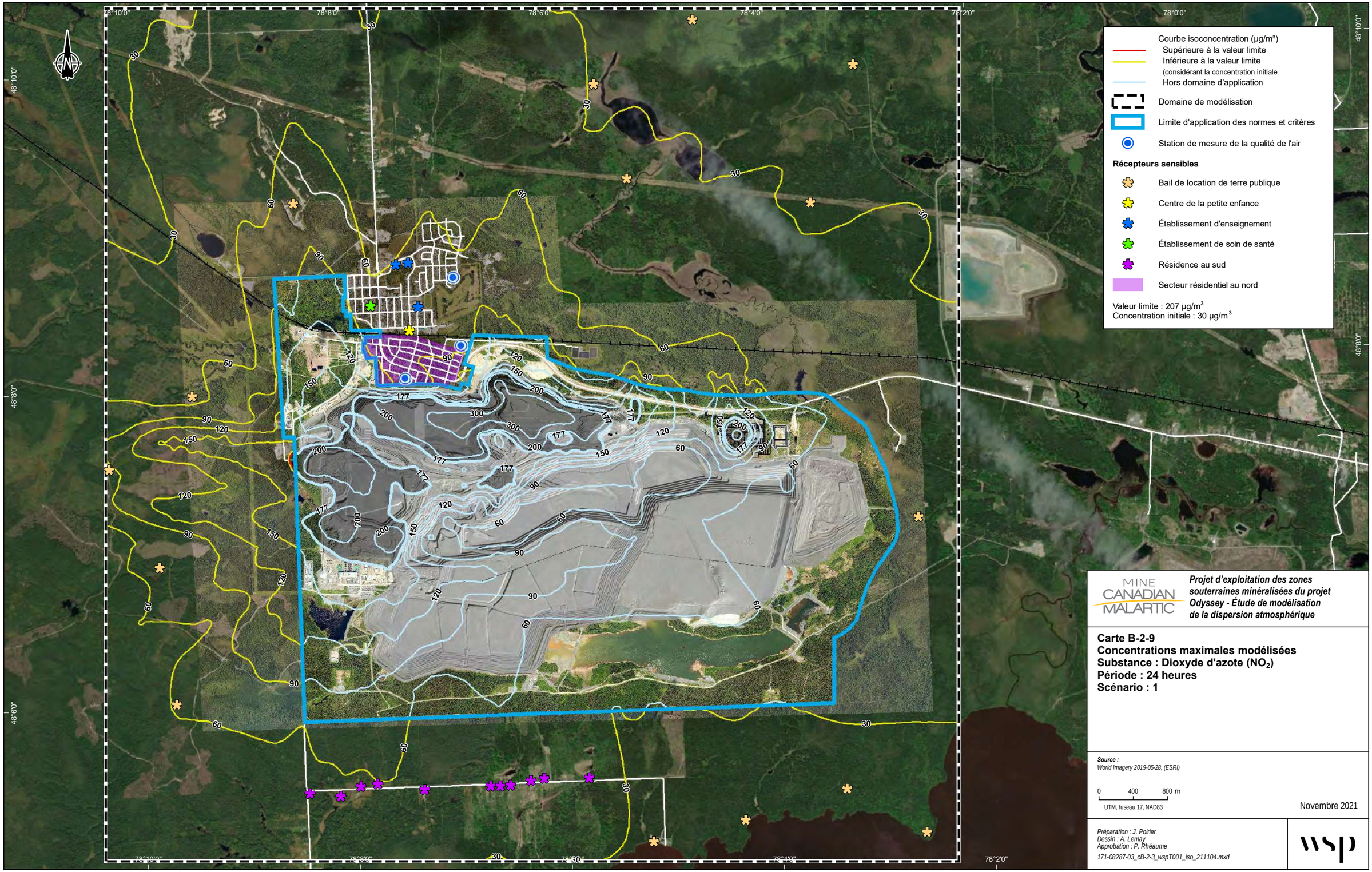
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-9**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 24 heures**
**Scénario : 1**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 207 µg/m$^3$
Concentration initiale : 30 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-10**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 24 heures**
**Scénario : 1 - Sans Odyssey**

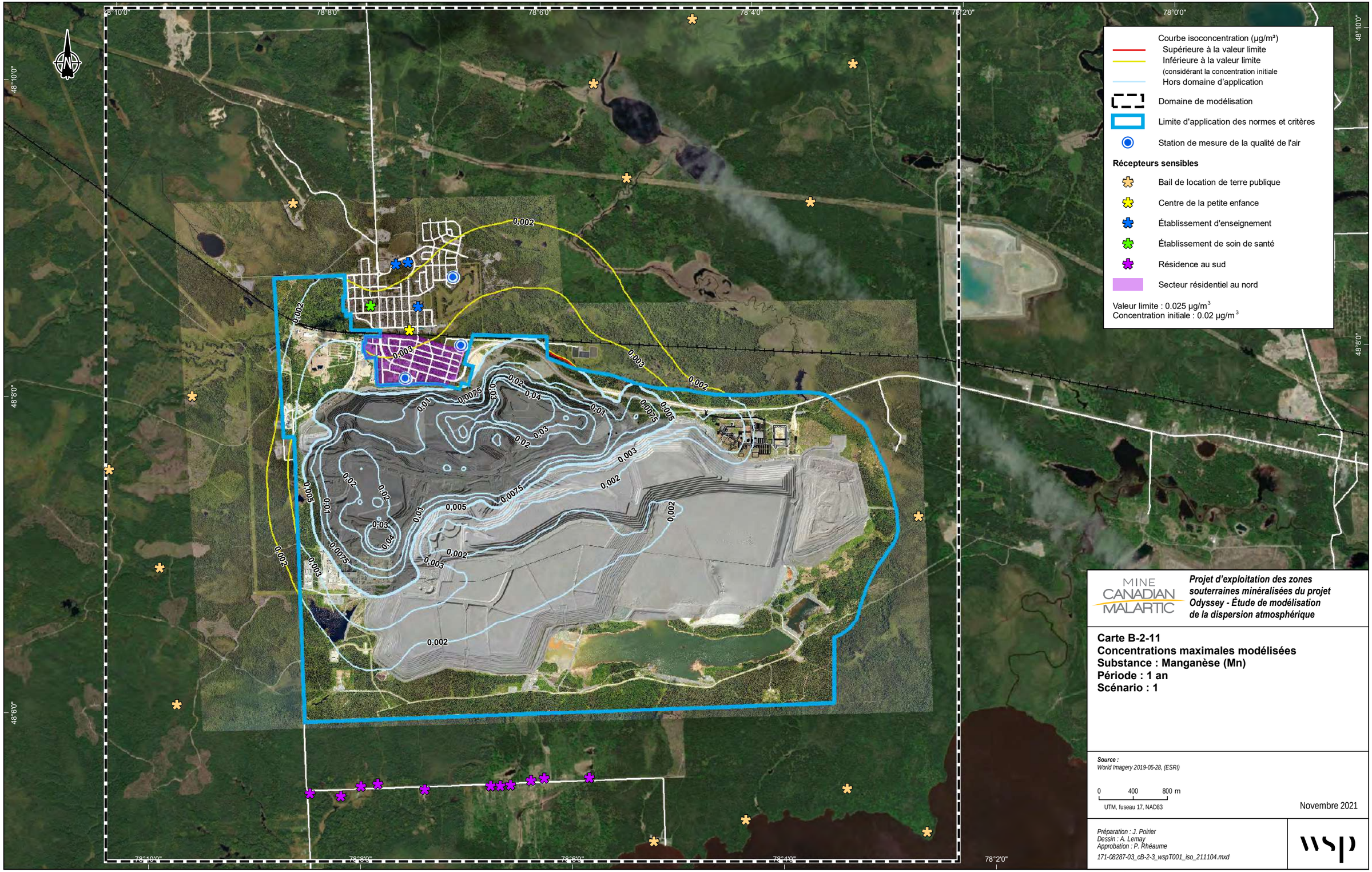
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-11**
**Concentrations maximales modélisées**
**Substance : Manganèse (Mn)**
**Période : 1 an**
**Scénario : 1**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

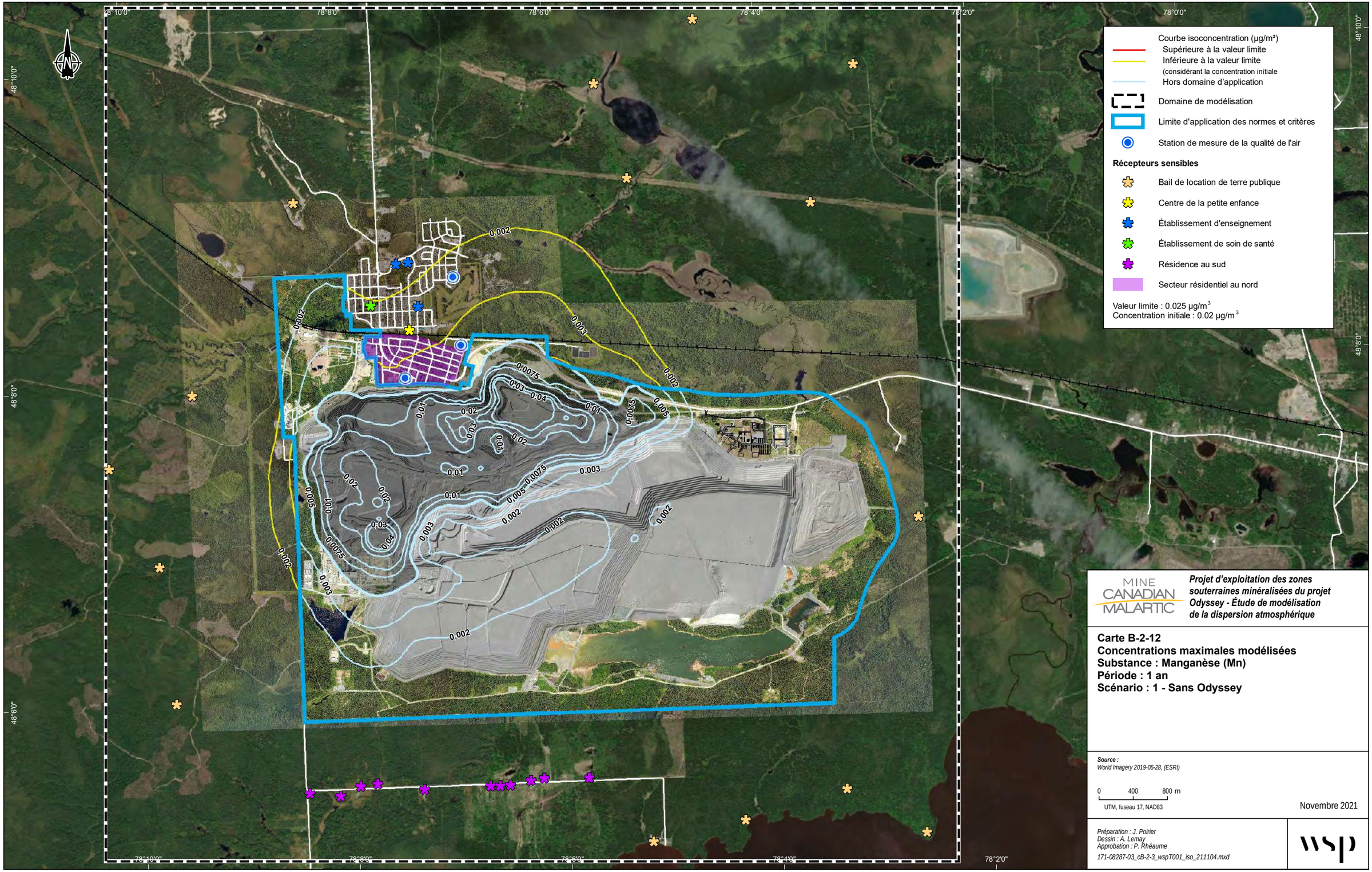
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-12**
**Concentrations maximales modélisées**
**Substance : Manganèse (Mn)**
**Période : 1 an**
**Scénario : 1 - Sans Odyssey**

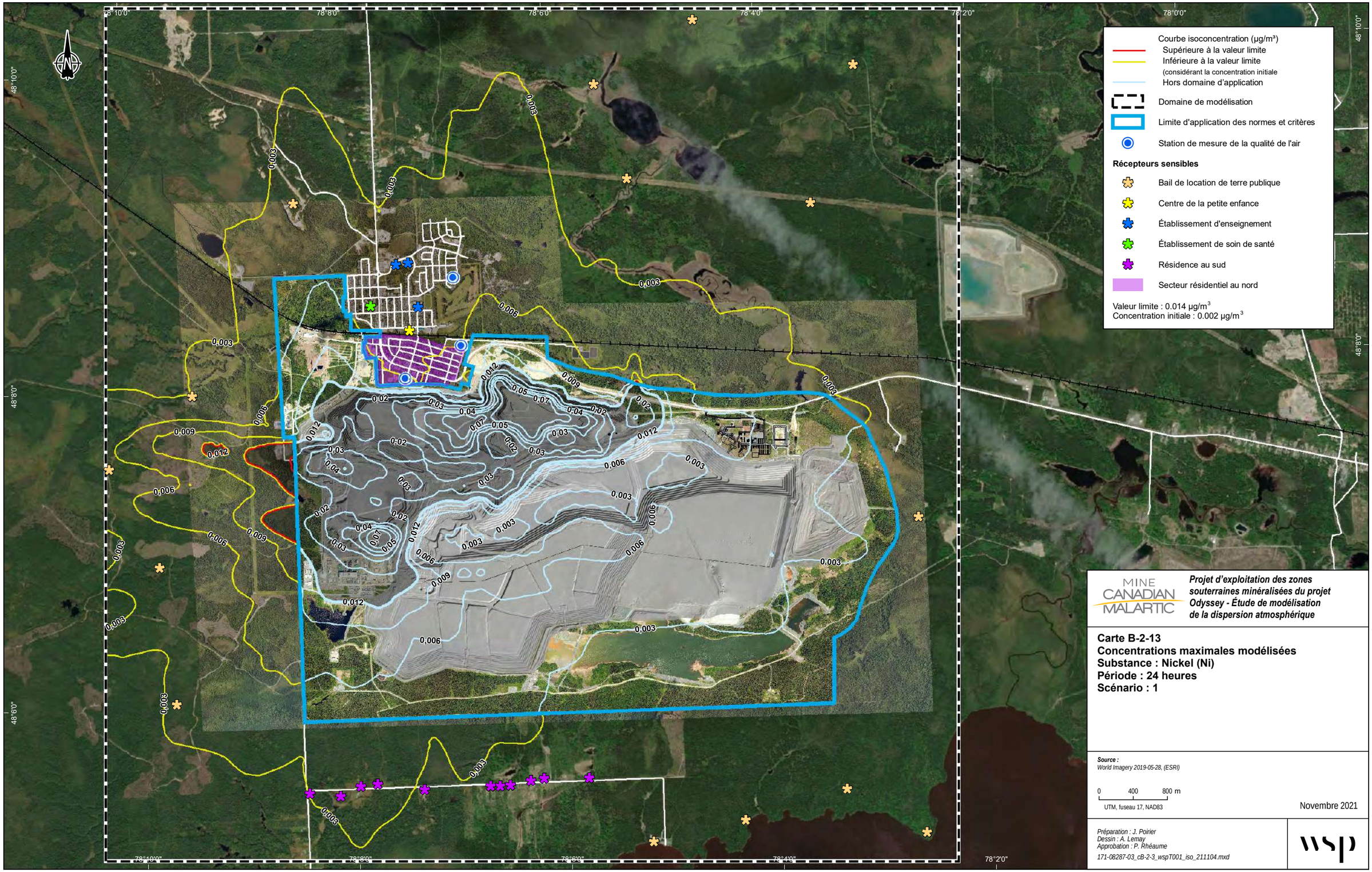
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-13**
**Concentrations maximales modélisées**
**Substance : Nickel (Ni)**
**Période : 24 heures**
**Scénario : 1**

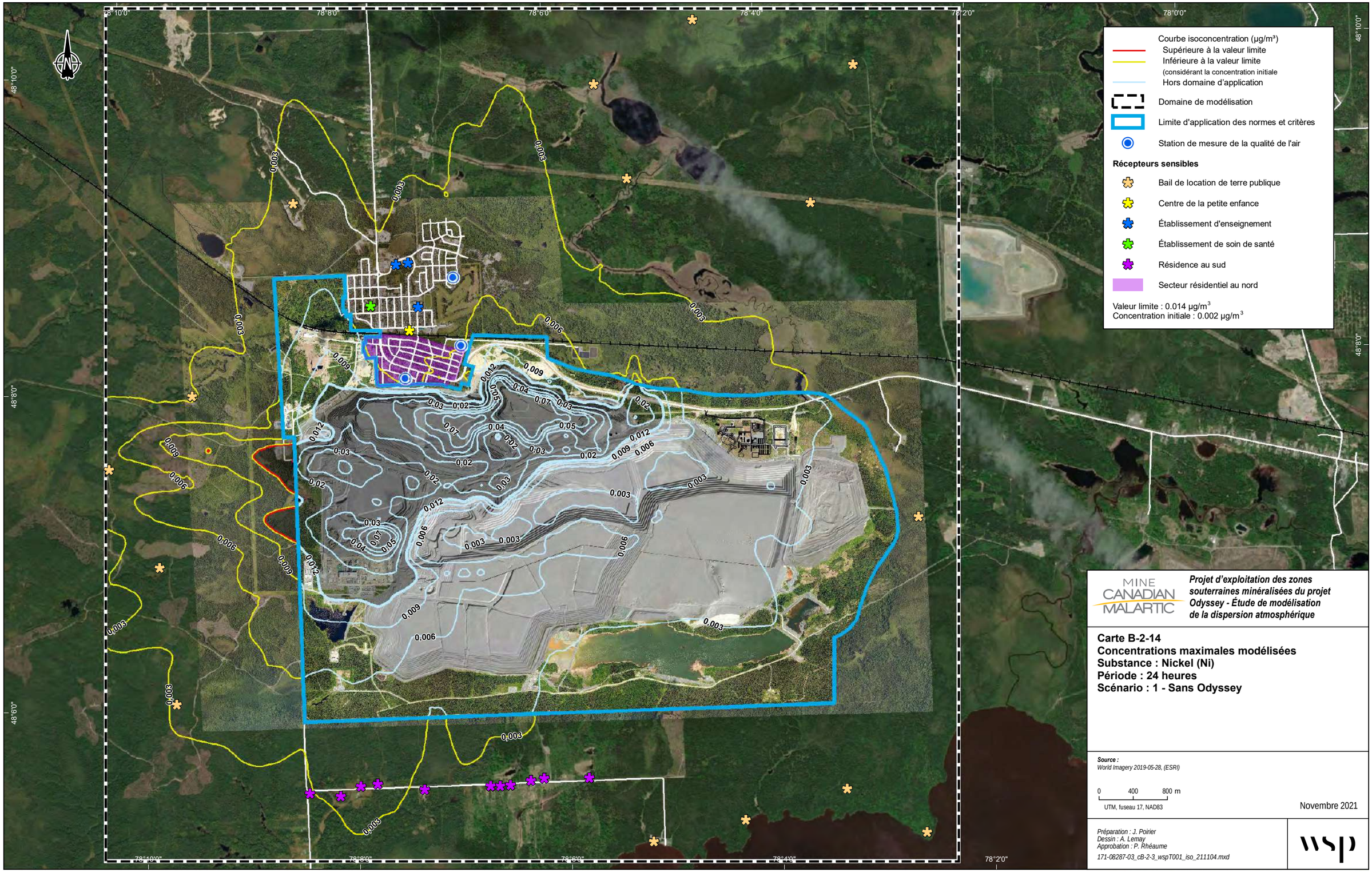
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-14**
**Concentrations maximales modélisées**
**Substance : Nickel (Ni)**
**Période : 24 heures**
**Scénario : 1 - Sans Odyssey**

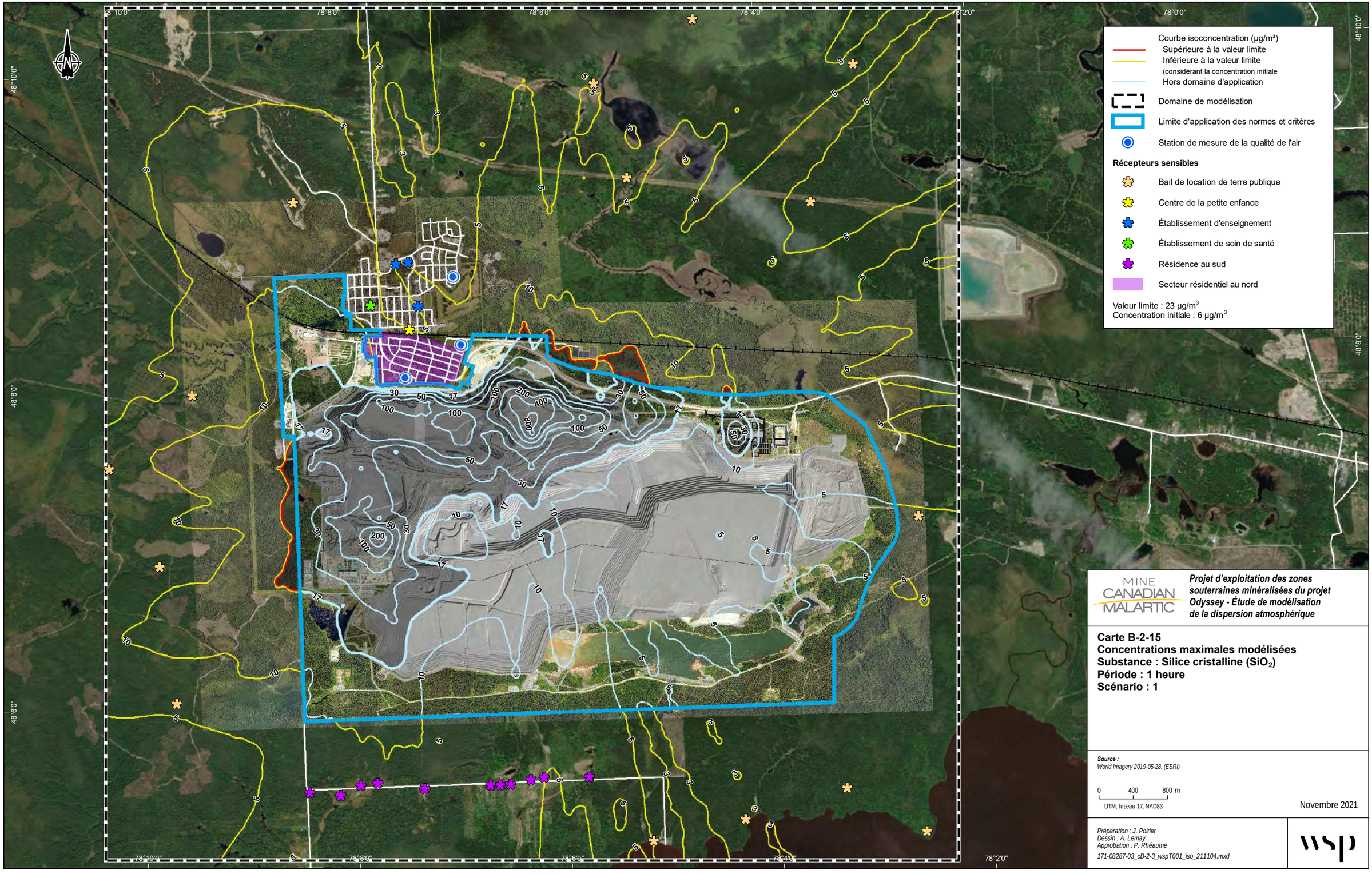
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-15**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 heure**
**Scénario : 1**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

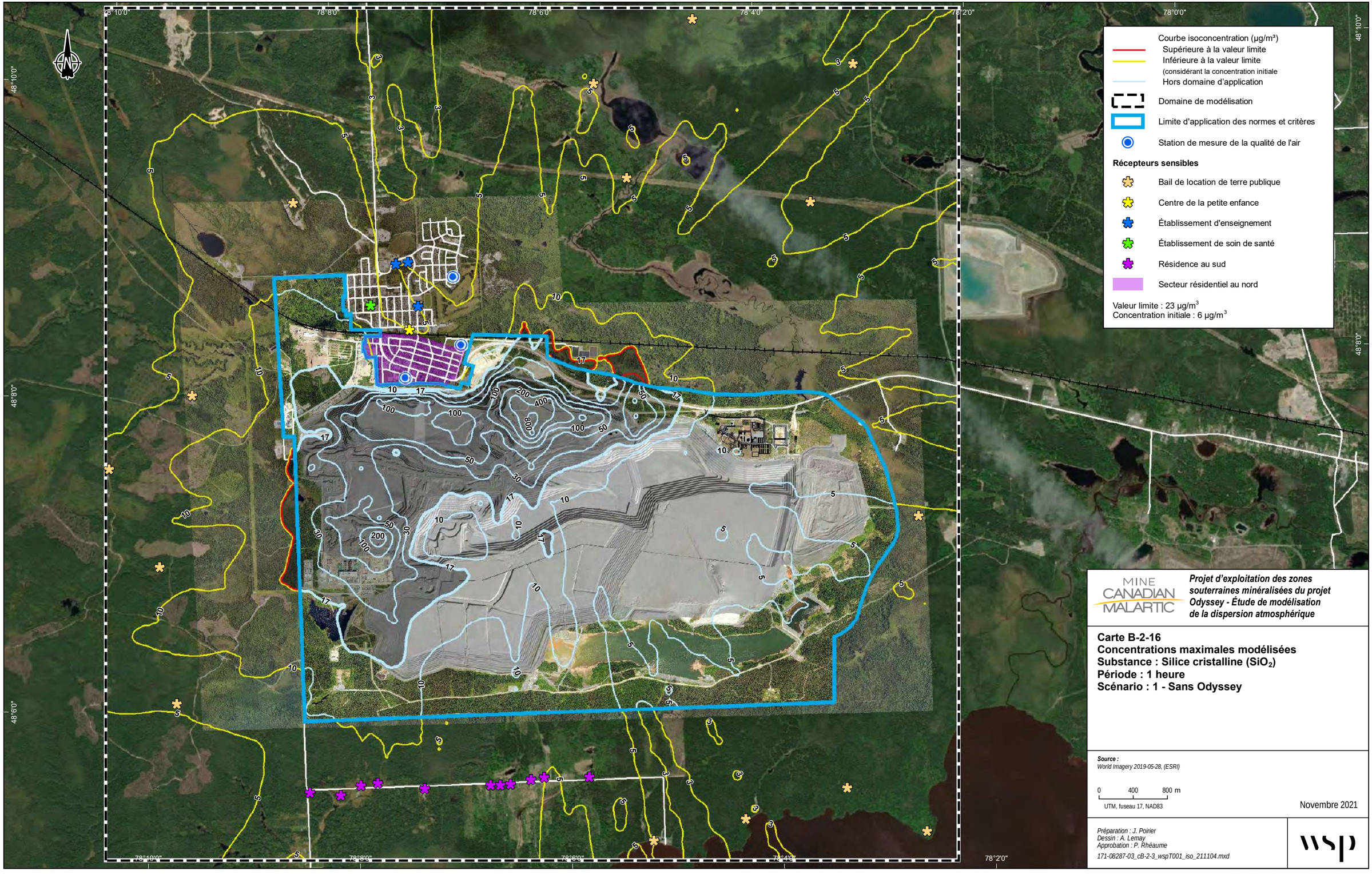
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-16**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 heure**
**Scénario : 1 - Sans Odyssey**

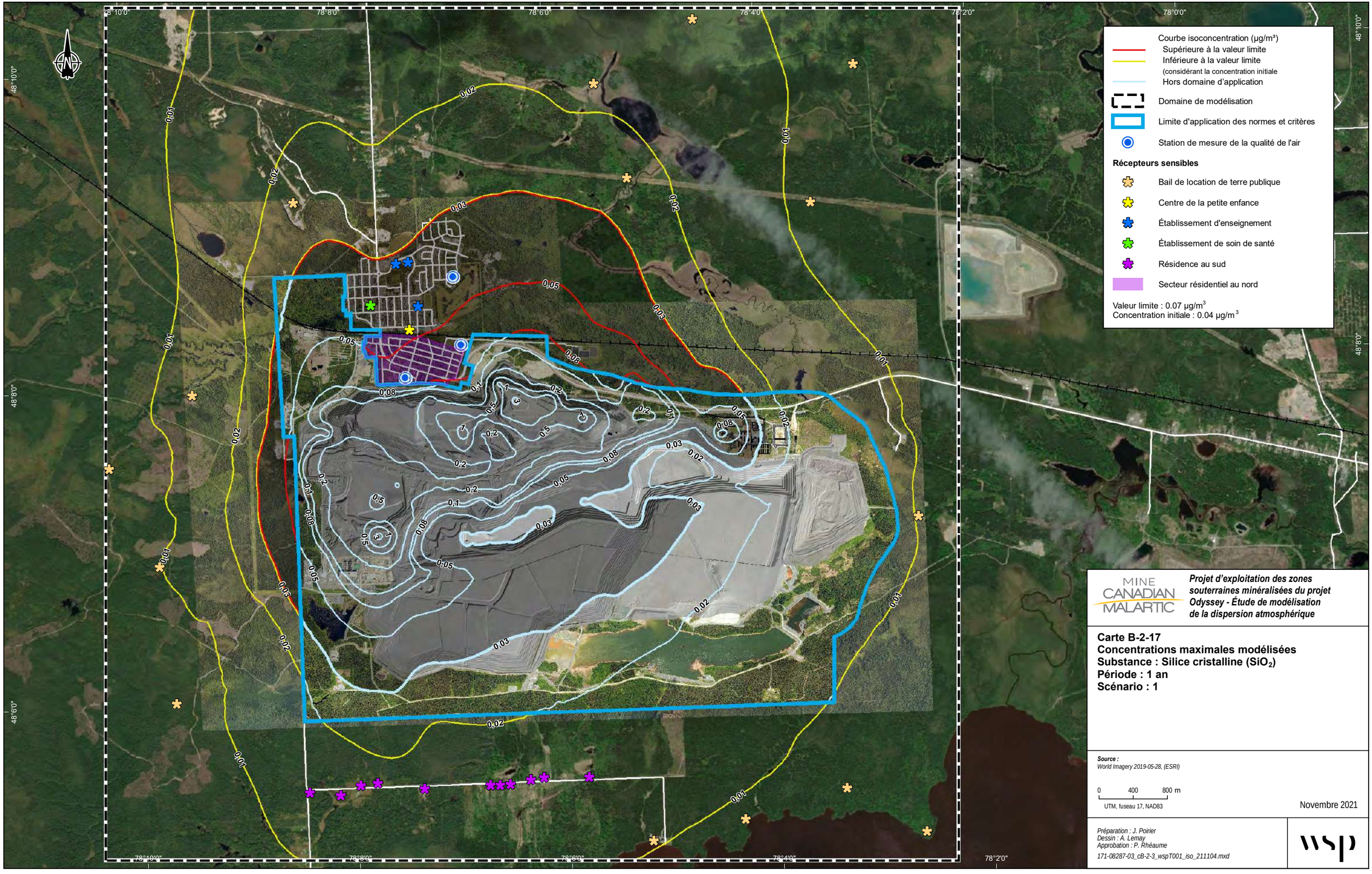
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-17**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 an**
**Scénario : 1**

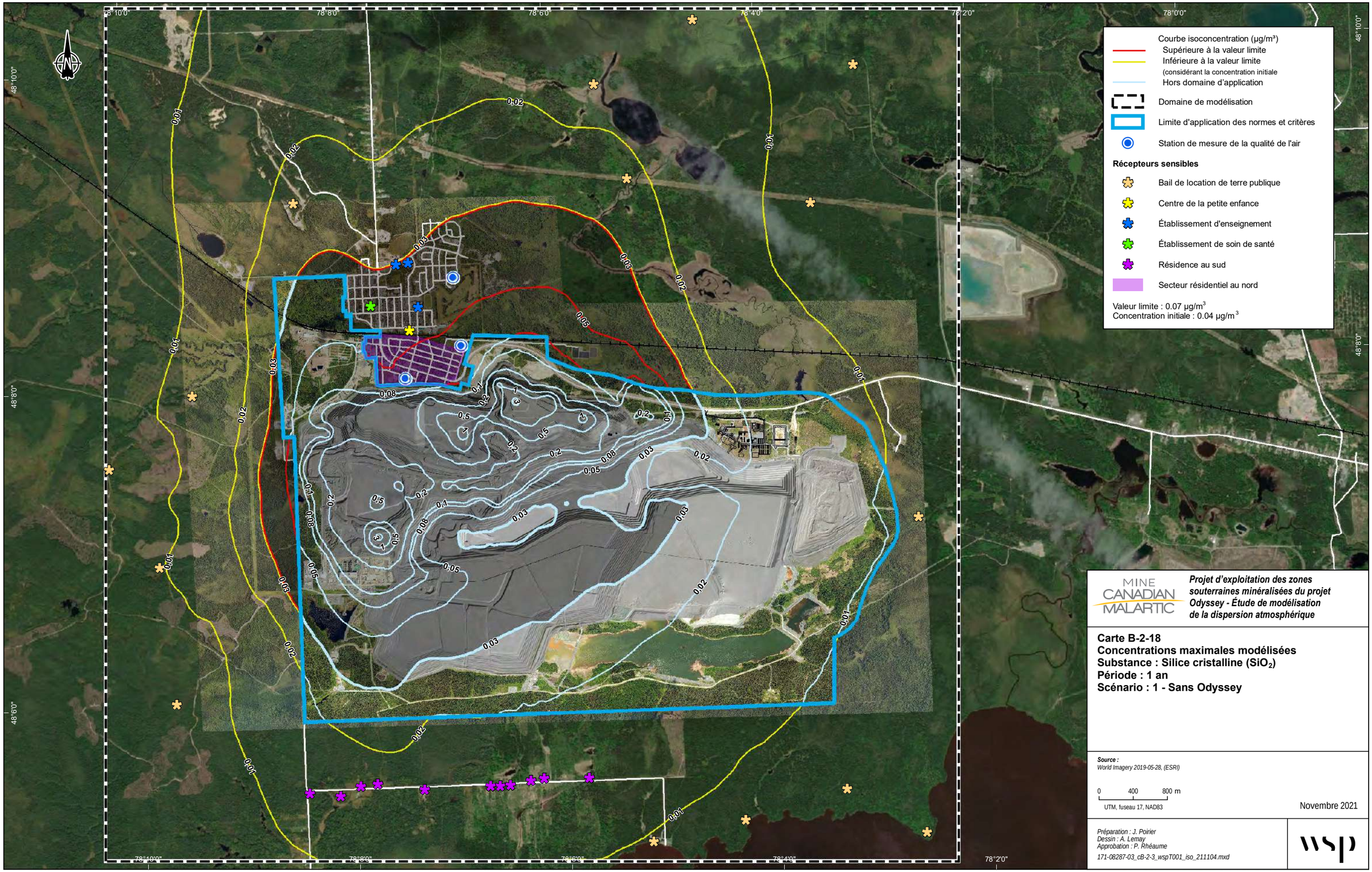
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-18**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 an**
**Scénario : 1 - Sans Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

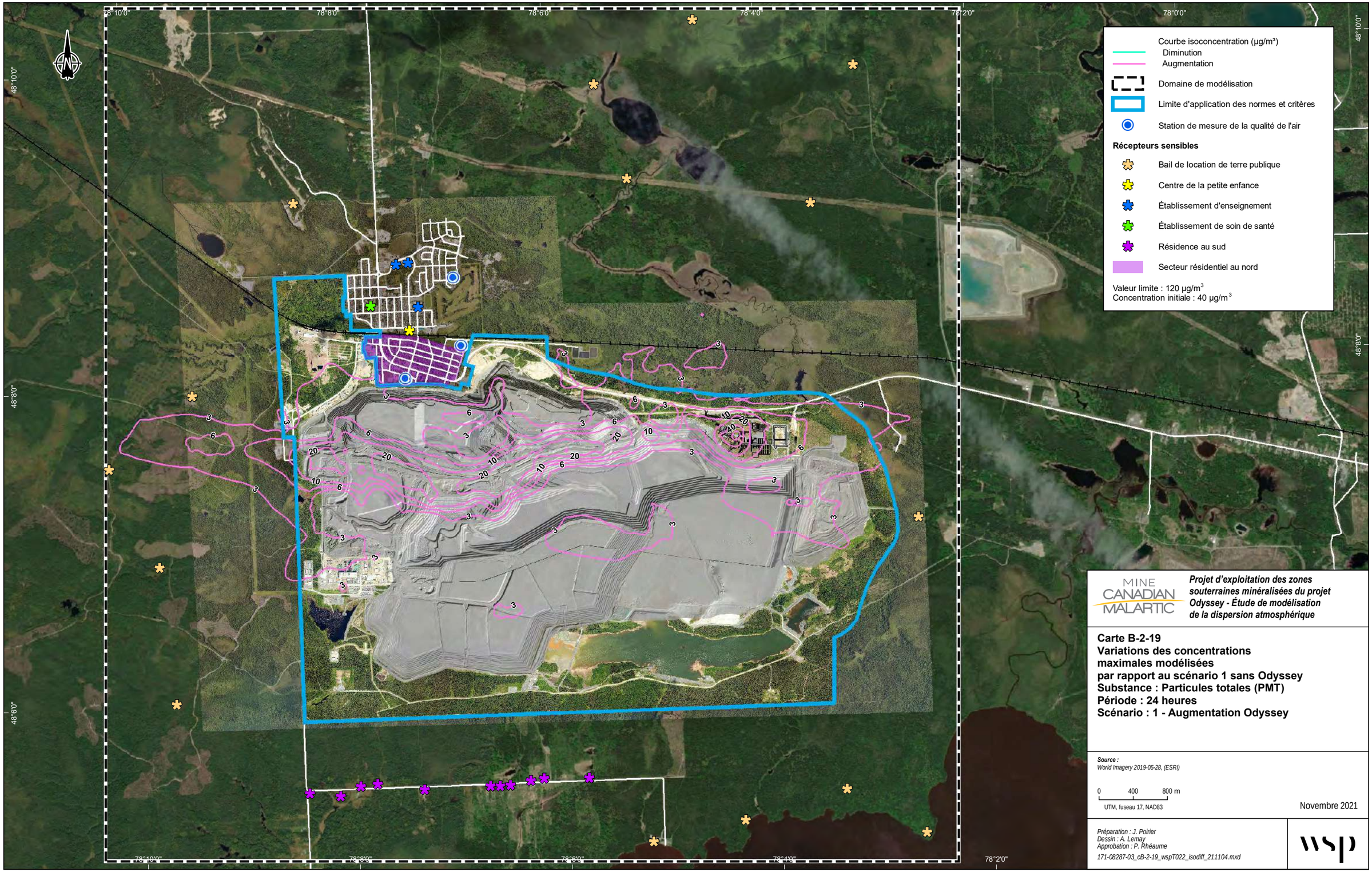
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-3_wspT001_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique***

**Carte B-2-19**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Particules totales (PMT)**
**Période : 24 heures**
**Scénario : 1 - Augmentation Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-2-19_wspT022_isodiff_211104.mxd*

wsp

78°10'0"
78°8'0"
78°6'0"
78°4'0"
78°2'0"
78°0'0"
48°10'0"
48°8'0"
48°6'0"

Courbe isoconcentration (µg/m³)
Diminution
Augmentation
Domaine de modélisation
Limite d'application des normes et critères
Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique
Centre de la petite enfance
Établissement d'enseignement
Établissement de soin de santé
Résidence au sud
Secteur résidentiel au nord

Valeur limite : 30 µg/m$^3$
Concentration initiale : 15 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-20**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Particules fines ($PM_{2,5}$)**
**Période : 24 heures**
**Scénario : 1 - Augmentation Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

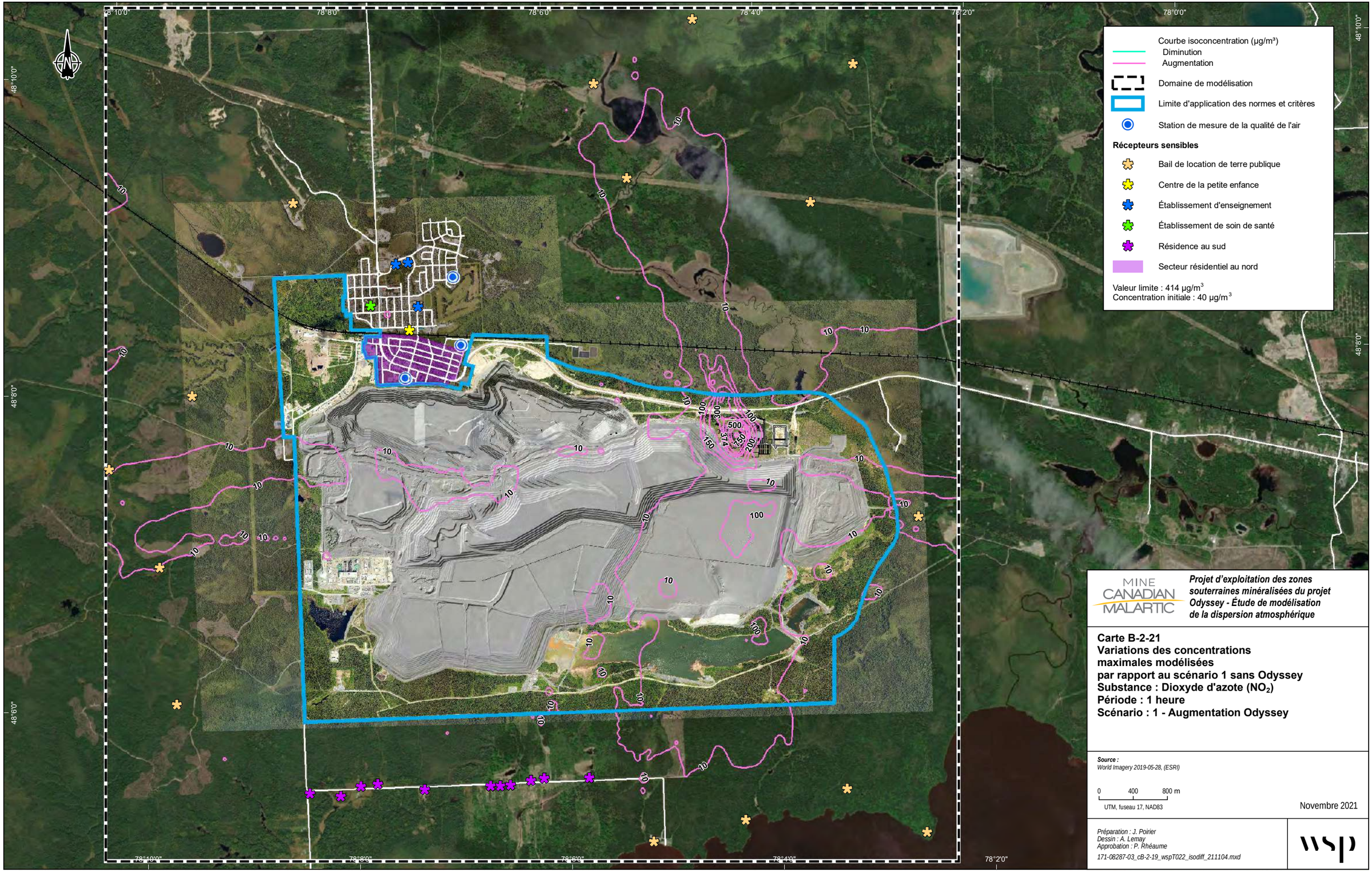
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-19_wspT022_isodiff_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-21**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 1 heure**
**Scénario : 1 - Augmentation Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

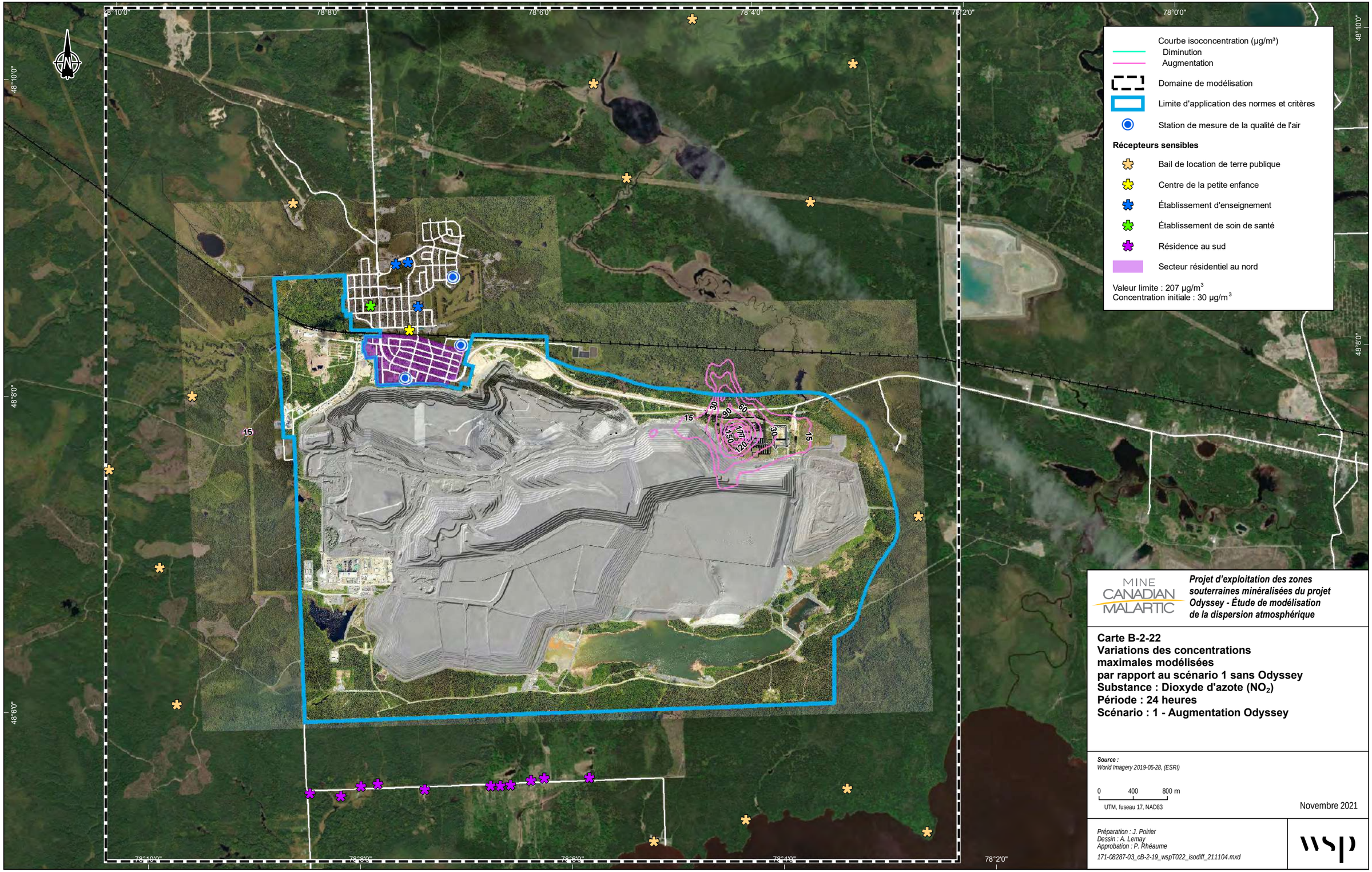
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-2-19_wspT022_isodiff_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-2-22**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 24 heures**
**Scénario : 1 - Augmentation Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

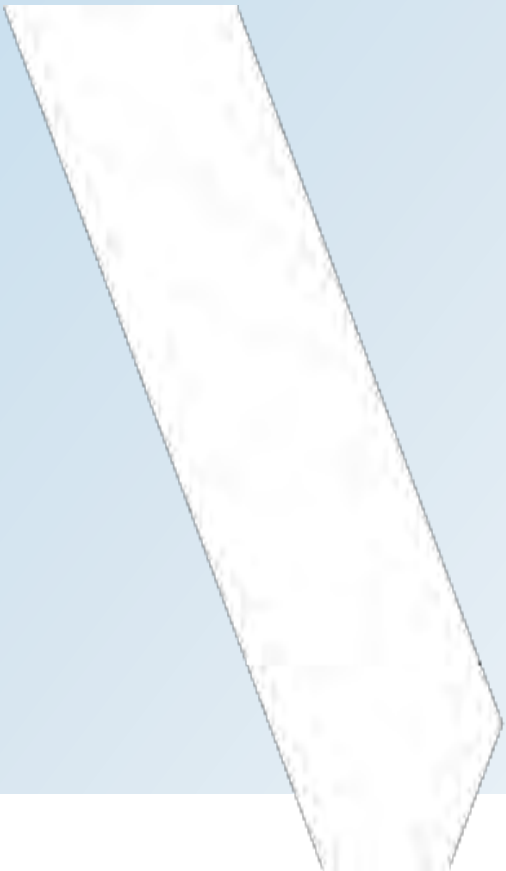
*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

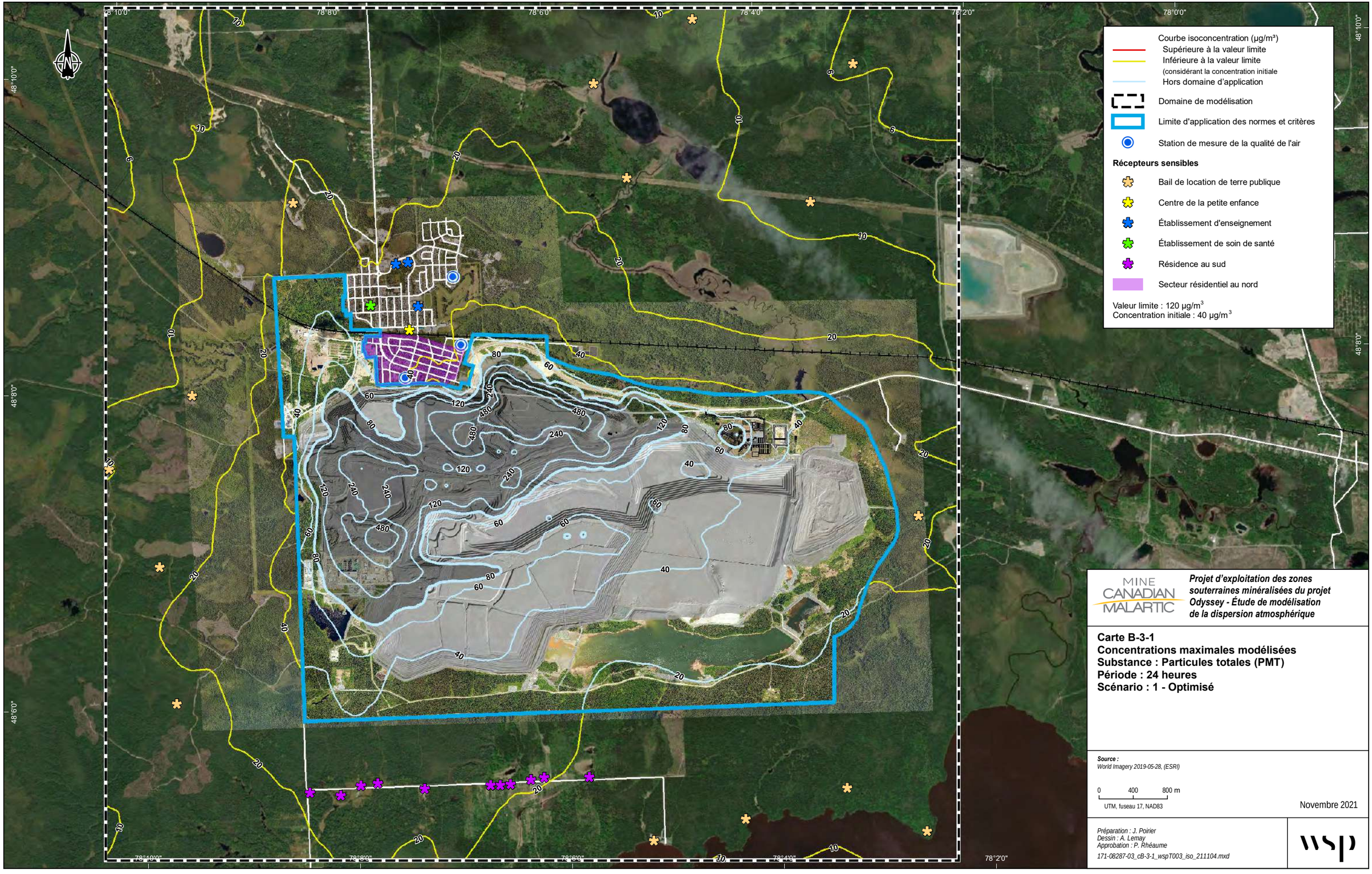
*171-08287-03_cB-2-19_wspT022_isodiff_211104.mxd*

wsp

# ANNEXE

## B-3 *SCÉNARIO 1 OPTIMISÉ*






MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-1**
**Concentrations maximales modélisées**
**Substance : Particules totales (PMT)**
**Période : 24 heures**
**Scénario : 1 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp

78°10'0"
78°8'0"
78°6'0"
78°4'0"
78°2'0"
78°0'0"
48°10'0"
48°8'0"
48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application
Domaine de modélisation
Limite d'application des normes et critères
Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique
Centre de la petite enfance
Établissement d'enseignement
Établissement de soin de santé
Résidence au sud
Secteur résidentiel au nord

Valeur limite : 30 µg/m$^3$
Concentration initiale : 15 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-2**
**Concentrations maximales modélisées**
**Substance : Particules fines ($PM_{2,5}$)**
**Période : 24 heures**
**Scénario : 1 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

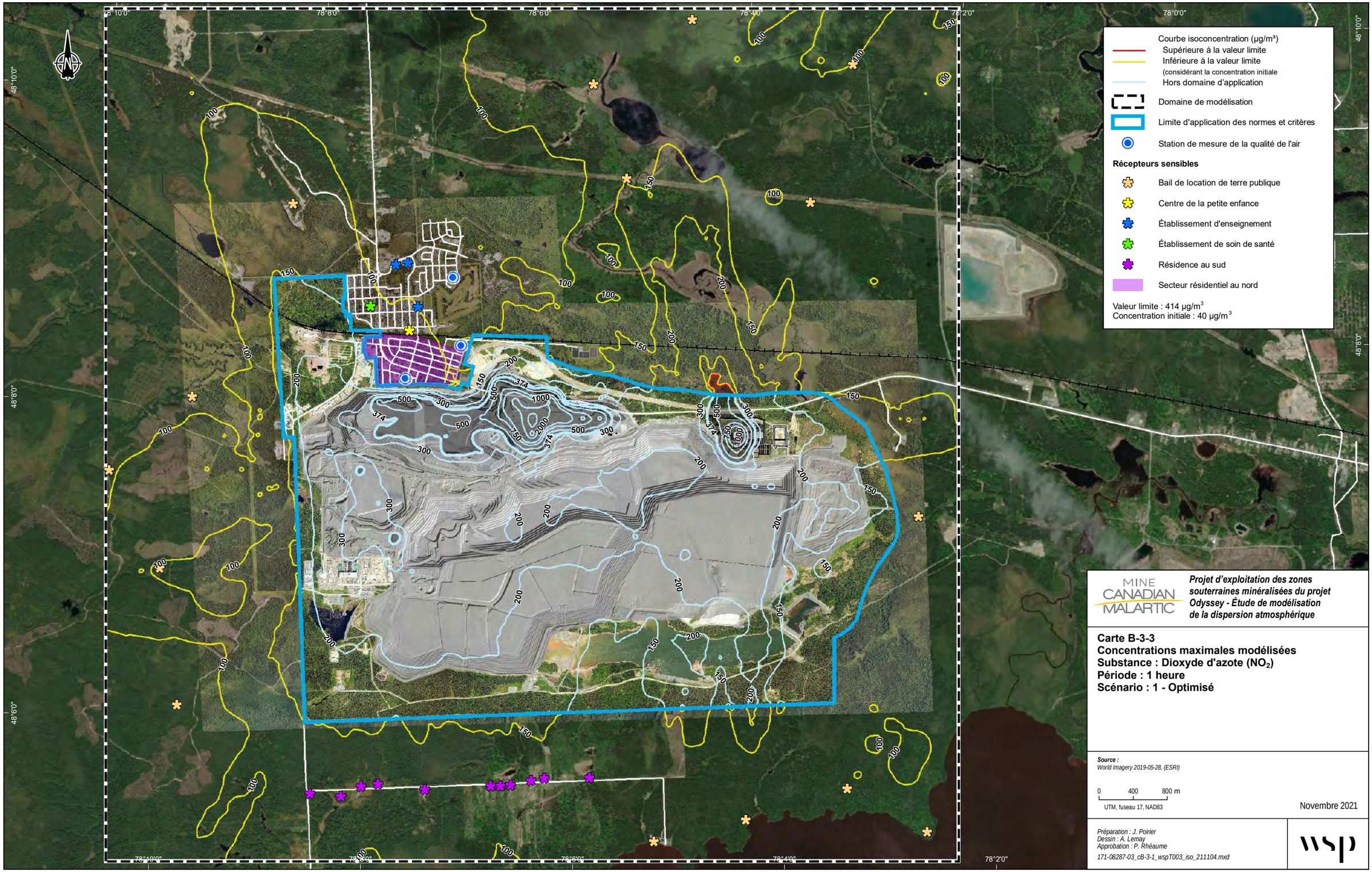
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-3**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 1 heure**
**Scénario : 1 - Optimisé**

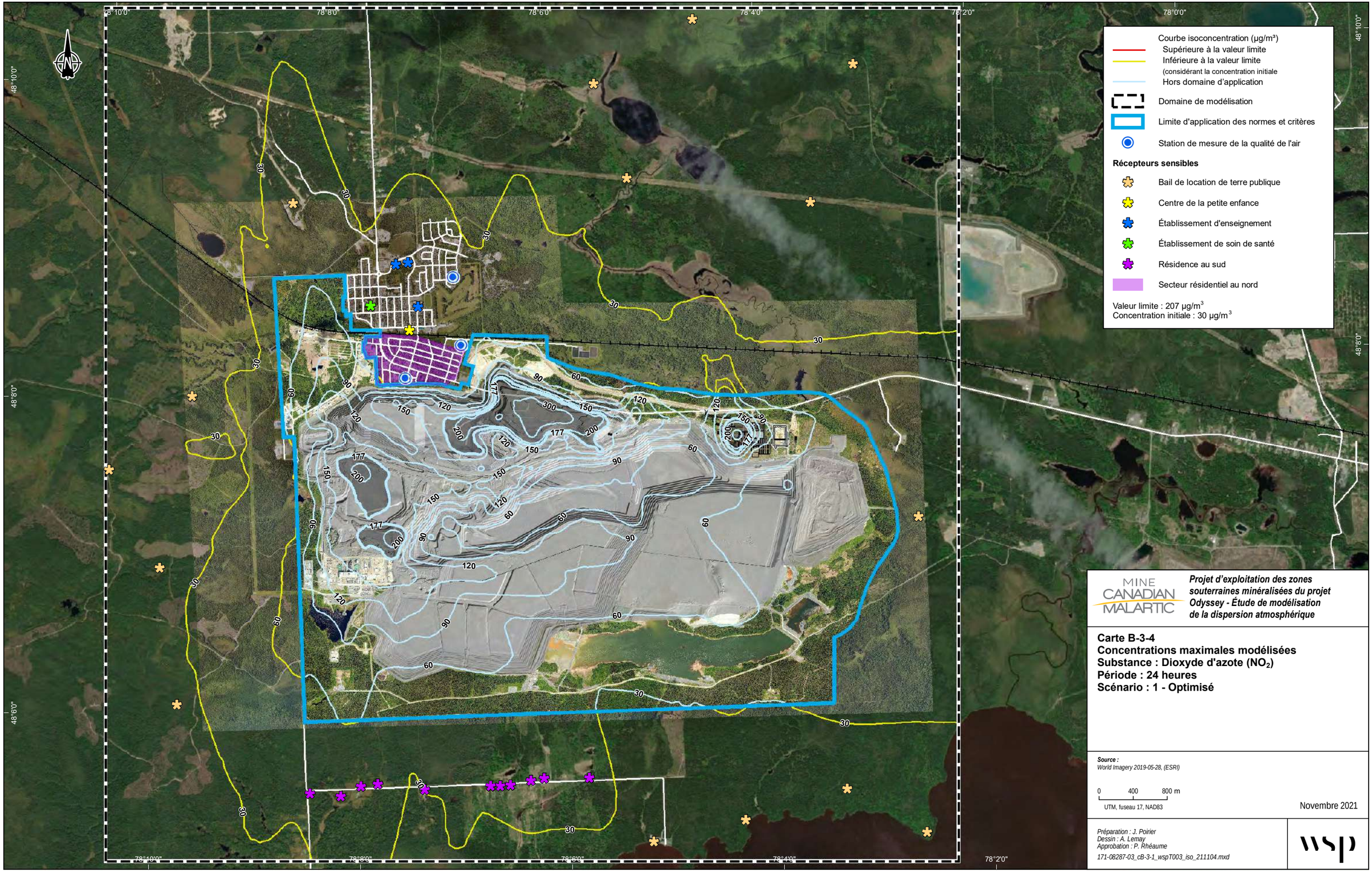
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp


78°10'0"
78°8'0"
78°6'0"
78°4'0"
78°2'0"
78°0'0"
48°10'0"
48°8'0"
48°6'0"
Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application
Domaine de modélisation
Limite d'application des normes et critères
Station de mesure de la qualité de l'air
Récepteurs sensibles
Bail de location de terre publique
Centre de la petite enfance
Établissement d'enseignement
Établissement de soin de santé
Résidence au sud
Secteur résidentiel au nord
Valeur limite : 207 µg/m3
Concentration initiale : 30 µg/m3
MINE CANADIAN MALARTIC
Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique
Carte B-3-4
Concentrations maximales modélisées
Substance : Dioxyde d'azote (NO2)
Période : 24 heures
Scénario : 1 - Optimisé
Source :
World Imagery 2019-05-28, (ESRI)
0 400 800 m
UTM, fuseau 17, NAD83
Novembre 2021
Préparation : J. Poirier
Dessin : A. Lemay
Approbation : P. Rhéaume
171-08287-03_cB-3-1_wspT003_iso_211104.mxd
wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 0.025 µg/m$^3$
Concentration initiale : 0.02 µg/m$^3$

0.002 0.003 0.005 0.0075 0.01 0.02 0.03 0.04

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-5**
**Concentrations maximales modélisées**
**Substance : Manganèse (Mn)**
**Période : 1 an**
**Scénario : 1 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

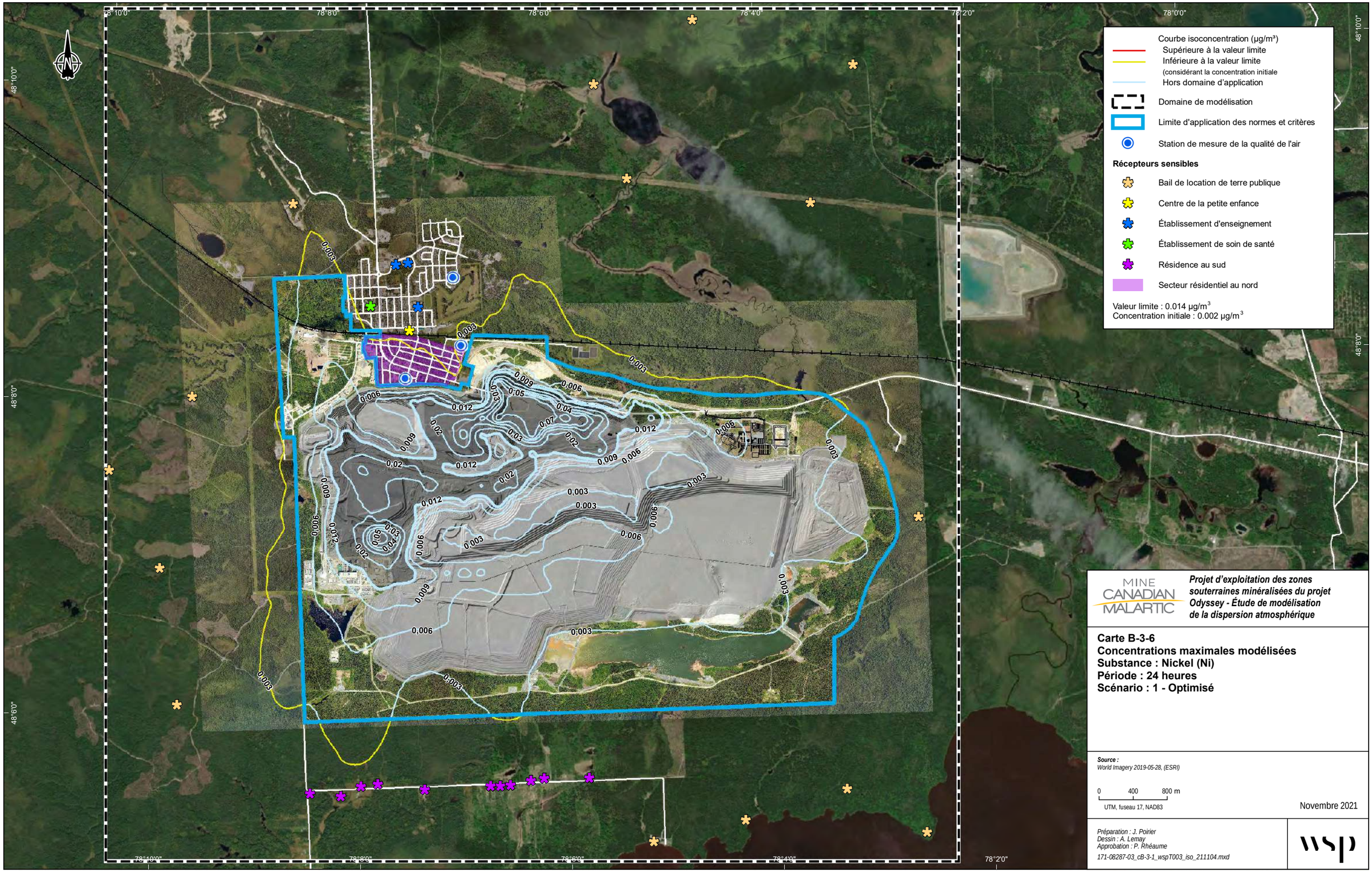
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-6**
**Concentrations maximales modélisées**
**Substance : Nickel (Ni)**
**Période : 24 heures**
**Scénario : 1 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
- Supérieure à la valeur limite
- Inférieure à la valeur limite
- (considérant la concentration initiale
- Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

- Bail de location de terre publique
- Centre de la petite enfance
- Établissement d'enseignement
- Établissement de soin de santé
- Résidence au sud
- Secteur résidentiel au nord

Valeur limite : 23 µg/m$^3$
Concentration initiale : 6 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-7**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 heure**
**Scénario : 1 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

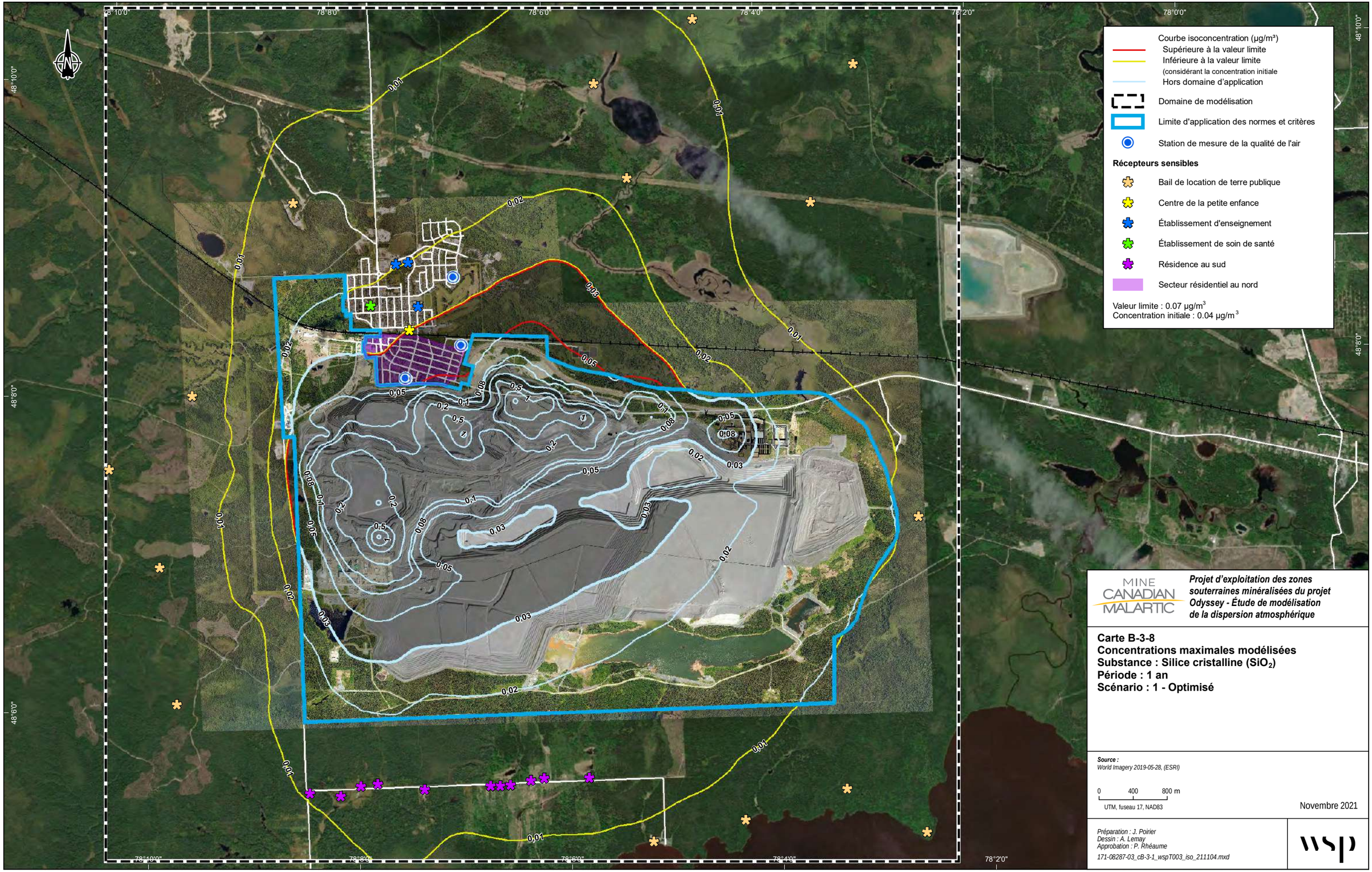
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-8**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 an**
**Scénario : 1 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

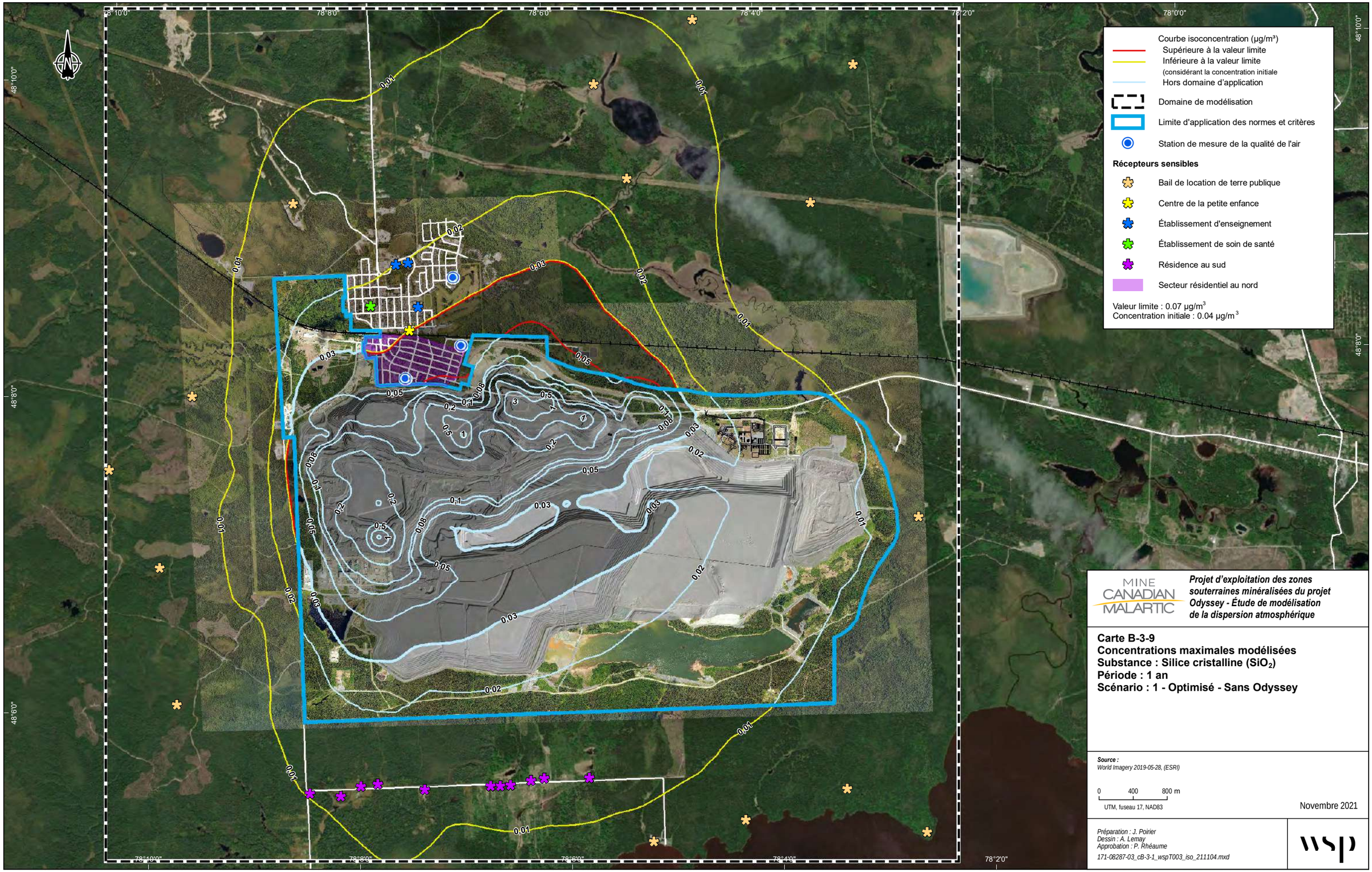
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-3-9**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 an**
**Scénario : 1 - Optimisé - Sans Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

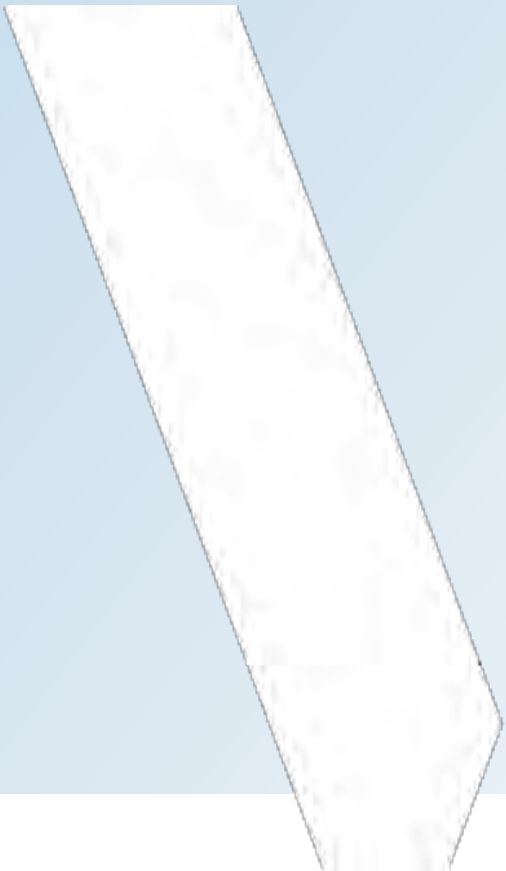
Novembre 2021

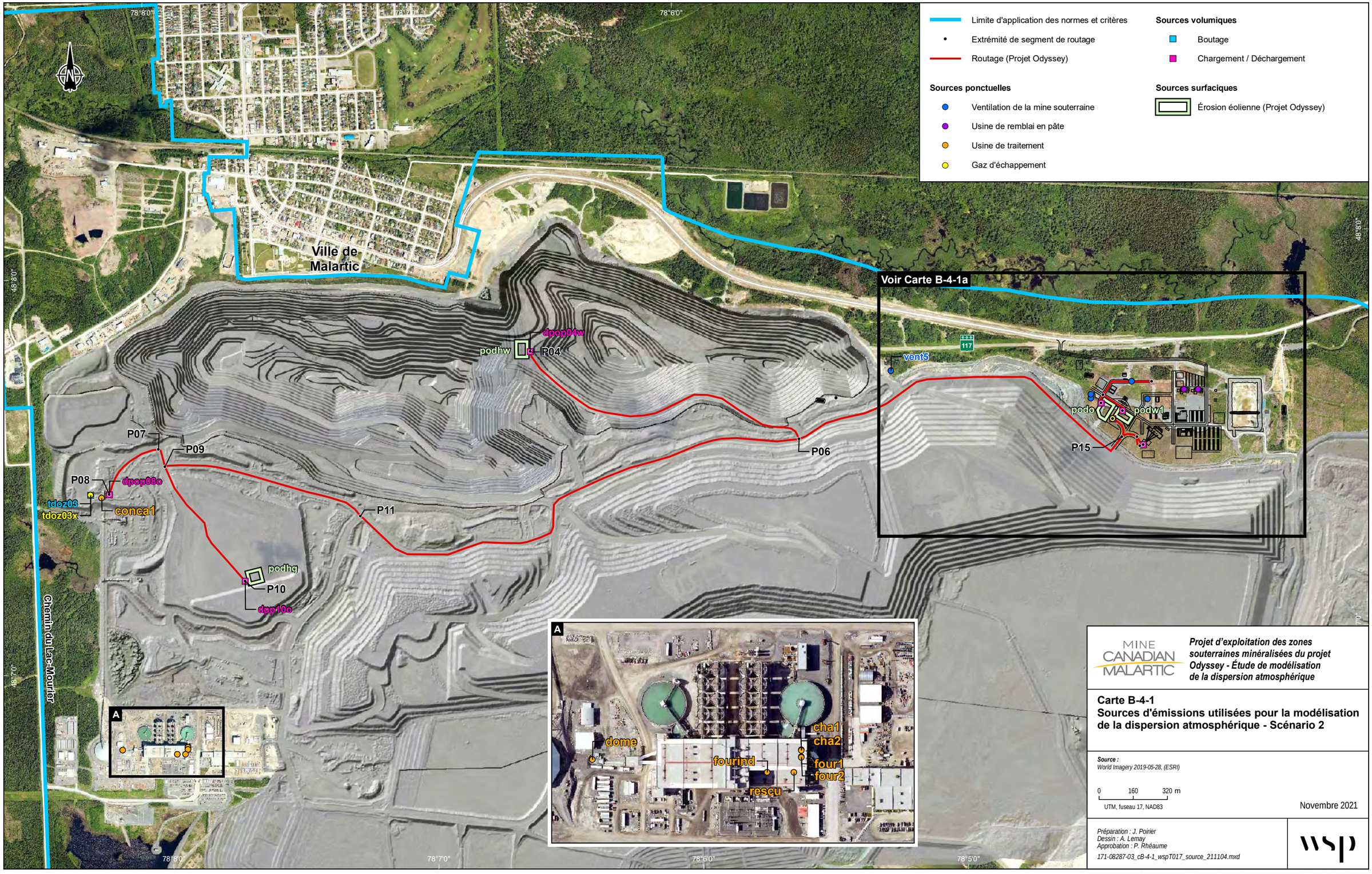
*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-3-1_wspT003_iso_211104.mxd*

wsp

# ANNEXE

## B-4 *SCÉNARIO 2*






*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

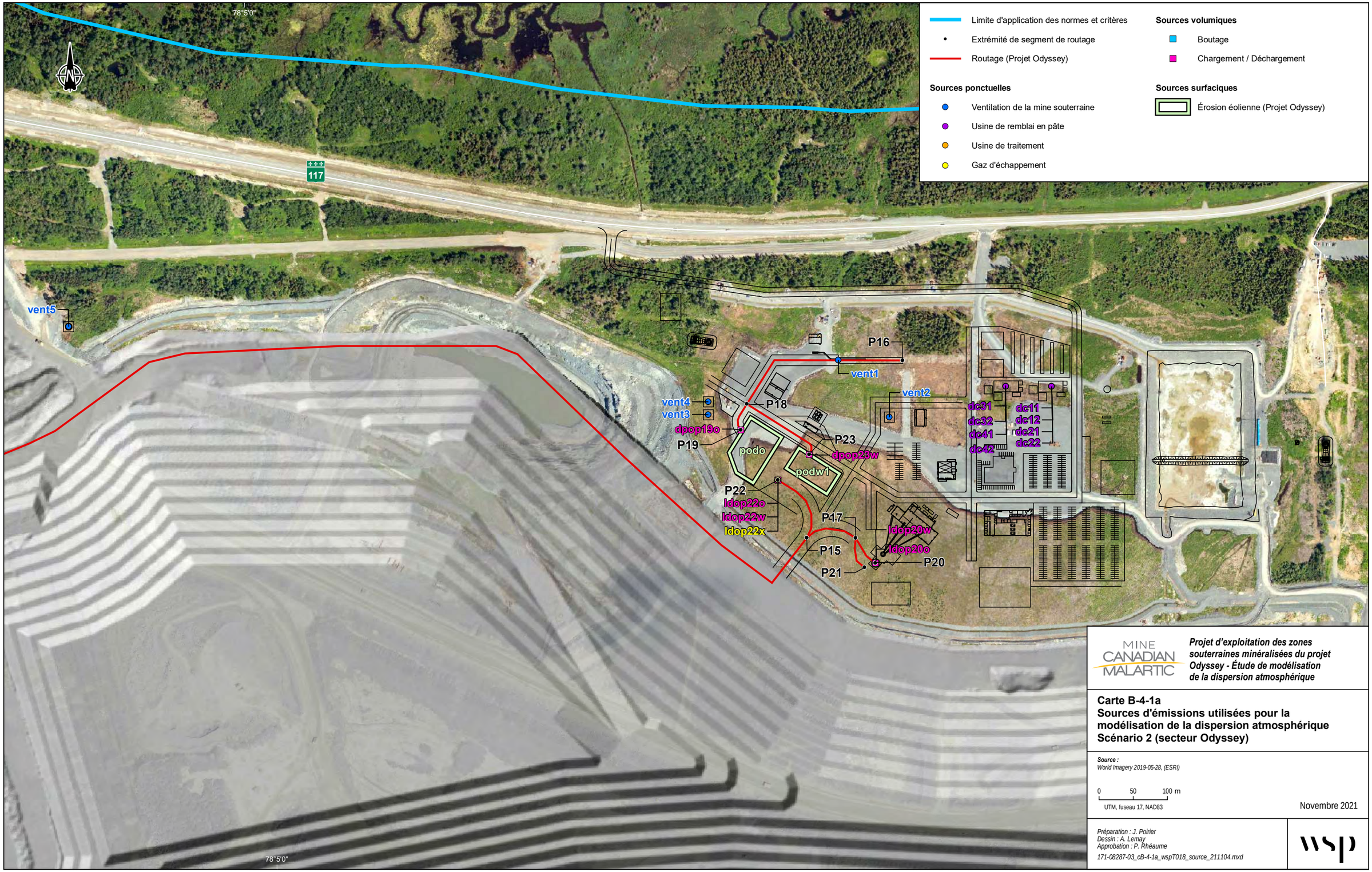
**Carte B-4-1**
**Sources d'émissions utilisées pour la modélisation de la dispersion atmosphérique - Scénario 2**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-1_wspT017_source_211104.mxd*




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-1a**
**Sources d'émissions utilisées pour la modélisation de la dispersion atmosphérique**
**Scénario 2 (secteur Odyssey)**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 50 100 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-4-1a_wspT018_source_211104.mxd*

wsp

78°8'0"
78°7'0"
78°6'0"
78°5'0"
78°4'0"
48°8'0"
48°7'0"

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P20_P08 et P22_P08

P20_P10 et P22_P10

P16_P19

P04
P06
P07
P08
P09
P10
P11

Chemin du Lac-Mourier

A

P16
P18
P19
P23
P22
P17
P20
P15
P21

0 80 160 m

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-2a**
**Trajets de transport - Scénario 2**
**Transport du minerai - Projet Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-2a_wspT019_trajets_211104.mxd*

78°8'0"
78°7'0"
78°6'0"
78°5'0"
78°4'0"
48°8'0"
48°7'0"

Limite d'application des normes et critères

**Modèle de dispersion atmosphérique**

Intersection de segment de routage

Routage

**Trajets**

P16_P23

P20_P04 et P22_P04

P04
P06
P07
P08
P09
P10
P11
Chemin du Lac-Mourier

A

P16
P18
P19
P23
P22
P17
P20
P15
P21

0 80 160 m

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-2b**
**Trajets de transport - Scénario 2**
**Transport du stériles - Projet Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 160 320 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-2b_wspT020_trajets_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 120 µg/m$^3$
Concentration initiale : 40 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-3**
**Concentrations maximales modélisées**
**Substance : Particules totales (PMT)**
**Période : 24 heures**
**Scénario : 2**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 30 µg/m$^3$
Concentration initiale : 15 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-4**
**Concentrations maximales modélisées**
**Substance : Particules fines ($PM_{2,5}$)**
**Période : 24 heures**
**Scénario : 2**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
- Supérieure à la valeur limite
- Inférieure à la valeur limite (considérant la concentration initiale
- Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

- Bail de location de terre publique
- Centre de la petite enfance
- Établissement d'enseignement
- Établissement de soin de santé
- Résidence au sud
- Secteur résidentiel au nord

Valeur limite : 414 µg/m$^3$
Concentration initiale : 40 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-5**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 1 heure**
**Scénario : 2**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique

Centre de la petite enfance

Établissement d'enseignement

Établissement de soin de santé

Résidence au sud

Secteur résidentiel au nord

Valeur limite : 207 µg/m$^3$
Concentration initiale : 30 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-6**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 24 heures**
**Scénario : 2**

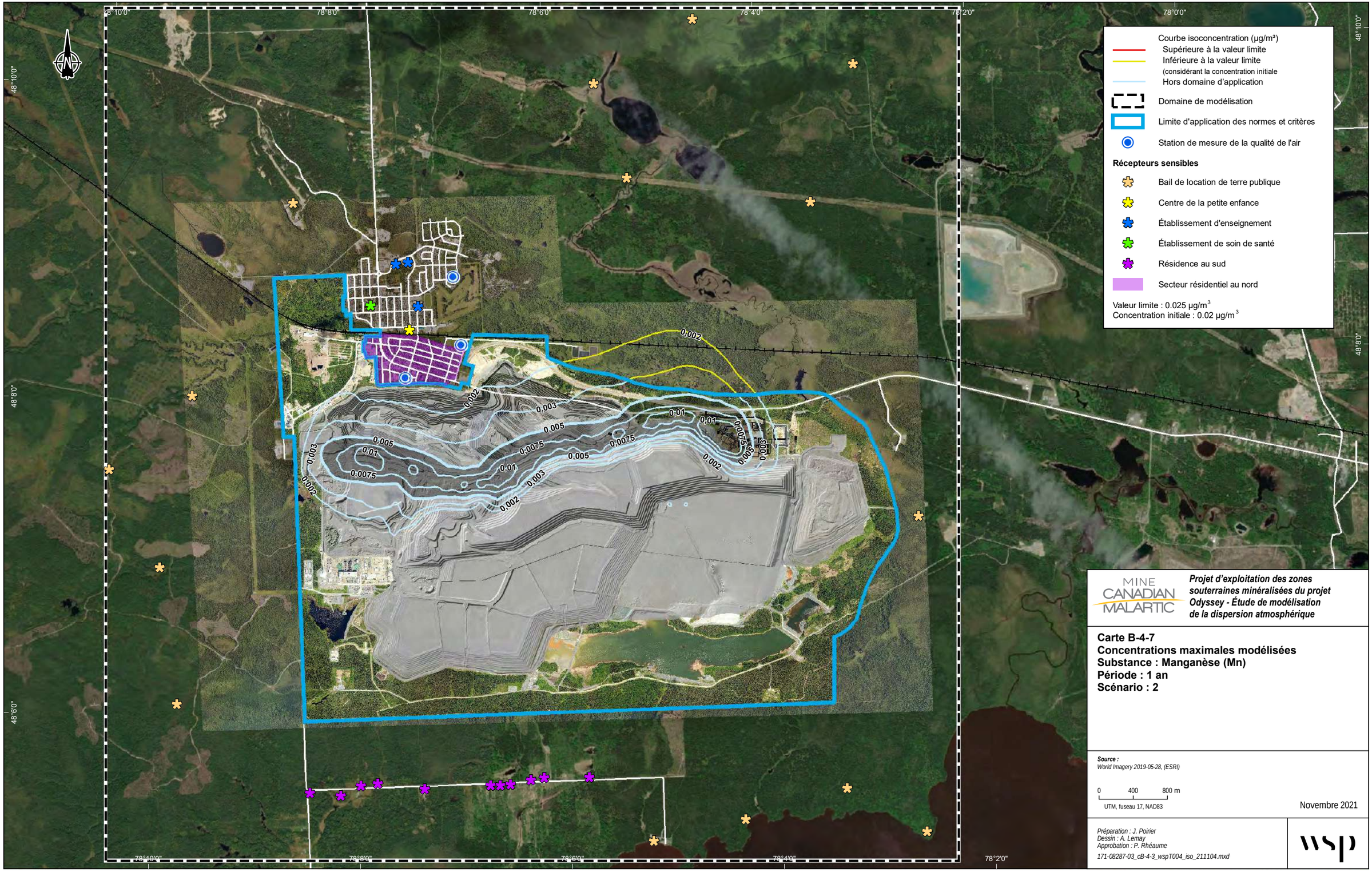
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-7**
**Concentrations maximales modélisées**
**Substance : Manganèse (Mn)**
**Période : 1 an**
**Scénario : 2**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

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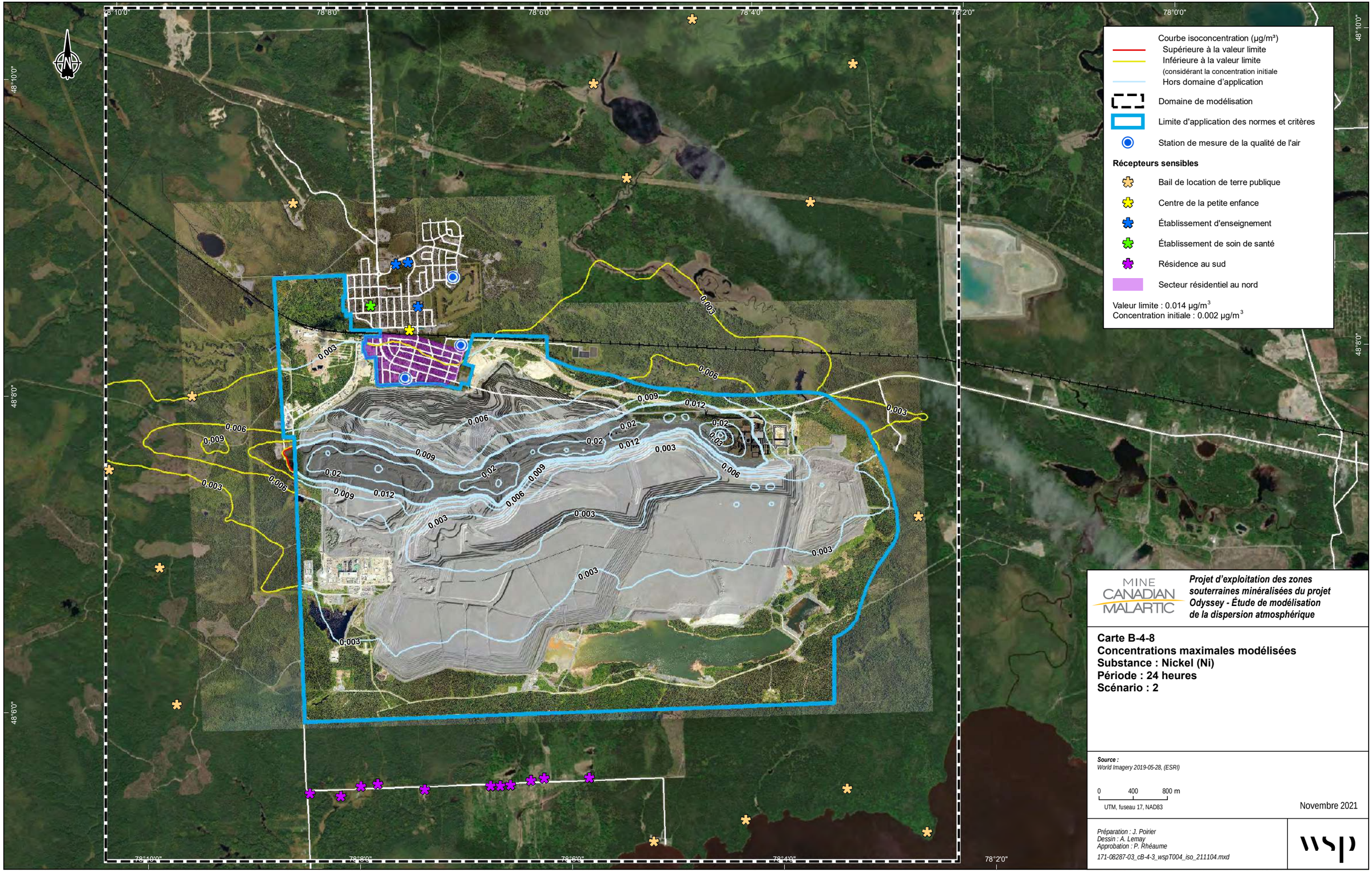


MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-8**
**Concentrations maximales modélisées**
**Substance : Nickel (Ni)**
**Période : 24 heures**
**Scénario : 2**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

wsp

78°10'0"
78°8'0"
78°6'0"
78°4'0"
78°2'0"
78°0'0"
48°10'0"
48°8'0"
48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application
Domaine de modélisation
Limite d'application des normes et critères
Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique
Centre de la petite enfance
Établissement d'enseignement
Établissement de soin de santé
Résidence au sud
Secteur résidentiel au nord

Valeur limite : 23 µg/m$^3$
Concentration initiale : 6 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-9**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 heure**
**Scénario : 2**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

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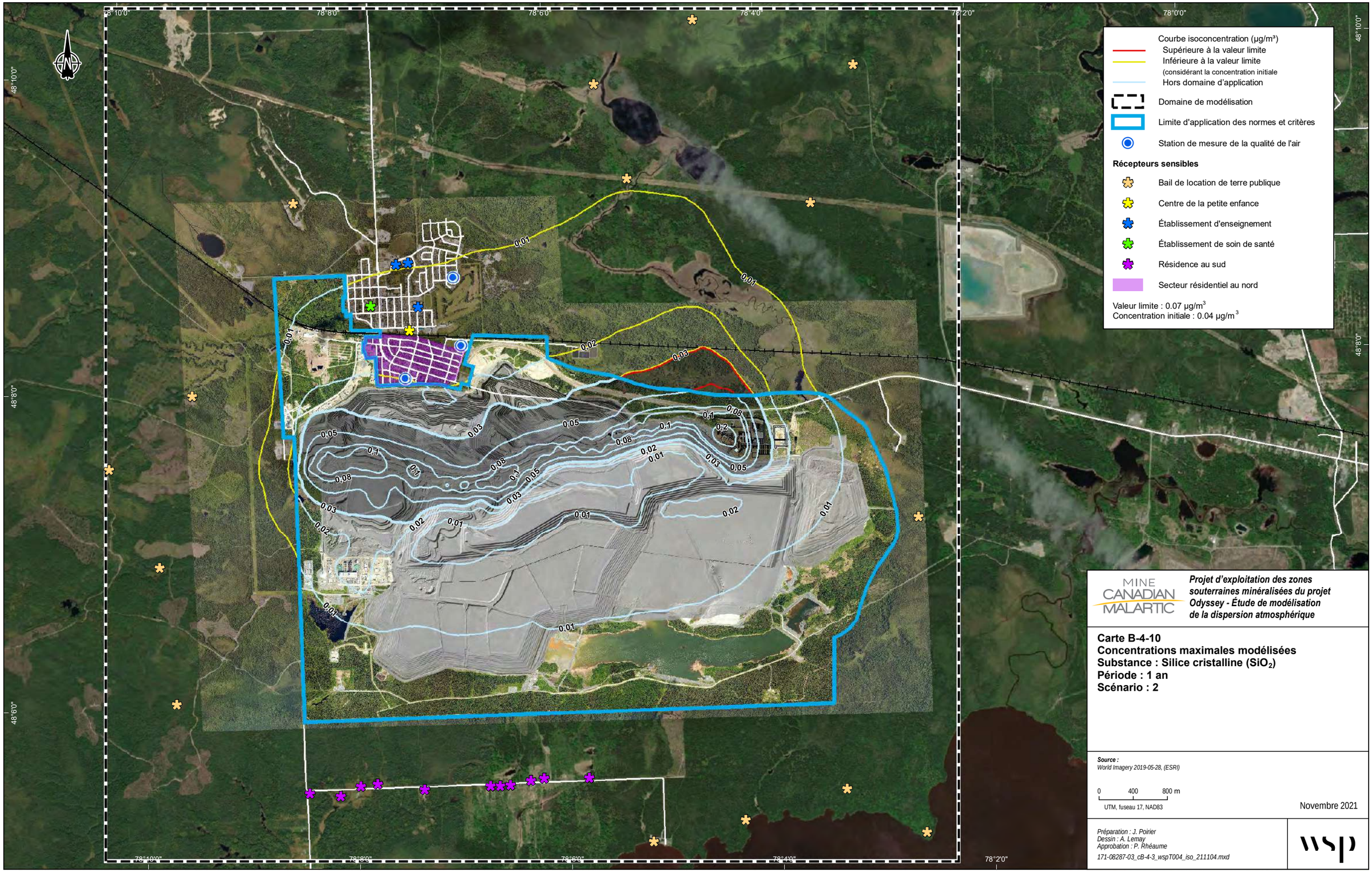



MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-10**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 an**
**Scénario : 2**

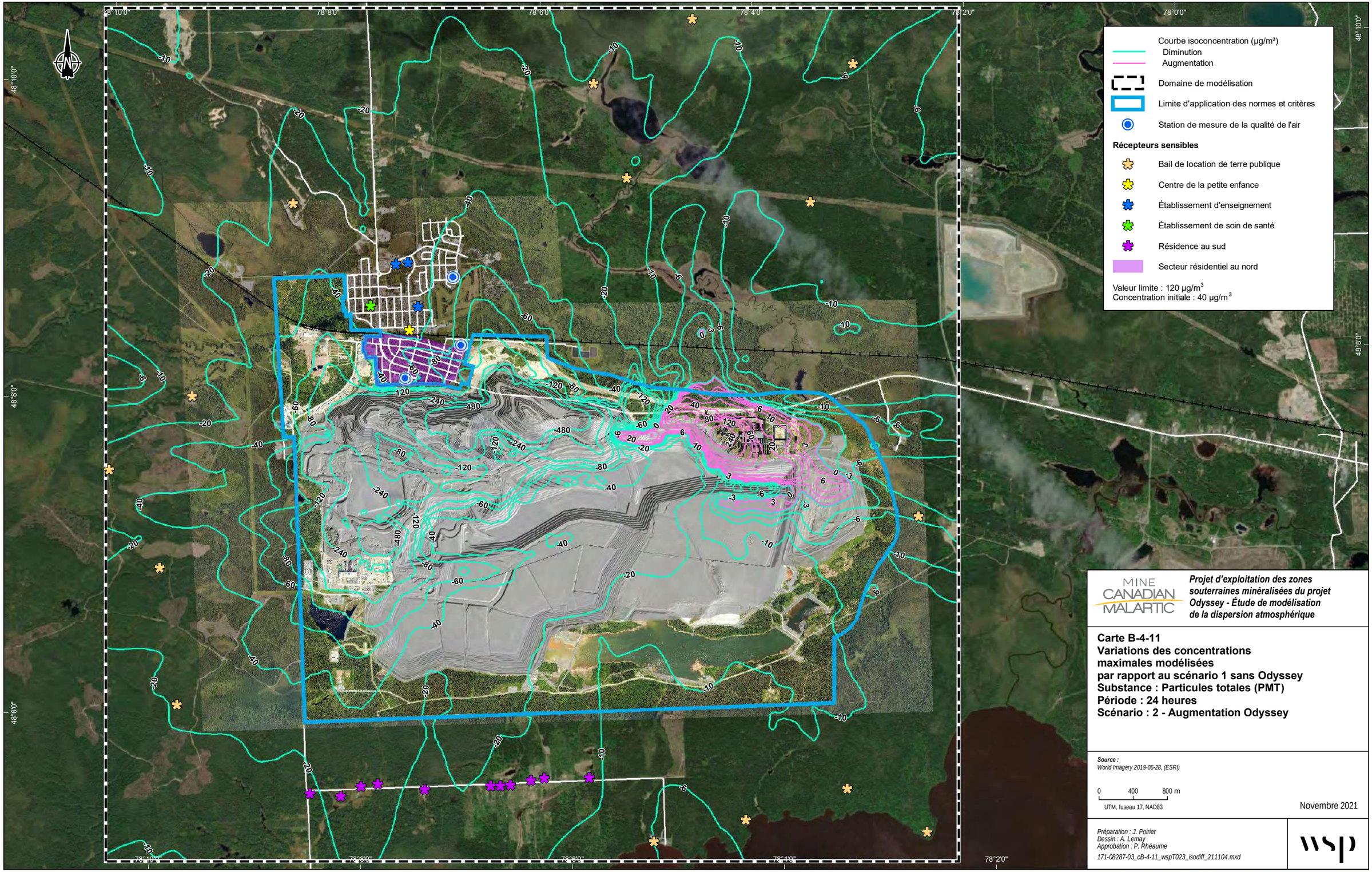
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-3_wspT004_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-11**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Particules totales (PMT)**
**Période : 24 heures**
**Scénario : 2 - Augmentation Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

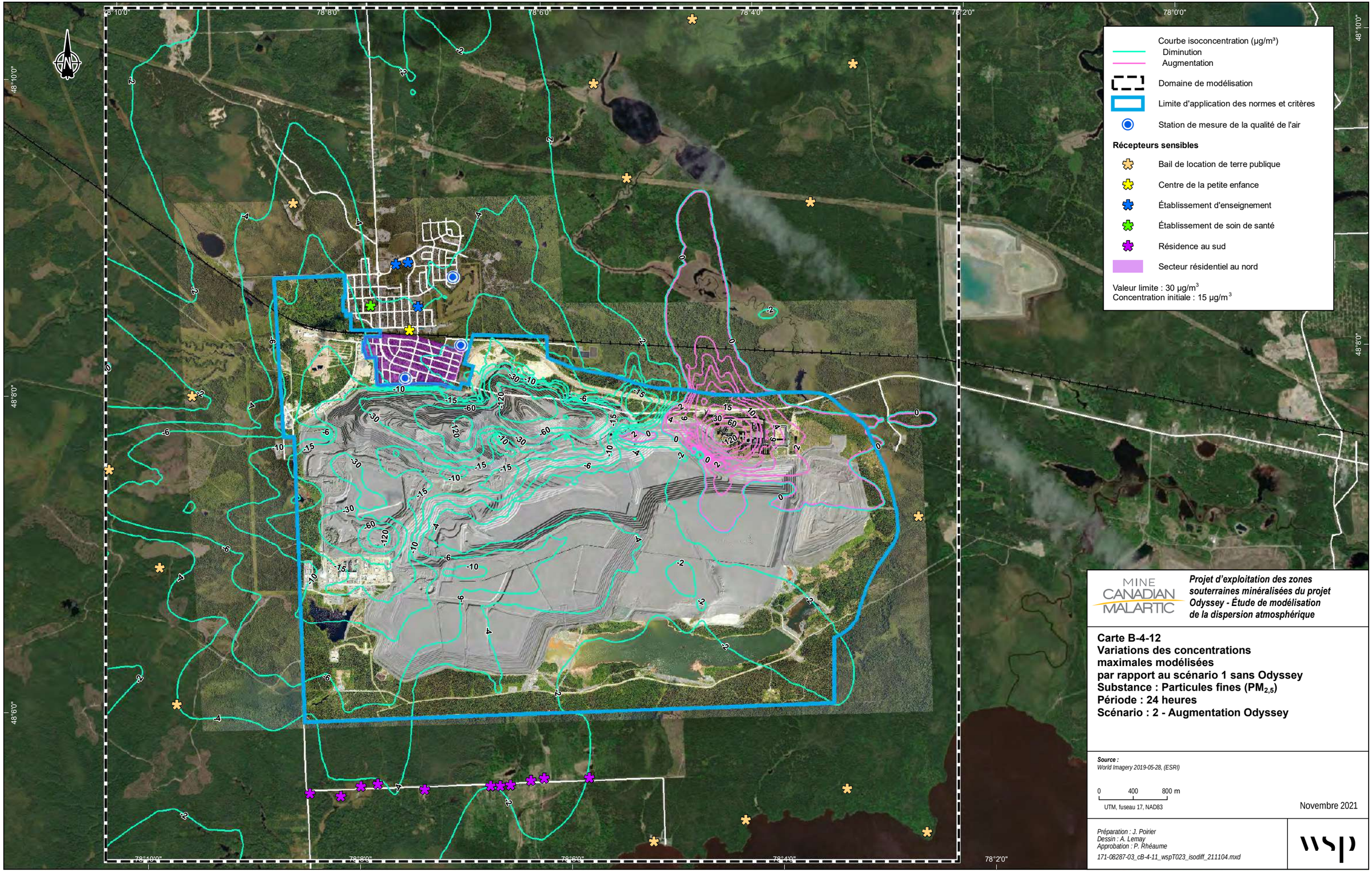
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-4-11_wspT023_isodiff_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-12**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Particules fines ($PM_{2,5}$)**
**Période : 24 heures**
**Scénario : 2 - Augmentation Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

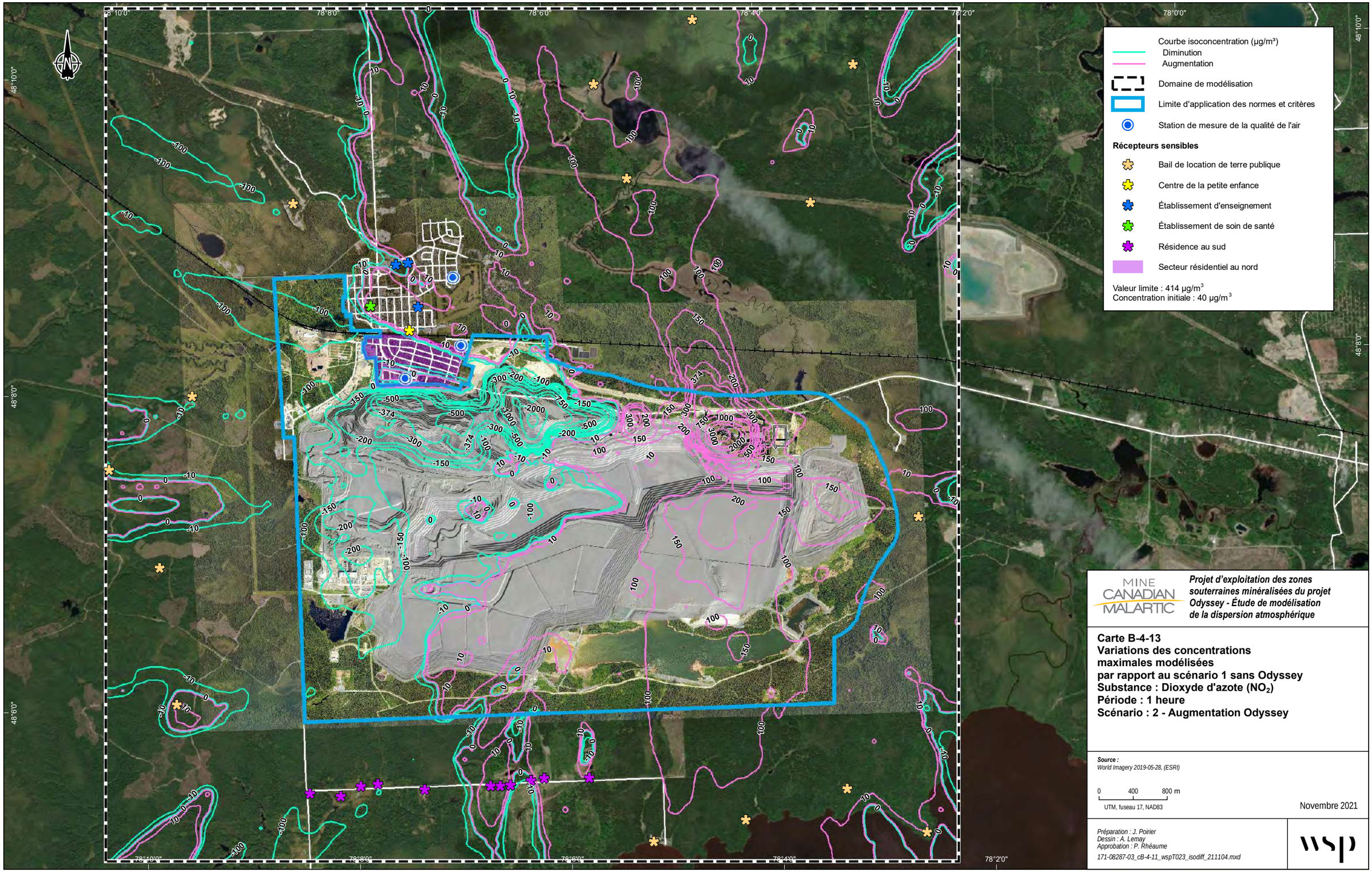
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-4-11_wspT023_isodiff_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-13**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 1 heure**
**Scénario : 2 - Augmentation Odyssey**

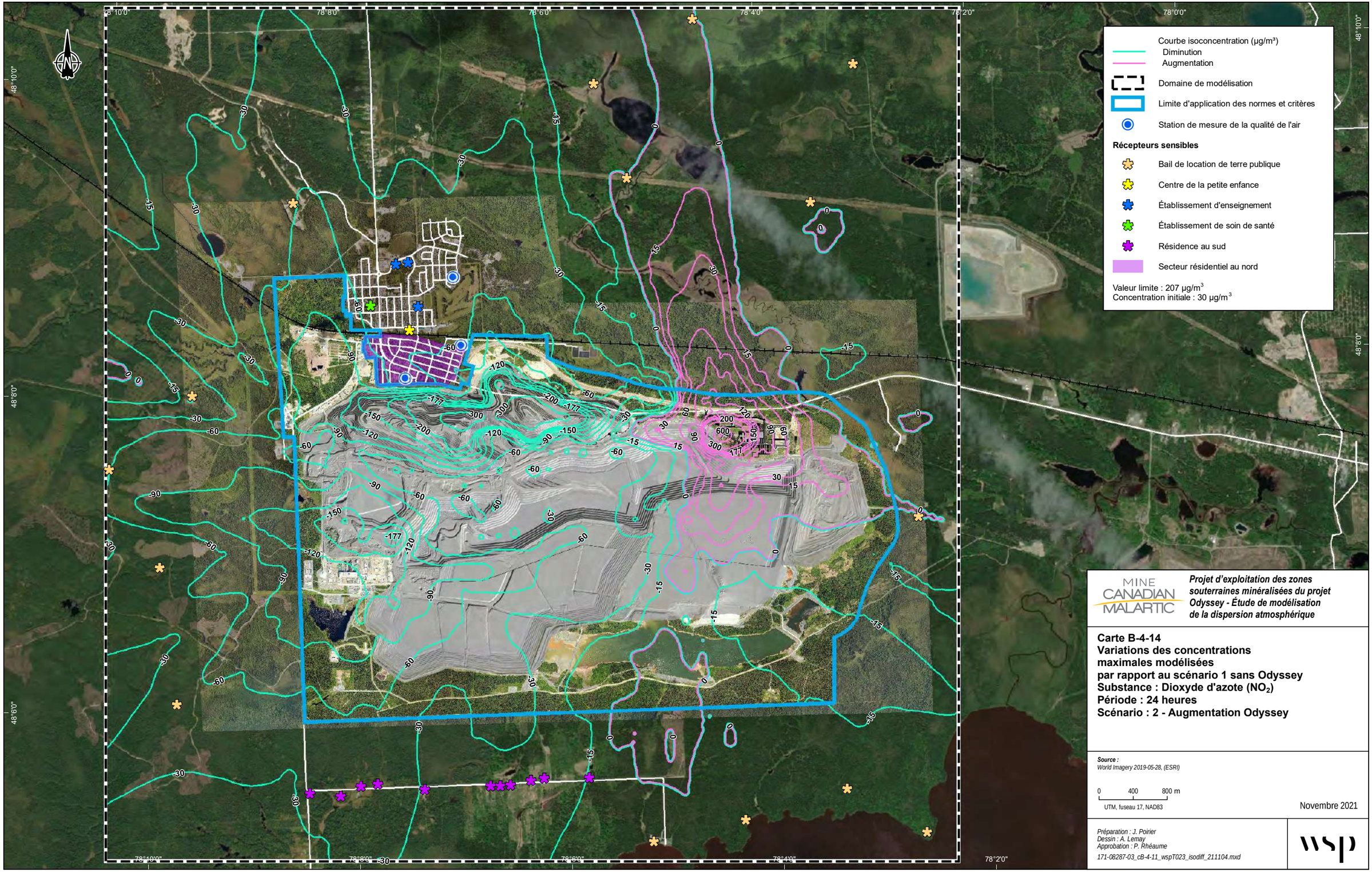
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-4-11_wspT023_isodiff_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-4-14**
**Variations des concentrations maximales modélisées par rapport au scénario 1 sans Odyssey**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 24 heures**
**Scénario : 2 - Augmentation Odyssey**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

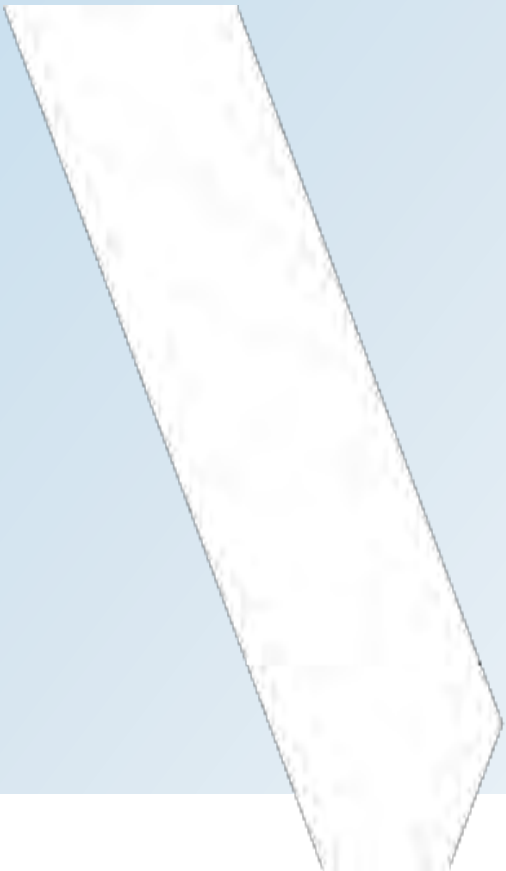
*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

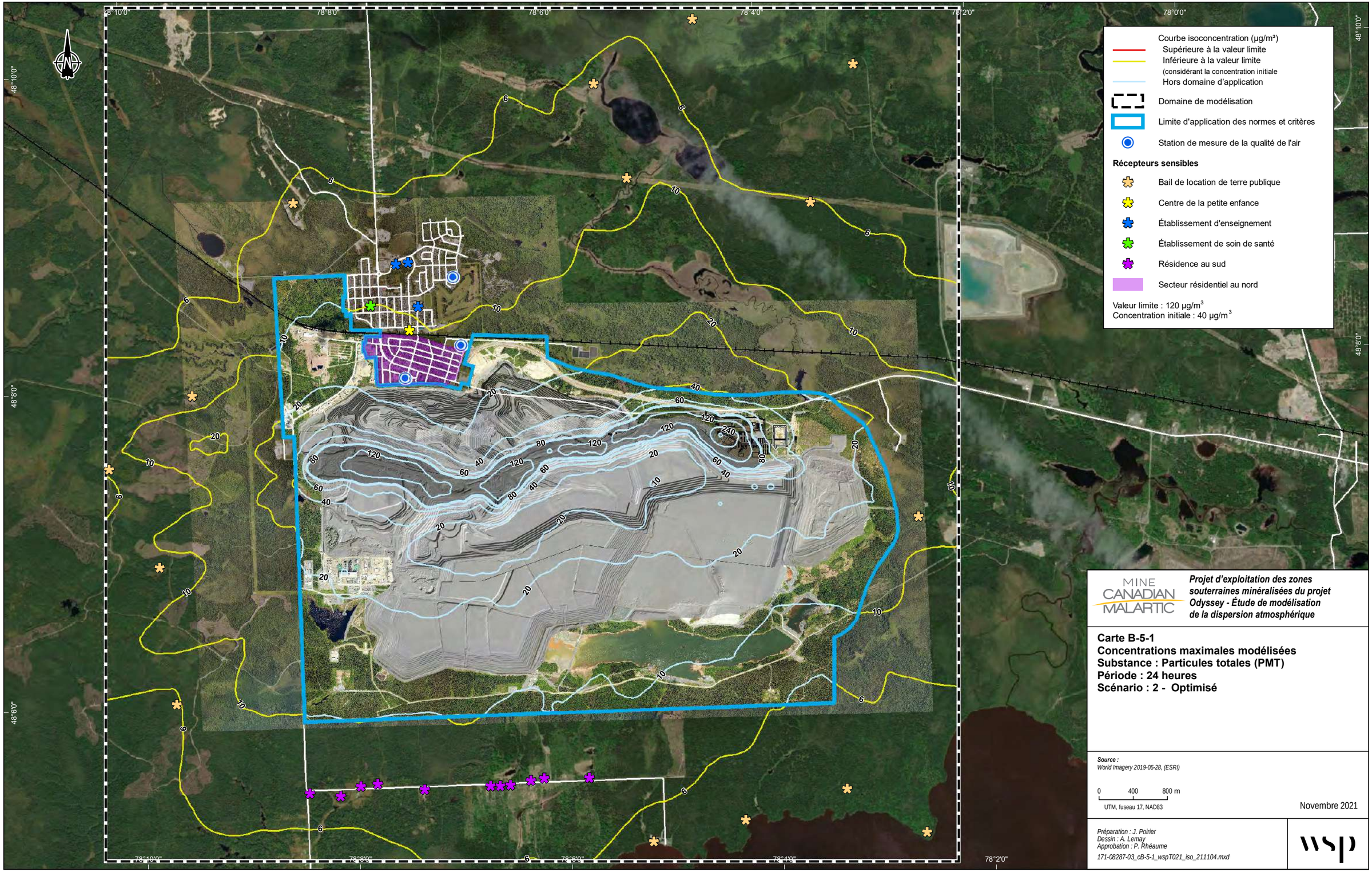
*171-08287-03_cB-4-11_wspT023_isodiff_211104.mxd*

wsp

# ANNEXE

## B-5 *SCÉNARIO 2 OPTIMISÉ*






MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-1**
**Concentrations maximales modélisées**
**Substance : Particules totales (PMT)**
**Période : 24 heures**
**Scénario : 2 - Optimisé**

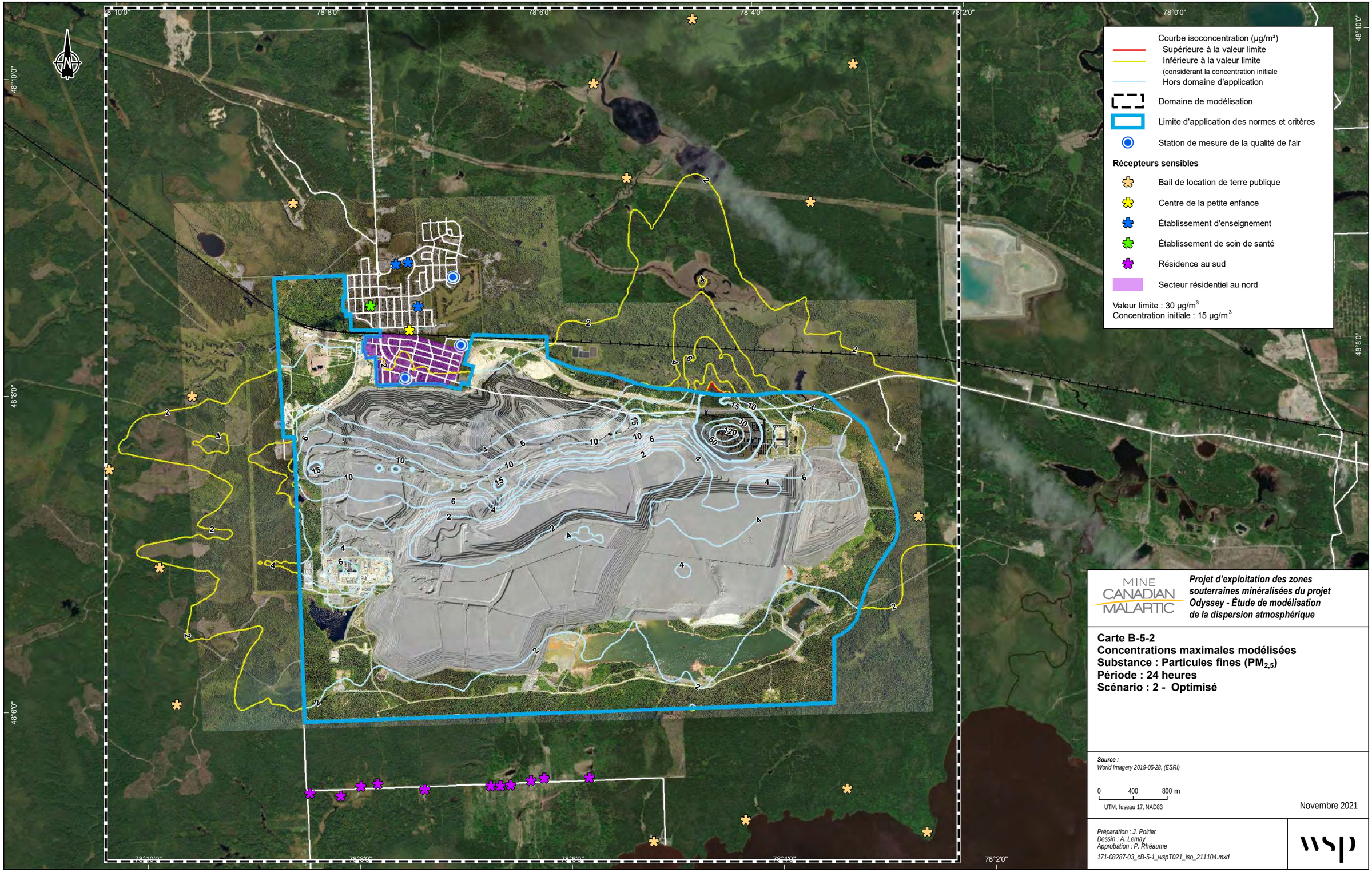
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-2**
**Concentrations maximales modélisées**
**Substance : Particules fines ($PM_{2,5}$)**
**Période : 24 heures**
**Scénario : 2 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

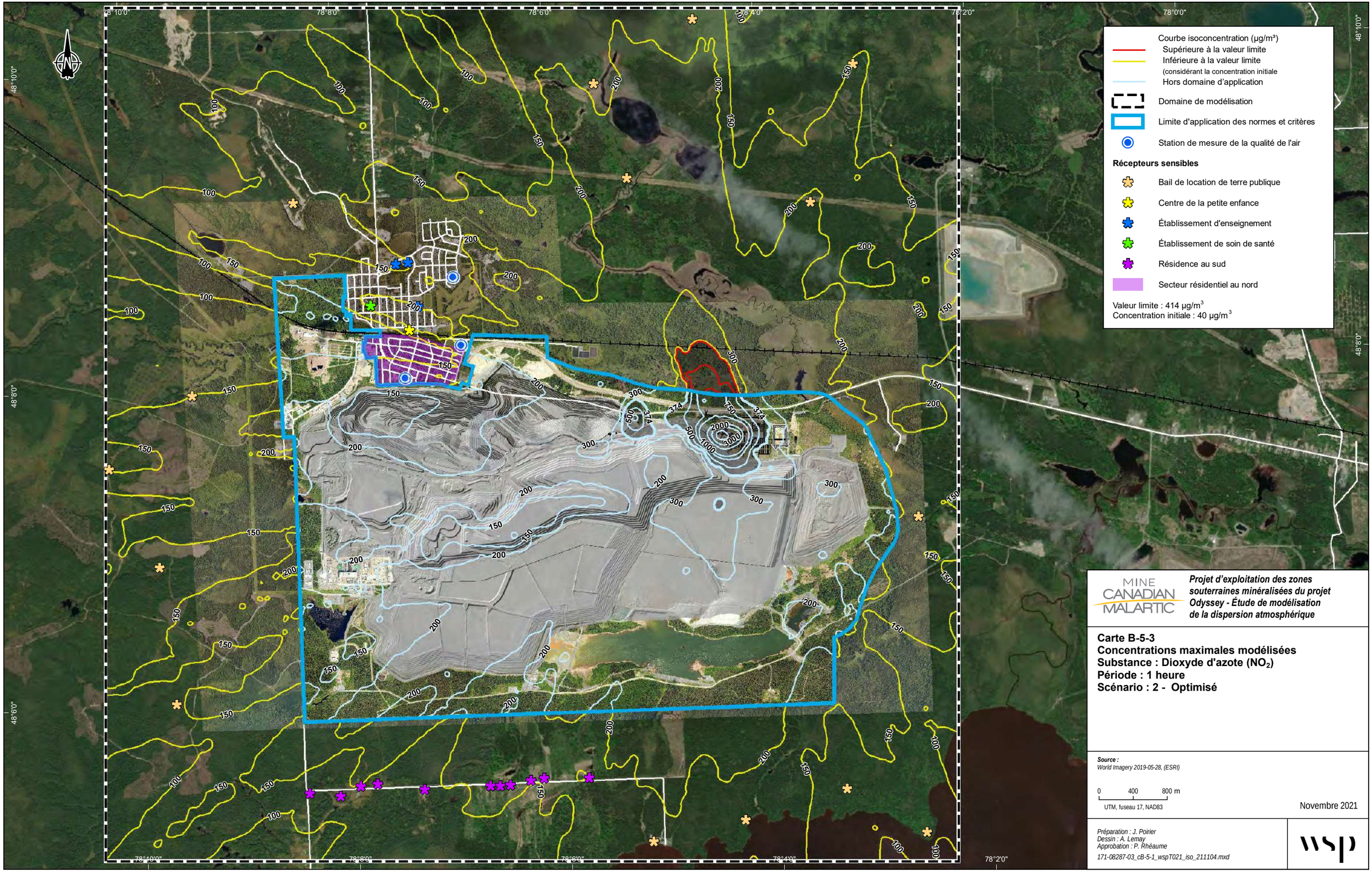
0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-3**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 1 heure**
**Scénario : 2 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

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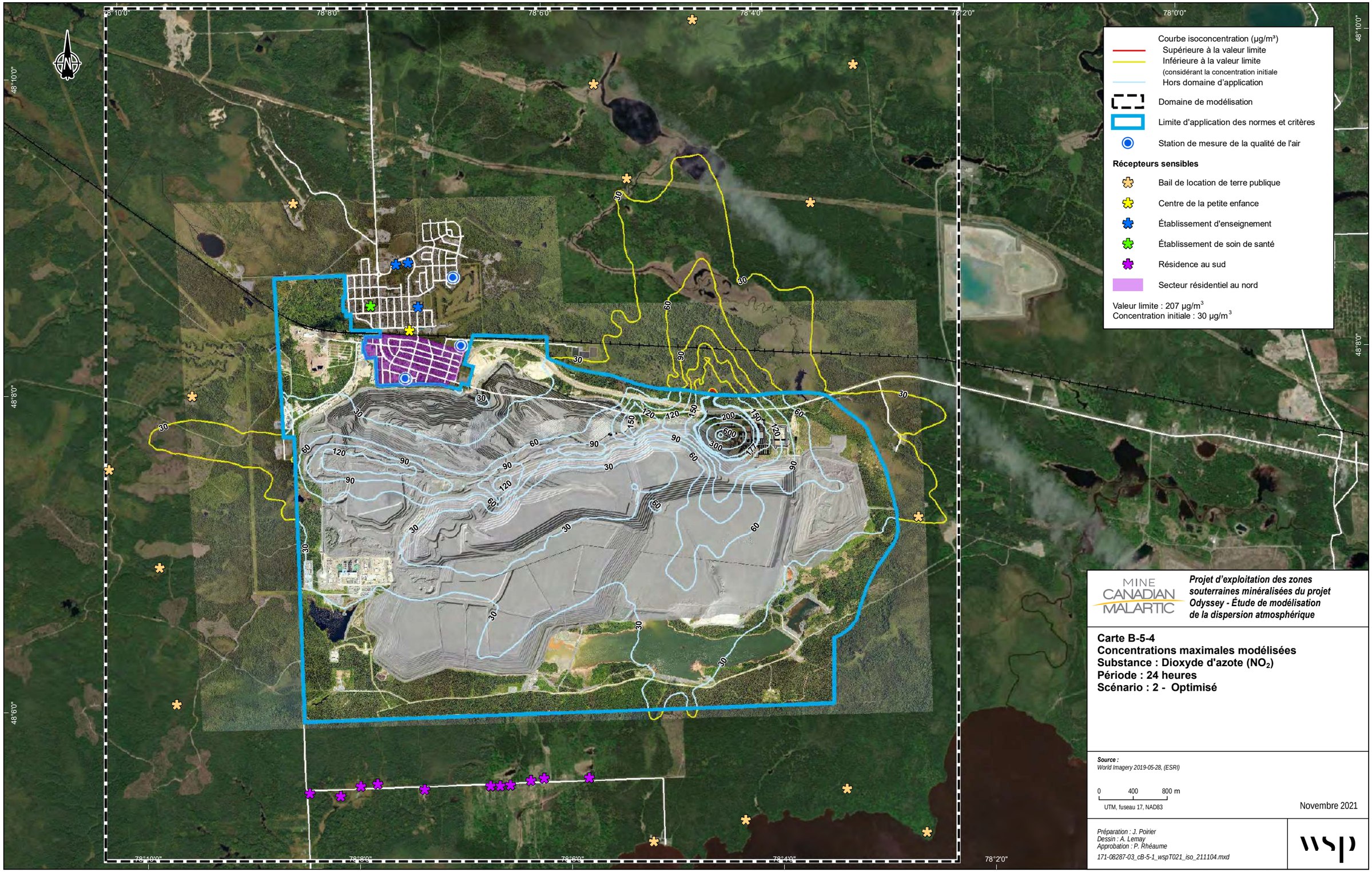



MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-4**
**Concentrations maximales modélisées**
**Substance : Dioxyde d'azote ($NO_2$)**
**Période : 24 heures**
**Scénario : 2 - Optimisé**

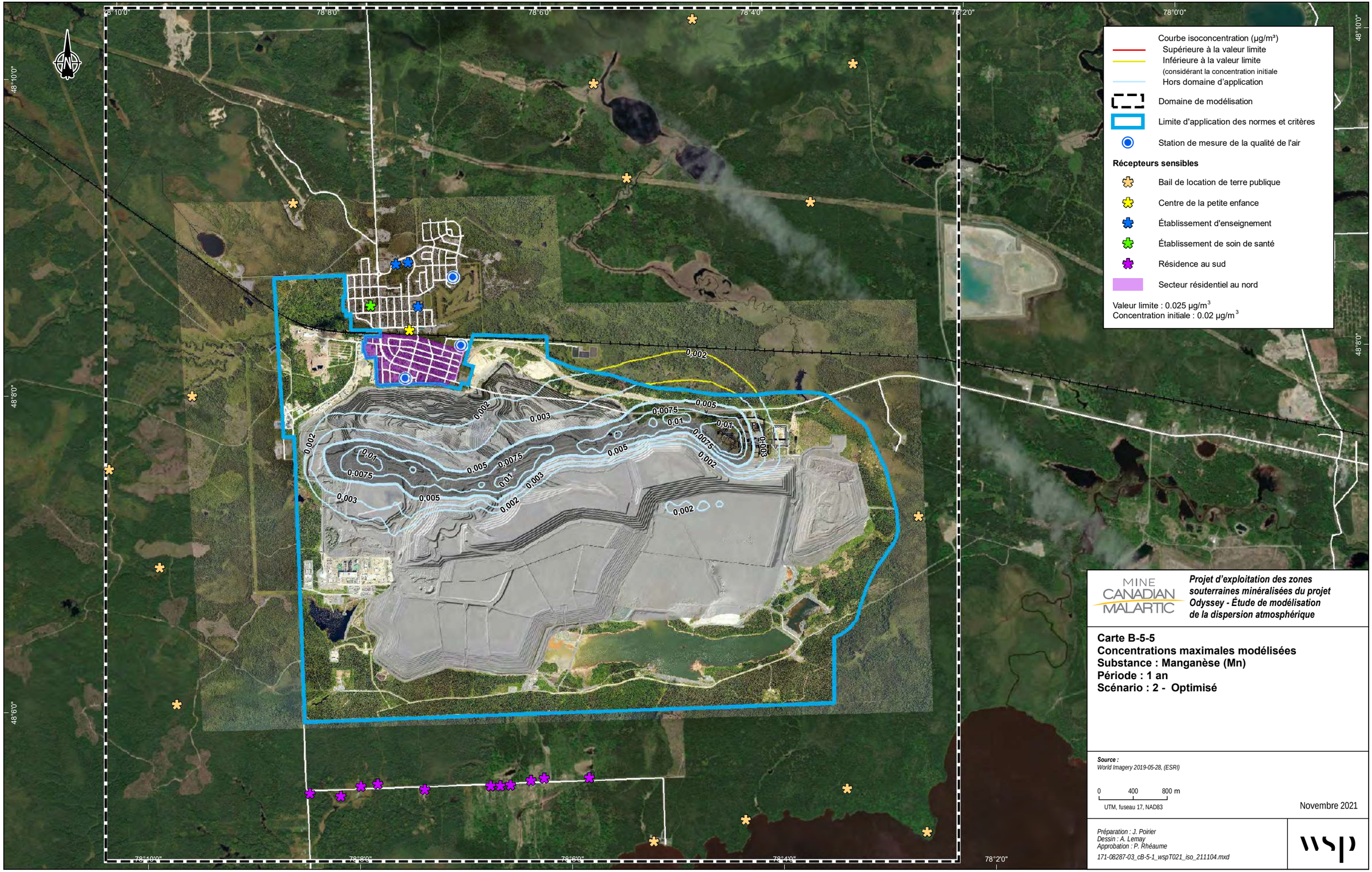
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-5**
**Concentrations maximales modélisées**
**Substance : Manganèse (Mn)**
**Période : 1 an**
**Scénario : 2 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*

*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

wsp

78°10'0"
78°8'0"
78°6'0"
78°4'0"
78°2'0"
78°0'0"
48°10'0"
48°8'0"
48°6'0"

Courbe isoconcentration (µg/m³)
Supérieure à la valeur limite
Inférieure à la valeur limite
(considérant la concentration initiale
Hors domaine d'application
Domaine de modélisation
Limite d'application des normes et critères
Station de mesure de la qualité de l'air

**Récepteurs sensibles**

Bail de location de terre publique
Centre de la petite enfance
Établissement d'enseignement
Établissement de soin de santé
Résidence au sud
Secteur résidentiel au nord

Valeur limite : 0.014 µg/m$^3$
Concentration initiale : 0.002 µg/m$^3$

0,003
0,006
0,009
0,012
0,02

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-6**
**Concentrations maximales modélisées**
**Substance : Nickel (Ni)**
**Période : 24 heures**
**Scénario : 2 - Optimisé**

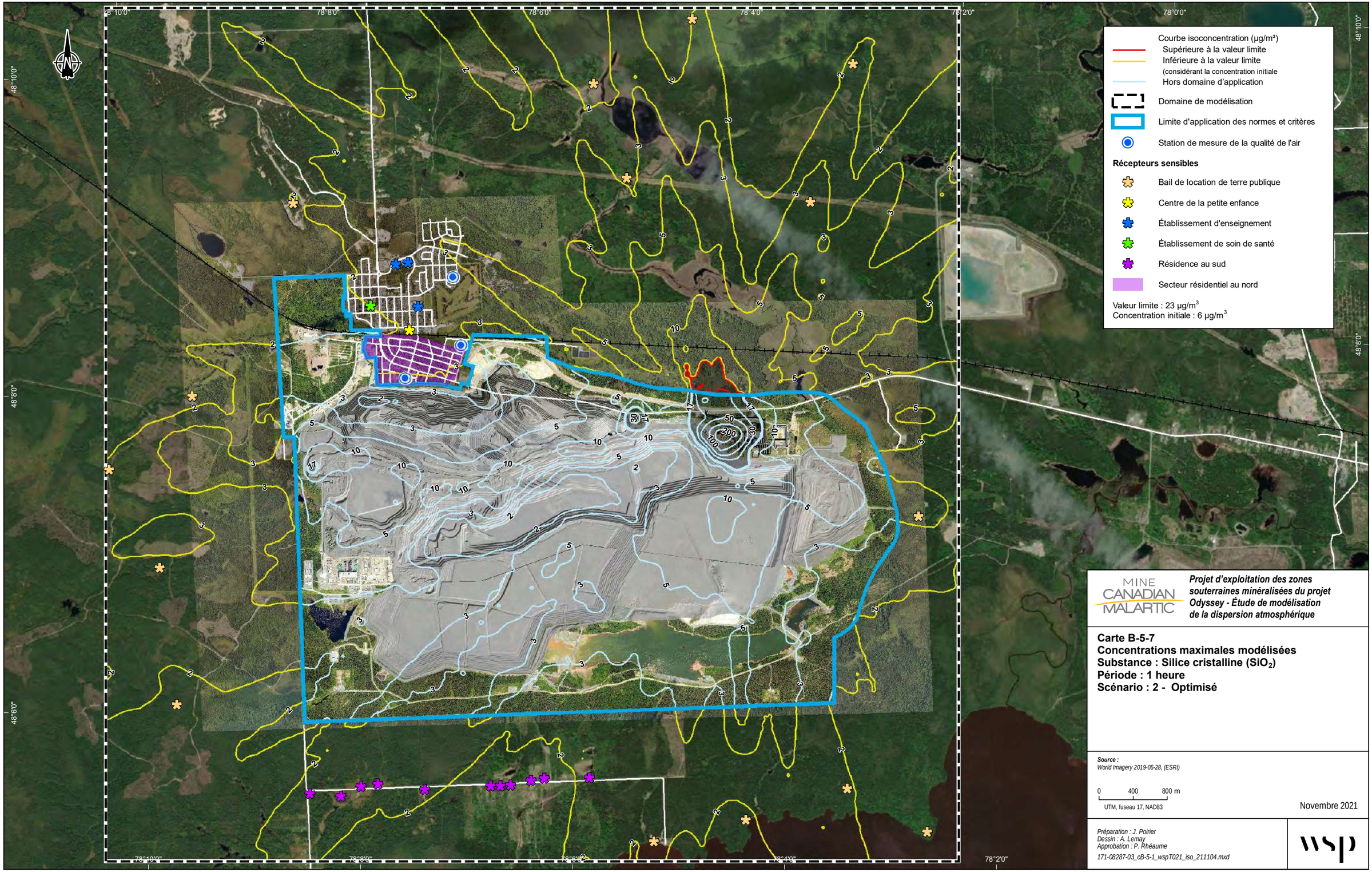
***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

wsp




MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-7**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 heure**
**Scénario : 2 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

wsp

78°10'0" 78°8'0" 78°6'0" 78°4'0" 78°2'0" 78°0'0"

48°10'0" 48°8'0" 48°6'0"

Courbe isoconcentration (µg/m³)
- Supérieure à la valeur limite
- Inférieure à la valeur limite (considérant la concentration initiale
- Hors domaine d'application

Domaine de modélisation

Limite d'application des normes et critères

Station de mesure de la qualité de l'air

**Récepteurs sensibles**

- Bail de location de terre publique
- Centre de la petite enfance
- Établissement d'enseignement
- Établissement de soin de santé
- Résidence au sud
- Secteur résidentiel au nord

Valeur limite : 0.07 µg/m$^3$
Concentration initiale : 0.04 µg/m$^3$

MINE CANADIAN MALARTIC

*Projet d'exploitation des zones souterraines minéralisées du projet Odyssey - Étude de modélisation de la dispersion atmosphérique*

**Carte B-5-8**
**Concentrations maximales modélisées**
**Substance : Silice cristalline ($SiO_2$)**
**Période : 1 an**
**Scénario : 2 - Optimisé**

***Source :***
*World Imagery 2019-05-28, (ESRI)*

0 400 800 m
UTM, fuseau 17, NAD83

Novembre 2021

*Préparation : J. Poirier*
*Dessin : A. Lemay*
*Approbation : P. Rhéaume*
*171-08287-03_cB-5-1_wspT021_iso_211104.mxd*

wsp

# ANNEXE

# QCM-8

## RÉSULTATS ACTUELLEMENT DISPONIBLES POUR A2 ET A3

# Silice A2

**Concentration de silice cristalline - Station sud**
**Année 2019**

| Date | Durée (min) | Volume ($m^3$) | Si ($ug/m^3$) |
|---|---|---|---|
| 2019-01-08 | 7 204 | 72,04 | <0,069 |
| 2019-01-19 | 7 203 | 72,03 | 0,139 |
| 2019-01-31 | 7 203 | 72,03 | <0,069 |
| 2019-02-12 | 7 202 | 72,02 | <0,069 |
| 2019-02-26 | 7 203 | 72,03 | <0,069 |
| 2019-03-08 | 7 203 | 72,03 | <0,069 |
| 2019-03-25 | 5 719 | 57,19 | 0,140 |
| 2019-04-02 | 7 203 | 72,03 | 0,111 |
| 2019-04-13 | 7 205 | 72,05 | 0,194 |
| 2019-04-25 | 7 205 | 72,05 | 0,097 |
| 2019-05-07 | 7 203 | 72,03 | 0,083 |
| 2019-05-22 | 7 203 | 72,03 | 0,139 |
| 2019-05-31 | 7 203 | 72,03 | 0,069 |
| 2019-06-12 | 7 202 | 72,02 | 0,069 |
| 2019-06-26 | 7 203 | 72,03 | 0,125 |
| 2019-07-06 | 7 204 | 72,04 | 0,305 |
| 2019-07-18 | 7 204 | 72,04 | 0,139 |
| 2019-08-03 | 7 204 | 72,04 | 0,208 |
| 2019-08-15 | 7 204 | 72,04 | 0,278 |
| 2019-08-23 | 7 208 | 72,08 | 0,208 |
| 2019-09-04 | 7 203 | 72,03 | 0,111 |
| 2019-09-17 | 7 204 | 72,04 | 0,458 |
| 2019-09-28 | 7 208 | 72,08 | 0,083 |
| 2019-10-10 | 7 204 | 72,04 | <0,069 |
| 2019-10-22 | 7 204 | 72,04 | 0,167 |
| 2019-11-05 | 7 204 | 72,04 | 0,083 |
| 2019-11-15 | 7 207 | 72,07 | 0,222 |
| 2019-12-02 | 5 764 | 57,64 | 0,104 |
| 2019-12-10 | 7 207 | 72,07 | 0,139 |
| 2019-12-27 | 4 323 | 43,23 | <0,116 |

**Concentration de silice cristalline - Station sud**
**Année 2020**

| Date | Durée (min) | Volume ($m^3$) | Si ($ug/m^3$) |
|---|---|---|---|
| 2020-01-04 | 7 203 | 72,03 | 0,069 |
| 2020-01-14 | 7 210 | 72,10 | 0,083 |
| 2020-01-28 | 7 208 | 72,08 | 0,208 |
| 2020-02-07 | 7 209 | 72,09 | 0,180 |
| 2020-02-19 | 7 203 | 72,03 | 0,139 |
| 2020-03-03 | 7 205 | 72,05 | 0,083 |
| 2020-03-14 | 7 203 | 72,03 | 0,167 |
| 2020-03-26 | * | * | * |
| 2020-04-07 | * | * | * |
| 2020-04-21 | 7 203 | 72,03 | <0,069 |
| 2020-05-01 | 7 202 | 72,02 | 0,083 |
| 2020-05-13 | 7 204 | 72,04 | 0,125 |
| 2020-05-26 | 7 203 | 72,03 | 0,194 |
| 2020-06-06 | 7 203 | 72,03 | 0,097 |
| 2020-06-18 | 7 203 | 72,03 | 0,361 |
| 2020-06-30 | 7 206 | 72,06 | 0,153 |
| 2020-07-14 | 7 204 | 72,04 | 0,167 |
| 2020-07-24 | 7 203 | 72,03 | 0,097 |
| 2020-08-05 | 7 203 | 72,03 | 0,125 |
| 2020-08-18 | 7 203 | 72,03 | 0,111 |
| 2020-08-29 | 7 203 | 72,03 | 0,139 |
| 2020-09-15 | 4 323 | 43,23 | <0,116 |
| 2020-09-22 | 7 202 | 72,02 | 0,194 |
| 2020-10-06 | 7 203 | 72,03 | 0,125 |
| 2020-10-16 | 7 202 | 72,02 | 0,125 |
| 2020-10-28 | 7 203 | 72,03 | 0,139 |
| 2020-11-10 | 7 202 | 72,02 | 0,111 |
| 2020-11-21 | 7 203 | 72,03 | 0,125 |
| 2020-12-03 | 7 202 | 72,02 | <0,069 |
| 2020-12-15 | 7 203 | 72,03 | 0,167 |
| 2020-12-29 | 7 203 | 72,03 | 0,111 |

* Arrêt des activités de MCM en raison de la directive gouvernementale pour limiter la propagation de la COVID-19

**Concentration de silice cristalline - Station sud**
**Q1 & Q2 - 2021**

| Date | Durée (min) | Volume ($m^3$) | Si ($ug/m^3$) |
|---|---|---|---|
| 2021-01-08 | 7203 | 72,0 | 0,083 |
| 2021-01-20 | 7207 | 72,1 | < 0,069 |
| 2021-02-02 | 3499 | 35,0 | < 0,143 |
| 2021-02-18 | 5700 | 57,0 | 0,211 |
| 2021-02-25 | 7205 | 72,1 | < 0,069 |
| 2021-03-09 | 7204 | 72,0 | 0,167 |
| 2021-03-23 | 7204 | 72,0 | 0,222 |
| 2021-04-02 | 7204 | 72,0 | 0,250 |
| 2021-04-14 | 7203 | 72,0 | 0,125 |
| 2021-04-29 | 7202 | 72,0 | 0,167 |
| 2021-05-08 | 7204 | 72,0 | 0,083 |
| 2021-05-20 | 7203 | 72,0 | 0,153 |
| 2021-06-03 | 7204 | 72,0 | 0,250 |
| 2021-06-19 | 4323 | 43,2 | 0,116 |
| 2021-06-28 | 4323 | 43,2 | < 0,116 |

# Silice A3

**Concentration de silice cristalline - Station est**
**Année 2019**

| Date | Durée (min) | Volume ($m^3$) | Si ($ug/m^3$) |
|---|---|---|---|
| 2019-01-08 | 7202 | 72,02 | <0,069 |
| 2019-01-19 | 7202 | 72,02 | 0,083 |
| 2019-01-31 | 7203 | 72,03 | <0,069 |
| 2019-02-12 | 7205 | 72,05 | <0,069 |
| 2019-02-26 | 7202 | 72,02 | <0,069 |
| 2019-03-08 | 7203 | 72,03 | <0,069 |
| 2019-03-20 | 7203 | 72,03 | 0,083 |
| 2019-04-02 | 7203 | 72,03 | 0,083 |
| 2019-04-13 | 7204 | 72,04 | 0,097 |
| 2019-04-25 | 7203 | 72,03 | 0,097 |
| 2019-05-07 | 7203 | 72,03 | 0,097 |
| 2019-05-22 | 7203 | 72,03 | 0,111 |
| 2019-05-31 | 7202 | 72,02 | <0,069 |
| 2019-06-12 | 7202 | 72,02 | 0,069 |
| 2019-06-26 | 7203 | 72,03 | 0,111 |
| 2019-07-06 | 7203 | 72,03 | 0,222 |
| 2019-07-18 | 7203 | 72,03 | 0,139 |
| 2019-07-30 | 7202 | 72,02 | 0,097 |
| 2019-08-13 | 7204 | 72,04 | 0,180 |
| 2019-08-23 | 7204 | 72,04 | 0,167 |
| 2019-09-04 | 7202 | 72,02 | <0,069 |
| 2019-09-19 | 7212 | 72,12 | <0,069 |
| 2019-09-28 | 7202 | 72,02 | 0,097 |
| 2019-10-10 | 7205 | 72,05 | 0,250 |
| 2019-10-22 | 7205 | 72,05 | <0,069 |
| 2019-11-05 | 7207 | 72,07 | 0,111 |
| 2019-11-15 | 7206 | 72,06 | <0,069 |
| 2019-11-27 | 7202 | 72,02 | <0,069 |
| 2019-12-12 | 7207 | 72,07 | 0,097 |
| 2019-12-21 | 7202 | 72,02 | <0,069 |

17 septembre 2019 - problématique avec l'équipement - Reprise
10 décembre 2019 - SP too low

**Concentration de silice cristalline - Station est**
**Année 2020**

| Date | Durée (min) | Volume ($m^3$) | Si ($ug/m^3$) |
|---|---|---|---|
| 2020-01-06 | 5402 | 54,02 | <0,093 |
| 2020-01-14 | 7208 | 72,08 | 0,069 |
| 2020-01-28 | 7207 | 72,07 | 0,125 |
| 2020-02-07 | 7208 | 72,08 | 0,166 |
| 2020-02-19 | 7203 | 72,03 | 0,097 |
| 2020-03-03 | 7203 | 72,03 | 0,097 |
| 2020-03-14 | 7202 | 72,02 | 0,083 |
| 2020-03-26 | * | * | * |
| 2020-04-07 | * | * | * |
| 2020-04-21 | 7203 | 72,03 | <0,069 |
| 2020-05-01 | 7202 | 72,02 | 0,069 |
| 2020-05-13 | 7203 | 72,03 | 0,111 |
| 2020-05-26 | 7203 | 72,03 | 0,139 |
| 2020-06-06 | 7202 | 72,02 | 0,069 |
| 2020-06-18 | 7202 | 72,02 | 0,250 |
| 2020-06-30 | 7206 | 72,06 | 0,125 |
| 2020-07-14 | 7203 | 72,03 | 0,111 |
| 2020-07-24 | 7203 | 72,03 | 0,097 |
| 2020-08-05 | 7202 | 72,02 | 0,125 |
| 2020-08-18 | 7203 | 72,03 | 0,083 |
| 2020-08-29 | 7202 | 72,02 | 0,083 |
| 2020-09-10 | ** | ** | ** |
| 2020-09-22 | 7203 | 72,03 | 0,125 |
| 2020-10-07 | 7202 | 72,02 | 0,069 |
| 2020-10-16 | 7203 | 72,03 | 0,097 |
| 2020-10-28 | 7203 | 72,03 | 0,097 |
| 2020-11-10 | 7202 | 72,02 | 0,083 |
| 2020-11-21 | 7204 | 72,04 | 0,083 |
| 2020-12-03 | 7203 | 72,03 | <0,069 |
| 2020-12-15 | 7203 | 72,03 | <0,069 |
| 2020-12-29 | 7202 | 72,02 | <0,069 |

4 janvier 2020 - SP too low - afin de respecter le calendrier de nickel, 3 jours
Duplica de nickel - Échantillon annulé

**Concentration de silice cristalline - Station est**
**Q1 & Q2 - 2021**

| Date | Durée (min) | Volume ($m^3$) | Si ($ug/m^3$) |
|---|---|---|---|
| 2021-01-08 | 7203 | 72,0 | < 0,069 |
| 2021-01-20 | 7205 | 72,1 | < 0,069 |
| 2021-02-02 | 7205 | 72,1 | < 0,069 |
| 2021-02-13 | 7205 | 72,1 | < 0,069 |
| 2021-02-27 | 7203 | 72,0 | < 0,069 |
| 2021-03-09 | 7203 | 72,0 | 0,111 |
| 2021-03-23 | 7203 | 72,0 | 0,139 |
| 2021-04-02 | 7204 | 72,0 | 0,167 |
| 2021-04-14 | 7203 | 72,0 | 0,111 |
| 2021-04-27 | 7203 | 72,0 | 0,153 |
| 2021-05-08 | 7203 | 72,0 | < 0,069 |
| 2021-05-20 | 7203 | 72,0 | 0,153 |
| 2021-06-01 | 7203 | 72,0 | 0,153 |
| 2021-06-17 | 7205 | 72,1 | 0,153 |
| 2021-06-26 | 7203 | 72,0 | 0,097 |

# ANNEXE

# QCM-9

## PLAN DE GESTION DE GESTION DES ÉMISSIONS ATMOSPHÉRIQUES (AOÛT 2021)

PARTENARIAT CANADIAN MALARTIC

# Plan intégré de gestion des émissions atmosphériques

**Août 2021**

PARTENARIAT CANADIAN MALARTIC

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## 1. CONTEXTE ET OBJECTIFS

Canadian Malartic GP (CMGP) exploite la mine Canadian Malartic et la mine Odyssey qui sont situées au cœur de la prolifique ceinture aurifère abitibienne du Québec, juste au sud de la ville de Malartic, approximativement 20 kilomètres à l'ouest de Val-d'Or.

Dans le cadre de l'étude d'impact sur l'environnement et le milieu social du Projet Extension Malartic (PEM), la modélisation de la dispersion atmosphérique réalisée a démontré des enjeux significatifs au niveau des émissions atmosphériques, notamment au niveau des poussières.

De plus, l'utilisation de la machinerie et les opérations souterraines dans le cadre des activités de construction et d'exploitation de la mine Odyssey génèreront également des émissions atmosphériques. Toutefois, les modélisations effectuées démontrent que la mise en place d'un plan de gestion intégré des émissions atmosphériques permet, malgré l'augmentation des activités sur le site, le respect des normes de qualité de l'air ambiant.

En tant que gestionnaire responsable du site minier, CMGP s'engage à mettre en œuvre son « **Plan intégré de gestion des émissions atmosphériques** » comprenant un contrôle des émissions, un programme de suivi de la qualité de l'atmosphère et un programme de suivi des émissions à la source.

Ce plan intégré de gestion des émissions atmosphériques est présenté dans les sections suivantes.

## 2. SOURCES D'ÉMISSIONS ATMOSPHÉRIQUES

Les sources d'émissions atmosphériques en période de construction sont principalement celles associées aux activités suivantes :

- Décapage (enlèvement de la terre végétale et du mort-terrain);
- Forage topographique;
- Sautage;
- Chargement et déchargement des matériaux;
- Transport des différents matériaux (routage).

En phase d'exploitation, certaines opérations et infrastructures sont susceptibles d'émettre des matières particulaires dans l'atmosphère sous des conditions normales d'exploitation.

Plus spécifiquement, ce sont les opérations suivantes :

- Opération de forage;
- Sautage au niveau de la fosse;
- Chargement et déchargement des matériaux;
- Transport des différents matériaux (routage);
- Boutage sur les haldes et les infrastructures du parc à résidus;
- Érosion éolienne des haldes et des infrastructures du parc à résidus;

- Équipements d'alimentation et de concassage du minerai;
- Concasseurs mobiles;
- Entreposage et manutention de minerai ou de matière première;
- Fours de réactivation du charbon, chaudières à élution et fours à induction.

L'entraînement de la poussière lors du passage des véhicules lourds sur le réseau de routes non pavées représente une des plus importantes sources de particules. En effet, le routage de minerais, de stériles ainsi que du mort-terrain est le principal contributeur parmi toutes les sources fugitives d'un complexe minier. Ainsi, beaucoup d'efforts sont consentis pour gérer efficacement cette source d'émission.

## 3. MESURES D'ATTÉNUATION COURANTES

La stratégie de gestion de CMGP est d'appliquer continuellement des mesures d'atténuation courantes à l'ensemble de ses activités minières génératrices d'émissions atmosphériques, et ce, afin de répondre aux exigences suivantes :

- Limiter les effets individuels et cumulatifs d'émissions atmosphériques sur la qualité de l'atmosphère dans la ville et, particulièrement, aux résidences les plus rapprochées du site minier;
- Contrôler et contenir les émissions sur le site;
- Minimiser les effets négatifs sur les aménagements et les écosystèmes à proximité du site minier;
- Respecter les normes de qualité de l'air en ville.

### 3.1 Phase de construction

#### 3.1.1 Décapage

Le décapage sera limité au minimum afin de réduire l'érosion éolienne sur les surfaces décapées. En effet, les opérations de décapage seront planifiées en fonction des besoins du plan d'exploitation.

L'empilement de la couche de terre végétale et du mort-terrain qui ne seront pas utilisés pour un certain temps seront revégétés avec des graminées. Ceci réduira les émissions de poussières générées par l'érosion éolienne et contrôlera la contamination des eaux de ruissellement, tout en améliorant l'aspect visuel.

Les pentes ceinturant la fosse seront stabilisées à l'aide d'empierrement pour limiter l'érosion hydrique et éolienne.

#### 3.1.2 Opérations de forage

Les foreuses, utilisant des forets de plus de 14 cm de diamètre, doivent être équipées de dispositifs de contrôle des émissions atmosphériques.

Ces dispositifs seront contrôlés quotidiennement (inspection visuelle).

### 3.1.3 Sautage

Le sautage est restreint sous certaines conditions fixées dans les autorisations.

Une rose des vents dynamique a été développée par CMGP spécifiquement pour les sautages réalisés dans le cadre des opérations de la mine Canadian Malartic. Cette rose des vents dynamique détermine les angles d'interdiction de sautage en fonction de la position exacte du sautage par rapport aux habitations. De plus, la vitesse des vents est un paramètre supplémentaire que s'est imposé volontairement CMGP ce qui ajoute une marge de sécurité additionnelle permettant ainsi de limiter les impacts potentiels.

Selon les modalités prévues dans nos autorisations, lors du sautage, des pare-éclats sont installés pour éviter les risques de projections de pierres et de poussières à proximité des zones habitées ou des routes, en fonction des paramètres de conception établis.

### 3.1.4 Chargement et déchargement des matériaux

Compte tenu de leur faible taux d'humidité, lorsque nécessaire, le matériel de surface et la roche extraite (minerai et stériles) seront arrosés avant le chargement. Ceci afin de réduire les émissions de poussières lors du chargement et du déchargement.

Autant que possible, lors du chargement et du déchargement, la hauteur à laquelle le matériel est relâché ainsi que la distance sur laquelle il sera en chute libre seront gardées au minimum afin de minimiser les émissions de poussières.

Puisque la poussière s'accumule généralement à proximité de la machinerie, le nettoyage et l'arrosage régulier des zones de travail seront effectués afin d'empêcher la remise en suspension de ces poussières.

### 3.1.5 Le transport des matériaux (routage)

Le transport des matériaux sur des routes non pavées représente une des plus grandes sources d'émission de poussières sur le site minier. Les poussières sont soulevées de terre par les roues et entraînées par la turbulence créée lors du déplacement des camions.

L'utilisation de matériaux non friables et présentant une bonne résistance à l'abrasion routière sera utilisée pour la construction et l'entretien des routes. Aucune pierre argileuse ou friable ne sera employée dans la confection des routes.

Lorsque nécessaire, les routes de transport et les sections non pavées des voies d'accès seront maintenues humides afin de réduire la poussière générée par les véhicules. Plusieurs camions-citernes seront utilisés à cet effet.

Un entretien régulier des routes est effectué afin de maintenir une bonne surface de roulement.

La fréquence et l'intensité d'arrosage des routes seront ajustées en fonction des conditions météorologiques. Les journées ensoleillées combinées à des températures élevées contribuent à l'évaporation plus rapide de l'eau étendue et nécessite un arrosage plus fréquent. Les concentrations mesurées aux stations d'air ambiant permettent aussi d'orienter l'intensité d'arrosage requise.

La vitesse des véhicules a un impact majeur sur la quantité de poussière générée au niveau de la route. Une limitation de vitesse sera imposée pour les camions.

## 3.2 Phase d'exploitation

Les mesures de gestion des poussières décrites pour les opérations de **forage**, de **sautage**, de **chargement et déchargement des matériaux** et de **routage** dans la section phase de construction (section 3.1) seront maintenues en phase exploitation.

### 3.2.1 Boutage sur les haldes et les infrastructures du parc à résidus

Les opérations de boutage, c'est-à-dire l'épandage, le nivellement des stériles ou des matières déchargées ainsi que le profilage de routes seront gérés en tenant compte des conditions météorologiques en vigueur afin d'éviter la manipulation du matériel dans les zones exposées à des vents forts défavorables.

### 3.2.2 Érosion éolienne des haldes et des infrastructures du parc à résidus

Le parc à résidus, les piles de dépôts meubles et la halde de roches stériles seront revégétés lorsque leur capacité maximale d'accumulation aura été atteinte. Tout au long de l'exploitation, la restauration progressive sera favorisée lorsque possible afin de maximiser la réduction des émissions de poussières générées par l'érosion éolienne. Cette mesure aura également comme effet de réduire les apports en matières en suspension dans les eaux de ruissellement et ainsi limiter la nécessité de traitement en aval des empilements.

### 3.2.3 Équipements d'alimentation et de concassage de minerai

Plusieurs équipements sont munis de système de contrôle des poussières :

- Le déchargement au concasseur giratoire est protégé du vent par un muret et une porte de lanières en caoutchouc. Ce concasseur est muni d'un dépoussiéreur humide;
- Le concasseur secondaire est équipé d'un dépoussiéreur à filtres;
- Le puits de reprise et la tour de transfert de la trémie d'alimentation en minerai préconcassé sont chacun équipés d'un dépoussiéreur à filtres;
- Le concasseur à galets est équipé d'un dépoussiéreur à filtres.

L'entretien est effectué régulièrement afin de réduire la vibration des équipements qui peuvent augmenter les émissions.

Ces systèmes de dépoussiérage sont contrôlés et nettoyés régulièrement. La poussière recueillie par ces appareils est éliminée de manière à prévenir sa dispersion.

### 3.2.4 Concasseurs mobiles

Un système de contrôle de la poussière est installé aux concasseurs mobiles afin de réduire les émissions de poussières.

Dans la mesure du possible, les convoyeurs ainsi que les différentes chutes sont couverts afin de prévenir l'érosion éolienne.

L'entretien est effectué régulièrement afin de réduire la vibration des équipements qui peuvent augmenter les émissions.

### 3.2.5 Entreposage et manutention de minerai ou de matière première

Le minerai après concassage est transféré à l'aide de convoyeurs couverts dans un dôme d'entreposage afin de prévenir l'érosion éolienne. Des convoyeurs également couverts situés sous le dôme acheminent ensuite le minerai vers l'usine de traitement du minerai.

Trois filtres à cartouche (dépoussiéreur) sont en en place sous le dôme pour récupérer les poussières. Ceux-ci sont contrôlés (inspection visuelle) et nettoyés régulièrement. La poussière recueillie par ces appareils est éliminée de manière à prévenir sa dispersion.

Les réservoirs de sulfate de cuivre de l'usine de traitement du minerai et de l'usine de traitement de l'effluent sont munis de dépoussiéreurs hydrostatiques. Le silo d'entreposage de la chaux est muni d'un dépoussiéreur à cartouche. Ils font l'objet de la même procédure de gestion des poussières.

### 3.2.6 Fours de réactivation du charbon, chaudières à élution et fours à induction

À l'usine de traitement du minerai, deux chaudières à élution, deux fours de réactivation du charbon ainsi que deux fours à induction sont en exploitation.

Un des fours à induction est muni qu'un épurateur à voie humide tandis que le second est muni d'un filtre à cartouche.

Tous ces systèmes sont contrôlés (inspection visuelle) et nettoyés régulièrement. La poussière recueillie est éliminée ou récupérée de manière à prévenir sa dispersion.

## 4. STATION MÉTÉOROLOGIQUE

Une station météorologique est installée depuis 2011 à environ 650 m au nord de la fosse Canadian Malartic. L'emplacement est suffisamment représentatif pour juger convenablement des conditions locales pour appuyer l'interprétation des mesures de qualité de l'air obtenues aux stations de mesure de la qualité de l'air.

Les équipements utilisés, leurs modalités d'installation, la compilation des données météorologiques incluant la fréquence de mesure, le calcul des valeurs horaires ainsi que les étiquettes de données sont conformes aux normes édictées dans le document Normes de gestion et d'exploitation des réseaux du Réseau météorologique coopératif du Québec.

Avant l'installation, la localisation de la station météo et les équipements prévus ont été validés par le Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC).

Les données météorologiques sont enregistrées sur une base horaire.

## 5. PROGRAMME DE SUIVI DE LA QUALITÉ DE L'ATMOSPHÈRE

### 5.1 Mise en place du programme de suivi

L'objectif du programme de suivi est de mesurer l'impact des activités minières sur la qualité de l'atmosphère, et de déterminer la conformité et l'acceptabilité des activités minières par rapport aux normes et critères applicables tel que présentés dans le *Règlement sur l'assainissement de l'atmosphère (RAA)*.

Le programme présente les points de mesure, la méthodologie et les activités de contrôle de la qualité établis pour le suivi. Dès 2012, deux stations du suivi de la qualité de l'atmosphère ont été déployées conformément au programme. La première station (A1) au nord est positionnée à plus de 1 300 m de la fosse Canadian Malartic dans un secteur résidentiel. La seconde (A2), plus au sud, est située à moins de 150 m des opérations à ciel ouvert, près de la butte-écran. À la fin de l'année 2016 une troisième station (A3) a été installée dans le secteur Est de la Ville de Malartic, soit à environ 580 mètres de la fosse Canadian Malartic. Les trois stations ont été installées dans le but de mesurer les paramètres suivants :

Mesures en continu (stations A1, A2 et A3) :

- Particules totales;
- Particules fines PM2,5;
- Oxydes d'azote.

Mesures sur filtre (stations A2 et A3) :

- Particules totales;
- Composition en métaux;
- Silice cristalline.

La stratégie de gestion des particules dans l'atmosphère repose sur des instruments électroniques de mesure en continu des particules totales et fines. Ce type d'appareil permet d'avoir une mesure relativement précise et rapide à toutes les heures. Cette stratégie permet de mettre en place les mesures de mitigation appropriées en fonction des seuils atteints.

L'échantillonneur d'air à grand débit installé aux stations A2 et A3 permet de vérifier la conformité à la norme concernant les particules totales en fonction d'une méthode de référence reconnue par le MELCC.

### 5.2 Procédure d'opération actuelle

CMGP a mis en place diverses procédures d'opération pour assurer le bon fonctionnement de chaque instrument. De plus, un manuel détaille l'ensemble des procédures d'entretien des équipements et des instruments des stations de la qualité de l'air ambiant. Finalement, une série de fiches de vérification ont également été produites pour s'assurer du bon fonctionnement des équipements et des instruments aux trois stations.

#### 5.2.1 Opérations d'entretien et d'étalonnage

Les activités d'entretien et d'étalonnage décrites dans les procédures et manuels d'opération sont réalisées en fonction des périodes prescrites par les méthodes et/ou les fabricants des appareils. Les activités effectuées sont consignées dans un registre d'entretien.

### 5.2.2 Gestion des données et contrôle de la qualité

CMGP a installé un système de collecte des données numériques relié aux appareils de mesure des particules totales et fines, de même que les appareils de mesure de $NO_x$. Les données colligées sont traitées et affichées sur une interface web. L'interface calcule les moyennes nécessaires à la détermination de la conformité avec les normes ou critères applicables. L'interface est aussi en mesure de recueillir les informations relatives à la qualité des données et l'état des instruments : valeurs au-delà de la limite de quantification, appareil en panne ou sujet à une situation technique atypique, etc.

Les données des appareils non électroniques requérant des manipulations (échantillonneurs manuels) sont transférées manuellement dans la base de données par le personnel de CMGP tandis que les résultats d'analyse mesurés par ces appareils sont transférés automatiquement dans cette dernière.

Depuis 2012, CMGP dépose un rapport au MELCC dans le cadre de son programme de suivi de la qualité de l'atmosphère à Malartic.

### 5.2.3 Programme d'alerte

CMGP mesure en continu les particules totales (PTS) et fines ($PM_{2,5}$) et ce, à chacune de ses trois stations de qualité de l'atmosphère. Notre procédure en situation de « possible dépassement de norme » intègre un programme d'alerte interne qui transmet automatiquement un courriel au personnel en fonction (répartiteurs, contremaitres, personnels en environnement, direction, etc.) lorsqu'une valeur horaire des PTS ou $PM_{2,5}$ mesurées atteint 80 % de la norme journalière. Cette première alerte est appelée « Alerte jaune ». Une deuxième série de courriels est envoyée lorsque la valeur horaire mesurée de PTS ou de $PM_{2,5}$ atteint 100 % de la norme journalière. Cette alerte est appelée « Alerte rouge ».

- Lorsque l'alerte « Jaune » est déclenchée, le principal intervenant ciblé (par courriel) est le contremaître des opérations minières. Même si plusieurs intervenants peuvent agir, cette personne est en contact avec tous les opérateurs (camions, pelles, camions-citernes, chargeuses, foreuses, parc à résidus, etc.). Elle a également accès, par le biais du répartiteur, aux caméras du site minier. Elle doit vérifier si les opérations en cours causent des poussières visibles et doit mettre en place des correctifs qu'elle adresse directement aux opérateurs sur le terrain. Le répartiteur ou le contremaitre des opérations minières demandent aux opérateurs une réduction de la vitesse des camions et une augmentation de la fréquence d'arrosage. Les interventions importantes d'une journée sont colligées dans l'interface web.
- Lorsque l'alerte « Rouge » est signalée, même si plusieurs intervenants peuvent agir, le principal intervenant ciblé (par courriel) est toujours le contremaître des opérations minières, mais dans le cas de l'alerte « rouge » le personnel de l'équipe environnement joue un rôle plus soutenu au niveau des constats sur le site et dans les environs de la ville de Malartic. La personne de service du département de l'environnement doit alors suivre la procédure décrite à l'annexe 1.

Le programme d'alerte lors de dépassements des normes de CMGP déclenche des mesures correctives concrètes qui sont appliquées rapidement. Par exemple :

- Arrosage continu du réseau de chemins;
- Arrosage des matelas avant leur déplacement;
- Réduction de la vitesse des camions;
- Arrosage du matériel chargé;
- Arrosage des zones de sautage;
- Arrosage des zones problématiques;
- Système d'arrosage au concasseur mobile;
- Réduction immédiate de certains équipements, ex. : foreuse, chargeuses ou camions;
- Si la situation se détériore encore, il peut y avoir un arrêt des opérations dans les secteurs problématiques.

Les mesures sont choisies en fonction de la source, de l'importance du dépassement anticipé, des conditions météorologiques présentes et à venir, des concentrations de particules dans l'air ambiant, etc. Plusieurs mesures d'atténuation des poussières peuvent être combinées et appliquées en même temps.

### 5.2.4 Carte dynamique

La carte dynamique identifie, en tenant compte de la force et de la direction des vents, les zones pour lesquelles la poussière générée est susceptible de se propager vers la ville de Malartic.

Cette carte montre la position des équipements sur le site et un code de couleur y est superposé. La couleur rouge permet au personnel des opérations d'identifier les zones pour lesquelles il est prioritaire d'intervenir pour contrôler et minimiser la génération de poussière tandis que la couleur jaune indique les zones à surveiller.

### 5.2.5 Outil prédictif

CMGP a travaillé à la création d'une nouvelle interface, soit l'outil prédictif pour la gestion des particules. Ce nouvel outil prend en compte les prévisions horaires pour la vitesse et la direction du vent puis recherche dans l'historique de la base de données des échantillonneurs en continu (BAM) des conditions similaires pour ainsi prédire les concentrations horaires à venir. L'information est ensuite reportée sur une interface qui permet aux utilisateurs de visualiser le portrait de la journée entière.

L'outil prédictif pour la gestion des particules oriente l'intensité des actions à mettre en place. En fonction des concentrations horaires mesurées et de celles prédites, l'outil affiche à l'utilisateur si la situation est en contrôle (zone verte), si des interventions ciblées doivent être appliquées (zone jaune) ou encore si les opérations doivent passer au mode opérations minimales (zone rouge).

## 6. SUIVI DES ÉMISSIONS À LA SOURCE

Du côté de la mine Canadian Malartic, les équipements faisant l'objet d'un suivi des émissions à la source ont été intégrés dans l'attestation d'assainissement de l'atmosphère délivrée en novembre 2018. Pour ce qui est de la mine Odyssey, le suivi des émissions comprendra l'échantillonnage à la source du système de ventilation de chacune des mines souterraines.

En complément au programme de suivi de la qualité de l'atmosphère, les nouveaux équipements représentant des sources d'émissions fixes seront échantillonnés selon les modalités prévues aux autorisations. L'échantillonnage sera effectué selon les modalités et les méthodes de référence prescrites dans le *Guide d'échantillonnage aux fins d'analyses environnementales – Cahier 4 – Échantillonnage des émissions atmosphériques en provenance de sources fixes.* Pour la mine Odyssey, les caractéristiques particulières des points d'émission font en sorte qu'il est possible que les méthodes de référence ne puissent s'appliquer dans leur intégralité. Dans ce cas, les modalités prévues à la section *2 Principes méthodologiques* du guide seront appliquées.

Un rapport d'échantillonnage sera produit et transmis au MELCC. Si l'analyse révèle un dépassement d'une valeur limite ou d'une norme d'émission, l'événement sera mentionné ainsi que les mesures correctrices appliquées.

## 7. MESURES D'ATTÉNUATION PARTICULIÈRES

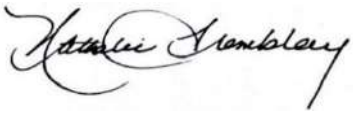
Bien que la stratégie de gestion de CMGP soit d'appliquer continuellement des mesures de contrôle et d'atténuation courantes à l'ensemble de ses activités minières, si le suivi en temps réel des poussières mesure des concentrations dans l'air ambiant indiquant une tendance probable vers un dépassement des normes de la qualité de l'atmosphère, CMGP procédera à la modification ou à l'interruption de certaines activités sur son site. Ceci a été fait à plusieurs reprises au cours des dernières années.

Le personnel de CMGP et ses sous-traitants sont informés et sensibilisés aux bonnes pratiques permettant de réduire les émissions de poussières sur le site.

## 8. MISE À JOUR ET AMÉLIORATION DU PLAN DE GESTION

CMGP s'engage à mettre à jour et à bonifier son *Plan intégré de gestion des émissions atmosphériques* annuellement.

En effet, CMGP a démontré que son programme d'alerte permet de contrôler les poussières en augmentant les contraintes. Cependant, l'amélioration de son plan intégré de gestion des émissions atmosphériques est primordiale afin de minimiser les épisodes de dépassements et assurer en tout temps le respect des normes de la qualité de l'atmosphère.



Nathalie Tremblay
**Directrice environnement et développement durable**

# ANNEXE 1

PARTENARIAT CANADIAN MALARTIC

**PROCÉDURE D'INSPECTION EN CAS DE DÉPASSEMENT HORAIRE DES NORMES DE QUALITÉ DE L'AIR**

Révision : Août 2021

PARTENARIAT CANADIAN MALARTIC

# PROCÉDURE D'INSPECTION EN CAS DE DÉPASSEMENT HORAIRE DES NORMES DE QUALITÉ DE L'ATMOSPHÈRE

| PROC-ENV-001-04 | *Nombre total de pages : 4* |
|---|---|

| Historique des mises à jour | | | | |
|---|---|---|---|---|
| **Version** | **Date** | **Auteur** | **Sections modifiées** | **Objet de la mise à jour** |
| 02 | 2021-03-19 | Kim Cournoyer | 6.3.1 | Ajout concasseur mobile saisonnier |
| 03 | 2021-07-14 | Michaël Paquin | 6.3.5 | Ajout secteur Barnat et PBA |
| 04 | 2021-08-23 | Kim Cournoyer | 6.3.6 | Ajout mine Odyssey |

## 1. Objectif

Cette procédure a pour but de définir la méthodologie d'inspection et de documentation lors d'un dépassement de la norme horaire du Règlement sur l'assainissement de l'atmosphère (RAA). Cette procédure s'applique pour les particules totales (PTS) et les particules fines ($PM_{2.5}$) mesurées par les échantillonneurs en continu des stations de qualité de l'air. Cette procédure fait office de mesure de contrôle des risques associés à la qualité de l'air.

## 2. Document de travail

- *Fiche d'inspection des dépassements de poussière - FICH-INSP-PS*

## 3. Responsabilités

### Responsable scientifique

- S'assurer de la mise en œuvre de la procédure par le personnel.

### Technicien en validation

- Inspecter les secteurs ayant un potentiel d'émissions atmosphériques;
- Documenter les sources d'émissions atmosphériques;
- Informer les responsables internes des activités émettrices.

## 4. Conditions d'application de la procédure

En fonction des lectures horaires aux stations de qualité de l'air, un système d'alerte par courrier électronique informe les différents intervenants de l'atteinte des seuils suivants :

- De 80% à 99% de la norme pour les PTS : alerte jaune;
- De 80% à 99% de la norme pour les $PM_{2.5}$ : alerte jaune;
- À 100% et plus de la norme pour les PTS : alerte rouge;
- À 100% et plus de la norme pour les $PM_{2.5}$ : alerte rouge.

La procédure s'applique lors d'une alerte rouge.

Les conditions d'application de la procédure sont sujettes à être ajustées lors d'évènements tels que des compétitions sportives ou des festivals.

## 5. Matériel nécessaire

En plus des équipements de protection individuels (EPI), le matériel suivant est nécessaire :

- *Fiche d'inspection des dépassements de poussière - FICH-INSP-PS*;
- Téléphone portable.

## 6. Étapes d'intervention

### 6.1. Cueillette des données de dépassement

À l'aide de l'interface du département d'environnement, consigner les informations de la section « Météo » sur la fiche *FICH-INSP-PS*.

### 6.2. Vérification des caméras de surveillance

Avant de débuter l'inspection, rejoindre le bureau de la répartition pour identifier les sources potentielles d'émissions atmosphériques à l'aide des caméras. Si des sources émettrices provenant du site peuvent être identifiées, noter celles-ci et aviser immédiatement le contremaître support aux opérations pour des sources en provenance de la fosse Canadian Malartic et le contremaître auxiliaire pour des sources en provenance de la fosse Barnat.

### 6.3. Inspection

Dans le but d'identifier les sources d'émissions atmosphériques, une inspection du site minier et de ses environs doit être faite. Les informations doivent être consignées sur la fiche *FICH-INSP-PS*.

#### 6.3.1. Site de Mine Canadian Malartic

Si la vérification des caméras de surveillance n'est pas concluante, inspecter la fosse Canadian Malartic, la fosse Barnat, le concasseur giratoire, le concasseur mobile permanent et le concasseur mobile saisonnier. Lors de l'inspection à l'extérieur du site, une photo de l'horizon au-dessus de la butte-écran de la fosse, prise à partir de la station de qualité de l'air A2, doit être faite en toute circonstance. Si la vitesse des vents est faible, une photo de la fosse, prise à partir du belvédère de la butte-écran, doit être faite.

Les sources potentielles sont le transport, le chargement, le déchargement, le forage, le concassage et l'érosion aérienne.

Prendre en note, photographier et documenter toutes anomalies.

Si des sources d'émission sont identifiables, transmettre immédiatement l'information aux contremaîtres support aux opérations et auxiliaires.

### 6.3.2. Secteur industriel de la Ville de Malartic

Inspecter le chemin du Lac Mourier, le parc industriel et l'aréna.

Les sources potentielles sont le transport, les travaux de voirie, les procédés industriels et l'érosion aérienne.

Prendre en note, photographier et documenter toutes anomalies.

### 6.3.3. Milieu urbain de la Ville de Malartic

Inspecter les environs de la station de qualité de l'air d'où provient l'alerte.

- Pour la station de qualité de l'air A1, inspecter les rues Authier et Régine-Lanoix ainsi que l'avenue Armstrong;
- Pour la station de qualité de l'air A2, inspecter les rues Frontenac et de la Paix ainsi que les avenues Abitibi et de la Sarre;
- Pour la station de qualité de l'air A3, inspecter les rues Lasalle et Laurier ainsi que les avenues Champlain et St-Louis.

Les sources potentielles sont le transport, les travaux de voiries, les travaux résidentiels, les fumées de combustion, les activités sportives et l'érosion aérienne.

Prendre en note, photographier et documenter toutes anomalies.

### 6.3.4. Station de qualité de l'air

Inspecter et confirmer le fonctionnement des équipements de la station de qualité de l'air d'où provient l'alerte. Vérifier que la température intérieure de la station est autour de **20°C**. Inspecter et prendre en photo les points sur le ruban du BAM. Répéter les manœuvres pour les deux autres stations de qualité de l'air.

Les anomalies potentielles sont les bris et les disfonctionnements d'équipements.

Prendre en note, photographier et documenter toutes anomalies.

### 6.3.5. Secteur de la fosse Barnat et concasseur mobile saisonnier

Inspecter les environs du concasseur mobile saisonnier (PBA) et de la fosse Barnat

- Circuler sur la route 117 en direction de la Mine Odyssey et vérifier si les opérations dans la fosse Barnat ou dans le secteur du PBA génèrent des poussières. Le cas échéant, contacter rapidement le contremaître auxiliaire ou le répartiteur et assurez-vous de le mentionner dans le courriel de l'inspection.
- Accéder au site minier via l'entrée de la mine Odyssey et inspecter le secteur du PBA et de la fosse Barnat à partir de l'intérieur du site minier.

#### 6.3.6. Site de Mine Odyssey

L'inspection de la Mine Odyssey doit être réalisée en circulant sur le site afin de vérifier si les activités de construction génèrent des émissions de particules. Le secteur du chevalement ainsi que le secteur du portail doivent être inspectés.

Les sources potentielles sont principalement, le décapage, le forage, le chargement, le déchargement, le transport et l'érosion aérienne.

Prendre en note, photographier et documenter toutes anomalies.

Si des sources d'émission sont visibles, contacter immédiatement le surintendant civil et mécanique.

## 7. Communications

À tout moment de l'intervention, si des sources émettrices provenant du site peuvent être identifiées, aviser immédiatement le contremaître support aux opérations pour des sources en provenance de la fosse Canadian Malartic et le contremaître auxiliaire pour des sources en provenance de la fosse Barnat.

Un courrier électronique résumant l'inspection doit être envoyé à la liste de distribution «CM Suivi Dépassement de Poussière» au retour de l'inspection.

## 8. Système d'identification unique

La *Procédure de maîtrise de la documentation et des enregistrements - PROC-003* s'applique.

# ANNEXE

# QCM-13

## LETTRE DE LA MRC DE LA VALLÉE-DE-L'OR DU 5 AOÛT 2021

MRC de La Vallée-de-l'Or

40 ans d'histoire

Val-d'Or, le 5 août 2021

Madame Josée Plouffe
Directrice communications et relations avec le milieu
Partenariat Canadian Malartic
1041 rue Royale
Malartic (Québec)
J0Y 1Z0

Objet – Développement du Projet Odyssey et nouvelles cellules au Parc à Résidu

Madame,

La présente fait suite à votre courriel du 27 juillet 2021 relativement à la demande de rencontre afin de présenter l'état de la situation dans les dossiers du développement du Projet Odyssey et dans le projet d'ajouts de nouvelles cellules à votre Parc à résidus.

Premièrement, monsieur Mario Sylvain directeur du service de l'aménagement et directeur général adjoint, ainsi que moi-même, préfet de la MRCVO et maire de Malartic, sommes tous deux sur le Comité d'échange et de suivi Canadian Malartic. Par conséquent, la MRCVO, par ces deux représentants, est déjà aux faits des deux projets ci-devant mentionnés.

Ensuite, après vérification, nous vous informons que les projets tels que présentés n'entrent pas en conflit avec le schéma d'aménagement établi par la MRCVO.

En regard de ce qui précède, nous vous informons qu'une rencontre supplémentaire n'est pas nécessaire. Nous comprenons par ailleurs que si des modifications doivent être apportées auxdits projets, ceux-ci seront communiqués à nos représentants siégeant au Comité d'échange et de suivi Canadian Malartic, qui verront à requérir une nouvelle rencontre si cela s'avère nécessaire.

Nous vous invitons à contacter les représentants de la MRCVO pour toutes questions relatives à la présente correspondance.

Espérant le tout conforme.

Martin Ferron, préfet

42, PLACE HAMMOND
VAL-D'OR (QUÉBEC) J9P 3A9
TÉL. : 819-825-7733 > TÉLÉC. : 819-825-4137

WWW.MRCVO.QC.CA
INFO@MRCVO.CA

# ANNEXE

# QCM-17

## PLAN DE MESURES D'URGENCE (PMU)
## RÉVISÉ (SEPTEMBRE 2021)

# Mine Odyssey

# PLAN DE MESURES D'URGENCE

**Septembre 2021**

## SECTIONS DU PLAN DE MESURES D'URGENCE


**SECTION N$^{O}$ 1 – PERSONNEL ET MATÉRIEL DISPONIBLES**

**SECTION N$^{O}$ 2 – RÔLE ET RESPONSABILITÉS DES INTERVENANTS**

**SECTION N$^{O}$ 3 – LISTE TÉLÉPHONIQUE**

**SECTION N$^{O}$ 4 – GESTION DES RISQUES**

**SECTION N$^{O}$ 5 – MODALITÉ D'ALERTE ET NOTIFICATION**

**SECTION N$^{O}$ 6 – DÉCLENCHEMENT DU PLAN DE MESURES D'URGENCE**

**SECTION N$^{O}$ 7 – PLANS DE LOCALISATION**

**SECTION N$^{O}$ 8 – FORMULAIRES**

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PARTENARIAT CANADIAN MALARTIC

# POLITIQUE DE DÉVELOPPEMENT DURABLE DE CANADIAN MALARTIC GP

Le développement durable fait partie intégrante de la stratégie d'affaires de Canadian Malartic GP (le « **Partenariat** »). Nous travaillons à créer de la valeur pour nos actionnaires et nos partenaires, tout en contribuant à la prospérité de nos employés et des communautés qui nous accueillent. Nous croyons qu'à travers un dialogue soutenu avec nos employés et nos parties prenantes, un engagement à intégrer les meilleures pratiques applicables disponibles, y compris des audits internes et externes, et une attention particulière portée à l'amélioration continue de notre performance, nous pouvons obtenir et maintenir l'acceptabilité sociale de nos activités et assurer leur durabilité. La présente Politique de développement durable fait partie de nos valeurs fondamentales et de notre culture. Elle est mise en œuvre au moyen de l'application d'un système de gestion visant la santé et sécurité, l'environnement, ainsi que les relations avec nos employés et nos communautés d'accueil, et se traduit par les engagements suivants :

## 1. SANTÉ ET SÉCURITÉ

Nous nous engageons à créer et exploiter un milieu de travail sain et sécuritaire en :

a) reconnaissant que toutes les blessures, maladies professionnelles et décès peuvent être évités et en s'assurant que la responsabilité et l'imputabilité de la sécurité sont partagées par le Partenariat, ses employés, entrepreneurs et partenaires commerciaux;
b) ayant recours à une évaluation continue des risques et à des mesures d'atténuation en vue de protéger les travailleurs contre les dangers;
c) faisant la promotion de la santé et du mieux-être et en établissant des programmes pertinents;
d) fournissant à nos employés et à nos entrepreneurs une formation appropriée en santé-sécurité;
e) fournissant à nos employés et à nos partenaires commerciaux les ressources adéquates et les outils appropriés pour qu'ils puissent accomplir leur travail de façon sécuritaire et efficace;
f) ayant recours à de solides principes d'ingénierie dans la conception et l'exploitation de nos installations;
g) prévenant les maladies et affections professionnelles en s'assurant que des programmes efficaces de santé et d'hygiène industrielle sont en place; et
h) assurant un haut niveau de préparation aux situations d'urgence afin de gérer les effets d'événements imprévus.

## 2. ENVIRONNEMENT

Nous nous engageons à minimiser les effets de nos activités sur l'environnement et à maintenir sa viabilité et sa diversité pour les générations futures en :

a) utilisant efficacement les ressources naturelles;
b) adoptant des mesures afin de réduire l'empreinte de nos activités et de nos émissions;
c) adoptant des mesures de réduction des émissions de gaz à effet de serre et de lutte contre les changements climatiques et en utilisant efficacement l'énergie;
d) effectuant la gestion des résidus, des stériles et du mort-terrain de façon à assurer leur sécurité à long terme et la protection de l'environnement;

ADOPTÉE : 3 septembre 2014
MODIFIÉE : 8 avril 2021

e) intégrant la conservation de la biodiversité et les aspects relatifs à l'aménagement du territoire à toutes les étapes de nos activités commerciales et de production;
f) minimisant l'utilisation de l'eau douce et en gérant les risques et les occasions liés au bassin versant afin de réduire l'impact cumulatif sur les autres utilisateurs;
g) minimisant et atténuant les risques afin de réduire les impacts potentiels sur l'environnement; et
h) restaurant nos sites miniers afin d'en assurer la stabilité physique et chimique et, lorsque possible, en effectuant de la restauration progressive.

## 3. EMPLOYÉS ET COMMUNAUTÉS

Nous nous engageons à contribuer, au niveau social et économique, au développement durable des communautés où nous exerçons nos activités et à entretenir des relations justes et respectueuses avec nos employés et nos communautés d'accueil en :

a) traitant nos employés de façon juste et en offrant des conditions de travail concurrentielles;
b) veillant à ce qu'aucune pratique discriminatoire ne soit tolérée en milieu de travail et en mettant en place un mécanisme de règlement des différends équitable et non discriminatoire pour nos employés;
c) assurant l'égalité des chances à tous les niveaux de l'organisation, en soutenant le développement des compétences et en valorisant la diversité;
d) offrant un milieu de travail exempt de drogue et d'alcool;
e) établissant une relation à long terme avec nos communautés d'accueil, fondée sur la confiance par le biais d'une communication ouverte et transparente;
f) fournissant un mécanisme confidentiel de règlement des plaintes pour signaler un comportement contraire à l'éthique, illégal ou irresponsable;
g) contribuant au développement des communautés d'accueil en créant des emplois, favorisant les achats locaux et en investissant dans des projets communautaires à l'échelle locale en vue de leur viabilité socio-économique à long terme;
h) respectant les droits humains fondamentaux et les cultures, coutumes et valeurs de tous ceux qui sont touchés par nos activités; et
i) travaillant en partenariat avec les peuples autochtones en vue d'établir une relation mutuellement bénéfique, coopérative et productive, fondée sur une approche caractérisée par des communications bidirectionnelles, une consultation et un partenariat efficace.

Daniel Paré
Vice-président

Yohann Bouchard
Vice-président

ADOPTÉE : 3 septembre 2014
MODIFIÉE : 8 avril 2021

# Liste de distribution du plan de mesures d'urgence

| Propriétaires d'une copie du PMU | |
|---|---|
| **N° copie** | **Détenteur** |
| **01** | Coordonnateur du PMU et surintendant santé sécurité construction<br>**Jude Boucher** |
| **02** | Directeur général<br>**Patrick Mercier** |
| **03** | Surintendant de projet<br>**Yoan Roy** |
| **04** | Directeur construction<br>**Marc André Bélanger** |
| **05** | Surintendant santé sécurité<br>**À être nommé** |
| **06** | Surintendant opération minière<br>**À être nommé** |
| **07** | Surintendant entretien<br>**À être nommé** |
| **08** | Directeur des opérations de sauvetage minier (salle de sauvetage minier)<br>**Alain Rioux (CMAC)** |
| **09** | Superviseur général Odyssey<br>**Pierre Luc Bellavance** |
| **10** | Assistant surintendant de projet<br>**Pierre Olivier Richard** |
| **11** | Coordonnatrice santé sécurité mine Odyssey<br>**Annie Guay** |
| **12** | Poste de garde |
| **13** | Surintendante environnement<br>**Kim Cournoyer** |
| **14** | Sécurité civile |
| **15** | Ville de Malartic |
| **16** | Service incendie |
| **17** | |
| **18** | |
| **19** | |
| **20** | |
| **21** | |
| **22** | |
| **23** | |
| **24** | |
| **25** | |

# 1. COORDONNATEUR DES MESURES D'URGENCE

Le partenariat Canadian Malartic, Mine Odyssey, désigne M. Jude Boucher, surintendant santé sécurité construction, à titre de coordonnateur des mesures d'urgence. Celui-ci aura comme tâches, entre autres, de :

- Concevoir et administrer le plan de mesures d'urgence (PMU);
- S'assurer que chacun des intervenants accorde suffisamment d'attention à tous les aspects du plan de mesures d'urgence;
- S'assurer du respect des normes en vigueur;
- S'assurer de la coordination en cas d'urgence impliquant ce plan;
- Assurer la mise à jour au moins deux fois par année;
- Assurer la mine à l'essai une fois par année.

Le plan évoluera en fonction de l'avancement de la mine, il est donc sujet à de fréquents changements d'ici la mise en production.

# 2. GÉNÉRALITÉS

## 2.1 LOCALISATION

**BUREAU ADMINISTRATIF**

**Nom légal** Mine Odyssey
**Adresse** 9, route 117
**Téléphone** (819) 757-2225 **Fax** (819) 757-2351 (ces numéros sont provisoires)

## 2.2 DESCRIPTION DE LA MINE

Le Partenariat Canadian Malartic qui exploite commercialement une mine à ciel ouvert dans la région de l'Abitibi, au nord-ouest de la province de Québec, depuis avril 2011, débute le développement d'une nouvelle mine souterraine, ci-après appelée Mine Odyssey.

Cette mine, une fois en production, devrait produire environ 20 000 tonnes de minerai par jour, et ceci, pour une durée approximative de 15 ans.

Le minerai de cette nouvelle mine sera acheminé, par camion, jusqu'aux installations de Mine Canadian Malartic, à trois kilomètres à l'ouest. C'est à cet endroit qu'une usine de traitement déjà en fonction fera l'extraction de l'or et autre métaux associés.

Une fois complétées, les installations se composeront de ce qui suit :

- Chevalement d'extraction et salle des treuils;
- Portail d'accès aux opération minières (rampe avec portail);
- Garage d'entretien mécanique;
- Bâtiment administratif;
- Usine de remblais en pâte;
- Ventilateur de surface;
- Dépôt pétrolier.

Des plans provisoires se retrouvent à la fin du document.

## 3. PARTICULARITÉ DE LA MINE ODYSSEY

La mine Odyssey se situe à l'est de la Ville de Malartic, petite ville minière de 3 500 habitants située dans la MRC de la Vallée-de-l'Or à environ 25 km à l'ouest de Val-d'Or.

Le site est accessible par deux endroits :

- Par la route 117;
- Par la mine Canadian Malartic, via les opérations minières.

Une collaboration étroite entre les élus et officiers municipaux, ainsi qu'une approche proactive auprès de la communauté, est essentielle à la mise en place d'une cohabitation harmonieuse et des mesures d'urgence efficaces.

Un bureau de relation avec la communauté est d'ailleurs installé au cœur de la Ville de Malartic.

## 4. TRAITEMENT DU MINERAI

Le minerai extrait de la mine Odyssey sera transporté à l'usine de traitement de la mine Canadian Malartic.

Ce transport s'effectuera avec des camions de dimensions diverses. Aucun minerai ne sera donc traité sur le site de la mine Odyssey.

# 5. MATÉRIELS ET PERSONNEL DISPONIBLES

## 5.1 MATÉRIEL ET PERSONNEL DE LA VILLE DE MALARTIC

La mine Odyssey est située à trois km au l'est de la Ville de Malartic qui dispose des services suivants :

- Caserne de pompiers;
- Service d'ambulance;
- Centre hospitalier;
- CLSC.

La Ville dispose d'un plan de sécurité civile et elle s'assure de le maintenir à jour régulièrement.

Mine Canadian Malartic et la Ville de Malartic ont convenu de mettre en commun du personnel et du matériel et de s'entraider en cas d'événement. Ces mises en commun et cette entraide sont officialisées par des lettres d'entente. Cette entente pourra s'étendre aux installations de la mine Odyssey.

C'est à l'annexe 23 de ce document que se retrouve l'entente.

- Arrimage PMU de Odyssey et la ville de Malartic.

**Service incendies de la ville de Malartic**

*Matériel (liste fournie par la Ville de Malartic)*

La Ville dispose d'une caserne de pompiers et celle-ci dispose du matériel suivant :

| Services de sécurité incendie | Caserne # | Véhicules | | | | | Équipements (nombre) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Numéro Type (année) | Débit de pompe (l / min) | Réservoir (l / min) | Vidange (cm) | Échelles (nombre) | Habits de combat | Appareils radio véhiculaires (ondes émettrices) | APRIA + cylindres | Cylindres de rechange | Alarmes | Ventilateurs | Volume des bassins (litres) | Génératrice |
| **Malartic** | **8** | 708 Autopompe-citerne (1995) | 4 654 | 4 540 | 25 | 4 | | 1 x VHF | 6 | 10 | 6 | | | 1 |
| | | 208 Autopompes (2008) | 6 010 | 4 191 | | 4 | | 1 x VHF | 4 | 6 | 6 | | 1 X 1500 | |
| | | 1008 Fourgons d'équipement (2000) | | | | 0 | | 1 x VHF | 5 | 33 | 6 | 3 | 1 X 6 800 | 1 |
| | | 508, véhicule de désincarcération | | | | | | 1 x VHF | | | | | | |

Note : le camion V208 est équipé d'un système CAFS et le camion V708 d'un système mousse pro :

- Équipement de sauvetage en hauteur, système trois en un;
- Équipement de colmatage et système de rétention pour les fuites chimiques;
- Équipements d'intervention en matière dangereuse, encapsuleur, 10 Apria 45 minutes, etc.;
- 2 équipements de désincarcération lors d'accident;
- 2 ensembles de matelas pour soulever.

La Ville compte sur vingt-sept (25) pompiers volontaires, répartis comme suit :

- 1 directeur;
- 4 capitaines;
- 20 pompiers.

La force de frappe initiale est de 12 pompiers et d'un officier. La Ville est tenue de maintenir ce personnel en place en accord avec le plan de couverture de risques adopté par la MRC de la Vallée-de-l'Or.

Les pompiers sont formés et entraînés selon les standards exigés par la province de Québec.

Le temps d'intervention dans des conditions normales et dans les limites de la Ville, incluant Mine Canadian Malartic (MCM), est de 10 minutes.

### 5.2 SERVICE AMBULANCIER

Un service ambulancier est disponible dans les limites de la ville.

### 5.3 CENTRE INTÉGRÉ DE SANTÉ ET DE SERVICES SOCIAUX

Le Centre intégré de santé et de services sociaux de la Vallée-de-l'Or (CISSSVO) dessert la population de la MRC de la Vallée-de-l'Or dont fait partie la Ville de Malartic.

Les services sont offerts par le CISSSVO au site du CLSC de Malartic où on y retrouve des services médicaux d'urgence de première ligne.

### 5.4 PERSONNEL DE MINE CANADIAN MALARTIC

Mine Canadian Malartic dispose d'un coordonnateur des mesures d'urgence et d'un coordonnateur de relève qui est en mesure de le remplacer efficacement. L'équipe doit maintenir le plan des mesures d'urgence à jour et en assurer l'application. Le coordonnateur désigné est M. Jude Boucher, surintendant santé sécurité construction. Le coordonnateur de relève est M. Michael Perron, surintendant production de l'usine.

Ainsi, en attendant que tous les effectifs ne soient déployés sur le site de la mine Odyssey, MCM s'engage à soutenir le projet Odyssey en cas d'urgence.

Les premiers intervenants de MCM pourront intervenir pour les accidents majeurs en surface et aider le service incendie de Malartic en cas de besoin.

En cas d'incendie, la brigade de pompiers de la Ville de Malartic sera appelée.

## 5.5 LUTTE CONTRE LES INCENDIES SURFACE (ACCOMPAGNEMENT DES POMPIERS DE LA VILLE DE MALARTIC)

### Matériel (sur le site de MCM)

- 1 véhicule d'urgence avec équipement (civière, génératrice, etc.)
- 8 appareils respiratoires APRIA avec 16 bouteilles de 60 minutes :
  - 4 appareils dans la salle des mesures d'urgence (Bureaux Norrie)
  - 4 appareils dans les bureaux à l'est de l'usine
- 3 détecteurs multi-gaz (O2, CO, SO2, NH3, CH4) et 2 détecteurs MX6 :
  - 1 détecteur dans les bureaux à l'est de l'usine
  - 2 détecteurs dans la salle des mesures d'urgence
- 6 habits de classe B avec APRIA intérieur :
  - 6 dans la salle des mesures d'urgence
- 6 couvre tout en Tyveck
- 12 habits de combat incendie (dans la salle des mesures d'urgence)
- 4 habits de classe A :
  - 4 dans la salle des mesures d'urgence
- 4 habits de classe B avec APRIA extérieur :
  - 4 dans la salle des mesures d'urgence
- 4 masques avec cartouche filtrante
- Équipement de stabilisation
- 1 douche portative (décontamination)
- Ensemble de ballon pour colmatage
- Bornes-fontaines installées pour les bâtiments

La Ville de Malartic possède déjà du matériel de lutte contre les incendies. Ce matériel sera utilisé au besoin.

## 5.6 PERSONNEL MINE ODYSSEY

### Personnel

Sauveteurs miniers :

La mine Odyssey aura son équipe de sauveteurs miniers conforme à la réglementation.

Elle sera composée de travailleurs et de superviseurs de l'entrepreneur minier principal et de cadre de la mine Odyssey.

Ces sauveteurs seront formés selon la réglementation et recevront également une formation de premiers répondants industriels. Ils seront ainsi aptes à intervenir sur des accidents graves autant en surface que sous terre.

Infirmière :

Aussitôt qu'une infirmière sera requise par la réglementation, les responsables en santé-sécurité verront à combler le poste.

Présentement, deux infirmières sont en poste à plein temps sur le quart de jour du lundi au vendredi au site de MCM et elles peuvent être jointes en tout temps par cellulaire.

## 5.7 MATÉRIEL EN CAS D'ACCIDENT DE TRAVAIL MAJEUR ET INCENDIE SOUS TERRE MINE ODYSSEY

### Matériel

Un sous-poste de sauvetage minier sera fonctionnel dès le début des opérations souterraines. Le matériel est entretenu par les instructeurs en sauvetage minier.

**À** mesure que les travaux souterrains avanceront, il y aura une réévaluation des besoins en matériel. Présentement, la mine Odyssey dispose du matériel suivant :

- 8 appareils auto-sauveteur
- 6 appareils de protection respiratoire BG4
- 1 appareil de réanimation Care Vent
- 1 séchoir de BG4
- 4 bâtons d'exploration
- 2 bobines de fil téléphonique
- 6 cylindres de BG4
- 2 détecteurs de gaz
- 1 kit de calibration
- 6 ensemble grande distance BG4
- 1 ensemble de communication puissance vocale
- 12 harnais de sécurité
- 2 sifflets de sauvetage
- 2 masques Com5000
- 6 paniers
- 6 moules à glace
- 1 panier civière
- 1 ensemble de cordage
- 1 trépied/sauvetage espace clos
- 1 chariot de transport pour civière
- 1 appareil oxygénothérapie a pression positive, 6 l/minute minimum 25 minutes

### Système de communication

Un système téléphonique avec répartitrice ainsi qu'un système de boîtes vocales sont en fonction sur l'ensemble du site.

Chaque bureau possède son téléphone.

Le système de télécommunication utilisé autant pour la surface que sous terre sera un système de cellulaire LTE privé. Le système LTE appartient à la compagnie Mine Canadian Malartic et n'est nullement relié au système cellulaire LTE de Bell, Vidéotron ou autres. Celui-ci sera évolutif dans le temps afin d'adapter de nouvelles technologies.

Le système de télécommunication utilisera deux moyens pour rejoindre les employés :

- Appel de numéro de téléphone à numéro de téléphone : un numéro de poste téléphonique attribué à une personne ou à un équipement qui pourra être utilisé pour communiquer de personne à personne;

- Appel avec service Appuyez et parler (Push to talk) : Le système est un genre de système de radio utilisant des téléphones cellulaires LTE afin de rejoindre des groupes de personnes. Les groupes de diffusion seront configurés en fonction de modèle. (Exemple de groupe de diffusion : Urgence)

  Ce système s'apparente à un système de radio mais adapté pour l'utilisation sous terre. Le système d'antenne utilisé pour la télécommunication sera géré par un groupe qui reste à définir. Les appareils qui seront fournis auront la capacité de fournir de la télécommunication par la voix, vidéo ou courriel selon les besoins. Le système sera soumis à un contrat de service Premium qui prévoit des temps de résolution de problème très rapide. Il est prévu un système de télécommunications LTE privé en redondance afin d'éliminer les pannes et s'assurer que le système soit fonctionnel en tout temps.

## 5.8 MATÉRIEL ET PERSONNEL EN CAS D'ACCIDENT ENVIRONNEMENTAL (DÉVERSEMENT)

### Matériel

Mine Canadian Malartic, située directement à l'ouest de la mine Odyssey, sera en mesure de prêter main forte en cas de nécessité. Elle dispose des équipements suivants en cas d'évènement à caractère environnemental:

- 2 pelles mécaniques de marque CAT
- 5 camions articulés de 45 tons CAT
- 2 bouteurs D6
- 3 chargeurs sur roue de différentes capacités
- 1 niveleuse
- 1 compacteur

D'autres équipements sont également disponibles sur le site. Tous ces équipements seront disponibles sur demande auprès du département des opérations minières.

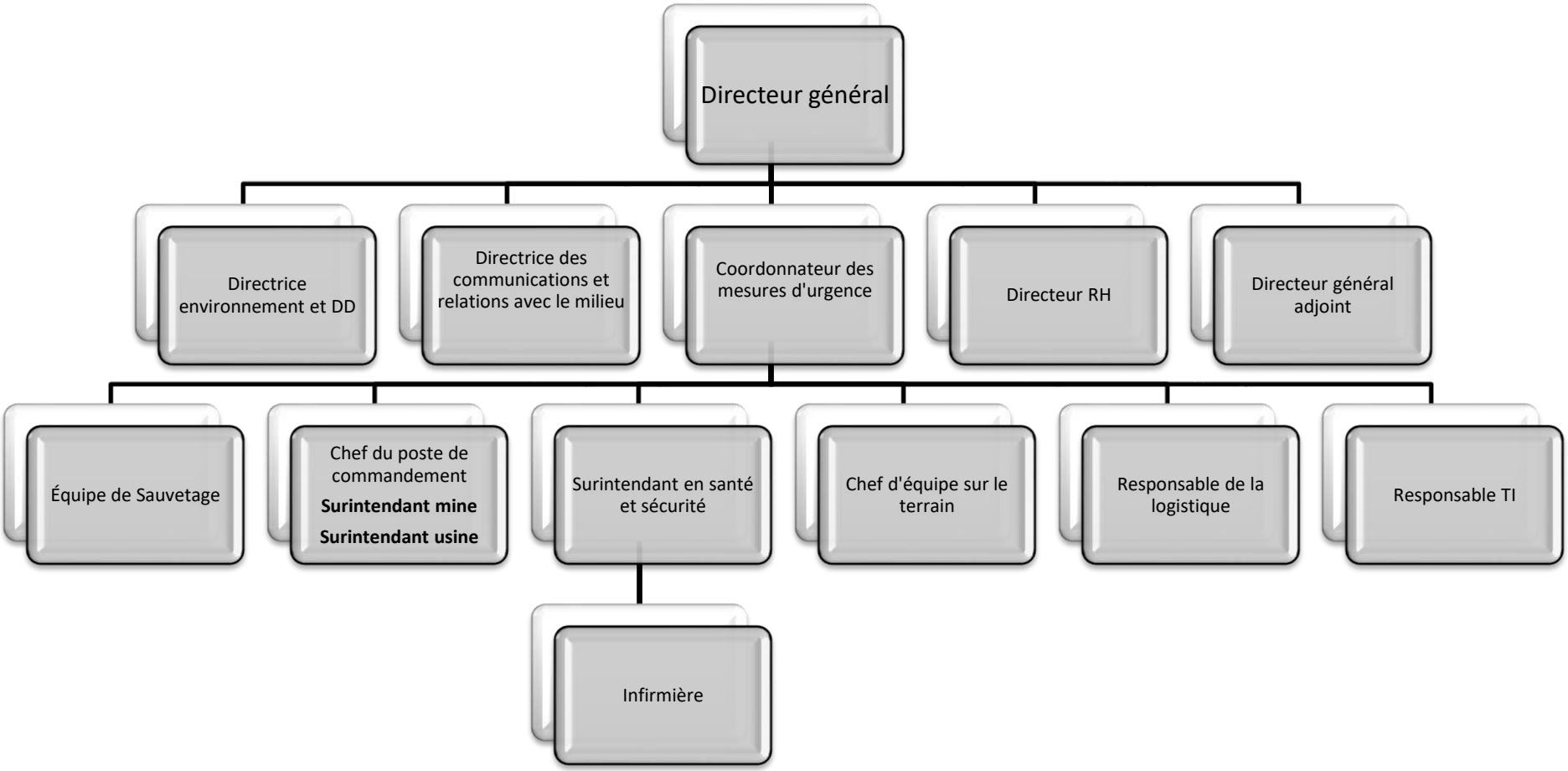
Des trousses environnementales sont disponibles pour les déversements importants. Le département de l'environnement mettra en place, au moment jugé opportun, une remorque pour les interventions environnementales. La localisation de cette remorque sera déterminée plus tard.

### Personnel

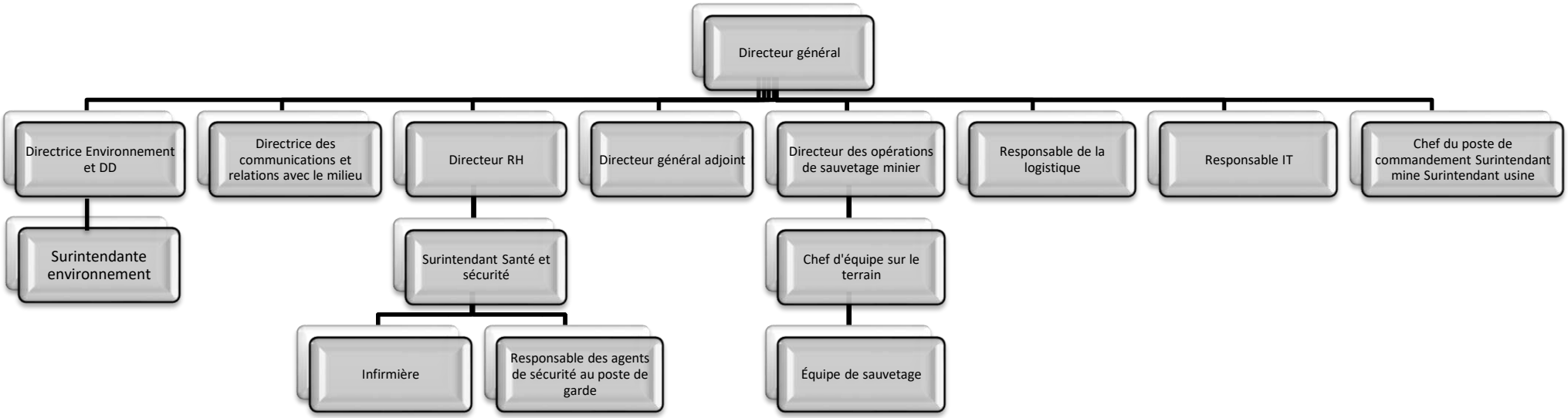
La mine Odyssey dispose de personnel en environnement afin d'intervenir en cas d'urgence. L'équipe environnement MCM est également disponible pour supporter Odyssey pour intervenir en cas de déversement et assurer une couverture environnementale 7 jours sur 7. L'équipe environnement en place compte sur une directrice environnement et développement durable, d'une surintendante en environnement et d'une équipe de spécialistes en environnement.

# 6. RÔLES ET RESPONSABILITÉS DES INTERVENANTS INTERNES

## Schéma décisionnel accident majeur surface et installation



## Schéma décisionnel accident majeur et incendie sous terre



# Équipe de direction

**RÔLES**

- Comprend les directeurs et surintendants de la compagnie ;
- Responsable de la définition des objectifs, de la répartition des ressources, de l'établissement ainsi que de l'évaluation de l'efficacité du plan d'urgence;
- Assure la protection de la santé et la sécurité des travailleurs, des visiteurs et de la population, ainsi que de l'environnement.

**Responsabilités**

**PRÉVENTION**

- S'assure que les budgets et les équipements nécessaires sont disponibles (achat et entretien de matériel, formation du personnel, exercices, etc.);
- Fournit le personnel et le temps nécessaire à l'exécution sécuritaire des activités;
- S'assure que différents responsables sont identifiés pour répondre aux cas d'urgence;
- S'assure que les outils d'intervention nécessaires sont disponibles;
- S'assure que les intervenants reçoivent une formation adéquate à leurs tâches.

**INTERVENTION**

- Assure un support administratif aux intervenants lors d'une situation d'urgence;
- Se rend disponible dans la salle de coordination des mesures d'urgence afin d'aider aux communications;
- Participe (ou désigne un représentant) aux réunions de coordination avec les intervenants externes (pompiers, autorités municipales, représentants gouvernementaux, etc.) lors d'une intervention majeure;
- Autorise les budgets nécessaires au bon déroulement de l'intervention;
- Participe aux communications avec les employés, la population et les médias, lorsque requis.

# Coordonnateur des mesures d'urgence

Substitut : surintendant mine

## RÔLES

- Relève de l'équipe de direction durant une intervention;
- Planifie et coordonne l'organisation d'une intervention d'urgence;
- Travaille en étroite collaboration avec les autres intervenants de façon à s'assurer que le PMU est opérationnel en tout temps (prévention et intervention).

## RESPONSABILITÉS

### PRÉVENTION

- Conçoit et administre le plan des mesures d'urgence (PMU);
- S'assure que les rapports requis sont complétés adéquatement et en assure la distribution;
- Fait rapport à la direction sur le fonctionnement du PMU;
- Maintient le PMU à jour et en assure l'application;
- Effectue une rencontre d'information avec tous les employés de façon à ce que ceux-ci soient tous informés des tenants et aboutissants du plan d'urgence (noms et coordonnées des responsables, structure d'alerte, procédure d'urgence, contenu de la trousse d'urgence, etc.);
- Assure l'implantation d'exercices d'inter-vention d'urgence sur une base périodique;
- Assure la réalisation des débriefings post intervention;
- Planifie et organise des formations adaptées;
- S'assure que chacune des personnes chargées de mettre à exécution le plan aient reçu les formations adéquates;
- Identifie et s'assure de la formation des intervenants internes sur les techniques d'intervention (ex. : détecteurs de gaz, etc.) ou s'assure qu'ils reçoivent une formation adéquate et périodique.

### INTERVENTION

- Évalue la situation et propose les stratégies d'intervention à l'équipe d'intervention sur le terrain;
- S'assure que les mesures d'intervention utilisées respectent les lois, règlements et normes applicables en matière de santé, sécurité et environnement;
- Renseigne l'équipe d'intervention sur le terrain à propos de leurs tâches précises;
- En cas d'incendie, s'assure d'envoyer quelqu'un à la station de pompage afin de s'assurer du bon fonctionnement des pompes;
- Communique avec les intervenants externes et les ressources additionnelles nécessaires selon la stratégie d'intervention (équi-pement et personnel);
- Agit à titre d'agent de liaison avec les autorités publiques (Ville de Malartic et sécurité publique);
- Décrète la fin de l'urgence et la reprise des opérations normales sur le complexe, dans le cas d'une urgence majeure, après évaluation avec les différents intervenants concernés (ex. : pompiers);
- Prépare le rapport d'incident et autres rapports de soutien afin de documenter l'intervention.

# Directrice en environnement

Substitut : surintendante suivi et contrôle environnemental

## RÔLES

- Assiste le coordonnateur du PMU;
- Travaille en étroite collaboration avec les autres intervenants de façon à s'assurer que le PMU est opérationnel en tout temps.

## RESPONSABILITÉS

### PRÉVENTION

- S'assure que les intervenants reçoivent périodiquement une formation adéquate à leurs tâches (direction, agents de sécurité, gardiens, superviseurs, etc.);
- Procède à des inspections ponctuelles sur le site et ordonne les mesures nécessaires afin d'assurer le respect des normes en vigueur;
- Organise une rencontre d'information avec tous les employés du département environnement de façon à ce que ceux-ci soient tous informés des tenants et aboutissants du plan d'urgence (noms et coordonnées des responsables, structure d'alerte, procédure d'urgence, contenu de la trousse d'urgence, etc.);
- S'assure que les outils d'intervention nécessaires sont disponibles.

### INTERVENTION

- Informe les intervenants des dangers environnementaux reliés à l'intervention;
- En cas de déversement accidentel ou d'incendie impliquant une substance dangereuse, avise les ministères concernés (MELCC, Environnement Canada) et s'assure que les formulaires requis sont complétés;
- Participe (ou désigne un représentant) aux réunions de coordination avec les intervenants externes (pompiers, autorités municipales, représentants gouvernementaux, etc.), lors d'une intervention majeure.

# Directrice des communications

Substitut : conseillère en communication ou directeur général

## RÔLE

- Voit à l'établissement des mesures de communication et agit comme porte-parole vis-à-vis des employés, des médias et du public.

## RESPONSABILITÉS

### PRÉVENTION

- Maintient à jour une liste avec les coordonnées des principaux médias nationaux et régionaux;
- Connaît la procédure de gestion de la communication (gestion de l'information, fréquence et type de messages, gestion des représentants des médias, etc.);
- Élabore et maintient à jour un plan de gestion de crise en communication.

### INTERVENTION

- Consigne les renseignements reçus, au fur et à mesure, lorsque requis;
- Rencontre les journalistes au besoin;
- Reçoit les demandes d'information des employés, du public et des médias;
- Prépare des communiqués à l'intention des employés, des familles des employés, des médias, des clients et fournisseurs, etc., les fait approuver par la direction et les fait émettre, lorsque requis.

### POST-INTERVENTION

- Fait mettre à jour les comptes rendus des médias et conserve des copies des articles, y compris des enregistrements d'émissions radio, télé, si possible.

# Directeur de opérations de sauvetage minier

Substitut : chef d'équipe de sauvetage minier

## RÔLE

- Coordonne l'intervention sur le site en cas d'incendie sous terre ou lors d'accident grave.

## RESPONSABILITÉS

### PRÉVENTION

- Est familier avec les procédures d'urgence ;
- Connaît la localisation des équipements d'intervention dans le complexe et s'assure qu'ils sont en bon état;
- Fait rapport à la direction de toute anomalie concernant la planification des interventions (ex.: manque de personnel formé, matériel d'intervention inadéquat, etc.);
- Prépare un programme annuel d'exercices en tenant compte des différents risques et assure l'implantation des exercices d'évacuation et d'intervention d'urgence;
- S'assure que les sauveteurs participent aux entrainements;
- S'assure que les sauveteurs miniers reçoivent toute autre formation jugée utile permettant de sauver des vies et rétablir la mine en cas de sinistre.

### INTERVENTION

- Assume le contrôle des activités sur le terrain;
- S'assure que les interventions soient faites en sécurité pour les équipes d'intervention;
- Coopère avec le responsable de la santé et de la sécurité sur place afin d'évaluer le niveau de protection à établir;
- Veille au respect des mesures de contrôle des lieux.

### POST-INTERVENTION

- Doit compléter les rapports requis à la suite de l'intervention et en communiquer une copie à Sauvetage Minier Québec.

# Responsable TI

Substitut : coordonnateur TI

## RÔLE

- Est responsable de la logistique des communications (fonctionnement des radios, téléphones, caméras, ordinateurs, liens internet, etc.).

## RESPONSABILITÉS

### PRÉVENTION

- Assure que tous les équipements de communication nécessaires lors d'une urgence sont fonctionnels et entretenus;
- Assure que le bottin téléphonique du PMU soit maintenu à jour;
- Évalue les actions stratégiques de communications;
- S'assure d'avoir les mêmes communications dans toutes les salles de mesures d'urgence.

### INTERVENTION

- Maintient les lignes de communication en tout temps.

# Équipe de sauvetage

## (Premiers intervenants : accident de surface
## Sauveteur minier : accident souterrain et incendie)

**RÔLE**

- Offre l'assistance à toute personne qui est blessée ou en danger, selon ses compétences.

**RESPONSABILITÉS**

**PRÉVENTION**

- Connaît les procédures d'urgence ;
- Participe au programme d'exercices 6 fois par année;
- Suit et maintient à jour ses formations.

**INTERVENTION**

- Portant une partie ou la totalité de son équipement de protection, l'équipe reste prête à intervenir à proximité des zones de travail dangereuses;
- Effectue le sauvetage de tout travailleur dont la santé ou la sécurité est menacée sans mettre sa propre sécurité en danger ;
- Effectue le sauvetage ou le contrôle de situation dangereuse selon les procédures et compétences acquises lors des exercices et formations;
- Participe aux rétablissements des opérations après un sinistre.

# Surintendant en santé et en sécurité

Substituts : conseillers SST

## RÔLE

- Conseille le chef d'équipe sur tous les aspects de la santé et la sécurité sur les lieux.

## RESPONSABILITÉS

### PRÉVENTION

- Sélectionne et recommande les équipements de protection;
- Veille à l'entretien périodique des vêtements et équipements de protection;
- Surveille les signes de stress, tels que l'exposition au froid, le stress causé par la chaleur et la fatigue, chez les membres des groupes de travail lors de simulation;
- Surveille les dangers et les conditions sur les lieux;
- Participe à la préparation et à la mise en œuvre du PMU;
- Connaît les procédures d'urgence, les itinéraires d'évacuation et dispose des numéros de téléphone de l'ambulance, de l'hôpital local, du centre antipoison, du service des incendies et de la police;
- Se tient informé des techniques les plus récentes d'intervention et de restauration des lieux contaminés (ex : déversement d'hydrocarbures), de façon à conseiller les intervenants du PMU sur les techniques d'intervention les plus appropriées.

### INTERVENTION

- Prend connaissance des informations sur le sinistre afin de faire une évaluation des dommages ou des risques de dommages affectant ou pouvant affecter la qualité de l'eau, de l'air ou du sol;
- S'assure que les mesures d'intervention utilisées respectent les lois, règlements et normes applicables en matière de santé, sécurité et environnement;
- Travaille en étroite collaboration avec les représentants externes en santé et en environnement tout au long de l'intervention et assure un suivi à la fin de l'intervention;
- Surveille les signes de stress, tels que l'exposition au froid, le stress causé par la chaleur et la fatigue, chez les membres des groupes de travail.

# Responsable de la logistique

Substitut : acheteur sénior

## RÔLE

- S'assure du support logistique lors d'intervention.

## RESPONSABILITÉS

### PRÉVENTION

- S'assure que MCM a des ententes de service valides avec les intervenants externes requis en cas d'urgence. Ceci comprend :
  - Les équipements ou outils spécialisés;
  - Tout ce qui concerne l'alimentation et approvisionnement en eau potable;
- En collaboration avec le **coordonnateur des mesures d'urgence** et des conseillers SST, s'assure de la mise à jour périodique de l'inventaire de tout le matériel d'intervention;
- Prévoit des contrats de service pour la décontamination des équipements à la suite d'une intervention, s'il y a lieu.

### INTERVENTION

- Planifie et s'assure de la mobilisation des installations, du matériel et du personnel nécessaires à l'intervention;
- À la fin de l'intervention, s'assure de remplacer ou de faire restaurer les équipements et le matériel utilisé.

# Infirmière

Substitut : deuxième infirmière ou conseiller en santé et sécurité responsable de l'hygiène

**RÔLE**

- S'assure que les interventions sont sécuritaires et apporte des recommandations pour le personnel, si requis.

**RESPONSABILITÉS**

**PRÉVENTION**

- Assiste le coordonnateur des mesures d'urgence et les conseillers en santé et sécurité lors de l'évaluation des dangers pour la santé des employés;
- Offre des conseils sur la manière de protéger adéquatement la santé;
- Connaît la réglementation en ce qui concerne les aspects santé et sécurité;
- Établit des protocoles d'intervention selon nos contaminants.

**INTERVENTION**

- Donne et coordonne des premiers soins et assiste les premiers intervenants;
- Assiste le conseiller en santé et sécurité lors de l'intervention;
- Prend connaissance de la situation afin d'évaluer les risques à la santé pour les travailleurs;
- Assure la communication avec les services ambulancier et hospitalier et le médecin.

**POST-INTERVENTION**

- À la demande du coordonnateur du PMU, participe à la réunion post-mortem.

# Agent de sécurité au poste de garde

**RÔLE**

- Reçoit les appels d'urgence et en avise immédiatement le plus haut responsable sur le site.

**RESPONSABILITÉS**

**PRÉVENTION**

- Connaît les procédures d'urgence du Projet Odyssey;
- Garde à portée de la main une copie à jour du PMU, incluant une liste mise à jour des coordonnées de chacune des différentes ressources, tant externes qu'internes nécessaires en cas d'urgence.

**INTERVENTION**

- Lorsqu'il reçoit un appel d'urgence ou dès qu'une alarme a été déclenchée, appelle les ressources d'intervention concernées et informe le coordonnateur du PMU de la situation;
- Contrôle l'accès au site;
- Communique immédiatement toute information pertinente au coordonnateur du PMU ou à tout autre intervenant (ex. : arrivée des pompiers sur le site, etc.);
- Assiste le coordonnateur du PMU en effectuant les appels téléphoniques demandés par ce dernier;
- Reçoit et dirige les ressources externes appelées (pompiers, ambulance, police, etc.);
- Prend en note l'heure de départ et la destination des personnes évacuées en cas d'évacuation;
- Complète le formulaire de collecte de données d'appel d'urgence et le remet au coordonnateur du PMU.

# 7. INTERVENANTS EXTERNES

## 7.1 VILLE DE MALARTIC

La Ville veille à la protection de ses citoyens ainsi qu'à la protection des infrastructures municipales sur son territoire. La personne à joindre en cas d'urgence est le chef du service de prévention des incendies et, si requis, le responsable municipal des mesures d'urgence.

## 7.2 SERVICE DE POLICE

Le service de police pour la Ville de Malartic est assuré par la Sûreté du Québec. La Sûreté du Québec est également responsable du contrôle de la circulation sur les routes provinciales à proximité du site en cas de sinistre et elle assure un périmètre de sécurité autour du site et en contrôle l'accès en cas de sinistre majeur.

## 7.3 SERVICE DES INCENDIES DE LA VILLE DE MALARTIC

En tant qu'experts en combat d'incendie, les pompiers doivent être appelés lors de tout incendie (même maîtrisé), explosion et situation pouvant entraîner un incendie ou une explosion (ex. : déversement d'une matière dangereuse inflammable).

Le chef pompier ou son remplaçant a alors la responsabilité de coordonner les opérations visant à protéger la population et les propriétés avoisinantes. Au besoin, il fera appel à d'autres ressources (ex. : service de police, ambulanciers, etc.). À l'intérieur des limites de la propriété de la mine Odyssey, les différents responsables concernés collaborent étroitement avec les pompiers afin de leur fournir les informations pertinentes concernant les produits en cause, la nature des risques, les chemins d'accès et autres informations utiles.

Le temps d'intervention dans des conditions normales et dans les limites de la ville, incluant Mine Canadian Malartic, est de 10 minutes.

## 7.4 PERSONNEL MÉDICAL

En plus du service ambulancier et des centres hospitaliers de la région, Mine Canadian Malartic a deux infirmières qui travaillent à plein temps sur le quart de jour du lundi au vendredi. Elles pourront être rejointes en tout temps par cellulaire, et ceci, avant que l'infirmière dédiée au site ne soit engagée. De plus, un médecin responsable de l'entreprise peut être rejoint par cellulaire via l'infirmière, si nécessaire.

## 7.5 ENVIRONNEMENT CANADA

En vertu de la Loi canadienne sur la protection de l'environnement (LCPE, art.95) et du Règlement sur les urgences environnementales (art.9), tout incident (feu, déversement) impliquant une substance inscrite dans la liste des substances à l'annexe 1 du Règlement sur les urgences environnementales doit être signalé à Environnement Canada dans les meilleurs délais.

Le rapport doit être fait à un inspecteur ou à toute autre autorité prévue par les règlements (agent aux urgences d'Environnement Canada) dans les trente (30) jours suivants l'urgence. La surintendante en environnement assure cette communication.

Présentement aucun de ces produits n'est présent sur le site de la mine Odyssey.

## 7.6 MINISTÈRE DE L'ENVIRONNEMENT ET DE LA LUTTE CONTRE LES CHANGEMENTS CLIMATIQUES (MELCC)

En vertu de l'article 21 de la Loi sur la qualité de l'environnement, le MELCC doit être avisé dès qu'il y a présence accidentelle dans l'environnement d'un contaminant prohibé par règlement du gouvernement ou étant susceptible de nuire à la vie, à la santé, à la sécurité, au bien-être ou au confort de l'être humain, de causer du dommage ou de porter autrement préjudice à la qualité du sol, à la végétation, à la faune ou aux biens.

En plus de s'assurer que les mesures d'intervention et de réhabilitation du site respectent l'intégrité de l'environnement, les experts du MELCC peuvent apporter un appui technique important sur les méthodes d'intervention.

Le directeur en environnement assure les communications avec le MELCC.

## 7.7 COMMISSION DE LA SANTÉ ET DE LA SÉCURITÉ AU TRAVAIL (CNESST)

Un programme de prévention pour l'établissement est présentement en élaboration. Dès qu'il sera complété, il sera approuvé par le comité de santé et de sécurité qui sera en place. Ce programme sera transmis à la CNESST et toutes ses mises à jour seront transmises au fur et à mesure de son évolution.

En vertu de la, Loi sur la santé et la sécurité du travail (article 62) seront aussi transmis à la CNESST les rapports d'accident survenus lors de l'exécution des divers travaux, de même que le rapport écrit de l'enquête et de l'analyse de l'accident, dans l'une ou l'autre des conditions suivantes :

- Le décès d'un travailleur;
- Des blessures entraînant une perte totale ou partielle d'un membre ou de son usage ou un traumatisme physique important;
- Des dommages matériels de 165 000 $ et plus;
- Des blessures à plusieurs travailleurs telles qu'ils ne pourront pas accomplir leurs fonctions pendant un jour ouvrable.

## 7.8 ENTREPRENEURS SPÉCIALISÉS EN ENVIRONNEMENT

Certaines entreprises sont spécialisées dans les interventions lors d'urgences environnementales (ex. : Véolia ES, Newalta, Amnor, etc.). Leur personnel possède une formation de base pour le déploiement de matériel de pompage et de nettoyage des lieux lors d'un déversement.

Leur service de réponse aux urgences peut être disponible 24 heures par jour et elles peuvent offrir un personnel et des équipements spécialisés.

### 7.9 HYDRO-QUÉBEC

Lors d'un incident relié à l'approvisionnement électrique (panne électrique) de la mine Odyssey, la société Hydro-Québec pourrait être appelée à fournir une équipe de mesures d'urgence. Cet organisme possède l'expertise et les moyens pour rétablir le plus rapidement possible le service et réparer les équipements endommagés.

### 7.10 FOURNISSEURS

Les fournisseurs des produits doivent fournir tous les détails importants concernant les dangers associés au produit, les techniques d'intervention ainsi que les lieux d'élimination des déchets générés. Les coordonnées des fournisseurs peuvent être obtenues sur la fiche signalétique des produits ou auprès de l'acheteur du produit.

### 7.11 L'ENTRAIDE ENTRE LES MINES EN CAS DE SINISTRE

La mine Odyssey a conclu des ententes avec les mines situées à proximité afin qu'elles lui viennent en aide en cas de sinistre. Ceci comprend le matériel et les sauveteurs miniers disponibles pour la période requise.

L'entièreté des opérations de sauvetage est sous la responsabilité de la mine qui en fait la demande, soit la mine Odyssey.

Ceci est une pratique largement répandue dans le domaine minier.

### 7.12 SOUS-POSTE CENTRAL DE SAUVETAGE MINIER ET INSTRUCTEUR EN SAUVETAGE MINIER

Sauvetage minier Québec possède et opère un poste central situé dans la municipalité de Val-d'Or. Ce poste central est administré par les instructeurs qui s'y trouvent.

En cas de besoin, l'instructeur devra fournir aux sauveteurs du matériel en bon état et s'assurer qu'il est correctement utilisé. Si la situation d'urgence se prolonge, il devra demander le concours d'autres instructeurs afin d'assurer une permanence sur les lieux.

### 7.13 CATAMINE

L'organisme CATAMINE est mis en place et administré par toutes les mines du Québec.

Elle sert à faire l'inventaire du matériel et du personnel disponibles en cas de sinistre majeur dans une opération minière.

Chaque mine participante doit tenir à la disposition d'une autre mine membre, et qui en a fait la demande, le matériel qu'elle s'est engagée à fournir en cas de besoin.

Un représentant par entreprise doit être nommé.

# 8. LISTE DES NUMÉROS DE TÉLÉPHONE EN CAS D'URGENCE

## 8.1 INTERVENANTS EXTERNES

**Sécurité publique**

| | |
|---|---|
| Urgence (incendie, police, ambulance) | 9-1-1 (24 h) |
| Service des incendies Malartic | 9-1-1 |
| Sûreté du Québec | 9-1-1 |
| Ville de Malartic | 819-757-3611 |
| • Maire de Malartic: Martin Ferron | [redacted] (cellulaire) |
| • Directeur général ville de Malartic: Gérald Laprise | [redacted] (cellulaire) |
| Sécurité publique Québec (Centre des opérations gouvernemental) | 1-866-650-1666 (24 h) |
| Sécurité publique Québec- Direction régionale A-T | 819-763-3636 poste 42750 |
| Sécurité publique Canada | 1-800-830-3118 |
| CANUTEC | 1-603-996-6666 (24 h) |
| CNESST (Martin Roy) | 819-354-7100 |
| Transport Québec | 5-1-1 ou 1-800-355-0511 |

**Santé**

| | |
|---|---|
| Centre antipoison du Québec | 1-800-463-5060 (24 h) |
| Hôpital de Val-d'Or | 819-825-5858 poste 1 |
| Hôpital de Malartic | 819-757-5858 poste 2 |
| Médecin désigné : Marc Frédérick Lee | Cellulaire : [redacted] |
| Centre de toxicologie du Québec | 1-418-650-5115 |
| Centre intégré de santé et des services sociaux | 1-819-764-3264 |

**Environnement**

| | |
|---|---|
| MELCC - Direction régionale (Abitibi-Témiscamingue) | 819-763-3333 |
| MELCC - Urgence Environnement | 1-866-694-5454 (24 h) |
| Environnement Canada-Urgence Environnementale | 1-866-283-2333 |
| Transport Canada (TMD) | 1-514-283-5722 (jour) |
| Régie du Bâtiment du Québec | 819-763-3185 |

**Entrepreneurs spécialisés en environnement**

| | |
|---|---|
| Véolia ES, Rouyn-Noranda | 819-762-6577 |
| Amnor | 819-762-9044 |
| Newalta, Rouyn-Noranda | 1-877-762-5151 |

**Utilités**

| | |
|---|---|
| Hydro-Québec (Pannes et urgences) | 1-800-790-2424 |
| Canadien National (Urgence- police du CN) | 1-800-465-9239 |
| SOPFEU | 819-824-4100 |
| Gaz Métro # compte : 9995-2879-007 | 911 ou 1-800-361-8003 |

**Services météorologiques**

| | |
|---|---|
| Environnement Québec (Info Climat) | 1-418-521-3820 #4579 |
| Environnement Canada | 819-825-4071 |
| **Poste central de sauvetage minier (URGENCE)** | **418-845-9815** |

## 9. INTERVENANTS INTERNES

**Mine Odyssey** **819-757-2225**

| **POSTE DE GARDE** | **Poste 819-757-2225 poste :9000** |
|---|---|
| **DIRECTEUR GÉNÉRAL ODYSSEY**<br>Patrick Mercier | Poste 2503<br>Cellulaire: [redacted] |
| **DIRECTRICE COMMUNICATION MCM**<br>Josée Plouffe | Poste : 2027<br>Cellulaire : [redacted] |
| **DIRECTRICE ENVIRONNEMENT ET DD MCM**<br>Nathalie Tremblay | Poste : 2458<br>Cellulaire : [redacted] |
| **SURINTENDANT MESURES D'URGENCE MCM**<br>Jude Boucher | Poste 2225<br>Cellulaire : [redacted] |
| **SURINTENDANT DE PROJET**<br>Yoan Roy | Poste<br>Cellulaire : [redacted] |
| **SURINTENDANT ADJOINT, ÉVALUATION DE PROJET**<br>Pierre-Olivier Richard | Poste<br>Cellulaire : [redacted] |
| **DIRECTEUR CONSTRUCTION**<br>Marc André Bélanger | Poste 2388<br>Cellulaire : [redacted] |
| **SURINTENDANT GÉNÉRAL CONSTRUCTION**<br>Michel Lemire | Poste 2312<br>Cellulaire : [redacted] |
| **DIRECTEUR ADMINISTRATIF MCM**<br>Christian Roy | Poste 2268<br>Cellulaire : [redacted] |
| **DIRECTREUR RH MCM**<br>Maxime Grondin | Poste 2358<br>Cellulaire : [redacted]<br>Résidence : [redacted] |
| **SUPERVISEUR GÉNÉRAL ODYSSEY**<br>Pierre-Luc Bellavance | Poste 2675<br>Cellulaire : [redacted] |
| **COORDONNATRICE SANTÉ ET SÉCURITÉ**<br>Annie Guay | Poste 6008<br>Cellulaire : [redacted] |
| **INFIRMIÈRE**<br>Stéphanie Nolet | Poste 6911<br>Cellulaire : [redacted] |
| **COORDONNATEUR SÛRETÉ INDUSTRIELLE**<br>Serge Bertrand | Poste 2407<br>Cellulaire : [redacted] |
| **SURINTENDANTE ENVIRONNEMENT**<br>Kim Cournoyer | Poste : 2331<br>Cellulaire : [redacted] |
| | |

## 10. LISTE DES SECOURISTES EN MILIEU DE TRAVAIL

La liste des secouristes en milieu de travail est affichée sur le site de la mine, aux endroits requis. Le nombre devra être en accord avec la règlementation.



Le registraire a supprimé ces informations en vertu des articles 53 et 54 de la Loi sur l'accès aux documents des organismes publics et sur la protection des renseignements personnels (chapitre A-2.1).

# 11. GESTION DES RISQUES

## 11.1 MISE EN CONTEXTE

Ce chapitre présente les principaux risques d'accident reliés à l'exploitation de la mine Odyssey. Soulignons d'emblée que les risques reliés aux activités de l'entreprise sont largement contrôlés par les mesures préventives mises en place.

Les risques soulevés sont ceux qui pourraient avoir des conséquences sur la santé, la sécurité, l'environnement ou les biens pendant la phase exploitation. Pour chaque risque d'accident, les causes possibles sont déterminées et des mesures de contrôle sont présentées en guise de prévention. Les mesures d'urgence appropriées sont élaborées afin d'agir avec diligence, assurance et rapidité en cas de sinistre.

Concernant la phase d'exploitation, tout événement pouvant menacer ou affecter fortement les composantes du milieu induirait le déclenchement du plan de mesures d'urgence. L'application du PMU est assurée par l'équipe de direction. Il importe de souligner que tout employeur sur le site devra se conformer au PMU. En ce sens, tous les employés ayant à travailler sur le site minier devront être informés des mesures d'urgence à suivre (PIU sous forme de procédure), et ceci, via les réunions de sécurité mensuelles.

Lors de l'arrivée sur le site, les nouveaux employeurs, ainsi que tous leurs travailleurs, recevront un accueil. Durant cet accueil, les différentes procédures en cas d'urgence sont présentées. Chacun des employeurs devra fournir un programme de prévention et faire les mêmes activités de prévention que la mine Odyssey (réunion de sécurité, inspection des équipements, etc.).

## 11.2 PROCÉDURES D'INTERVENTION

**Rapport de situation dangereuse**

Le témoin d'une situation dangereuse doit recueillir le maximum d'informations possible afin de pouvoir décrire la situation aux intervenants. Il doit les transmettre à son superviseur immédiat dès que possible afin de faciliter l'analyse de la situation.

**Analyse de la situation**

Dans un premier temps, à la suite d'une alerte ou d'un signalement d'une situation d'urgence, il faut **bien évaluer la situation**, c'est-à-dire connaître :

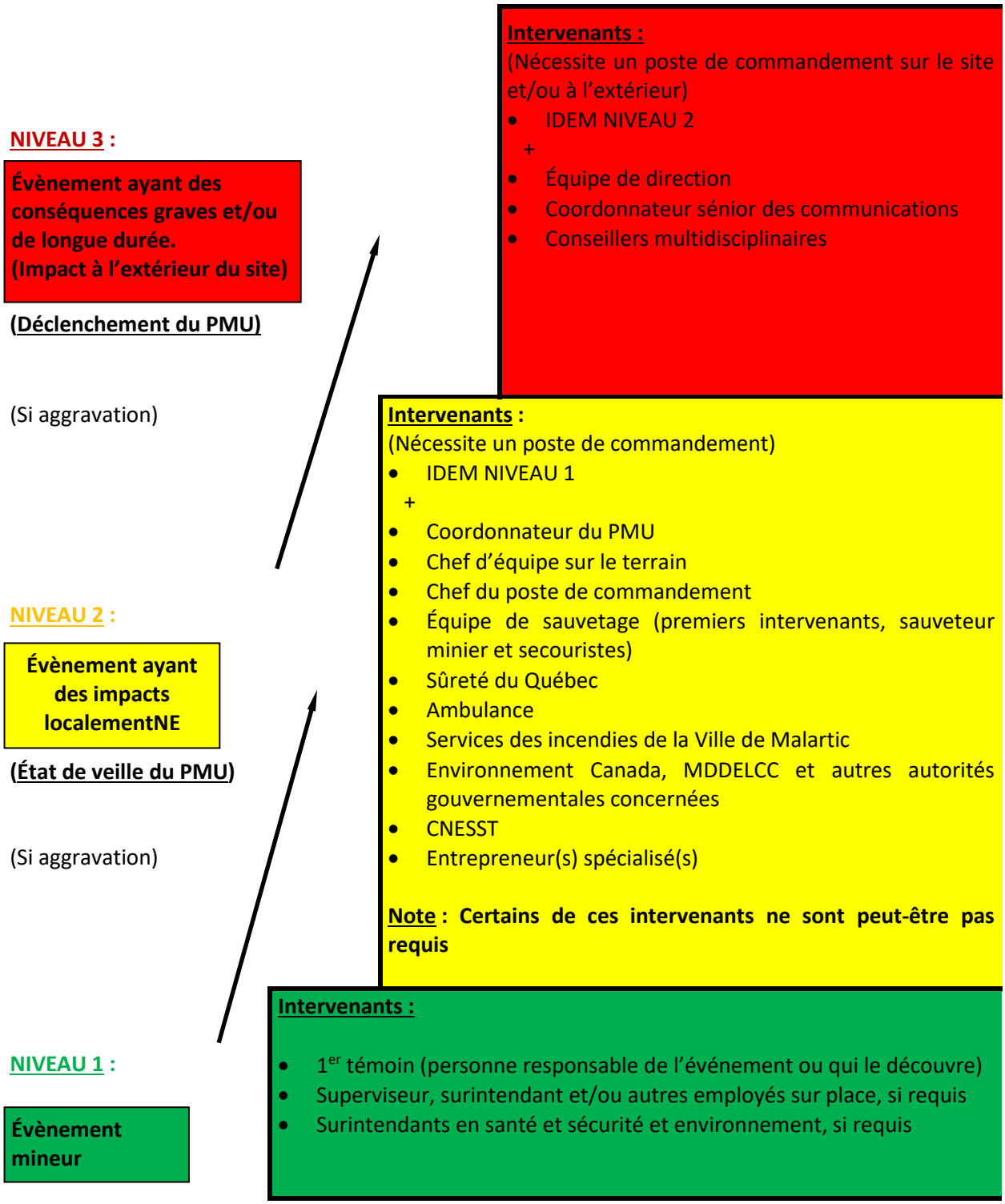
- **La nature du problème**
  - chronologie de l'évènement;
  - nocivité du produit en cause (si nécessaire);
  - type et condition du conteneur (si applicable).

- **Les conditions variables**
  - localisation de l'accident/incident;
  - période (les ressources sont-elles toutes disponibles?);
  - conditions météorologiques actuelles et prévues;
  - accessibilité.
- **Les pertes potentielles**
  - danger pour les travailleurs ?
  - menace à l'environnement?
  - risques pour la propriété et les biens?
- **Les mesures de contrôle**
  - identification des ressources internes et externes qui seront nécessaires.

Dans un second temps, il faut effectuer une **analyse décisionnelle**, c'est-à-dire qu'il faut analyser les diverses alternatives d'intervention et choisir celles qui sont les mieux adaptées à la situation en cours. Pour ce faire, il faut mettre en priorité les objectifs suivants :

- Se protéger contre les expositions en présence des produits ou gaz toxiques, de chaleur, de manque d'oxygène;
- Secourir les personnes blessées ou en danger;
- Contenir ou neutraliser les risques;
- Contrôler l'incendie ou la fuite;
- Prévenir l'escalade des dommages;
- Nettoyer et réhabiliter le site;
- Éliminer les déchets générés.

*Tableau 2 : Niveaux d'intervention*



## 11.3 SUBSTANCES À DÉCLARER EN VERTU DU RÈGLEMENT SUR LES URGENCES ENVIRONNEMENTALES (RUE)

Présentement aucun de ces produits n'est présent sur le site.

## 11.4 PRINCIPAUX RISQUES D'ACCIDENT

Des observations de danger avec les risques associés ont été identifiées. Tous ces risques ont été pris en compte lors de la conception des différentes infrastructures du projet. Les principaux risques d'accident associés à l'exploitation de la mine Odyssey sont :

- Déversement de produits pétroliers ou de produits chimiques;
- Explosion impliquant des explosifs ou des matières dangereuses;
- Érosion et affaissement d'une halde de stérile;
- Accident majeur dans les opérations souterraines;
- Accident majeur dans le complexe (chevalement, bâtiment, garage, etc.)
- Effondrement de galerie;
- Incendie souterrain;
- Incendie de surface.

Les scénarios proposés à titre d'exemple aux sections 12 à 19 servent à illustrer les niveaux d'alarmes selon la gravité de l'évènement.

## 11.5 PRINCIPALES MATIÈRES DANGEREUSES ENTREPOSÉES ET UTILISÉES

Les matières dangereuses mentionnées ci-dessous sont prévues être entreposées et utilisées sur le site. La localisation des réservoirs sur le site est présentée à la section 22 (Plans de localisation des réservoirs et des trousses de déversement).

**Matières :**

- Diesel; (12, 32 et 47)
- Gaz naturel: (4243)
- Essence (58)
- Propane (33)
- Dépôt explosif (46)
- Dépôt détonateur (45)
- Soude caustique (géotube 67)
- Sulfate ferrique (géotube 67)

En cas de déversement, des trousses de déversement sont disponibles aux endroits ciblés dans le plan de localisation situé à la section 22.

# 12. DÉVERSEMENT DE PRODUITS PÉTROLIERS

**Causes**

Les facteurs susceptibles de causer un déversement accidentel de produits pétroliers sont :

- Le débordement ou le bris des réservoirs ou autres contenants;
- La fuite d'une valve ou d'un raccordement;
- Un accident lors du transport;
- La fuite de réservoirs hors terre;
- Un bris de la machinerie;
- Un équipement qui entre en contact avec un réservoir.

Les principales causes des déversements accidentels sont soit reliées à un bris d'équipement ou soit à l'erreur humaine. Les principales origines des déversements accidentels liés aux activités minières sont les fuites de valves, fuites de conduite, fuites de réservoirs hors terre et le débordement des réservoirs ou autres contenants lors du remplissage (Environnement Canada 1998).

# Déversement de produits pétroliers ou de produits chimiques

Tout déversement doit être immédiatement signalé à un membre de l'équipe en environnement de la mine Odyssey.

Le transporteur s'assurera de la mise en place de ses propres procédures d'urgence advenant un déversement accidentel de matières dangereuses (produits pétroliers) lors du transport ou lors du remplissage des réservoirs.

Si un déversement survient, le PMU de Odyssey sera également déployé, si nécessaire. De plus, le secteur d'un déversement sera isolé par un périmètre de sécurité jusqu'au retour normal à la situation.

Si le travailleur ou le témoin connaît les risques et possède les compétences requises (ex. : formation SIMDUT), il peut suivre la procédure suivante. Sinon, il doit demander de l'aide de son supérieur ou d'un autre employé ayant les compétences requises, ou encore appeler l'agent de sécurité au poste de garde pour obtenir de l'aide.

**Note :** *Tout déversement de matières dangereuses doit faire l'objet d'un rapport d'incident.*

**Niveau 1 : Déversement mineur**

SITUATION : Lors de la manipulation d'un produit, une **petite** quantité est déversée sur le sol ou une fuite mineure est découverte.

1. Essayer de contrôler la fuite. Si requis, demandez de l'aide;
2. Aller chercher le matériel d'intervention nécessaire et se vêtir des équipements de protection individuelle (ÉPI) supplémentaires requis;
3. Établir un périmètre de sécurité;
4. Confiner le produit déversé;
5. Aviser les responsables concernés (supérieur) qui évalueront les moyens de récupération;
6. Disposer des résidus contaminés au lieu désigné, après avoir informé la surintendante en environnement;
7. Restaurer le site, sous la supervision du département d'environnement.

**Niveau 2 : Déversement majeur**

SITUATION : Lors de la manipulation d'un produit, une **grande** quantité est déversée sur le sol ou une fuite importante est remarquée.

1. Tenter de contrôler le déversement sans s'exposer aux risques;
2. Contacter son superviseur pour demander assistance. Indiquer de quel produit il s'agit;
3. Établir un périmètre de sécurité;
4. Intervenir auprès de l'équipe formée pour le contrôle de déversement (solide ou liquide). Utiliser les trousses environnementales et faire appel à des firmes extérieures, s'il y a lieu;
5. Confiner le produit déversé;
6. Contrôler tout risque que le produit se retrouve dans l'environnement (ex : boucher les drains, endiguer le produit, etc.);
7. Déclencher, au besoin, l'évacuation du secteur si le produit déversé peut représenter un danger pour les autres travailleurs. Déclencher l'alarme visuelle et sonore sur l'ensemble du site (le déclenchement peut être manuel ou automatique), si nécessaire;
8. Mettre en veille le plan de mesure d'urgence (PMU).

**Niveau 3 : Déversement incontrôlable**

SITUATION : Lors de la manipulation de produit, une grande quantité s'est déversée et la situation risque de devenir incontrôlable. Les effectifs sur le site peuvent devenir insuffisants des ressources externes sont nécessaire. La situation met en danger la sécurité des employés, les infrastructures et l'environnement.

1. Déclenchement du PMU.

# 13. EXPLOSION IMPLIQUANT DES EXPLOSIFS OU DES MATIÈRES DANGEREUSES

**Causes**

Les activités liées à l'exploitation minière requièrent l'usage d'explosifs. Les différents produits composant les explosifs, tous sous forme inerte, seront entreposés et livrés indépendamment des détonateurs, rendant de ce fait impossible une explosion spontanée. Les facteurs à l'origine d'un accident impliquant une explosion seront donc essentiellement liés à une erreur ou à une négligence lors de l'usage ou de la manutention des explosifs.

**Mesures préventives et de contrôle**

Afin de prévenir toute négligence ou erreur lors de la manutention ou de l'usage des explosifs, des panneaux d'affichage seront installés dans tous les lieux d'entreposage. Ces panneaux indiqueront :

- Les conditions d'entreposage;
- Les précautions à prendre lors de la manutention;
- Les conditions d'utilisation et les autres informations pertinentes.

Le transport sera effectué selon les règlements de la CNESST. Les véhicules servant au transport des produits explosifs seront balisés à cet effet et les personnes qui manipuleront les explosifs auront les compétences et les formations requises.

## EXPLOSION IMPLIQUANT DES EXPLOSIF OU DES MATIÈRES DANGEREUSES

**Niveau 1 : Lors d'une explosion, le niveau 2 est activé automatiquement**

**Niveau 2 : explosion nécessitant une évacuation**

SITUATION : L'explosion provoque des dommages aux installations, un début d'incendie et des gaz sont présents sur le site.

### TÉMOIN

- Activer l'alarme d'incendie;
- Aviser immédiatement son superviseur immédiat, si ce n'est pas déjà fait, et l'agent de sécurité au poste de garde (poste 9000) et donner les informations suivantes :
  - Son nom;
  - La nature de l'explosion (produit impliqué, équipement, etc.);
  - L'endroit exact de l'explosion;
  - Le nom des personnes en difficulté, s'il y a lieu.
- Aviser les autres travailleurs présents à proximité de son environnement de travail;
- Se diriger vers le lieu de rassemblement (carte du lieu de rassemblement à la fin du document et affichée aux endroits stratégiques sur le complexe) et y demeurer jusqu'à nouvel ordre. Ceci permettra aux responsables de l'évacuation de s'assurer que personne ne manque à l'appel.

### AGENT DE SÉCURITÉ AU POSTE DE GARDE

- À la réception d'un appel signalant une explosion, l'agent de sécurité doit prendre en note toutes les informations qui lui ont été communiquées;
- Communiquer le service des incendies de la Ville de Malartic si requise. Fournir toutes les informations pertinentes à la situation d'urgence;
- Utiliser le formulaire à la page 63 (Formulaires de collecte de données : appel d'urgence);
- Demeurer à son poste et attendre les services d'urgence. Diriger ceux-ci vers le lieu de l'explosion;
- L'agent de sécurité doit fermer la barrière afin de ne permettre aucune entrée ni aucune sortie sans obtenir préalablement l'autorisation d'un responsable de l'évacuation. Ceci est valable pour tous les employés à l'exception des personnes concernées par l'urgence.

### Surintendant Santé Sécurité/surintendant surface

- Coordonner les interventions sur le site;
- Aviser la direction;
- Mise en état de veille le PMU
- Voir au rétablissement et déclarer la fin de l'urgence seulement après les ordres du chef pompier;
- Compléter le rapport d'incident et le rapport post-mortem afin de documenter l'incident.

**Niveau 3 : suite à l'explosion avec présence d'incendie non contrôlé, possibilité de nouvelles explosions, dégagement de gaz possible nécessitant une évacuation de plus grand périmètre**

SITUATION : suite à l'explosion avec incendie non contrôlé, possibilité de nouvelles explosions, dégagement de gaz possible nécessitant une évacuation et dont des fumées potentiellement toxiques peuvent atteindre la population de Malartic :

1. Activer le plan de mesures d'urgence (PMU).

Note : un feu impliquant des explosifs demande une évacuation et 1.5 km par rapport au centre de l'incendie d'où la nécessité de déclencher le PMU

# 14. ÉROSION ET AFFAISEMENT D'UNE HALDE DE STÉRILE

**Causes**

Les causes les plus fréquentes concernant les bris ou les fuites des digues sont :

- Une mauvaise conception;
- Une lacune au niveau de l'inspection des ouvrages;
- Une pluie exceptionnelle ou un séisme de force majeure.

**Mesures préventives et de contrôle**

La conception d'ouvrage de retenue est réalisée par une firme d'ingénieur reconnue. Les plans et devis ont été émis pour tous les ouvrages. Des analyses de stabilité statique et pseudo-statique ont été réalisées en utilisant les propriétés des matériaux de construction utilisés Les propriétés sont basées sur l'expérience acquise lors de travaux similaires de construction, avec des types de matériaux comparables et des digues existantes dans la région et d'essais de laboratoire.

Le suivi de l'intégrité des composantes de la halde de stérile est basé sur la réalisation systématique d'inspections visuelles tout au long de l'année. Cinq types d'inspection sont possibles et seront mises en place si nécessaire :

- Des inspections routinières (quotidiennes);
- Des inspections hebdomadaires;
- Des inspections spécifiques (suite à des anomalies observées);
- Des inspections détaillées (mensuelles);
- Une inspection annuelle faite par le concepteur.

Toutes ces inspections sont tenues en registre lorsqu'effectuées.

# Érosion et affaissement d'une halde de stérile

Tout déplacement de matériel non prévu à la halde de stérile au sud des installations doit être signalé.

La première action à prendre serait d'arrêter immédiatement l'ajout de matériel sur la halde.

Effectuer les travaux nécessaires afin de stabiliser la halde.

**Note :** *Cette procédure s'applique à une urgence de niveaux 2 ou 3 seulement.*

**Niveau 2 : détection d'un déplacement de matériel à la halde de stérile**

SITUATION : mise en danger des installations incluant le chevalement et donc la sortie principale des travailleurs œuvrant sous terre :

1. Évaluer la nécessité d'évacuer les bâtiments;
2. Évaluer la possibilité que le chevalement soit inutilisable;
3. Évaluer la possibilité que du matériel se retrouve dans le puit;
4. Mettre en veille le plan de mesures d'urgence (PMU) et aviser les personnes clés.

**Niveau 3 : déplacement de matériel incontrôlable à la halde de stérile**

- Mettre en place un plan d'intervention d'urgence spécifique pour le déplacement de la halde.
- Activer le plan de mesures d'urgence (PMU).
- Aviser les autorités :
  - Les autorités gouvernementales (Sécurité publique, MELCC, SQ);
- Mettre en place un plan de communication aux médias et à la population;

# 15. ACCIDENT MAJEUR DANS LES OPÉRATIONS SOUSTERRAINES

**Causes d'accident majeur**

Les éléments susceptibles de causer un accident majeur dans les opérations minières souterraines sont les suivants :

- Stabilité des murs et plafonds;
- Coup de terrain ou secousse sismique et infiltration d'eau;
- Défaillance mécanique (équipement mobile);
- Erreur humaine.

Les facteurs mentionnés ci-dessus n'auront pas tous le même genre d'impact sur les mesures d'urgence à adopter et les mesures préventives. Les mesures préventives et de contrôle qui seront prises pour chacun de ces facteurs sont les suivantes :

**Stabilité des murs et plafonds**

- Programme de contrôle de terrain en conformité avec les exigences de la CNESST;
- Registre de contrôle de terrain;
- Formation spécifique pour les travailleurs; reconnaître les instabilités de terrain.

**Coup de terrain, secousse sismique et infiltration d'eau**

- Étude et caractérisation géologique;
- Instrumentation;
- Formation au personnel.

**Défaillance mécanique**

- Formation pour les travailleurs sur les équipements qu'ils devront utiliser (foreuse, chargeuse, camions, etc.);
- Inspection préventive des équipements;
- Formation de nos mécaniciens par le fabricant.

**Erreur humaine**

- Formation des travailleurs par un programme de formation adapté à nos besoins;
- Mise en place d'un comité de formation qui identifie les besoins de formation et fait les recommandations qui s'imposent à la direction. Un programme de suivi des compétences fera partie intégrante du processus d'évaluation du personnel;
- Application de la « Formule de supervision » telle que préconisée par l'Association minière du Québec.

Dans les mesures préventives, il faut avoir un nombre suffisant de secouristes sur tous les quarts de travail et assurer leur formation.

# Accident majeur dans les opérations souterraines

Tout accident majeur doit être immédiatement signalé à son superviseur et par la suite au surintendant en santé et sécurité. De plus, le secteur de l'accident sera isolé par un périmètre de sécurité jusqu'au retour à la situation normale.

Si le travailleur ou le témoin connaît les risques et possède les compétences requises (ex. : formation en premiers soins), il peut suivre la procédure suivante. Sinon, il doit demander de l'aide de son supérieur ou d'un autre employé ayant les compétences requises, ou appeler l'agent de sécurité au poste de garde.

**Note :** *Tout évènement doit faire l'objet d'un rapport d'accident.*

**Niveau 1 : Évènement sans conséquence**

SITUATION : Un événement survient dans les opérations souterraines **sans conséquence** sur la santé la sécurité et sans bris d'équipement.

- Évaluer le besoin d'une enquête : isoler la zone de l'évènement en mettant en place un périmètre de sécurité si une enquête est nécessaire;
- Communiquer l'information au supérieur immédiat.

**Niveau 2 : Accident avec conséquence mineure**

SITUATION : Un accident survient dans les opérations souterraines avec une conséquence **mineure** sur la santé et la sécurité d'un travailleur.

- Évaluer le besoin d'une enquête : isoler la zone de l'accident en mettant en place un périmètre de sécurité;
- Communiquer l'accident au supérieur immédiat et donner les informations suivantes :
  - Son nom;
  - La nature de l'accident (produit impliqué, équipement, etc.);
  - L'endroit exact de l'accident;
  - Le nom des personnes en difficulté, s'il y a lieu.
- Aviser les autres travailleurs présents à proximité;
- Le superviseur doit contacter son surintendant
- Le surintendant du département doit contacter le surintendant en santé et sécurité.

**Niveau 3 : accident avec conséquence majeure**

SITUATION : Un accident survient dans les opérations souterraines avec une conséquence **majeure** sur la santé et la sécurité de plus d'un travailleur.

**TÉMOIN**

- Aviser immédiatement son superviseur immédiat, si ce n'est déjà fait, et l'agent de sécurité au poste de garde (poste 9000) si une ambulance est requise et donner les informations suivantes :
  - Son nom;
  - La nature de l'accident;
  - L'endroit exact de l'accident;
  - Le nom des personnes en difficulté, s'il y a lieu.
- Demander l'intervention des sauveteurs miniers ;
- Demander l'intervention de l'infirmière.

**SUPERVISEUR**

- Organiser les secours avec l'aide des sauveteurs minier ;
- Assurer le transport de la victime ;
- S'assurer que le service ambulancier est contacté.
- Faire libérer les voies d'accès

**AGENT DE SÉCURITÉ AU POSTE DE GARDE**

- À la réception d'un appel signalant un accident, l'agent de sécurité doit prendre en note toutes les informations qui lui ont été communiquées et suivre les directives qui lui sont données ;
- Communiquer avec le service ambulancier si requis ;
- Aviser le surintendant en santé sécurité et suivre ses directives ;
- Utiliser le formulaire à la page 63 (Formulaires de collecte de données : appel d'urgence);
- Demeurer à son poste et attendre les services d'urgence. Diriger ceux-ci vers le lieu de l'accident;
- L'agent de sécurité doit fermer la barrière afin de ne permettre aucune entrée ni aucune sortie sans obtenir préalablement l'autorisation d'un responsable. Ceci est valable pour tous les employés à l'exception des personnes concernées par l'urgence ;
- Communiquer avec le coordonnateur du PMU si la demande est faite.

**DIRECTION DE LA MINE et SURINTENDANT SANTÉ SÉCURITÉ**

- Assister la coordination des interventions sur le site ;
- Mettre en veille ou activer le plan de mesures d'urgence (PMU) si plusieurs travailleurs sont impliqués ;
- Contacter la CNESST
- Contacter le département des ressources humaines
- Voir au rétablissement et déclarer la fin de l'urgence ;
- Compléter le rapport d'accident et le rapport post-mortem afin de documenter l'accident.

# 16. ACCIDENT MAJEUR DANS LE COMPLEXE (CHEVALEMENT, BÂTIMENT, GARAGE, ETC.)

**Causes d'accident majeur**

Les facteurs susceptibles de causer un accident majeur au complexe sont les suivants :

- Défaillance mécanique d'équipement mobile;
- Défaillance mécanique d'équipement fixe;
- Erreur humaine.

Les facteurs mentionnés ci-dessus n'auront pas tous le même genre d'impact sur les mesures d'urgence à adopter et les mesures préventives. Voici les mesures préventives et de contrôle qui seront prises pour chacun de ces facteurs :

**Défaillance mécanique équipement mobile**

- Formation pour les travailleurs sur les équipements qu'ils devront utiliser (foreuse, chargeuse sur roues, camions, etc.);
- Inspection préventive des équipements;
- Formation de nos mécaniciens par le fabricant;

**Défaillance mécanique d'équipement fixe**

- Formation pour les travailleurs sur les équipements qu'ils devront utiliser (pont roulant, moteur, pompe, treuil, compresseur, etc.);
- Inspection préventive des équipements;
- Formation de nos mécaniciens par le fabricant.

**Erreur humaine**

- Formation des travailleurs par un programme de formation adapté à leurs besoins;
- Mise en place d'un comité de formation qui identifie les besoins de formation et fait les recommandations qui s'imposent à la Direction;
- Établissement de contrôle des compétences acquises durant et après la formation.

Dans les mesures préventives, il faut avoir un nombre suffisant de secouristes sur tous les quarts de travail et en assurer leur formation.

**Procédure applicable**

Toute personne témoin d'un accident de travail majeur devra appliquer la procédure en cas d'accident. Cette dernière est maintenue à jour sur le réseau informatique interne.

# Accident majeur dans le complexe (chevalement, bâtiment, garage, etc. )

Tout accident majeur doit être immédiatement signalé à son superviseur et par la suite au surintendant en santé et sécurité. De plus, le secteur de l'accident sera isolé par un périmètre de sécurité jusqu'au retour à la situation normale.

Si le travailleur ou le témoin connaît les risques et possède les compétences requises (ex. : formation premiers soins), il peut suivre la procédure suivante. Sinon, il doit demander de l'aide de son supérieur ou d'un autre employé ayant les compétences requises, ou appeler l'agent de sécurité au poste de garde.

**Note :** *Tout évènement doit faire l'objet d'un rapport d'accident.*

**Niveau 1 : Évènement sans conséquence**

SITUATION : Un événement survient au complexe **sans conséquence** sur la santé la sécurité et sans bris d'équipement.

- Évaluer le besoin d'une enquête : isoler la zone de l'évènement en mettant en place un périmètre de sécurité si une enquête est nécessaire;
- Communiquer l'information au supérieur immédiat.

**Niveau 2 : Accident avec conséquence mineure**

SITUATION : Un accident survient au complexe avec une conséquence **mineure** sur la santé et la sécurité d'un travailleur.

- Évaluer le besoin d'une enquête : isoler la zone de l'accident en mettant en place un périmètre de sécurité;
- Communiquer l'accident au supérieur immédiat et donner les informations suivantes :
  - Son nom;
  - La nature de l'accident (produit impliqué, équipement, etc.);
  - L'endroit exact de l'accident;
  - Le nom des personnes en difficulté, s'il y a lieu.

- Aviser les autres travailleurs présents à proximité;
- Contacter le surintendant en santé et sécurité.

**Niveau 3 : accident avec conséquence majeure**

SITUATION : Un accident survient au complexe avec une conséquence **majeure** sur la santé et la sécurité de plus d'un travailleur.

**TÉMOIN**

- Aviser immédiatement son superviseur immédiat, si ce n'est pas déjà fait, et l'agent de sécurité au poste de garde (poste 9000) si une ambulance est requise et donner les informations suivantes :
  - Son nom;
  - La nature de l'accident;
  - L'endroit exact de l'accident;
  - Le nom des personnes en difficulté, s'il y a lieu.
- Aviser les autres travailleurs présents à proximité de son environnement de travail ;
- Se diriger vers le lieu de rassemblement (carte du lieu de rassemblement à la fin du document et affichée aux endroits stratégiques sur le complexe) et y demeurer jusqu'à nouvel ordre. Ceci permettra aux responsables de l'évacuation de s'assurer que personne ne manque à l'appel.

**AGENT DE SÉCURITÉ AU POSTE DE GARDE**

- À la réception d'un appel signalant un accident, l'agent de sécurité doit prendre en note toutes les informations qui lui ont été communiquées et suivre les directives qui lui sont données ;
- Communiquer avec le service ambulancier si requis ;
- Aviser le surintendant en santé sécurité et suivre ses directives ;
- Utiliser le formulaire à la page 63 (Formulaires de collecte de données : appel d'urgence);
- Demeurer à son poste et attendre les services d'urgence. Diriger ceux-ci vers le lieu de l'accident ;
- L'agent de sécurité doit fermer la barrière afin de ne permettre aucune entrée ni aucune sortie sans obtenir préalablement l'autorisation d'un responsable. Ceci est valable pour tous les employés à l'exception des personnes concernées par l'urgence.
- Communiquer avec le coordonnateur du PMU si la demande est faite.

**Superviseur**

- Coordonner les interventions sur le site (périmètre de sécurité, sauveteurs, ambulanciers, etc.)
- Aviser la direction ;
- Mettre en veille ou activer le plan de mesures d'urgence (PMU);
- Compléter le rapport d'accident et le rapport post-mortem afin de documenter l'accident.

# 17. EFFONDREMENT DE GALERIE

Le risque d'effondrement dans une mine souterraine est l'un des dangers les plus présents.

C'est pourquoi toutes les excavations doivent faire l'objet de plan et devis d'ingénieur. Ces plans déterminent la grandeur d'excavation permise ainsi que le support de terrain adéquat pour supporter les murs et plafond. Des plans de forage et sautage sont également émis afin de minimiser les impacts sur les ouvertures adjacentes.

Un registre de contrôle de terrain doit aussi être mis en place afin de permettre à tout travailleur de rapporter toutes anomalies présentes sous terre. Lors d'un tel rapport, l'ingénieur en charge doit en prendre connaissance et y apporter les correctifs nécessaires et, dans tous les cas, expliquer sa position. La prise de connaissance de ce registre est faite au quotidien.

Des inspections périodiques doivent également être faites par des personnes compétentes pour l'ensemble des ouvrages. Ces inspections doivent être maintenues en registre.

Avec de tel mesure de contrôle, les effondrements sont exceptionnels. Lorsqu'ils surviennent, c'est souvent le résultat d'erreur humaine (procédure de travail mal exécutée, charge explosive mal calculée, etc.) ou d'une méconnaissance de contact géologique ou de failles non identifiées. « Les coups de terrain » sont spectaculaires mais heureusement peu fréquents. Une instrumentation adéquate pourra être installée au fur et à mesure de l'avancement des travaux. Il est encore trop tôt pour établir la fréquence des contrôles et las actions subséquentes.

Un effondrement, même sans travailleur impliqué, demeure une situation préoccupante. Cependant, ceci ne constitue pas un élément des mesures d'urgence. En termes de perte, seule la production et les activités à proximité de l'effondrement seront affectées.

Si des travailleurs sont blessés suite à un tel événement, les mesures d'urgence seront les mêmes qu'à la section 15 - Accident majeur dans les opérations souterraines.

# 18. INCENDIES SOUTERRAINS

Un incendie dans les opérations souterraines est probablement la pire catastrophe qui peut survenir. Ainsi, toutes les précautions doivent être prises afin d'éviter ce type de sinistre.

Les incendies peuvent avoir pour origine le matériel roulant ou stationnaire. On les classe en trois catégories :

1. Matériel stationnaire :
   Compresseur, pompe, câble, courroie, convoyeur, équipement de coupe au chalumeau et équipement de soudage, moteur, génératrice, transformateur, concasseur, trolley, etc.
2. Matériel roulant :
   Tout véhicule motorisé circulant au fond de la mine : foreuse, chargeuse, camion, locomotive, boulonneuse, plateforme de travail, etc.
3. Autres causes
   Combustion spontanée, explosion, article de fumeur, etc.

**Causes d'incendie**

Les causes les plus fréquentes sont les suivantes :

- Électricité
- Friction
- Surchauffe
- Explosifs
- Étincelles
- Appareils de coupe au chalumeau (métal chaud ou en fusion)
- Meules
- Soudage
- Chaufferettes
- Combustion spontanée
- Explosions de poussière
- Explosions causées par la présence de gaz

Les incendies sont presque toujours le résultat d'une négligence et de défectuosités que des inspections préventives auraient permis de déceler. Les causes les plus fréquentes d'incendie dans les mines du Québec au cours des dix dernières années sont, par ordre d'importance :

a) Le matériel roulant diesel circulant au fond des mines : camions, chargeuses, etc. ;
b) L'électricité : câbles, moteurs, chargeurs de batteries, chaufferettes, locomotives, etc. ;
c) Le matériel de coupe au chalumeau (au gaz) ;
d) Le matériel fixe : concasseur, convoyeur ;
e) Le matériel de soudage ;
f) Les rebus, la combustion spontanée, etc.

Pendant ou après un incendie de mine, les deux plus grands dangers sont l'intoxication au monoxyde de carbone et la suffocation par manque d'oxygène, et ceci, en plus de la possibilité d'être directement atteint par la chaleur.

En présence d'un incendie, on doit toujours tenir compte des points suivants :

- L'origine du feu
    - Électrique
    - Hydraulique
- Le type de combustible
    - Solide (bois, caoutchouc, câblage électrique
    - Liquide (carburant, huile, etc.)
- La présence d'explosif
- La présence de boisage
- La direction de la ventilation
- La proximité des sorties de secours et des refuges

Si on est en présence d'un petit feu, on peut l'éteindre soi-même si la personne ne se met pas en danger et que le risque de propagation est très limité. S'il s'agit d'un feu moyen, on doit plutôt aller chercher du renfort. Si on est en présence d'un gros feu, on doit immédiatement faire appel à des spécialistes.

Se rappeler que tous les feux (à moins d'une explosion) ont débuté petit et qu'il est possible qu'il progresse très rapidement.

Il est très important que toute personne qui œuvre dans un milieu souterrain connaisse les procédures en cas d'incendie et les applique avec rigueur.

**Procédure applicable**

Toute personne témoin d'un incendie devra appliquer la procédure en cas d'incendie. Cette dernière est maintenue à jour sur le réseau informatique interne.

## INCENDIE SOUTERRAIN

**Niveau 1 : découverte d'un incendie naissant**

SITUATION : Un travailleur est témoin du début d'un incendie.

1. Déterminer le type d'incendie (solide, liquide, électrique);
2. Avoir l'assurance d'éteindre le feu sans mettre sa vie en danger. Ne jamais mettre de l'eau s'il s'agit d'un feu d'origine électrique. Utiliser les extincteurs de type ABC;
3. Aviser le superviseur ou son remplaçant désigné et l'informer de la situation;
4. Assister le superviseur pour compléter le rapport d'incident.

**Niveau 2 -3: découverte d'un incendie qui ne pourras être maitrisé**

SITUATION : L'incendie ne peut être maîtrisé rapidement et risque de prendre de l'ampleur

**TÉMOIN**

- Activer l'alarme d'incendie (selon l'endroit et l'avancement du développement des opération, la façon de pourrait changer);
- Aviser immédiatement les travailleurs de son secteur ainsi que son superviseur immédiat, si ce n'est pas déjà fait;
- Aviser l'agent de sécurité au poste de garde (poste 9000) avec le système LTE et donner les informations suivantes :
  - Son nom;
  - La nature de l'incendie (bois, huile, électrique, etc.);
  - L'endroit exact de l'incendie;
  - Le nom des personnes en difficulté, s'il y a lieu;
  - Demander de déclencher le système d'alarme souterrain;
  - Attendre que votre interlocuteur ait raccroché;
- Se diriger vers le refuge le plus près en tenant compte de la ventilation;
- Marche à suivre dans un refuge :
  - Contactez votre superviseur avec le réseau LTE et indiquer votre localisation;
  - Fermer la porte du refuge et colmater s'il y a de la fumée dans la galerie;
  - Récupérer de l'eau si possible;
  - Ouvrir l'air comprimé;
  - Fermer les lampes non nécessaires;
  - Demeurer calme;

- Marche à suivre dans l'impossibilité de se rendre dans un refuge :
  - Se diriger vers une tente de survie ou un fond de galerie;
  - Ouvrir l'air comprimé;
  - Tenter de se faire un abri avec une toile de ventilation ou un vêtement;
  - Signaler votre présence en frappant régulièrement sur les canalisations en place.

**AGENT DE SÉCURITÉ AU POSTE DE GARDE**

- À la réception d'un appel signalant un incendie, l'agent de sécurité doit prendre en note toutes les informations qui lui ont été communiquées;
- Communiquer avec le(s) surintendant(s) en place. Fournir toutes les informations pertinentes à la situation d'urgence;
- Déclencher le système d'alarme souterrain;
- Demeurer à son poste et attendre les services d'urgence et les diriger vers la salle de sauvetage minier.

(L'agent de sécurité doit fermer la barrière afin de ne permettre aucune entrée ni aucune sortie sans obtenir préalablement l'autorisation d'un responsable de l'urgence. Ceci est valable pour tous les employés à l'exception des personnes concernées par l'urgence)

**Responsable du sauvetage minier**

- Aviser la direction;
- S'adjoindre toute l'aide nécessaire;
- Convoquer les sauveteurs miniers;
- Coordonner les interventions souterraines;
- Voir au rétablissement et déclarer la fin de l'urgence ;
- Compléter les rapports et faire un post-mortem.

# 19. INCENDIE DE SURFACE

**Causes**

Les incendies sont souvent liés à l'usage ou à la mauvaise manutention des produits pétroliers et chimiques tels que certains gaz comprimés comme l'acétylène et le propane. L'utilisation d'équipement défectueux ou de système de chauffage d'appoint ou temporaire est aussi à l'origine d'incendie. Dans le cas de déversements de produits pétroliers, le risque d'incendie est plus élevé lorsque la concentration des vapeurs atteint l'indice d'inflammabilité, surtout dans les endroits mal aérés et fermés.

Un incendie peut également survenir à la suite d'une défectuosité électrique ou une négligence telle une mauvaise procédure lors de l'oxycoupage.

**Mesures préventives et de contrôle**

Afin de réduire les risques d'incendie, différentes mesures seront mises en place :

- Formation du personnel ayant à manipuler ou utiliser des produits à risque;
- Panneaux indicateurs placés aux endroits où sont entreposés des produits inflammables afin d'informer les utilisateurs sur les mesures de précaution à prendre lors de l'utilisation de ces produits;
- Procédures de travail à chaud (permis de coupage et soudure obligatoire) sont élaborées;
- Le travail impliquant l'utilisation de chaleur et de flamme sera exécuté par des personnes dont la compétence est reconnue par MCM;
- Les bâtiments seront pourvus de système de protection des incendies ainsi que des détecteurs de fumée et de chaleur (selon le bâtiment);
- Les employés sont sensibilisés à l'importance des précautions à prendre face aux dangers des feux ;
- Un poste de garde et un système de sécurité ont été mis en place afin de contrôler les entrées et les sorties du site;
- Des exercices d'évacuation sont effectués chaque année pour chacun des groupes de travailleurs;
- Le directeur du Service d'incendie de la Ville de Malartic est invité à venir faire des inspections de nos installations et émettre des recommandations.

# Incendie de surface

Si le travailleur ou le témoin a déjà suivi une formation pour lutter contre les incendies, il peut suivre la procédure suivante, si sa sécurité n'est pas compromise. Sinon, il doit demander de l'aide de son supérieur ou d'un autre employé ayant les compétences requises.

Tout incendie doit être immédiatement signalé au surintendant de son département.

**Note :** *Tout incendie doit être rapporté au supérieur immédiat et faire l'objet d'un rapport d'incident, même s'il est contrôlé.*

**Niveau 1 : début d'incendie**

SITUATION : Un travailleur est témoin du début d'un incendie.

- Déterminer le type d'incendie (solide, liquide, électrique);
- Essayer d'éteindre le feu sans mettre sa vie en danger. Ne jamais mettre de l'eau s'il s'agit d'un feu d'origine électrique. Utiliser les extincteurs de type ABC;
- Aviser le superviseur ou son remplaçant désigné et l'informer de la situation;
- Rester sur les lieux afin de renseigner les responsables sur la situation;
- Assister le superviseur pour compléter le rapport d'incident.

**Note :** *Si la situation s'aggrave et que le témoin ne peut éteindre l'incendie, il doit activer l'alarme d'incendie et aviser l'agent de sécurité au poste de garde.*

**Niveau 2 : incendie non contrôlé nécessitant une évacuation**

SITUATION : L'incendie ne peut être maîtrisé rapidement et risque de prendre de l'ampleur (propagation aux autres secteurs).

**TÉMOIN**

- Activer l'alarme d'incendie;
- Aviser immédiatement son superviseur immédiat, si ce n'est pas déjà fait, et l'agent de sécurité au poste de garde (poste 9000) et donner les informations suivantes :
  - Son nom;
  - La nature de l'incendie (bois, huile, électrique, etc.);
  - L'endroit exact de l'incendie;
  - Le nom des personnes en difficulté, s'il y a lieu.
- Aviser les autres travailleurs présents à proximité de son environnement de travail;
- Se diriger vers le lieu de rassemblement (carte du lieu de rassemblement à la fin du document et affichée aux endroits stratégiques sur le complexe) et y demeurer jusqu'à nouvel ordre. Ceci permettra aux responsables de l'évacuation de s'assurer que personne ne manque à l'appel.

AGENT DE SÉCURITÉ AU POSTE DE GARDE

- À la réception d'un appel signalant un incendie, l'agent de sécurité doit prendre en note toutes les informations qui lui ont été communiquées;
- Communiquer avec le service des incendies de la Ville de Malartic. Fournir toutes les informations pertinentes à la situation d'urgence;
- Aviser les surintendants en place et suivre ces directives;
- Utiliser le formulaire à la page 63;
- Demeurer à son poste et attendre les services d'urgence. Diriger ceux-ci vers le lieu de l'incendie;
- L'agent de sécurité doit fermer la barrière afin de ne permettre aucune entrée ni aucune sortie sans obtenir préalablement l'autorisation d'un responsable de l'évacuation. Ceci est valable pour tous les employés à l'exception des personnes concernées par l'urgence.

**SURINTENDANT SUR PLACE**

- Coordonner les interventions sur le site;
- Aviser la direction;
- Mettre le PMU en état de veille
- Voir au rétablissement et déclarer la fin de l'urgence seulement après les ordres du chef pompier de la Ville de Malartic;
- Compléter le rapport d'incident et le rapport post-mortem afin de documenter l'incident.

# 20. MODALITÉ D'ALERTE ET NOTIFICATION

Cinq types d'urgence sont identifiés dans cette planification des mesures d'urgence qui nécessitent des appels à l'extérieur du site :

1. Urgence environnementale (déversement de produit dangereux): secteur du complexe;
2. Urgence accident : secteur souterrain;
3. Urgence accident : secteur du complexe;
4. Incendie majeur; surface et souterrain
5. Urgence dépôt d'explosifs.

**1. <u>Urgence environnementale (déversement de produit dangereux incluant les produits toxique et pétrolier): Secteur du complexe</u>**

**Toute alarme de niveau 3 sera automatiquement notifiée aux instances responsables dans les plus brefs délais suivant le déclenchement de l'alarme. (Voir liste de téléphone d'urgence – externe)**

- Ministère de l'Environnement et de la lutte contre les changements climatiques (MELCC), provincial et Direction régionale;
- Environnement Canada;
- Ville de Malartic;
- CNESST;
- Sécurité publique Canada;
- Sécurité publique du Québec;
- Agence de la santé et des services sociaux.

**2. <u>Urgence accident: Secteur souterrain</u>**

**Toute alarme de niveau 3 sera automatiquement notifiée aux instances responsables dans les plus brefs délais suivant le déclenchement de l'alarme. (Voir liste de téléphones d'urgence – externe)**

- CNESST;
- CSSSVO si plusieurs blessés

**3. <u>Urgence accident : Secteur du complexe</u>**

**Toute alarme de niveau 3 sera automatiquement notifiée aux instances responsables dans les plus brefs délais suivant le déclenchement de l'alarme. (Voir liste de téléphones d'urgence – externe)**

- CSSSVO si plusieurs blessés;
- CNESST;

**4. <u>Incendie majeur surface et souterrain</u>**

**Toute alarme de niveau 3 sera automatiquement notifiée aux instances responsables dans les plus brefs délais suivant le déclenchement de l'alarme. (Voir liste de téléphones d'urgence – externe)**

- Ville de Malartic (pompiers);
- CNESST;
- CSSSVO
- Poste central de sauvetage minier
- CATAMINE

**5. <u>Urgence dépôt d'explosif</u>**

**Toute alarme de niveau 3 sera automatiquement notifiée aux instances responsables dans les plus brefs délais suivant le déclenchement de l'alarme. (Voir liste de téléphones d'urgence – externe)**

- Ville de Malartic (pompiers);
- CNESST;
- CSSSVO;

# 21. Déclenchement du plan de mesures d'urgence (PMU)

Le plan de mesures d'urgence peut être déclenché en tout temps. C'est un plan qui sert à identifier les acteurs principaux appelés à gérer une urgence et leur fonction. Il est basé sur l'évaluation de risque fait en concordance avec les dangers identifiés sur le site.

Seuls le directeur général, le directeur de projet ou le coordonnateur des mesures d'urgence peuvent amorcer le processus. Cependant, tous les directeurs et surintendants peuvent faire la demande de déclencher le PMU.

Trois lieux sont prévus pour la coordination des mesures d'urgence :

- La salle de sauvetage minier du complexe Odyssey;
- Salle Canadian Malartic, située dans le bâtiment administratif au site de la mine Canadian Malartic;
- Salle de conférence au Bureau des relations avec la communauté, 1041, Rue Royale, Malartic.

Il est à souligner que le déclenchement du plan de mesures d'urgence ne se fait pas immédiatement après une fuite, un déversement ou tout autre accident. Le plan sera déclenché lorsque la situation risque de dégénérer et de devenir incontrôlable et que des ressources externe et spécialisée seront requises.

À titre d'exemple, pour un incendie mineur qui requiert la présence des pompiers de Malartic, une évaluation de l'étendue, du nombre de personnes en danger, de la possibilité de perte de contrôle sera faite avant de devoir déclencher le plan.

**Déclenchement du PMU**

***(Note : La séquence ci-dessous illustre une situation où c'est le coordonnateur des mesures d'urgence qui reçoit un appel. Il est fort probable qu'avant que ce dernier ne reçoit l'appel, que plusieurs actions aient été menées par des travailleurs et superviseurs qui auraient été témoins des événements)***

- À la réception de l'appel d'urgence, le coordonnateur des mesures d'urgence demande au directeur général de la mine ou le directeur de projet de se rendre à l'endroit le plus adéquat et l'informe de la situation;
- Le coordonnateur du PMU informe le directeur général de la situation actuelle;
- Évaluation de la situation avec les données disponibles.

Deux choix :
- Demande d'information supplémentaire avant de prendre décision;
- Déclenchement immédiat du PMU.

**Note : demander de l'information supplémentaire peut retarder l'intervention d'urgence. Elle peut aussi préciser les ressources nécessaires.**

- Déclenchement du plan de mesures d'urgence.

**Note : à partir de ce moment, et selon la disponibilité des intervenants, certaines tâches sont exécutées simultanément.** Exemple : faire le contrôle de la circulation sur le site et l'appel des intervenants.

- Assurer le contrôle de la circulation sur le site par le poste de garde :
  - Fermer le chemin d'accès (route 117) sans exposer personne, selon le sinistre;
  - Faire libérer les voies de circulation;
  - Contrôler les entrées et les sorties du site;
  - Diriger les gens vers les aires d'évacuation ou les bâtiments les plus près et accessibles;
  - Diriger les ressources extérieures selon les instructions reçues.

- Convoquer toutes les ressources internes dans la salle de sauvetage minier. Utiliser la liste de téléphone d'urgence-interne.

- Aviser la CNESST si des travailleurs sont impliqués.

**Note : le rôle de chacun est défini dans la section *Descriptions et responsabilité des intervenants.***

À leur arrivée dans la salle de sauvetage minier, ils se rapportent au coordonnateur. À ce moment, ils doivent prendre les moyens nécessaires pour effectuer leurs tâches respectives.

Si l'un des intervenants devait quitter la salle, il doit en aviser le coordonnateur des mesures d'urgence et expliquer la raison de son départ. Il doit avoir un système de communication permettant de rejoindre la salle du sauvetage minier. L'équipe de direction avec le coordonnateur des mesures d'urgence doit procéder aux tâches suivantes ou les redistribuer à d'autres intervenants disponibles :

- Établissement de la stratégie d'intervention selon la nature du sinistre :
  i. Disponibilité du personnel;
  ii. Disponibilité du matériel;
  iii. Évaluation de l'étendue du sinistre :
    1. Nombre de victimes réel;
    2. Nombre de personnes manquantes;
    3. Étendue de la contamination (réelle ou potentielle);
    4. Étendue de l'incendie ou la possibilité qu'un incendie se déclare;
    5. Possibilité que la population soit affectée (évacuation ou sécurisation);
  iv. Établissement du plan d'intervention;
  v. Établir le périmètre de sécurité;
  vi. Établissement d'un centre de contrôle rapproché;
  vii. Décontamination, si nécessaire.

- Prévoir les sources d'énergie disponibles pour l'intervention :
  - Électricité;
  - Génératrice;
  - Compresseurs;
  - Autres.
- Communiquer avec les ressources externes. Utiliser la liste de téléphones d'urgence-externe.

**Note : les étapes suivantes se répètent périodiquement selon l'évolution de la situation et les rapports d'intervention des équipes sur le terrain. Elles se répètent jusqu'à contrôle de la situation.**

- Réévaluation de la situation de façon périodique selon l'évolution de la situation et les rapports des équipes d'intervention;
- Évaluation du personnel disponible. Prévoir suffisamment de personnel pour prendre la relève le cas échéant;
- Évaluation du matériel disponible et de remplacement;
- Prévoir si l'accès au site est possible et par quelles voies. Dans la négative, évaluer les alternatives;
- Prévoir une aire de repos pour les équipes d'intervention si la situation doit se prolonger;
- Communiquer régulièrement avec les employés confinés dans les bâtiments ou sous terre si tel est le cas. Donner l'information juste et concise;
- Prévoir un ravitaillement et des mesures d'hygiène si la situation doit se prolonger : eau potable en priorité.

Lorsque la situation est contrôlée, prévoir les mesures de réparation et de communication :

- Communiquer avec les employés et faire un bref bilan;
- Information de la population et médias;
- Mettre en place des équipes de surveillance ou de nettoyage;
- Apporter un support psychologique, selon les demandes (choc post-traumatique), aux équipes d'intervention et travailleurs impliqués;
- Mettre en place les mesures de réparation.

**Fin de l'intervention d'urgence**

Mesures de suivi à la suite du déclenchement du plan d'intervention d'urgence :

- Enquête et analyse avec les intervenants ;
- Recommandations ;
- Plan de mesures d'action ;
- Suivi ;
- Évaluations de la suffisance des correctifs apportés.

### 21.1 Mise à jour et mise à l'essai du PMU

Le PMU de la mine Odyssey sera révisé deux fois par année (en juin et décembre) et sera envoyé aux parties prenantes.

Pour ce qui est de la mise à l'essai du PMU ou des PIU (Plan d'Intervention d'Urgence), et en accord avec la réglementation, les essais suivants seront faits :

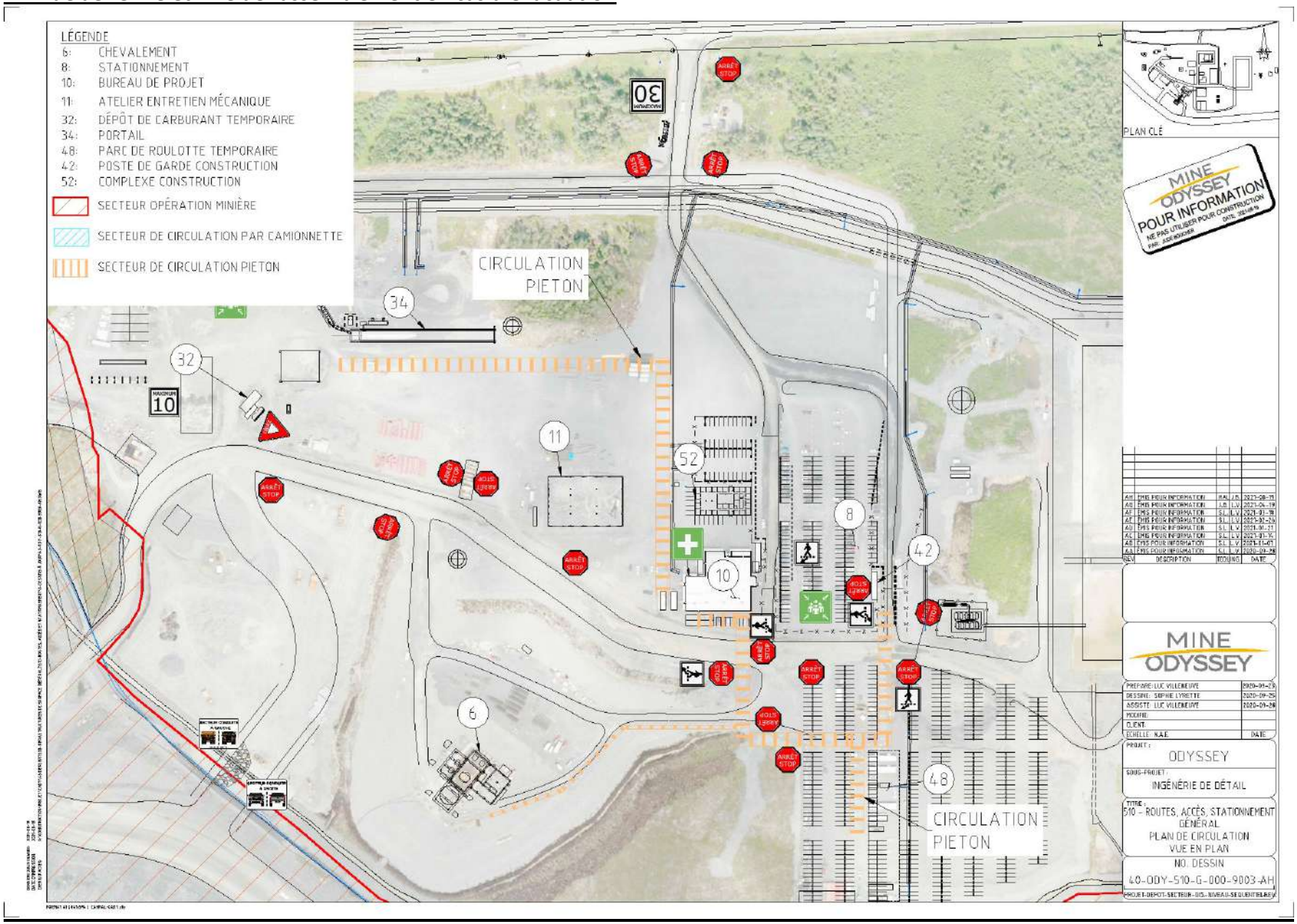
- Un exercice de sauvetage visant à vérifier l'efficacité et le fonctionnement du système d'alarme, et ceci une fois par année sur le quart de travail ou il y a le plus grand nombre de travailleur. Ce système d'alarme pour les opérations souterraines sera une combinaison d'alarme olfactif et d'appel sur le système téléphonique souterrain LTE.
- Les membres de l'équipe de sauvetage minier sont formés et entrainés régulièrement. Lors de chacun de ces entrainements, ils utilisent tout le matériel de sauvetage et simule des situations d'urgence. Ces entrainements sont sous la supervision d'un formateur de Sauvetage minier Québec. Pour chacun des membres, il y a un minimum de 4 entrainements par année. Idéalement, c'est 6 entrainements qui devraient être fait par chacun des membres.

# 22. PLAN DE LOCALISATION

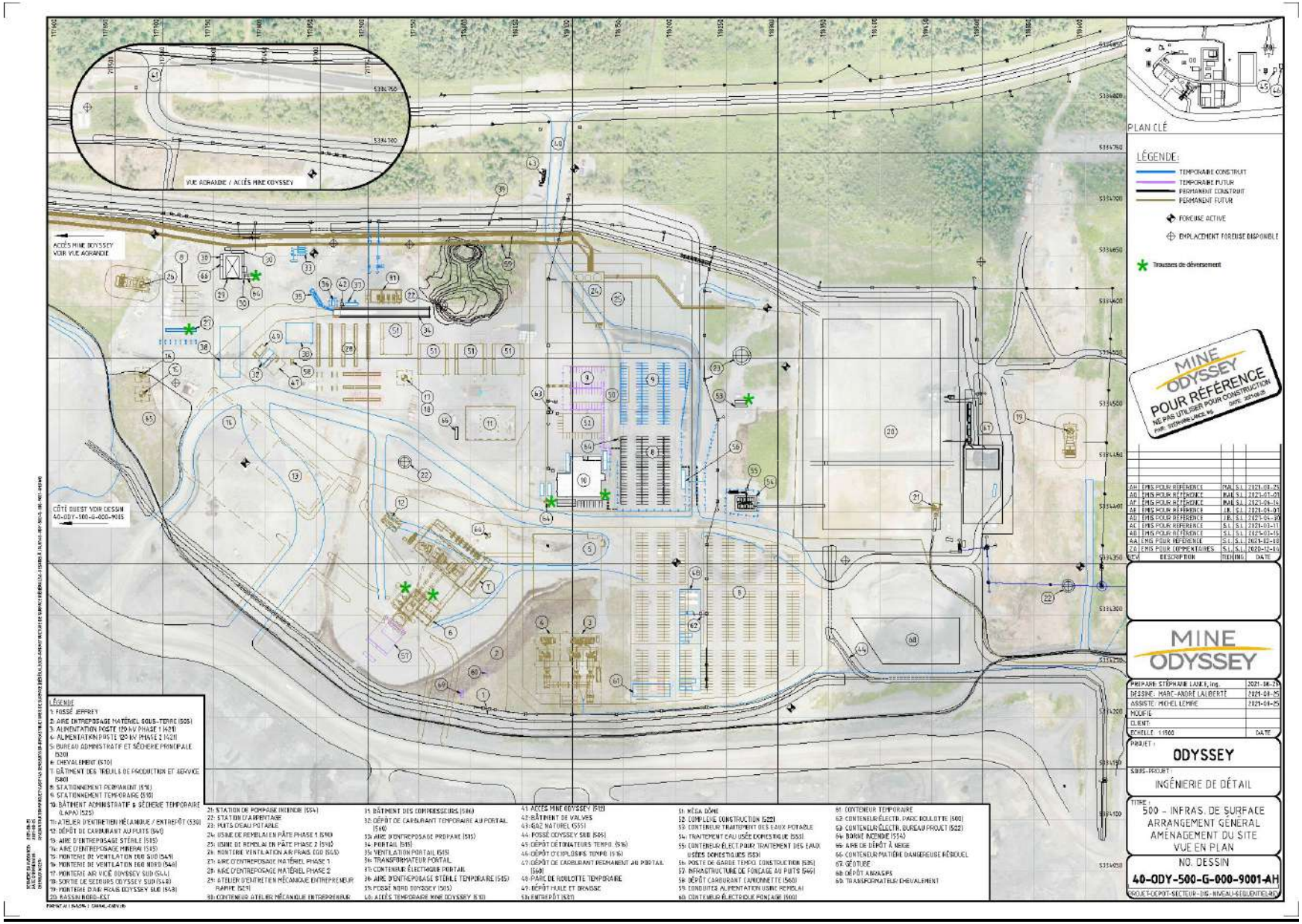
Plans de localisation:

- Vue aérienne (date) et Aire de rassemblement en cas d'évacuation (date)
- Plan de localisation des réservoirs et des trousses de déversement

## 1 – Vue aérienne et Aire de rassemblement en cas d'évacuation



## 2 - Plan de localisation des réservoirs et des trousses de déversement



# 23. ANNEXES : LETTRE D'ENTENTE

- Arrimage PMU de MCM et Ville de Malartic

Arrimage PMU de MCM et Ville de Malartic

| | |
|---|---|
| Destinataire(s) : | Martin Ferron, Maire de Malartic<br>Gérald Laprise, directeur général ville de Malartic<br>Louis Brisson, directeur service incendie de la ville de Malartic |
| Expéditeur : | Jude Boucher, surintendant mesures d'urgence Mine Canadian Malartic |
| Date : | 14 novembre 2017 |
| **Objet :** | **Arrimage entre les plans de mesures d'urgence de Mine Canadian Malartic et la Ville de Malartic** |

Mine Canadian Malartic et la Ville de Malartic sont en accord pour que les plans de mesures d'urgence des deux partenaires comportent des points d'arrimage solide afin de perpétuer une bonne entente et une bonification de nos plans respectifs.

En ce sens nous convenons des points d'arrimage suivants :

- Mise en commun entre les pompiers de la Ville de Malartic et les premiers intervenants de MCM des équipements et formation suivantes :
  - Site d'entrainement
  - Compresseurs
  - Détecteurs de gaz
  - Simulateur de gaz pour les pratiques
  - Station de calibration pour les détecteurs de gaz
  - Formation de sauvetage en espace clos et sauvetage en hauteur
  - Système de vérification pour les habits classe A (vérification annuelle)
- Participation sur le site de MCM des pompiers de Malartic à des exercices et simulations et ceci 4 fois par année
- Visite annuelle des installations
  - Visite de la caserne de pompiers de Malartic par les premiers intervenants de MCM
  - Visite de l'usine et bâtiment de MCM par les pompiers de Malartic
- Mise en commun des radios lors d'intervention
- Entente de libération des pompiers de la Ville de Malartic, et employé de la MCM lors d'intervention d'importance dans la ville de Malartic
- Information donnée à la direction des services incendie de tout changement sur le site de MCM
- Information transmise par MCM sur les particularités de certaines installations (garage, entrepôt, etc.) afin que les pompiers de Malartic puissent développer des plans d'intervention efficace
- Utilisation des premiers intervenants de MCM, formé HAZMAT, pour toute intervention de ce type dans les limites de la ville de Malartic
- Information donnée et mise à jour des PMU lors des rencontres du CMMI
- Assurance qu'en cas d'intervention ailleurs que chez MCM, la couverture sera toujours assurée via les ententes conclues entre les services incendie à l'intérieur du schéma de couverture de risque de la MRC

# 24. FORMULAIRES

Liste des formulaires joints à être utilisés en situation d'urgence :

- Formulaire de collecte de données : Appel d'urgence ;
- Suivi minute par minute.

## Formulaires de collecte de données : appel d'urgence

Date : _____ Heure : _____
Nom de la personne qui appelle : _____
Lieu d'appel de cette personne : _____
Téléphone du lieu de l'appel : _____
Nature du sinistre : Accident ☐ Déversement ☐
Incendie ☐ Explosion ☐
Autres ☐ _____
Lieu de l'urgence : _____
Nombre de personnes à secourir : _____
Secours nécessaire : Pompier ☐ Trousse environnementale ☐
Secouristes ☐ Désincarcération ☐
Autre ☐ _____
Personnel déjà sur les lieux : _____
Message reçu par : _____

---

**A compléter après avoir reçu l'appel d'urgence**
Heure que les secours furent appelés : _____
Heure d'arrivée des secours : _____
Autre personnel appelé : _____Heure : _____
Autre information : _____

Signature : _____

# FORMULAIRE D'INTERVENTION MINUTE PAR MINUTE

| TEMPS ESTIMÉ | INITIAL | TERMINAL | FAIT PAR | ACTIONS |
|---|---|---|---|---|
| | | | | |
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# ANNEXE

# QCM-19A

## APPROBATION PRÉLIMINAIRE DU PÉRIMÈTRE D'UN BAIL MINIER ENVISAGÉ (MÉRN, 2021)

Énergie et Ressources naturelles
Québec

**Direction du développement et du contrôle de l'activité minière**

Québec, le 30 avril 2021

Monsieur Martin Duclos, directeur environnement
Canadian Malartic GP
100, chemin du Lac Mourier
Malartic (Québec)  J0Y 1Z0

**Objet : Approbation préliminaire du périmètre d'un bail minier envisagé**

Monsieur,

Pour faire suite aux discussions au sujet d'une éventuelle demande de bail minier localisée dans le feuillet SNRC 32D01, nous avons reçu les plans nécessaires à l'analyse de la superficie visée. La superficie du bail envisagée est de 528 hectares et respecte l'article 102 de la Loi sur les mines. Suivant l'analyse du périmètre demandé, nous vous informons qu'aucune problématique majeure n'a été soulevée.

Afin de se conformer aux exigences de l'article 210 de la Loi sur les mines, l'arpentage du terrain visé doit être réalisé par un arpenteur-géomètre qui devra se conformer aux instructions du ministre, en l'occurrence les Instructions générales d'arpentage 2013 disponibles sur le site du ministère de l'Énergie et des Ressources naturelles. Avant d'entreprendre ses travaux, l'arpenteur-géomètre mandaté devra adresser une requête au Bureau de l'arpenteur général du Québec. Cette requête devra être accompagnée de la présente lettre avec le plan montrant le terrain requis.

Notez que cette approbation préliminaire de superficie ne garantit en rien la délivrance d'un bail minier. De plus, cette superficie pourrait être sujette à des changements et soumise à une ou des modifications de son périmètre durant l'analyse de la demande de bail minier.

Veuillez agréer, Monsieur, l'expression de mes sentiments les meilleurs.

Roch Gaudreau, directeur

Direction du développement et du contrôle de l'activité minière

p. j.

5700, 4e Avenue Ouest, local C-320
Québec (Québec)  G1H 6R1
**Téléphone : 418 627-6292**
**Sans frais : 1 800 363-7233**
Télécopieur : 418 643-4264
Courriel : roch.gaudreau@mern.gouv.qc.ca

| Point | Coordonnée (X) | Coordonnée (Y) |
|---|---|---|
| 1 | 715648 m.E | 5333405 m.N |
| 2 | 715660 m.E | 5334090 m.N |
| 3 | 716417 m.E | 5334193 m.N |
| 4 | 716783 m.E | 5334411 m.N |
| 5 | 717092 m.E | 5334408 m.N |
| 6 | 717287 m.E | 5334300 m.N |
| 7 | 717805 m.E | 5334310 m.N |
| 8 | 717797 m.E | 5334741 m.N |
| 9 | 717015 m.E | 5334808 m.N |
| 10 | 716389 m.E | 5334951 m.N |
| 11 | 716385 m.E | 5335048 m.N |
| 12 | 719245 m.E | 5334919 m.N |
| 13 | 719302 m.E | 5334538 m.N |
| 14 | 719328 m.E | 5334131 m.N |
| 15 | 719455 m.E | 5333654 m.N |
| 16 | 718666 m.E | 5332965 m.N |
| 17 | 715829 m.E | 5333336 m.N |

#111734

# Périmètre préliminaire de bail minier

**Périmètre du bail minier (528 ha)**

Site (SMS)

Le chiffre identifie le numéro du site, la lettre dans la partie inférieure gauche identifie la substance extraite et celle dans la partie droite le statut du site d'extraction

**Substance extraite**
G) Gravier S) Sable
A) Argile P) Pierre concassée
**Statut du site d'extraction**
C) Ouvert sous conditions O) Ouvert

Roch Gaudreau, directeur

**Métadonnées**

**Projection cartographique**
Système de référence géodésique North American 1983
Projection UTM (Universal Transverse Mercator)
Zone 17

**1/ 20 000**
0 250 500 750 1000 m

**Sources**

| Données | Organisme | Année |
|---|---|---|
| Données minières | MERN | 2021 |
| Référence cartographique | | |
| BDTQ 20K | MERN | 2006 |

Réalisation
Ministère de l'Énergie et des Ressources naturelles
Service de la gestion des droits miniers
Direction du développement et du contrôle de l'activité minière
Note : Le présent document n'a aucune portée légale

©Gouvernement du Québec, 30 avril 2021

Ministère de l'Énergie et des Ressources naturelles
Québec

# ANNEXE

# QCM-19B

## EXTRAITS DU SADR DE LA MRC DE LA VALLÉE-DE-L'OR (MAI 2005)

# Schéma d'Aménagement et de Développement

Entrée en vigueur : 20 mai 2005

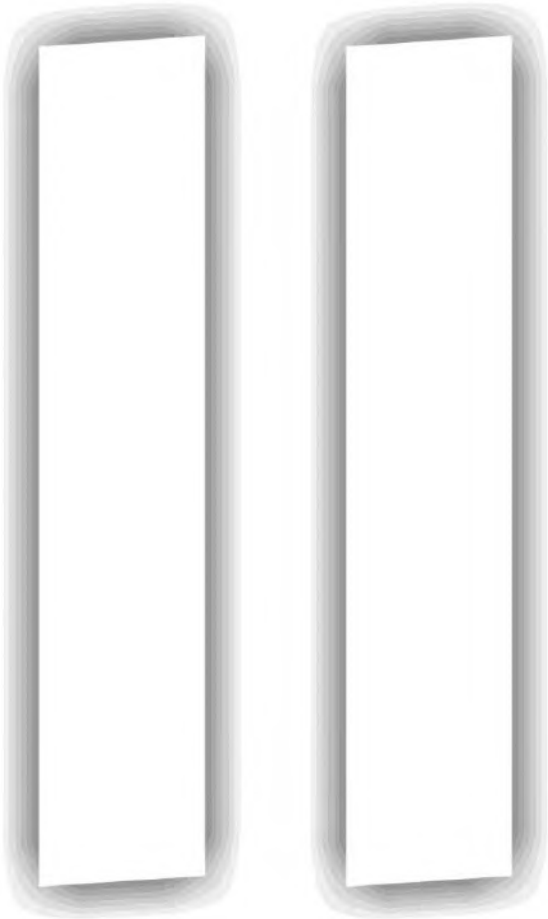
MRC de La Vallée-de-l'Or

*Service de l'aménagement et du développement*

# Chapitre II

## Les grandes orientations d'aménagement

**La structure hiérarchique municipale**
**Les services publics**
**L'urbanisation du territoire**
**Le transport et les télécommunications**
**Le développement énergétique**
**L'industrie**
**Les ressources naturelles**
**L'agriculture**
**L'environnement**
**L'activité récréo-touristique**
Les limites administratives



# 2.0 Les grandes orientations d'aménagement

## 2.1 Objectifs généraux

Les grandes orientations découlent à la fois d'une analyse du milieu, du développement passé, des tendances observables et des volontés municipales et régionales. Elles constituent un énoncé des principales intentions de la MRC de La Vallée-de-l'Or à l'égard de l'aménagement et du développement territorial. Les grandes orientations véhiculent les tendances majeures, les principes directeurs que la MRC veut promouvoir à cet effet.

Les grandes orientations énoncées à l'intérieur du présent document sont le résultat d'un travail de réflexion auquel s'est prêtée la MRC. Pour se faire, les facteurs suivants ont été pris en considération: le degré de réalisation du schéma de première génération, les nouvelles orientations gouvernementales en matière d'aménagement ainsi que les préoccupations et besoins exprimés par le milieu. La détermination des grandes orientations se veut donc l'expression d'un consensus établi entre les membres du conseil et ce, à partir des enjeux dégagés des problématiques d'aménagement et de développement du territoire.

Par ailleurs, les grandes orientations retenues par la MRC mettent l'accent sur trois éléments fondamentaux; la réalité géographique du territoire, les potentiels de développement et la recherche du mieux-être de la collectivité.

Par le biais des grandes orientations et des objectifs qui en résultent, le conseil de la MRC entend fournir un cadre propice au développement socio-économique du territoire. Cependant, l'atteinte d'un tel but requiert un effort concerté des partenaires du milieu. Le conseil compte impliquer chaque acteur dans la mise en oeuvre du schéma d'aménagement et de développement. Le plan d'action qui constitue un document d'accompagnement et de support à la réalisation du schéma précisera l'apport de chaque partenaire dans ce processus.

Les plans et règlements municipaux refléteront également les choix d'aménagement formulés par le conseil de la MRC. Aussi, ces derniers devront s'inscrire en conformité avec les orientations et objectifs du schéma d'aménagement et de développement.

La MRC énonce les onze (11) grandes orientations d'aménagement suivantes:

- ***Planifier l'aménagement et le développement du territoire en respectant la structure hiérarchique municipale;***

- ***Assurer le maintien et le développement des services et équipements publics sur le territoire de la MRC;***

- ***Limiter l'extension urbaine sur le territoire de la MRC en favorisant la consolidation des périmètres d'urbanisation;***

- ***Assurer une desserte régionale efficiente en matière de transport et de télécommunications;***

- ***Dans le respect des diverses composantes territoriales de la MRC, favoriser le développement des infrastructures et des ressources énergétiques en accord avec les principes d'efficacité et d'utilisation rentable;***

- ***Favoriser le développement et la diversification des activités industrielles sur le territoire de la MRC;***

- ***Privilégier une utilisation rationnelle et une mise en valeur intégrée des ressources naturelles;***

- ***Assurer la reconnaissance de la zone agricole comme base territoriale pour la pratique de l'agriculture et prioriser les activités agricoles en zone agricole;***

- ***Contribuer à la protection de l'environnement, au bien-être et à la sécurité des citoyens;***

- ***Développer l'activité récréo-touristique sur le territoire de la MRC;***

- ***Harmoniser les limites administratives des organismes publics et parapublics à celles de la MRC.***

Peu de municipalités de la MRC réunissent les conditions nécessaires au développement de l'industrie. Plusieurs d'entre elles présentent de nombreuses carences en matière de structure d'accueil industriel et ne peuvent ainsi pourvoir adéquatement aux besoins de certaines entreprises. Des facteurs tels que la taille de ces municipalités et leur incapacité à assumer la charge de certains équipements ne sont pas étrangers à cette situation. L'implantation de nouvelles activités industrielles devrait donc s'effectuer prioritairement à l'intérieur des espaces régionaux planifiés à cette fin, en particulier, lorsque celles-ci requièrent d'importants équipements et infrastructures.

Considérant la problématique industrielle explicitée, le conseil de la MRC énonce la grande orientation suivante:

Sixième grande orientation:

***Favoriser le développement et la diversification des activités industrielles sur le territoire de la MRC.***

Objectifs:

- ***Éviter l'étalement de l'industrie en concentrant son développement à l'intérieur des espaces planifiés à cette fin;***
- ***Préserver l'intégrité des espaces industriels de la MRC;***
- ***Assurer le développement prioritaire des espaces industriels régionaux;***
- ***Diversifier la structure industrielle de la MRC en favorisant le développement d'entreprises à valeur ajoutée (deuxième et troisième transformation).***

Moyens de mise en oeuvre:

- *La MRC verra à ce que le plan local d'action en matière de développement économique et de l'emploi du CLD reflète le plus fidèlement possible les objectifs du schéma d'aménagement et de développement en matière de développement industriel;*
- *La mise en branle, par le milieu, d'un projet mobilisateur interpellant la communauté des gens d'affaires et les organismes de soutien afin de stimuler le développement économique de la MRC (Zone active);*
- *La réalisation d'un parc thermique à Senneterre dans le cadre du projet de « Cité de l'énergie verte. ».*

- *Les entreprises industrielles ne pourront être implantées qu'à l'intérieur des secteurs planifiés à cette fin (à l'exception de l'industrie nécessitant le prélèvement ou le traitement de la ressource sur place). Seuls les usages industriels de même que ceux jugés compatibles à l'industrie pourront y être autorisés;*

- *La création ou l'agrandissement d'une zone industrielle ou d'un parc industriel ne sera autorisé que dans la mesure où les besoins en matière d'espaces le justifieront. À cet égard, le règlement modificateur devra être accompagné d'un document argumentaire démontrant une telle nécessité;*

- *Le schéma d'aménagement et de développement ne crée aucune limitation à l'égard des usages industriels ou connexes permis à l'intérieur des espaces industriels régionaux (voir affectation industrielle au "Plan d'affectation du territoire" en annexe). Par ailleurs, le tableau 3.2 du chapitre III définit les usages autorisés dans toute autre zone industrielle.*

### 2.2.7 Les ressources naturelles

Le développement économique de la MRC est largement tributaire des ressources naturelles présentes sur son territoire. Aujourd'hui encore, les entreprises minières et forestières constituent le fer de lance du développement économique régional. Cette dépendance incite le milieu à la vigilance notamment lorsque le mode de gestion des ressources est mis en cause. Une telle attitude découle non seulement des craintes engendrées par un tarissement éventuel de la ressource mais également des conséquences de son prélèvement sur les activités "coexistentes". Il ne faut donc guère s'étonner de l'intérêt que porte la population envers cette question ni du fait qu'elle se sente interpellée par celle-ci.

Vue l'importance des ressources naturelles pour le développement socio-économique régional, la MRC formule la grande orientation suivante:

*Septième grande orientation:*

***Privilégier une utilisation rationnelle et une mise en valeur intégrée des ressources naturelles.***

Les objectifs du schéma d'aménagement qui se lient à cette septième grande orientation et en précisent les intentions sont définis à la suite aux volets 2.2.7.1 et 2.2.7.2 portant respectivement sur les mines et la forêt.

### 2.2.7.1 Les mines

*Portrait:*

Depuis le "boom" minier des années 1930, les propriétés minières n'ont cessé de s'étendre jusqu'à couvrir la presque totalité du territoire de certaines municipalités. La majorité des propriétés minières sont des baux miniers accordés par le ministère des Ressources naturelles et de la Faune du Québec moyennant le paiement d'une rente et l'exécution de travaux d'exploration par la compagnie minière.

L'activité minière occupe une place prépondérante dans l'économie régionale. Elle procure plus de 1500 emplois directs dans le seul district minier de Val-d'Or. L'essentiel de l'activité minière s'exerce de part et d'autre de la faille de Cadillac soit dans l'axe Louvicourt-Val-d'Or-Malartic.

Le territoire de la MRC de La Vallée-de-l'Or compte quatre (4) mines en opération (figure 2.3). Les producteurs d'or sont les mines Sigma, Croinor de même que la mine Beaufor; notons que 25% de l'or produit au Québec origine des sous-sols du district minier de Val-d'Or. Pour sa part, la mine Louvicourt produit principalement des métaux usuels (cuivre, zinc et argent) en plus d'une certaine quantité d'or. Par ailleurs, huit (8) projets miniers à caractère aurifère sont présentement à l'étude dans le secteur de Val-d'Or : East Amphi, Goldex, Kiena et Westdome, ressource Métanor, Courville, Tiblemont et Demain. Une usine de traitement des minéraux opèrent ses activités sur le territoire soit Camflo; les mines Louvicourt et Sigma disposent également d'un concentrateur. Mentionnons l'existence d'une mine-laboratoire sur le territoire de Val-d'Or. Cette dernière est exploitée par le *Centre canadien de la technologie, des minéraux et de l'énergie* (CANMET) afin d'appuyer l'industrie minière dans la mise en oeuvre de projets liés à la recherche appliquée. La ville de Val-d'Or regroupe également les bureaux de la direction régionale du ministère des Ressources naturelles et de la Faune - secteur mines ainsi que ceux du centre régional de sauvetage minier (Abitibi-Témiscamingue).

La commission scolaire de l'Or-et-des-Bois possède le mandat provincial de ministère de l'Éducation pour la formation des travailleurs miniers. Reconnue pour son expertise, celle-ci a reçu le mandat du ministère des Ressources naturelles et l'ACDI d'implanter un programme de formation en santé et sécurité du travail en Bolivie. L'école nationale des mines vise aussi à répondre aux attentes du monde du travail en matière de formation initiale et continue des travailleurs miniers.

Ces dernières années, l'industrie minière a évolué dans un contexte économique peu favorable aux investissements miniers. La dépréciation des métaux, en particulier celui de l'or, a freiné de façon considérable la réalisation des projets d'exploration et de mise en valeur. Cette situation a également conduit à l'exode des capitaux vers l'étranger, notamment dans les régions où l'exploitation de gisements s'effectue à un coût moindre.

Le nombre de gravières et de sablières actuellement en exploitation sur le territoire de la MRC reste indéterminé. Toutefois, un inventaire réalisé par le ministère des Ressources naturelles et de la Faune du Québec, indique qu'il existerait plus de 211 sites offrant des possibilités d'extraction de substances minérales de surfaces. Finalement, signalons que vers la fin des années « 1990 » la production de granulats (sable et gravier) s'établissait à plus de 1 435 000 tonnes métriques.

*Problématique:*

En vertu de l'article 246 de la *Loi sur l'aménagement et l'urbanisme*, aucune disposition de ladite loi, d'un schéma d'aménagement, d'un règlement de contrôle intérimaire on d'un règlement de zonage, de lotissement ou de construction ne peut avoir pour effet d'empêcher le jalonnement ou la désignation sur une carte d'un claim, l'exploration, la recherche, la mise en valeur ou l'exploitation de substances minérales et de réservoirs souterrains, faits conformément à la *Loi sur les mines*. Cette disposition de la loi ne vise cependant pas l'extraction de sable, de gravier ou de pierres à construire sur des terres privées.

En d'autres termes, cela signifie que l'activité minière couvre pratiquement la totalité du territoire de la MRC de La Vallée-de-l'Or. Inévitablement, les problèmes d'utilisation du sol en rapport avec les affectations du territoire surviendront à la pièce, au gré des découvertes des gisements miniers. En dépit du fait que les travaux d'exploitation minière soient soumis à la *Loi sur la qualité de l'environnement du Québec*, il n'en demeure pas moins que les impératifs d'ordre économique priment, plus souvent d'ailleurs, sur les considérations environnementales et la qualité de vie des résidants du territoire. À ce propos, rappelons que ces dernières années ont été ponctuées par certains conflits entre municipalités et exploitants. Dans ces circonstances, la MRC estime nécessaire d'accroître le rôle du milieu municipal dans le processus décisionnel menant à la réalisation des projets miniers.

L'importance de l'industrie minière à titre de pilier économique majeur de la MRC n'est plus à démontrer. C'est pourquoi, diverses actions doivent être entreprises afin de soutenir le dynamisme de ce secteur d'activité. À cet effet, la MRC s'inscrit en accord avec les objectifs suivants du *"Plan stratégique de développement de l'Abitibi-Témiscamingue (CRDAT)* ":

- évaluer le potentiel régional des minéraux industriels;
- soutenir les démarches de l'industrie visant l'exploitation de petits gisements aurifères ou de métaux de base par les petites et moyennes entreprises;
- accentuer les liens de communication et de complicité avec l'Association minière du Québec (AMQ), l'Association des prospecteurs du Québec (APQ) et les autres intervenants du secteur minier;
- favoriser l'offre de services de sous-traitance dans le domaine minier;
- développer l'expertise régionale en environnement minier;
- assurer une mobilisation régionale permettant de consacrer l'Abitibi-Témiscamingue comme base du développement minier du nord et moyen nord.

La MRC entend s'assurer qu'elle recevra sa juste part de retombées en matière d'investissements miniers (exploitation, exploration, recherche et développement, formation, etc.) et ce, dans une perspective où son territoire constitue un pôle national d'excellence minier.

Par ailleurs, la MRC est d'avis que le développement de l'industrie minière ne doit pas se faire au détriment des activités coexistantes. À l'opposé, l'exercice de certaines activités doit s'effectuer de manière à ne pas empêcher la mise en valeur des substances minérales. Il importe donc d'assurer une certaine harmonisation entre l'activité extractive et les activités coexistantes afin de restreindre les incompatibilités et les nuisances.

Objectifs:

- ***Assurer la reconnaissance du territoire de la MRC comme "pôle national d'excellence minier";***
- ***Accroître le rôle de la MRC et de ses municipalités constituantes dans le processus décisionnel menant à la réalisation des projets miniers;***
- ***Optimiser les retombées économiques en matière de développement minier sur le territoire de la MRC;***
- ***Favoriser une cohabitation harmonieuse entre l'industrie minière et les activités coexistantes sur le territoire;***
- ***Appuyer les institutions scolaires de la MRC dans la mise en place et le développement de programmes de formation liés au secteur minier.***

*Moyens de mise en œuvre*

- *La MRC entend oeuvrer au sein des diverses instances régionales de façon à promouvoir ses intérêts en matière de développement minier. De plus, elle entreprendra des démarches auprès des paliers de gouvernements supérieurs afin d'assurer la reconnaissance de son territoire comme pôle national d'excellence minier;*

- *De concert avec ses partenaires régionaux, la MRC sensibilisera les autorités gouvernementales sur les diverses problématiques qui découlent de l'activité minière sur le territoire et auxquelles est confronté le milieu municipal. À cet égard, la révision des dispositions législatives entourant la pratique de cette activité, en particulier celles prescrites à l'article 246 de la LAU, fait partie des préoccupations de la MRC;*

- *La prise en compte, au plan de développement du CLD, des objectifs du schéma d'aménagement et de développement en matière de développement minier;*

- *Le schéma d'aménagement et de développement propose plusieurs mesures visant à limiter les conflits entre l'activité minière et les activités coexistantes sur le territoire (voir tableau 3.2 du chapitre III et le document complémentaire);*

- *De concert avec les intervenants du milieu, la MRC entend promouvoir la mise en valeur du potentiel minier de son territoire. De plus, celle-ci appuiera les initiatives visant la diversification de l'industrie minière (ex. production de tourbe, exploitation des minéraux industriels et de la pierre dimensionnelle, fabrication de produits dérivés, etc).*

Sur le territoire de la MRC, les risques d'origine naturelle sont le plus souvent associés aux zones d'inondation. On les retrouve majoritairement dans les secteurs du lac Tiblemont et de la rivière Bell. Par le passé, plus de 32 résidences, 4 fermes et 8 petites entreprises localisées à ces endroits ont subi des dommages suite à la crue des eaux. Il importe donc que les zones inondables fassent l'objet de mesures de contrôle plus rigoureuses. Dans ce contexte, l'élaboration d'une cartographie détaillée des zones inondables du territoire s'avère de mise.

La ressource hydrique demeure l'une des principales richesses du patrimoine naturel de la MRC; le territoire compte environ de 11 300 lacs et 8 000 rivières. Certains plans d'eau sont soumis à de fortes pressions environnementales, particulièrement en raison de l'urbanisation et de l'industrialisation. En plus de compromettre le déroulement des activités récréatives (pêche, nautisme, etc), cette situation nuit à la préservation de la diversité animale et végétale. L'attrait qu'offrent certains lacs localisés en zone périurbaine favorise la densification résidentielle à l'intérieur des couloirs riverains et, de ce fait, engendre des effets négatifs sur le milieu aquatique: apport supplémentaire en phosphate, conservation des aires fauniques inadéquates, interventions abusives à l'intérieur des bandes de protection riveraine, empiétement dans le littoral, etc. D'autres facteurs de nature anthropique affectent également la qualité des eaux. Parmi ceux-ci, mentionnons l'industrie minière dont les activités ne sont pas étrangères à la dégradation du réseau hydrographique de la MRC (ex. bassin de la rivière Bourlamaque).

Les interventions de l'homme sur le milieu contribuent, pour une large part, à la détérioration et à la disparition des habitats fauniques. Le *Règlement sur les habitats fauniques* a pour objectif de protéger les sites fauniques comptant parmi les plus fragiles. Toutefois, ce règlement ne s'applique qu'aux terres du domaine public. Or, plusieurs habitats fauniques d'intérêt de la MRC se situent sur les terres du domaine privé. Le développement urbain de même que les activités reliées à l'exploitation de la ressource peuvent s'avérer une menace sérieuse pour ceux-ci.

Dans son souci d'assurer une meilleure protection de l'environnement et de ses citoyens, la MRC énonce donc la grande orientation suivante:

*Neuvième grande orientation*

***Contribuer à la protection de l'environnement, au bien-être et à la sécurité des citoyens.***

Objectifs:

- ***Assurer un meilleur contrôle sur le rejet des eaux usées dans l'environnement;***
- ***Réduire les quantités de matières résiduelles destinées à l'enfouissement sur le territoire de la MRC;***
- ***Disposer de façon adéquate et sécuritaire les déchets produits sur le territoire de la MRC en favorisant une approche régionale (MRC);***
- ***Favoriser la restauration et le contrôle accru des parcs à résidus miniers et forestiers présentant des risques élevés pour l'environnement et la santé publique;***
- ***Dans une perspective de protection environnementale et de développement économique, appuyer la réalisation de projets visant la récupération des résidus miniers et forestiers sur le territoire;***
- ***Accroître la protection des eskers et des sources d'alimentation en eau potable (actuelles et potentielles) des collectivités;***
- ***Favoriser un meilleur contrôle des usages à proximité des zones de contraintes;***
- ***Préserver la qualité des plans d'eau sur le territoire de la MRC;***
- ***Conserver et mettre en valeur le caractère particulier des sites d'intérêt écologique.***

Moyens de mise en oeuvre:

- *Sensibiliser la population sur l'importance d'assurer une gestion adéquate de leurs installations septiques (campagne de sensibilisation);*
- *Création d'un comité de gestion des matières résiduelles ayant pour principal mandat de proposer des avenues de solutions aux différentes problématiques liées à la gestion des matières résiduelles sur le territoire de la MRC;*
- *Élaboration d'un plan de gestion intégré des matières résiduelles ;*
- *Réaliser une plate-forme de compostage à l'aide de résidus forestiers et des boues de fosses septiques;*
- *Agrandissement du lieu d'enfouissement technique (LET) de la MRC;*
- *Installation d'un éco-centre (déchetterie), d'un dépôt de RDD, d'un centre de transbordement et de mise en ballots sur le site du LET de la MRC et de deux mini-écocentres (Malartic et Senneterre);*

- *Instauration d'une collecte des résidus domestiques dangereux (RDD), des encombrants et de la collecte sélective porte-à-porte;*

- *De concert avec le ministère des Ressources naturelles et de la Faune et le ministère du Développement durable, de l'Environnement et des Parcs, établir un plan d'action en vue d'assurer la restauration des parcs à résidus et forestiers présentant des risques élevés pour l'environnement et la population;*

- *L'insertion au document complémentaire de mesures visant :*

  - *la protection des prises d'eau communautaires;*

  - *le contrôle des usages à proximité de certaines zones de contraintes;*

  - *la protection des territoires d'intérêt écologique;*

  - *la protection des rives et du littoral des lacs et cours d'eau;*

- *La réalisation d'un plan de protection des eskers;*

- *L'élaboration d'un « Plan directeur de l'eau » du bassin versant de la rivière Bourlamaque;*

- *Sensibiliser les propriétaires riverains sur l'importance d'assurer une meilleure protection des rives et du littoral des plans d'eau (campagne de sensibilisation);*

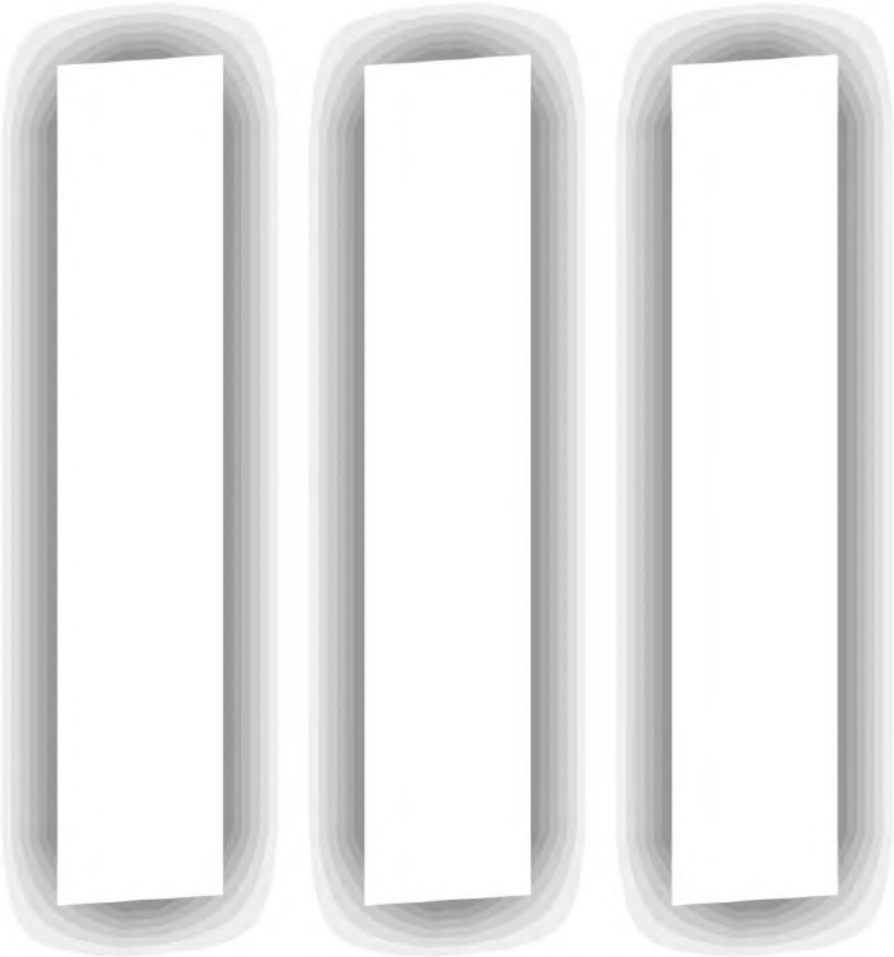
- *La MRC étudiera la possibilité de mettre en place et d'instaurer, à l'échelle de son territoire, un programme de vidange obligatoire des fosses septiques et d'inspection des installations septiques. De plus, elle encouragera le développement de nouvelles techniques d'épuration des eaux usées dans les sols argileux;*

- *La MRC entreprendra des démarches afin de s'assurer que son territoire soit doté d'un service d'analyse de la qualité de l'eau potable des puits privés.*

# Chapitre III

## Les grandes affectations du territoire

**Problématique et objectifs**
**L'affectation urbaine**
**L'affectation industrielle**
**L'affectation rurale**
**L'affectation agricole**
**L'affectation forestière**
**L'affectation récréative**
**Grille de compatibilité**



# 3.0 Les grandes affectations du territoire

## 3.1 Problématique et objectifs

Les grandes affectations du territoire sont définies selon la vocation actuelle d'un territoire donné ou encore, en fonction de celle qu'on souhaite lui conférer. Elles sont le reflet des grandes orientations d'aménagement retenues par la MRC. Le schéma d'aménagement et de développement identifie donc six (6) grandes affectations qui se veulent la traduction spatiale de ces orientations:

- l'affectation urbaine;
- l'affectation industrielle;
- l'affectation rurale;
- l'affectation agricole;
- l'affectation forestière;
- l'affectation récréative.

Le schéma d'aménagement de première génération, adopté en 1986, identifiait quatre grandes affectations: forestière, rurale, minière et villégiature. À l'instar de l'actuel schéma, l'affectation du territoire consistait à déterminer une vocation privilégiée autour de laquelle devait graviter les diverses activités liées à l'utilisation du sol.

Force est d'admettre que la dénomination parfois peu explicite de certaines affectations de même que la permissivité du schéma de première génération à l'égard des activités autorisées à l'intérieur de celles-ci n'ont pas toujours permis de mettre en évidence cette vocation privilégiée. Ces facteurs ont d'ailleurs contribué à l'émergence de développements disparates sur le territoire. De plus, la multiplication des activités, dans certains secteurs de la MRC, a eu pour effet de reléguer au second plan la vocation première de nombreux territoires. L'affectation rurale qui, par le passé, englobait la zone agricole, en plus de quelques zones résidentielles, constitue à ce titre, un exemple éloquent; pour les raisons évoquées précédemment, l'activité résidentielle y a tôt fait de supplanter l'activité agricole pourtant destinée à s'avérer la dominante de cette affectation.

Par l'entremise de ces six (6) grandes affectations, la MRC entend reconnaître la vocation première des territoires agricoles, forestiers, récréatifs et urbains/industriels en plus de favoriser une cohabitation harmonieuse entre les diverses activités qui s'exercent sur le territoire de la MRC.

- ***Fournir un cadre propice au développement de l'agriculture à l'intérieur de la zone agricole en y limitant l'insertion des usages non agricoles;***

- ***Favoriser une cohabitation harmonieuse entre les usages agricoles et non agricoles;***

- ***Consolider les îlots résidentiels en zone agricole de manière à assurer la rentabilité optimale des infrastructures et services publics;***

- ***De concert avec les intervenants du milieu, entreprendre des actions visant à stimuler le développement de l'agriculture en zone agricole.***

L'agriculture s'avère la vocation dominante de cette affectation. La MRC entend y favoriser la mise en valeur du potentiel agricole. Toutefois, l'insertion de certains usages non agricoles y sera autorisée dans la mesure où ceux-ci s'exercent en conformité avec les modalités établies au tableau 3.2 du présent chapitre. À cet effet, le degré de permissivité variera selon le potentiel des sols, l'homogénéité et le dynamisme des secteurs agricoles. Ainsi, dans les secteurs agricoles dynamiques, les résidences ne pourront être permises que dans l'optique où elles constituent un usage complémentaire à la fonction agricole alors que, dans les secteurs agroforestiers, une seule résidence par unité foncière d'un minimum de 25 hectares sera autorisée. Enfin, le schéma d'aménagement et de développement identifie des îlots déstructurés de façon à permettre la consolidation des îlots résidentiels et la viabilité de certains chemins municipaux.

### 3.2.5 L'affectation forestière

*Les caractéristiques*

L'affectation forestière occupe environ 98% de tout le territoire de la MRC. Elle englobe la quasi-totalité des terres publiques sous CAAF. Ces territoires forestiers sont destinés principalement à la production et au prélèvement de la matière ligneuse.

Par ailleurs, l'affectation forestière regroupe de vastes territoires structurés à vocation récréative et faunique: réserve faunique La Vérendrye, ZEC de Capitachouane et de Festubert de même que six (6) pourvoiries à droits exclusifs. De surcroît, mentionnons la présence d'une vingtaine de pourvoiries sans droit exclusif ainsi que celle de plusieurs chalets dispersés et abris sommaires.

*La vocation*

La grande orientation ***"Privilégier une utilisation rationnelle et une mise en valeur intégrée des ressources naturelles."*** rejoint l'affectation forestière. La reconnaissance de cette affectation s'appuie sur les objectifs suivants:

## 3.3 Grille de compatibilité

Les activités autorisées à l'intérieur d'une grande affectation du territoire sont établies au moyen du tableau 3.2 intitulé "Grille de compatibilité". Celles-ci ne visent, dans la réglementation municipale, que les usages autorisés à titre d'usage principal et ne touchent donc pas de fait, ceux autorisés par une municipalité à titre d'usage complémentaire (à l'exception des activités de services complémentaires à la fonction résidentielle).

Lorsqu'il est établi, au tableau 3.2, qu'une activité est permise à l'intérieur d'une affectation du territoire, la réglementation municipale peut, en toute conformité avec le schéma, comporter des dispositions permettant l'exercice de cette activité soit dans une partie, soit dans la totalité du territoire municipal compris à l'intérieur de cette affectation.

Le degré de compatibilité entre les activités et les grandes affectations du territoire s'établit comme suit:

### Compatible

L'activité est permise sur la totalité des territoires inclus à l'intérieur de l'affectation. La réglementation municipale peut cependant restreindre à certains secteurs de l'affectation l'exercice de cette activité.

### Compatible avec restrictions

L'activité ne peut s'exercer à l'intérieur de l'affectation qu'aux conditions définies au tableau 3.2 (Grille de compatibilité).

### Incompatible

L'activité est prohibée sur la totalité des territoires inclus à l'intérieur de l'affectation. La réglementation municipale doit interdire l'exercice de l'activité dans l'affectation.

Tableau 3.2
Grille de compatibilité

| ACTIVITÉS | AFFECTATIONS | | | | | |
|---|---|---|---|---|---|---|
| | *Urbaine* | *Industrielle* | *Rurale* | *Agricole* | *Forestière* | *Récréative* |
| Résidentielle | ● | X | O (1 et 5) | O (3 et 5) | X | O (4 et 5) |
| Commerciale | ● | O (6) | O (1 et 2) | O (3) | O (6) | X |
| Industrie | O (6) | ● | O (6) | O (3) | O (6) | X |
| Publique et institutionnelle | ● | ● | O (13 et 14) | O (14) | O (12 et 14) | O (12 et 14) |
| Villégiature privée | X | X | X | O (3) | X | O (4) |
| Villégiature commerciale | O (10) | X | ● | O (3) | ● | ● |
| Villégiature communautaire | X | X | X | O (3) | ● | ● |
| Abris sommaires | X | X | ● | ● | ● | X |
| Récréation intensive | ● | X | ● | X | ● | ● |
| Récréation extensive | ● | ● | ● | ● | ● | ● |
| Agriculture | X | X | O (11) | ● | O (7) | X |
| Aménagement et prélèvement de la ressource forestière | O (8) | ● | O (11) | ● | ● | O (8) |
| Exploitation des substances minérales | O (9) | O | O (11) | ● | ● | ● |

● Activité compatible  O Activité compatible avec restrictions  **X** Activité incompatible

(1) Le bâtiment principal ne peut être érigé que sur un lot contigu, en tout ou en partie, aux voies de circulation publiques et privées existantes ou identifiées sur un plan d'opération cadastrale ayant fait l'objet d'un dépôt officiel au cadastre préalablement à l'entrée en vigueur des règlements de concordance adoptés conformément à l'article 59 de la *Loi sur l'aménagement et l'urbanisme*. L'obligation du dépôt officiel au cadastre d'un plan d'opération cadastrale avant l'entrée en vigueur desdits règlements ne s'applique pas à l'égard des secteurs de « rurbanisation ». Toutefois, dans ce cas, le projet de lotissement des voies de circulation doit avoir fait l'objet d'une approbation municipale.

Les zones industrielles et les secteurs multifonctionnels sont exclus de l'application des dispositions du présent paragraphe.

(2) Dans l'affectation rurale, seules les activités commerciales suivantes peuvent être autorisées:

- les entreprises de transport;
- les entrepreneurs en construction;
- les commerces d'entreposage;
- les services relatifs à l'exploitation minière et forestière;
- les commerces de vente au détail d'équipement de machinerie lourde;
- les commerces de récupération, ferrailleurs et autres activités similaires;
- les stations-services et postes d'essence;
- les centres équestres, chenils et autres activités similaires reliées au domaine animalier;
- les entreprises horticoles, pépinières et autres activités similaires;
- les commerces de dépannage (dépanneurs);
- les activités de services complémentaires à la fonction résidentielle;
- les commerces d'hébergement de type "gîte du passant";
- les ateliers de réparation mécanique et de soudure;
- entrepreneurs spécialisés (plomberie, électricien, etc) ;
- entrepreneur en voirie.

*Note: La municipalité de Senneterre-paroisse pourra autoriser, sans restriction, les activités commerciales dans les secteurs multifonctionnels de son territoire (réf. Plan d'affectation du territoire).*

# ANNEXE

# QCM-20A

## PLAN DE RESTAURATION (JUIN 2021)

MINE CANADIAN MALARTIC

# PROJET D'EXPLOITATION DES ZONES SOUTERRAINES MINÉRALISÉES DU PROJET ODYSSEY

## PLAN DE RESTAURATION

### MALARTIC, QUÉBEC

RÉF. WSP : 171-08287-03

DATE : 30 JUIN 2021 (RÉVISION 01)

CONFIDENTIEL

MINE CANADIAN MALARTIC

# PROJET D'EXPLOITATION DES ZONES SOUTERRAINES MINERALISEES DU PROJET ODYSSEY

## PLAN DE RESTAURATION

### MALARTIC, QUÉBEC

CONFIDENTIEL

REF. WSP : 171-08287-03
DATE : 30 JUIN 2021 (RÉVISION 01)

RAPPORT FINAL

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# GESTION DE LA QUALITE

| VERSION | DATE | DESCRIPTION |
|---|---|---|
| 00 | 2020-10-14 | Version préliminaire |
| 01 | 2020-12-18 | Version préfinale |
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| 03 | 2021-06-30 | Version finale révision 01 |
| | | |
| | | |

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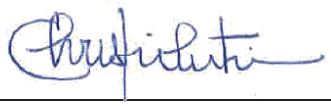
Chargée de discipline

2021-06-30
Date

RÉVISÉ PAR



Christine Martineau, biol, M. Sc.
Directrice de projet

2021-06-30
Date

**Référence à citer :**

WSP. 2021. *Projet d'exploitation des zones souterraines minéralisées du projet Odyssey, Plan de restauration, Malartic, Québec*. Rapport produit pour Mine Canadian Malartic. Réf. WSP : 171-08287-03. 62 pages, cartes et annexes.

WSP Canada Inc. (« WSP ») a préparé ce rapport uniquement pour Mine Canadian Malartic, conformément à la convention de consultant convenue entre les parties. Advenant qu'une convention de consultant n'ait pas été exécutée, les parties conviennent que les Modalités Générales à titre de consultant de WSP régiront leurs relations d'affaires, lesquelles vous ont été fournies avant la préparation de ce rapport.

Ce rapport est destiné à être utilisé dans son intégralité. Aucun extrait ne peut être considéré comme représentatif des résultats de l'évaluation.

Les conclusions présentées dans ce rapport sont basées sur le travail effectué par du personnel technique, entraîné et professionnel, conformément à leur interprétation raisonnable des pratiques d'ingénierie et techniques courantes et acceptées au moment où le travail a été effectué.

Le contenu et les opinions exprimées dans le présent rapport sont basés sur les observations et/ou les informations à la disposition de WSP au moment de sa préparation, en appliquant des techniques d'investigation et des méthodes d'analyse d'ingénierie conformes à celles habituellement utilisées par WSP et d'autres ingénieurs/techniciens travaillant dans des conditions similaires, et assujettis aux mêmes contraintes de temps, et aux mêmes contraintes financières et physiques applicables à ce type de projet.

WSP dénie et rejette toute obligation de mise à jour du rapport si, après la date du présent rapport, les conditions semblent différer considérablement de celles présentées dans ce rapport ; cependant, WSP se réserve le droit de modifier ou de compléter ce rapport sur la base d'informations, de documents ou de preuves additionnels.

WSP ne fait aucune représentation relativement à la signification juridique de ses conclusions.

La divulgation de tout renseignement faisant partie du présent rapport relève uniquement de la responsabilité de son destinataire. Si un tiers utilise, se fie, ou prend des décisions ou des mesures basées sur ce rapport, ledit tiers en est le seul responsable. WSP n'accepte aucune responsabilité quant aux dommages que pourrait subir un tiers suivant l'utilisation de ce rapport ou quant aux dommages pouvant découler d'une décision ou mesure prise basée sur le présent rapport.

WSP a exécuté ses services offerts au destinataire de ce rapport conformément à la convention de consultant convenue entre les parties tout en exerçant le degré de prudence, de compétence et de diligence dont font habituellement preuve les membres de la même profession dans la prestation des mêmes services ou de services comparables à l'égard de projets de nature analogue dans des circonstances similaires. Il est entendu et convenu entre WSP et le destinataire de ce rapport que WSP n'offre aucune garantie, expresse ou implicite, de quelque nature que ce soit. Sans limiter la généralité de ce qui précède, WSP et le destinataire de ce rapport conviennent et comprennent que WSP ne fait aucune représentation ou garantie quant à la suffisance de sa portée de travail pour le but recherché par le destinataire de ce rapport.

En préparant ce rapport, WSP s'est fié de bonne foi à l'information fournie par des tiers, tel qu'indiqué dans le rapport. WSP a raisonnablement présumé que les informations fournies étaient correctes et WSP ne peut donc être tenu responsable de l'exactitude ou de l'exhaustivité de ces informations.

Les bornes et les repères d'arpentage utilisés dans ce rapport servent principalement à établir les différences d'élévation relative entre les emplacements de prélèvement et/ou d'échantillonnage et ne peuvent servir à d'autres fins. Notamment, ils ne peuvent servir à des fins de nivelage, d'excavation, de construction, de planification, de développement, etc.

L'original du fichier électronique que nous vous transmettons sera conservé par WSP pour une période minimale de dix ans. WSP n'assume aucune responsabilité quant à l'intégrité du fichier qui vous est transmis et qui n'est plus sous le contrôle de WSP. Ainsi, WSP n'assume aucune responsabilité quant aux modifications faites au fichier électronique suivant sa transmission au destinataire.

Ces limitations sont considérées comme faisant partie intégrante du présent rapport.

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# RÉSUMÉ DU PLAN DE RESTAURATION

Le projet Odyssey est situé à l'est de la fosse à ciel ouvert Canadian Malartic et s'inscrit dans l'empreinte du projet Extension Canadian Malartic. Une modification de décret visant à inclure le projet Odyssey (Nord et Sud) au décret émis pour l'Extension Canadian Malartic a été obtenu en 2018. Ainsi, dans le but de faire une seule demande de modification de décret incluant toutes les avenues possibles du projet, le présent plan de restauration a été réalisé afin d'inclure toutes les zones minéralisées qu'il est actuellement envisagé d'exploiter lors de la mise en œuvre du projet souterrain Odyssey. Ainsi, le plan de restauration couvrira les éléments nécessaires à l'exploitation des zones Odyssey Nord, Odyssey Sud, East Gouldie et East Malartic.

Le scénario envisagé à l'heure actuelle s'articulera autour de l'exploitation des zones Odyssey Nord et Odyssey Sud, East Gouldie et East Malartic par voie souterraine. Il est envisagé d'exploiter les zones East Gouldie, Odyssey Nord et la portion comprise sous 600 m de profondeur de la zone East Malartic à l'aide d'un puits d'accès, alors que la zone Odyssey Sud et la portion entre 90 m et 600 m de profondeur de la zone East Malartic seront exploitées à l'aide d'une rampe d'accès munie d'un portail.

D'après les dernières évaluations réalisées par Canadian Malartic GP (CMGP), les ressources estimées jusqu'à présent permettraient d'opérer la mine du projet Odyssey sur 17 ans, soit de 2023 à 2040.

Des caractérisations géochimiques du minerai et des stériles ont été réalisées par EcoMetrix Incorporated (ECOMETRIX) en 2017 et 2019. Les résultats de ces études mentionnent que le minerai extrait des zones Odyssey Nord et Sud est considéré lixiviable en baryum et/ou plomb et/ou manganèse et potentiellement générateur acide (PGA), alors que les stériles miniers sont considérés non potentiellement générateur acide (NPGA), mais lixiviables en baryum et/ou plomb et/ou manganèse. De plus, les résidus miniers sont également considérés lixiviables en baryum et/ou plomb et PGA. Le minerai et les stériles de la zone East Malartic sont considérés lixiviables et PGA. Considérant que la halde à stériles et la halde à minerai au site Odyssey seront temporaires et ne serviront que de zone de transit lors de l'opération de la mine et que les matériaux constituant le substrat de ces dernières possèdent une perméabilité inférieure au débit limite de 3,3 L/m²/j défini dans la Directive 019 pour les mesures d'étanchéité de Niveau A (Golder Associés, 2017a), aucune mesure de protection ne sera mise en place sous les haldes.

Les infrastructures de surface relatives au projet Odyssey seront les suivantes :

- Aires de stationnements;
- Aires d'entreposage;
- Guérite;
- Deux bâtiments administratifs;
- Garages d'entretien mécanique, dont un pour les entrepreneurs;
- Bâtiment des compresseurs;
- Mégas dômes d'entreposage;
- Sous-station électrique 120 kV et ligne électrique;

- Tapis de mise à la terre;
- Un poste de distribution de carburant, comprenant des pompes distributrices, un réservoir d'entreposage de diesel (capacité d'au moins 50 000 litres) et un réservoir d'entreposage d'essence (capacité d'au moins 1 000 litres);
- Portail de la rampe souterraine (déjà aménagé);
- Chevalement et bâtiment des treuils;
- Deux réservoirs de diesel d'une capacité de 40 000 litres chacun et un réservoir de transfert d'une capacité de 3 000 litres situés près de la salle des treuils;
- Monteries de ventilation en air frais (trois plus le puits) et sorties d'air vicié (quatre plus le portail);
- Deux usines de remblai en pâte pour le remblayage souterrain (ou agrandissement de la première);
- Aire de chargement des camions 240 tonnes;
- Halde à minerai temporaire de 20 000 tonnes;
- Halde à stériles temporaire de 10 000 tonnes;
- Fossé de drainage des eaux vers le bassin nord-est;
- Une usine de production d'eau potable et un puits d'eau potable (déjà aménagés);
- Système de traitement des eaux usées (Ecoflow)
- Deux sorties de secours.

Des dépôts à explosifs et à détonateurs seront aménagés sous terre. De plus, un système de collecte des eaux de drainage en surface est déjà aménagé sur le site (fossé Odyssey). Les eaux collectées sont envoyées dans le bassin Nord-Est mis en place dans le cadre du projet Extension de la mine Canadian Malartic. Elles pourront être utilisées pour les besoins de la mine souterraine, ou seront incorporées à l'effluent final de la mine Canadian Malartic.

Les dépôts meubles et les sols végétaux à être excavés seront tous acheminés sur les haldes à dépôts meubles et à sols végétaux de la mine Canadian Malartic. Une aire d'entreposage du minerai temporaire d'une capacité de 20 000 t ainsi qu'une aire d'entreposage temporaire des stériles d'une capacité de 10 000 t seront également aménagées près du portail de la rampe.

Les eaux d'exhaure des zones exploitées via la rampe souterraine seront traitées par un système de traitement de type MUDWIZARD, installé directement à l'intérieur de la mine souterraine. Pour le moment, le mode de traitement des eaux d'exhaure des zones minées via le puits (zones Odyssey Nord et East-Gouldie) n'est pas encore défini. Cette information sera raffinée lors de l'avancement de l'ingénierie du projet.

Aucun procédé de traitement du minerai ne sera réalisé sur le site du projet Odyssey. Tout le minerai extrait du projet Odyssey sera transporté jusqu'au concentrateur de la mine Canadian Malartic. Les résidus issus du traitement du minerai seront également gérés au lieu de disposition des résidus de la mine Canadian Malartic.

Les mesures de protection, de réaménagement et de restauration qui seront appliquées au site minier du projet Odyssey incluront la restauration des infrastructures suivantes : les infrastructures routières, les bâtiments de services et administratifs, les aires d'accumulation, les aires de travail et d'entreposage, et le bassin d'accumulation des eaux.

À la fin des opérations d'extraction minière, le pompage des eaux de mine cessera et les infrastructures souterraines, ainsi que la rampe, seront lentement ennoyées par la remontée de la nappe phréatique. L'ouverture du portail de la rampe sera entièrement remblayée à l'aide de stériles miniers. Les ouvertures du puits d'extraction et des monteries de ventilation seront condamnées par des dalles de béton armé.

En période post-restauration, un suivi de l'intégrité du portail remblayé ainsi que des dalles de béton recouvrant le puits d'accès et les monteries de ventilation sera effectué annuellement pendant un minimum de cinq ans. De plus, un suivi environnemental visant à vérifier la qualité des eaux souterraines sera réalisé deux fois par an, pour une durée minimale de 10 ans. Un suivi agronomique afin de vérifier la reprise de la végétation sera également réalisé pendant une durée minimale de cinq ans.

Les travaux prévus pour le réaménagement et la restauration du site sont estimés à 13 025 352 $ CAD[1]. Ces coûts incluent les coûts de suivi, les frais d'ingénierie (30 %) ainsi qu'une contingence de 15 %.

1 En dollars 2021.

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F ÉTUDE GÉOTECHNIQUE ET HYDROLOGIQUE – AMÉNAGEMENT DES HALDES ET STRUCTURES DE DRAINAGE DE SURFACE (GOLDER ASSOCIÉS, 2020)

G ÉVALUATION DES DÉBITS D'EXHAURE ET DES IMPACTS POTENTIELS SUR LES NIVEAUX DES EAUX SOUTERRAINES (GOLDER, 2020)

H ÉTUDE DU PILIER DE SURFACE DE LA RAMPE ODYSSEY

# 1 INTRODUCTION

## 1.1 MISE EN CONTEXTE

Dans le cadre du projet Odyssey, Canadian Malartic GP (CMGP) projette d'exploiter quatre zones minéralisées, soit East Malartic, East Gouldie, Odyssey Sud et Odyssey Nord. Il est prévu que ces zones soient exploitées au moyen de galeries souterraines à proximité de la mine Canadian Malartic (la Mine). Ce projet nécessitera, entre autres, l'aménagement d'un puits et d'une rampe pour accéder aux gisements.

Le projet Odyssey est situé dans l'empreinte existante du projet Extension présenté par Canadian Malartic GP (CMGP) en 2015 au Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC) dans le cadre de l'étude d'impact sur l'environnement (ÉIE) et autorisé par décret émis par le gouvernement du Québec en 2017 (décret 388-2017). Le 28 novembre 2018, le décret 1370-2018 a été adopté, modifiant le décret n° 388-2017 de la mine Canadian Malartic et autorisant CMGP à réaliser son projet Odyssey. La présente demande de modification du décret vise l'ajout de l'exploitation souterraine des zones East Malartic et East Gouldie au projet Odyssey. Cette modification de décret permettrait une production d'environ 20 000 tonnes de minerai et de potentiellement 5 000 tonnes de stériles par jour.

WSP Canada Inc. (WSP) a été mandatée par Canadian Malartic GP (CMGP) afin de préparer le plan de restauration du projet Odyssey, situé dans la Ville de Malartic (Québec). Le présent plan de restauration a été élaboré dans le contexte d'une nouvelle modification de décret incluant toutes les zones minéralisées qu'il est actuellement envisagé d'exploiter lors de la mise en œuvre du projet Odyssey. Ainsi, le plan de restauration couvrira les éléments nécessaires à l'exploitation des zones East Gouldie, Odyssey Nord et Odyssey Sud et East Malartic.

Le scénario envisagé à l'heure actuelle s'articulera autour de l'exploitation des zones East Gouldie, Odyssey Nord et Odyssey Sud et East Malartic par voie souterraine. Il est envisagé d'exploiter les zones East Gouldie, Odyssey Nord et la portion comprise sous 600 m de profondeur de la zone East Malartic à l'aide d'un puits d'accès, alors que la zone Odyssey Sud et la portion entre 90 et 600 m de profondeur de la zone East Malartic seront exploitées à l'aide d'une rampe d'accès munie d'un portail.

## 1.2 OBJECTIFS

Le présent plan de restauration a été élaboré conformément aux dispositions de la *Loi sur les mines* (L.R.Q., ch. M-13.1) et selon les prescriptions et les recommandations du *Guide de préparation du plan de réaménagement et de restauration des sites miniers au Québec* (Guide) (MERN[2], 2017).

Ce plan de restauration est élaboré dans le contexte de la mise à jour du décret de la mine Canadian Malartic. Le plan de restauration s'articulera principalement autour des éléments suivants :

- Mesures de protection, de réaménagement et de restauration prévues;
- Programme de contrôle et de suivi post-restauration;

2 Ministère de l'Énergie et des Ressources naturelles

- Mesures en cas d'arrêt temporaire des activités;
- Plan des mesures d'urgence;
- Évaluation du coût des travaux de restauration;
- Évaluation de la garantie financière;
- Échéancier des travaux de restauration.

Afin de faciliter la lecture du document, les cartes citées ont toutes été regroupées et présentées à la fin du présent plan de restauration.

La grille de validation du contenu du plan de restauration dûment remplie est jointe à l'annexe A.

# 2 RENSEIGNEMENTS GÉNÉRAUX

## 2.1 IDENTIFICATION DU REQUÉRANT

### 2.1.1 REQUÉRANT

| | |
|---|---|
| Nom du requérant : | **Canadian Malartic GP** |
| Adresse : | 100, chemin du Lac Mourier<br>Malartic (Québec) J0Y 1Z0 |
| Téléphone : | 819 757-2225 |
| Télécopieur : | 819 759-2351 |
| Site internet : | www.canadianmalartic.com |
| Représentant autorisé : | M. Martin Duclos<br>Directeur Développement durable et Environnement<br>Courriel : mduclos@canadianmalartic.com |

### 2.1.2 CONSULTANT MANDATÉ

| | |
|---|---|
| Plan de restauration conceptuel : | **WSP Canada Inc.** |
| Adresse : | 1135, boul. Lebourgneuf<br>Québec (Québec) G2K 0M5 |
| Téléphone : | 418 623-2254 |
| Télécopieur : | 418 624-1857 |
| Site internet : | www.wsp.com |
| Personne ressource : | Mme Christine Martineau, directrice de projet<br>Courriel : christine.martineau@wsp.com |

### 2.1.3 NUMÉRO CIDREQ

Le numéro de code du centre informatique du registre des entreprises du Québec (CIDREQ) assigné par le registraire des entreprises pour l'entreprise Mine Canadian Malartic est le 3370117692.

### 2.1.4 RÉSOLUTION

La résolution du conseil d'administration autorisant Martin Duclos, Directeur Développement durable et Environnement, à agir au nom de l'organisation est fournie à l'annexe B.

## 2.2 LOCALISATION DU SITE MINIER

Le projet Odyssey est situé dans la région administrative de l'Abitibi-Témiscamingue, sur le territoire de la Ville de Malartic. Ce projet est situé à environ 3 km à l'est du périmètre urbain la Ville de Malartic. Ce site est accessible par la route 117. Les coordonnées géographiques du projet Odyssey sont les suivantes (au centre de la propriété) :

- Latitude nord (NAD 83) : 48° 7'30.53"N;
- Longitude ouest (NAD 83) : 78° 4'8.74"O.

L'emplacement du projet Odyssey se situe essentiellement dans un secteur à vocation minière et forestière, à proximité du périmètre urbain de la Ville de Malartic. La localisation générale du site minier est présentée à la carte 1.

## 2.3 PROPRIÉTÉ MINIÈRE DES TERRAINS

La propriété du projet Odyssey est couverte par six claims (72 285, 72 287, 72 289, 2 000 917, 2 000 857 et 2 000 913) et le titulaire des claims est Canadian Malartic GP (Mine Canadian Malartic; CMGP).

Le bail minier ayant été délivré pour la mine Canadian Malartic est le nº 1008. Le décret du projet Extension de la Mine Canadian Malartic fait présentement l'objet d'une demande de modifications afin d'y intégrer les nouvelles zones d'exploitation du projet Odyssey. Les limites du bail seront ajustées afin d'intégrer les zones géologiques souterraines pouvant présenter un potentiel économique futur. CMGP possède un bail de location de surface à l'emplacement du projet Odyssey (bail numéro 823 099), qui a été obtenu pour l'agrandissement des haldes à stériles de l'Extension.

Les titres miniers sont représentés sur la carte 2.

## 2.4 HISTORIQUE DU SITE

Les travaux d'exploration pour l'or ont débuté en 1923 dans le secteur de la zone Gouldie. En 1927, Malartic Gold Mines a acquis la propriété, et a mené divers travaux d'exploration jusqu'en 1929. En 1933, Canadian Malartic Gold Mines Company a acquis la propriété et a mis en opération la mine Canadian Malartic en 1935, laquelle a par la suite été exploitée jusqu'en 1965. Ce succès a encouragé la découverte d'autres mines d'or dans le camp minier Malartic, notamment les mines Sladen, East Malartic et Barnat. La mine Sladen a été exploitée de 1938 à 1970 par Barnat Mines Ltd et Sladen Mines Ltd. En 1970, Lake Shore Mines Ltd a racheté la propriété et exploité à nouveau la mine de 1976 à 1981. La mine East Malartic a quant à elle été en production de 1938 à 1983 et a été exploitée par East Malartic Mines. Deux petites fosses à ciel ouvert (Buckshot et Mammoth) ont également été exploitées à l'emplacement des mines Barnat et East Malartic afin d'extraire la minéralisation des piliers de surface après le remblayage des chantiers souterrains.

À la mine Barnat/Sladen, 8 452 000 tonnes de minerai ont été traitées à une teneur moyenne de 4,73 g Au/t et 1,17 g/t Ag, produisant un total de 1 285 300 onces d'or et 317 900 onces d'argent. Il n'y a pas de registres de production spécifiques pour la zone South Barnat. La production a repris de 1976 à 1981, mais les données de production ont été incluses dans celles de la mine East Malartic puisque les minerais des deux mines ont été traités à l'usine East Malartic.

À la suite de l'arrêt de l'exploitation minière en 1983, l'ensemble du camp aurifère de Malartic, couvrant le reste de la propriété Canadian Malartic, ainsi que les anciennes mines Barnat/Sladen et East Malartic, ont été acquis par Long Lac Exploration Ltd. Plusieurs autres campagnes de forage ont été complétées sur les portions Barnat/Sladen et East Malartic de la propriété jusqu'en 1990.

La mine East Malartic représente le plus grand producteur historique du camp aurifère de Malartic. Au cours de la durée de vie de la mine, un total de 18 316 000 tonnes de minerai a été extrait, à une teneur moyenne de 5,19 gAu/t et 1,27 g/t Ag, produisant 3 056 250 onces d'or et 747 900 onces d'argent. L'activité dans ce secteur a repris en 2010, quand la compagnie minière Osisko a réalisé des campagnes de forages supplémentaires jusqu'en 2012 dans le but de définir des ressources en vue d'une exploitation à ciel ouvert, et qui ont également contribué à définir les ressources souterraines.

Bien que la zone d'East Gouldie soit une découverte récente de CMGP, il est possible de corréler son extension à la zone Gouldie à l'ouest et à l'indice Bravo au sud-est. Plusieurs campagnes de forages ont été réalisées dans ce secteur par Osisko entre 2008 et 2012.

Les premiers travaux de forages dans le secteur d'Odyssey ont été effectués en 1990 par l'entreprise Mineras LAC. Environ 10 000 m de forages avaient été réalisés et ont permis de mettre au jour les premières zones minéralisées de ce gisement. Plusieurs campagnes de forages ont eu lieu par la suite afin de mieux définir le gisement. Ainsi, entre 2011 et 2020, c'est plus de 650 000 m de forages qui avaient été réalisés pour la propriété Odyssey, soit au niveau des zones Odyssey, East Malartic et East Gouldie.

Le secteur d'Odyssey a été couvert par le projet Extension et son étude d'évaluation des impacts. Certaines infrastructures ont été aménagées sur le site de façon permanente depuis le début de la phase d'exploration avancée qui est présentement en cours, soit le bâtiment administratif, le portail de la rampe ainsi que certaines voies de circulation et infrastructures de drainage.

Par contre, aucune étude de caractérisation des sols n'a eu lieu sur le site du projet Odyssey. D'après les photographies aériennes et les images satellites consultées, le site d'Odyssey est un terrain qui est resté majoritairement boisé jusqu'en 2018. Du déboisement a par la suite été réalisé sur certains secteurs spécifiques dans le cadre de campagnes de forages, et les infrastructures du projet ont par la suite été aménagées. Une caractérisation de l'eau souterraine a été réalisée dans le cadre de l'étude d'impact; celle-ci est présentée à la section 4.10.2 et à l'annexe 4-5 de l'étude d'impact. Les trois puits sur le site d'Odyssey ne présentent aucun dépassement des critères de l'eau souterraine.

## 2.5 RESSOURCES MINÉRALES

D'après les dernières évaluations réalisées par CMGP, les ressources estimées jusqu'à présent permettraient d'opérer le projet Odyssey sur une période de 17 ans, soit de 2023 à 2040. La production est estimée à 84 millions de tonnes (Mt) de minerai à une teneur moyenne de 2,67 g/t Au. Aucune estimation de ressources réalisée selon la norme NI-43-101 n'a été produite à ce jour.

# 2.6 GÉOLOGIE ET MINÉRALOGIE

## 2.6.1 GÉOLOGIE RÉGIONALE

D'après les informations fournies par CMGP, la propriété du projet Odyssey est située dans la province géologique du Supérieur, plus précisément à la limite sud de la ceinture de roches vertes archéennes de l'Abitibi. Le gisement est situé au contact entre le Groupe de Piché, qui est composé de volcanites et d'intrusions ultramafiques et mafiques, et le Groupe de Pontiac, composé d'un assemblage de roches sédimentaires métamorphisées (wacke, mudrock et schiste) et de minces horizons de roches ultramafiques. Le degré de métamorphisme du secteur est au faciès des schistes verts.

Le site du projet Odyssey est situé juste au sud de la zone de faille de Cadillac-Larder Lake et le secteur du site à l'étude est affecté par plusieurs failles de cisaillement régionales dextres et dextres inverses.

Le projet Odyssey est compris dans le camp minier de Malartic, à l'instar de la mine Canadian Malartic. La figure 1 présente un aperçu de la géologie régionale du projet Odyssey.

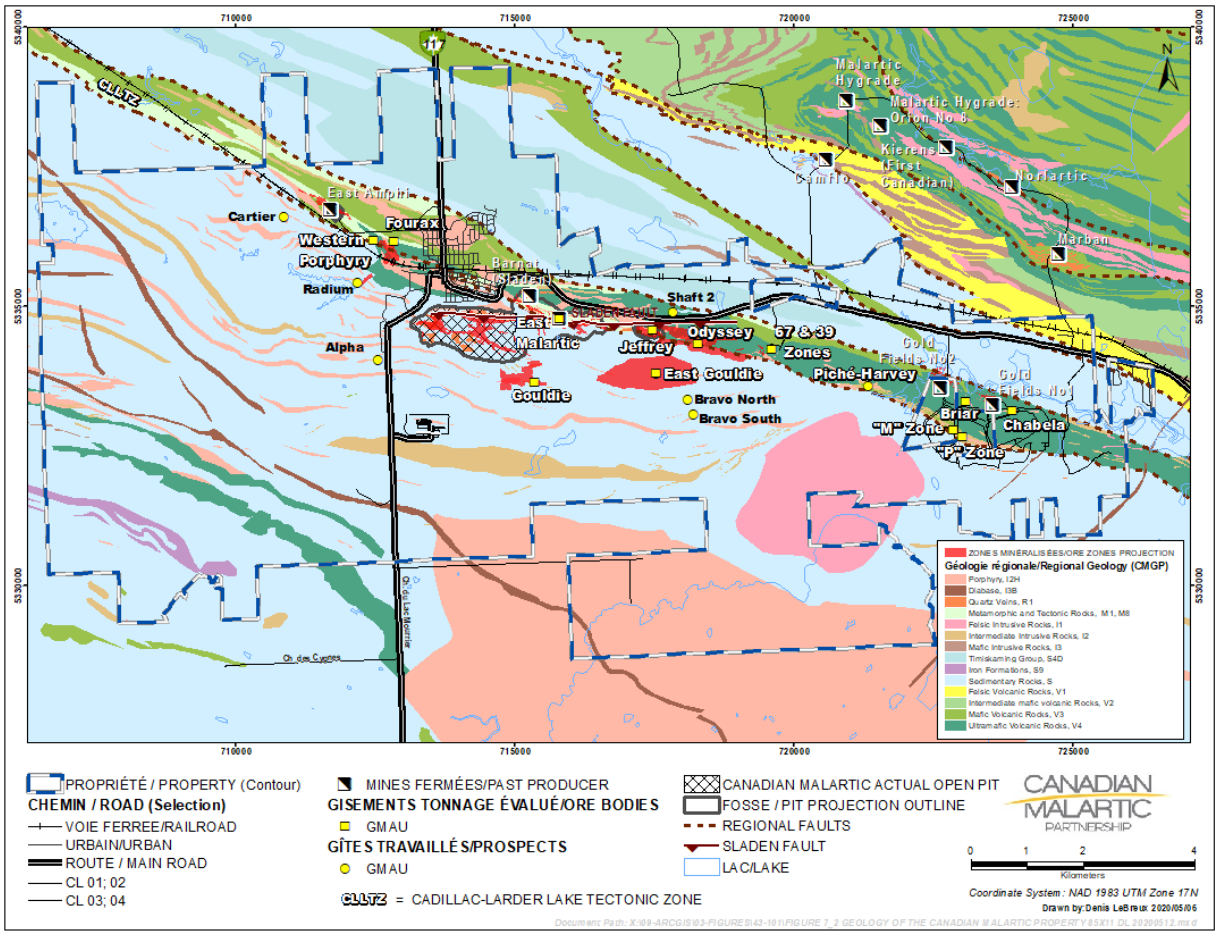


**Figure 1 Géologie régionale du projet Odyssey (figure fournie par CMGP)**

### 2.6.2 GÉOLOGIE DU PROJET ODYSSEY

D'après les informations fournies par CMGP, la majorité de la propriété Canadian Malartic repose sur des unités métasédimentaires du Groupe Pontiac, situées immédiatement au sud de la faille de Cadillac-Larder Lake. La partie centre-nord de la propriété couvre une section d'environ 9,5 km du corridor de la faille de Cadillac-Larder Lake et repose sur des roches métavolcaniques mafiques-ultramafiques du Groupe de Piché coupées par des intrusions porphyritiques et dioritiques. Le Groupe Cadillac couvre la partie nord de la propriété (au nord de la faille de Cadillac-Larder Lake). Il se compose de grauwacke contenant des lentilles de conglomérat.

### 2.6.3 MINÉRALOGIE ET MINÉRALISATION

D'après les informations fournies par CMGP, plusieurs zones minéralisées font partie du gisement Canadian Malartic, soit les zones F, P, A, Wolfe et Gilbert. Ces zones minéralisées font partie d'un large système minéralisé qui se prolonge en profondeur autour des anciens chantiers souterrains des mines Canadian Malartic et Sladen. La zone Gouldie se trouve également à environ 0,5 km au sud-est de la mine Canadian Malartic; la relation entre ces zones et le gisement principal est toutefois actuellement inconnue.

Plusieurs autres zones minéralisées sont reliées à la faille Cadillac-Larder Lake, dont les zones Barnat, East Malartic, Jeffrey et Odyssey. La minéralisation dans ces zones est généralement trouvée disséminée aux contacts de la faille ou associée aux nombreuses intrusions porphyriques qu'on y retrouve.

La minéralisation de ces zones se retrouve dans une enveloppe continue, contenant de 1 à 5 % de pyrite disséminée associée à de l'or natif fin et des traces de chalcopyrite, de sphalérite et de tellures (Eakins, 1962; Fallara et al., 2000). La majorité des zones minéralisées (70%) sont encaissées dans des sédiments clastiques altérés du Groupe de Pontiac recouvrant une intrusion de porphyre dioritique. Une portion de la minéralisation (30%) est également retrouvée dans les niveaux supérieurs de l'intrusion porphyrique.

De l'altération en biotite, séricite et carbonates est retrouvée dans les métasédiments bordant les zones minéralisées. Certaines zones sont également fortement silicifiées et présentent une texture « cherteuse » et sont couramment bréchifiées. Le type d'altération retrouvée au sein du porphyre consiste principalement en une altération potassique, soit un remplacement alcalo-feldspathique des feldspaths plagioclases. Des stockworks présentant une forte teneur en or sont également associées à des veines de quartz-feldspaths-muscovite retrouvées le long de la bordure nord des zones minéralisées (Eakins, 1962; Derry, 1939). De l'altération rétrograde en chlorite-calcite, affectant en particulier la biotite, est omniprésente mais est particulièrement intense le long des zones de cisaillement ductile, formant des schistes à chlorite-calcite.

La zone Barnat est située au nord et au sud des anciens chantiers miniers South Barnat et East Malartic, en grande partie le long du bord sud de la faille Cadillac-Larder Lake. La zone South Barnat représente en fait l'extension nord-ouest de la mine East Malartic. La minéralisation aurifère de la zone Barnat se présente sous forme disséminée ou de stockwork, et est encaissée au sud du contact de la faille dans des grauwackes silicifiés et altérés du Groupe de Pontiac, et au nord dans des dykes porphyriques potassiques et des roches ultramafiques schisteuses, altérées en carbonates et biotisées. Les dykes porphyriques des deux côtés de la faille, mais encore plus du côté nord, présentent une minéralisation disséminée et comprise dans des veines de quartz tardives.

La zone East Malartic a déjà été exploitée par les mines East Malartic, Barnat et Sladen et est située le long du contact entre la faille de Cadillac-Larder Laker et les métasédiments du Groupe de Pontiac, et inclus la partie profonde de la zone Barnat.

Les zones minéralisées sont concentrées le long des anciennes infrastructures minières, et sont associées à des zones de failles comprenant de l'altération en silice-calcite et potassique et contenant de la pyrite, de même qu'à des intrusions porphyriques. Les paramètres géologiques sont similaires à ce que l'on retrouve dans les autres zones de la propriété.

Les zones Odyssey Nord et Odyssey Sud sont également situées au contact entre la faille de Cadillac-Larder Lake et les métasédiments du Groupe de Pontiac. Il se caractérise par la présence d'une intrusion porphyrique massive appelée Porphyre n°12. Bien que l'ensemble de l'unité porphyritique soit légèrement minéralisé, des concentrations continues d'or à plus haute teneur sont retrouvées dans les zones de cisaillement au contact avec la roche encaissante (Groupe de Pontiac au sud et Groupe de Piché au nord). La minéralisation est associée à des zones altérées en silice et altérations potassiques, à des veines de quartz, et à de la pyrite retrouvée sous forme disséminée ou en stockworks dans des proportions de 0,5 à 2,0 %.

La zone East Gouldie est encaissée dans les métasédiments du Groupe de Pontiac, dans un couloir de déformation. La minéralisation est retrouvée dans des zones de cisaillement, en association avec de l'altération en silice. Comme pour les autres zones de la propriété, l'or est associé à de la pyrite retrouvée sous forme disséminée dans des proportions de 1 à 2 %.

### 2.6.4 CARACTÉRISATION GÉOCHIMIQUE

Les études de caractérisation géochimique réalisées pour la propriété présentent des résultats partiellement interprétés en fonction de la Directive 019 sur l'industrie minière (D019) (MELCC, 2012), et partiellement interprétés selon d'autres critères retenus par Ecometrix. Il est à noter qu'un nouveau Guide de caractérisation des résidus miniers et du minerai (MELCC, 2020) (Guide de caractérisation) a été publié en juin 2020, et présente une façon différente d'interpréter les résultats des études géochimiques des résidus miniers et du minerai. Les conclusions des études, interprétées en fonction de la D019 ou d'autres critères jugés plus représentatifs par les auteurs des études, ont été laissées telles quelles. Au besoin, les conclusions de ces dernières pourraient être revues par les entités les ayant réalisées afin d'être interprétées en fonction du Guide de caractérisation.

Des études de caractérisation géochimiques ont été réalisées pour les zones Odyssey Nord et Odyssey Sud ainsi que pour la zone East Malartic (0-600 m). Plus en profondeur, pour la zone East Malartic, une étude de caractérisation a également été effectuée intégrant les résultats obtenus dans l'étude antérieure (Ecometrix, 2019) sur des échantillons de la zone East Malartic et Sheehan 0-600 m. Pour la zone East Gouldie, une caractérisation géochimique des matériaux est actuellement en cours (essais statiques et cinétiques). Il est à noter que l'interprétation des résultats et l'évaluation des propriétés géochimiques des matériaux pour ces zones prennent en compte le nouveau Guide de caractérisation des résidus et du minerai (MELCC, 2020).

Les recommandations tirées des rapports d'Écometrix relatives à la gestion du minerai, des stériles et résidus miniers sont rapportées dans les lignes suivantes :

*« En considérant la qualité géochimique du secteur de East Malartic et Sheehan, aucune mesure de gestion supplémentaire n'est requise pour l'incorporation de ce matériel dans les opérations de Mine Canadian Malartic. Ce matériel peut être géré sécuritairement à l'intérieur des aires d'accumulation existantes et selon la méthode de gestion actuelle. »*

*« Si les échantillons de minerai d'East Malartic et de Sheehan sont comparables et peuvent générer des résidus similaires à la qualité des résidus actuels et sachant que les procédures de gestion d'entreposage existantes de Canadian Malartic traitent tous les résidus comme potentiellement générateurs d'acide, aucune mesure de gestion supplémentaire n'est requise pour intégrer les résidus d'East Malartic et de Sheehan à l'exploitation de Canadian Malartic. »*

*« Toutefois, des tests géochimiques additionnels, spécifiques au minerai extrait et aux résidus générés, sont recommandés afin de confirmer la similarité entre la qualité géochimique du minerai et des résidus gérés actuellement sur la Mine et ceux en provenance du projet Odyssey. »*

#### 2.6.4.1 CARACTÉRISATION GÉOCHIMIQUE DU MINERAI, DES RÉSIDUS ET DES STÉRILES DES ZONES ODYSSEY NORD ET SUD

Une caractérisation géochimique du minerai, des résidus et des stériles a été réalisée par Ecometrix en 2017. Un sommaire des résultats est présenté dans les sous-sections suivantes.

##### MINERAI

Au total, 10 échantillons composites de minerai provenant de la zone Odyssey Sud et 16 échantillons composites de minerai provenant de la zone Odyssey Nord ont été testés pour déterminer leur concentration en métaux totaux et la composition chimique de la roche totale (Whole rock analysis). Le potentiel de génération d'acide a également été évalué à l'aide de l'essai Acid Base Accounting (ABA) et les échantillons ont aussi été soumis à un essai de capacité de neutralisation. Finalement, le potentiel de lixiviation du minerai a été évalué grâce aux essais TCLP EPA 1311, SPLP EPA 1312 et CTEU-9. La description des échantillons et les résultats sont présentés dans le rapport d'Ecometrix, inséré à l'annexe C-1 de ce rapport.

Les résultats des essais de génération d'acide ont été interprétés à l'aide des relations entre les ratios carbonates-RPN[3] (Carb/RPN) et le ratio carbone/soufre (C/S). Ecometrix a déterminé que cette méthode est plus représentative pour les roches du gisement, d'après les corrélations linéaires observées. Cette méthode a permis de déterminer que le minerai présentant des valeurs de Carb/RPN supérieures à 2 est considéré non potentiellement générateur acide (NPGA), alors que le minerai présentant un ratio Carb/RPN inférieur à 1 est considéré potentiellement générateur acide (PGA). Le minerai présentant un ratio compris entre 1 et 2 présente un potentiel de génération d'acide incertain. Ainsi, selon cette étude, environ 60 % du minerai de la zone Odyssey Sud caractérisé est NPGA, alors que 88 % de la zone Odyssey Nord est considéré NPGA et que 30 % du minerai de la zone Odyssey Sud présente un potentiel de génération d'acide incertain, contre 13 % pour la zone Odyssey Nord.

Pour ce qui est des métaux extractibles totaux, des dépassements des critères génériques « A » du Guide, pour les valeurs moyennes des échantillons, sont observés pour le chrome et l'argent pour les deux zones, et pour le nickel dans la zone Odyssey Nord uniquement. Toutefois, au moins un échantillon a présenté un dépassement des critères génériques « A » du MELCC (MELCC, 2019) pour l'argent, le baryum, le cobalt, le chrome, le nickel, le plomb et le molybdène.

3 Ratio du potentiel de neutralisation = potentiel de neutralisation (PN) / potentiel d'acidité (PA)

En regard des résultats obtenus aux essais de lixiviation TCLP, 100 % du minerai serait considéré lixiviable en baryum et/ou en plomb selon la D019. Ecometrix a comparé les résultats des essais SPLP et CTEU-9 à la valeur de potabilité du *Règlement sur la qualité de l'eau potable* (CTEU-9) et à 10 fois cette valeur (SPLP). Aucun dépassement de ces critères n'a été obtenu aux essais SPLP et CTEU-9, et aucun dépassement des critères du tableau 1 de l'annexe II de la D019 n'a été observé au cours des essais. Ecometrix précise de plus que les résultats à l'essai TCLP ne sont pas représentatifs des conditions anticipées au site et qu'il est estimé que la qualité du lixiviat du minerai sera plus près des résultats aux essais SPLP et CTEU-9.

Les tableaux 1 à 5 présentent un sommaire des résultats, interprétés selon les critères considérés par Ecometrix. Les dépassements des critères considérés sont indiqués par des cases grisées dans les tableaux 2 à 5.

**Tableau 1 Sommaire du potentiel de génération d'acide du minerai des zones Odyssey Nord et Sud (tableau adapté de Ecometrix, 2017)**

| Zone | Nombre d'échantillons analysés | Potentiel de génération d'acide évalué/Nombre d'échantillons / Proportion (%) | | |
|---|---|---|---|---|
| | | PGA Carb-RPN < 1 | Zone d'incertitude 1 ≤ Carb-RPN < 2 | NPGA Carb-RPN ≥ 2 |
| Odyssey Nord | 16 | 0 % | 13 % | 88 % |
| Odyssey Sud | 10 | 10 % | 30 % | 60 % |

**Tableau 2 Sommaire des résultats des échantillons de minerai des zones Odyssey Nord et Sud, pour les paramètres pour lesquels plus de 10 % des échantillons excédaient les critères génériques « A » du MELCC (tableau adapté de Ecometrix, 2017)**

| Paramètres | | Critères Génériques « A »' | Odyssey Nord | Odyssey Sud |
|---|---|---|---|---|
| | | | 16 | 10 |
| Moyenne (mg/kg) | Baryum | 240 | 173 | 99 |
| | Cobalt | 30 | 13 | 12 |
| | Chrome | 100 | 155 | 113 |
| | Nickel | 50 | 69 | 49 |
| | Plomb | 40 | 35 | 16 |
| | Molybdène | 8 | 3,3 | 6,5 |
| | Argent | 0,5 | 0,6 | 0,8 |
| Minimum (mg/kg) | Baryum | 240 | 47 | 29 |
| | Cobalt | 30 | 5,7 | 5,5 |
| | Chrome | 100 | 14 | 10 |
| | Nickel | 50 | 8,4 | 8,2 |
| | Plomb | 40 | 8,3 | 2,6 |
| | Molybdène | 8 | 0,4 | 0,5 |
| | Argent | 0,5 | 0,2 | 0,1 |

| Paramètres | | Critères Génériques « A »' | Odyssey Nord | Odyssey Sud |
|---|---|---|---|---|
| | | | 16 | 10 |
| Maximum (mg/kg) | Baryum | 240 | 350 | 200 |
| | Cobalt | 30 | 36 | 41 |
| | Chrome | 100 | 910 | 890 |
| | Nickel | 50 | 360 | 310 |
| | Plomb | 40 | 200 | 47 |
| | Molybdène | 8 | 19 | 23 |
| | Argent | 0,5 | 2,2 | 1,7 |

**Tableau 3 Sommaire des résultats des critères RES et des recommandations de la D019 des échantillons de minerai des zones Odyssey Nord et Sud soumis à l'essai TCLP (tableau adapté de Ecometrix, 2017)**

| Paramètres | | Critères | | Nombre d'échantillons /Résultats |
|---|---|---|---|---|
| | | Résurgence dans l'eau de surface | Tableau 1 de l'annexe II Directive 019 | |
| | | | | 4 |
| Moyenne (mg/L) | Baryum | 0,6 | 100 | 2,5 |
| | Cobalt | 0,37 | -- | 0,002 |
| | Chrome | 1 | 5 | 0,0003 |
| | Nickel | 0,26 | -- | 0,002 |
| | Plomb | 0,034 | 5 | 0,006 |
| | Molybdène | 29 | -- | 0,001 |
| | Argent | 0,00062 | -- | 0,0005 |
| Minimum (mg/L) | Baryum | 0,6 | 100 | 1,1 |
| | Cobalt | 0,37 | -- | 0,001 |
| | Chrome | 1 | 5 | 0,0003 |
| | Nickel | 0,26 | -- | 0,002 |
| | Plomb | 0,034 | 5 | 0,004 |
| | Molybdène | 29 | -- | 0,001 |
| | Argent | 0,00062 | -- | 0,0005 |
| Maximum (mg/L) | Baryum | 0,6 | 100 | 4,3 |
| | Cobalt | 0,37 | -- | 0,003 |
| | Chrome | 1 | 5 | 0,0004 |
| | Nickel | 0,26 | -- | 0,003 |
| | Plomb | 0,034 | 5 | 0,010 |
| | Molybdène | 29 | -- | 0,002 |
| | Argent | 0,00062 | -- | 0,0005 |

**Tableau 4** **Sommaire des résultats des critères du Règlement sur la qualité de l'eau potable des échantillons de minerai des zones Odyssey Nord et Sud soumis à l'essai SPLP (tableau adapté de Ecometrix, 2017)**

| **Paramètres** | | **Critère** | **Nombre d'échantillons /Résultats** |
|---|---|---|---|
| | | **10 fois le *Règlement sur la qualité de l'eau potable*** | |
| | | | 4 |
| Moyenne (mg/L) | Baryum | 10 | 0,4 |
| | Cobalt | -- | 0,000006 |
| | Chrome | 0,5 | 0,00007 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,1 | 0,00003 |
| | Molybdène | -- | 0,0003 |
| | Argent | -- | 0,00005 |
| Minimum (mg/L) | Baryum | 10 | 0,1 |
| | Cobalt | -- | 0,000004 |
| | Chrome | 0,5 | 0,00004 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,1 | 0,00001 |
| | Molybdène | -- | 0,0001 |
| | Argent | -- | 0,00005 |
| Maximum (mg/L) | Baryum | 10 | 1,0 |
| | Cobalt | -- | 0,00001 |
| | Chrome | 0,5 | 0,0002 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,1 | 0,00004 |
| | Molybdène | -- | 0,0004 |
| | Argent | -- | 0,00005 |

**Tableau 5** **Sommaire des résultats des critères du Règlement sur la qualité de l'eau potable des échantillons de minerai des zones Odyssey Nord et Sud soumis à l'essai CTEU-9 (tableau adapté de Ecometrix, 2017)**

| **Paramètres** | | **Critères** | **Nombre d'échantillons /Résultats** |
|---|---|---|---|
| | | ***Règlement sur la qualité de l'eau potable*** | **4** |
| Moyenne (mg/L) | Baryum | 1 | 0,3 |
| | Cobalt | -- | 0,00003 |
| | Chrome | 0,05 | 0,0001 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,01 | 0,00009 |

| Paramètres | | Critères | Nombre d'échantillons /Résultats |
|---|---|---|---|
| | | ***Règlement sur la qualité de l'eau potable*** | **4** |
| | Molybdène | -- | 0,007 |
| | Argent | -- | 0,0002 |
| Minimum (mg/L) | Baryum | 1 | 0,2 |
| | Cobalt | -- | 0,00002 |
| | Chrome | 0,05 | 0,00009 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,01 | 0,00006 |
| | Molybdène | -- | 0,002 |
| | Argent | -- | 0,00005 |
| Maximum (mg/L) | Baryum | 1 | 0,4 |
| | Cobalt | -- | 0,00004 |
| | Chrome | 0,05 | 0,0001 |
| | Nickel | -- | 0,0002 |
| | Plomb | 0,01 | 0,0001 |
| | Molybdène | -- | 0,01 |
| | Argent | -- | 0,0004 |

## STÉRILES

Vingt-quatre (24) échantillons composites de roches stériles provenant de la zone Odyssey Sud et 27 échantillons composites de roches stériles provenant de la zone Odyssey Nord ont été testés pour déterminer leur concentration en métaux totaux et la composition chimique de la roche totale (Whole rock analysis). Le potentiel de génération d'acide statique a également été évalué à l'aide de l'essai ABA et les échantillons ont été soumis à un essai de la capacité de neutralisation. Finalement, le potentiel de lixiviation des stériles a été évalué grâce aux essais de laboratoire TCLP EPA 1311, SPLP EPA 1312 et CTEU-9, réalisés sur neuf des échantillons de stériles de la zone Odyssey Sud. Il est à noter que ces essais sont réalisés sur des échantillons broyés à des granulométries fines, qui ne sont pas vraiment représentatives de la granulométrie des stériles produits en opération. La description des échantillons et les résultats sont présentés dans le rapport d'Ecometrix, inséré à l'annexe C-1 de ce rapport.

Les résultats des essais de génération d'acide ont été interprétés à l'aide des relations entre les ratios carbonates-RPN et le ratio carbone/soufre (C/S). Ecometrix a déterminé que cette méthode est plus représentative pour les roches du gisement, d'après les corrélations linéaires observées. Cette méthode a permis de déterminer que le stérile présentant des valeurs de C/S supérieures à 0,81 est NPGA, alors que le stérile présentant un ratio C/S inférieur à 0,42 est PGA. Le stérile présentant un ratio compris entre 0,39 et 0,68 présente un potentiel de génération d'acide incertain.

Ainsi, selon cette étude, les résultats des essais de détermination du potentiel de génération d'acide montrent que 92 % des échantillons de stériles associés à la zone Odyssey Sud soumis aux essais sont NPGA, alors que 4 % sont situés dans la zone d'incertitude, et que 4 % sont PGA, selon les critères utilisés par Ecometrix. En ce qui concerne la zone Odyssey Nord, 93 % des échantillons de stériles soumis aux essais sont NPGA, alors que 7 % sont situés dans la zone d'incertitude, et que 0 % sont PGA, selon les critères considérés par Ecometrix.

Pour ce qui est des métaux extractibles totaux, des dépassements des critères génériques « A » du Guide d'intervention du MELCC sont observés pour le baryum, le cobalt, le chrome, le cuivre, le nickel et le plomb.

De plus, une alternative d'interprétation, autre que celle présentée dans la D019, a été utilisée par Ecometrix pour la classification des résultats des essais de lixiviation au TCLP (voir figure 2). Les résultats de l'essai de lixiviation TCLP, interprétés de cette façon, ne montrent aucun dépassement des critères de la D019 pour des résidus à risque élevé, mais montrent un dépassement du critère de RES pour le baryum (50 %) et le plomb (17 %). Les résultats des essais SPLP et CTEU-9 ont quant à eux été comparés à la valeur de potabilité du *Règlement sur la qualité de l'eau potable* (CTEU-9) et à 10 fois cette valeur (SPLP). Ainsi, Ecometrix considère qu'environ 36% des stériles sont classé à faible risque selon la D019.

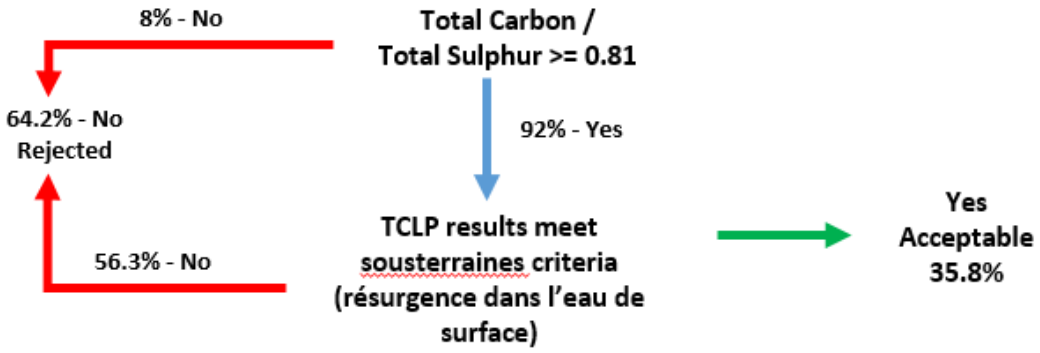


**Figure 2** **Alternative d'interprétation utilisée par Ecometrix pour la classification des stériles (figure tirée de Ecometrix, 2017)**

Les tableaux 6 à 10 présentent un sommaire des résultats, interprétés selon les critères considérés par Ecometrix. Les dépassements des critères considérés sont indiqués par des cases grisées dans le tableau 7.

**Tableau 6 Sommaire du potentiel de génération d'acide des stériles des zones Odyssey Nord et Sud (tableau adapté de Ecometrix, 2017)**

| Zone | | Potentiel de génération d'acide évalué/Nombre d'échantillons/ Proportion (%) | | |
|---|---|---|---|---|
| | | PGA C/S < 0.42 | Zone d'incertitude 0.42 ≥ C/S > 0.81 | NPGA C/S ≥ 0.81 |
| Odyssey Nord | Éponte inférieure | 0 % | 0 % | 100 % |
| | Éponte supérieure | 0 % | 11 % | 89 % |
| | Développement | 0 % | 11 % | 89 % |
| | Total | 0 % | 7 % | 93 % |
| Odyssey Sud | Éponte inférieure | 11 % | 0 % | 89 % |
| | Éponte supérieure | 0 % | 11 % | 89 % |
| | Développement | 0 % | 0 % | 100 % |
| | Total | 4 % | 4 % | 92 % |
| Total (Nord et Sud) | | 2 % | 6 % | 92 % |

**Tableau 7 Sommaire des résultats des échantillons de stériles pour les paramètres pour lesquels plus de 10 % des échantillons excédaient les critères génériques « A » du MELCC (tableau adapté de Ecometrix, 2017)**

| Paramètre | | Critères génériques pour les sols-'A' | Odyssey Nord (n=27) | | | Odyssey Sud (n=24) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Éponte inférieure | Éponte supérieure | Développement | Éponte inférieure | Éponte supérieure | Développement |
| | | | n=9 | n=9 | n=9 | n=9 | n=9 | n=6 |
| Baryum | Médiane (mg/kg) | 240 | 110 | 170 | 230 | 160 | 140 | 150 |
| | Moyenne (mg/kg) | | 104 | 166 | 266 | 169 | 168 | 152 |
| | Dépassement des critères génériques « A » | | 0 % | 11 % | 44 % | 22 % | 11 % | 0 % |
| Cobalt | Médiane (mg/kg) | 30 | 33 | 6,2 | 6,5 | 6,4 | 22 | 6,9 |
| | Moyenne (mg/kg) | | 28 | 11 | 14 | 6,9 | 24 | 16 |
| | Dépassement des critères génériques « A » | | 67 % | 11 % | 22 % | 0 % | 22 % | 33 % |
| Chrome | Médiane (mg/kg) | 100 | 650 | 21 | 18 | 17 | 87 | 14,5 |
| | Moyenne (mg/kg) | | 466 | 81 | 124 | 35 | 191 | 134 |
| | Dépassement des critères génériques « A » | | 56 % | 11 % | 22 % | 11 % | 33 % | 17 % |
| Cuivre | Médiane (mg/kg) | 65 | 29 | 5,6 | 8,7 | 6,8 | 39 | 8,05 |

| Paramètre | | Critères génériques pour les sols-'A' | Odyssey Nord (n=27) | | | Odyssey Sud (n=24) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Éponte inférieure | Éponte supérieure | Développement | Éponte inférieure | Éponte supérieure | Développement |
| | | | n=9 | n=9 | n=9 | n=9 | n=9 | n=6 |
| | Moyenne (mg/kg) | | 44 | 29 | 19 | 6,8 | 36 | 30 |
| | Dépassement des critères génériques « A » | | 22 % | 11 % | 11 % | 0 % | 11 % | 17 % |
| Nickel | Médiane (mg/kg) | 50 | 240 | 12 | 10 | 9,4 | 68 | 10 |
| | Moyenne (mg/kg) | | 177 | 36 | 63 | 13 | 102 | 49 |
| | Dépassement des critères génériques « A » | | 56 % | 22 % | 33 % | 0 % | 89 % | 17 % |
| Plomb | Médiane (mg/kg) | 40 | 11 | 23 | 30 | 8,6 | 5,5 | 11 |
| | Moyenne (mg/kg) | | 11 | 24 | 35 | 12 | 6,8 | 10 |
| | Dépassement des critères génériques « A » | | 0 % | 33 % | 33 % | 0 % | 0 % | 0 % |

**Tableau 8 Sommaire des dépassements des critères RES et des recommandations de la D019 des échantillons de stériles soumis à l'essai TCLP (tableau adapté de Ecometrix, 2017)**

| Nombre d'échantillons | Dépassements des critères RES du MELCC[1] | Dépassements des recommandations du tableau 1 de l'annexe II de la D019 |
|---|---|---|
| 18 | Baryum - 50 % | Baryum - 0 % |
| | Cobalt - 0 % | Cobalt - 0 % |
| | Chrome - 0 % | Chrome - 0 % |
| | Cuivre - 0 % | Cuivre - 0 % |
| | Nickel - 0 % | Nickel - 0 % |
| | Plomb - 17 % | Plomb - 0 % |

[1] Échantillons pour lesquels un dépassement du critère générique « A » a été observé pour le même paramètre.

**Tableau 9** **Sommaire des dépassements de 10 fois la valeur de potabilité du *Règlement sur la qualité de l'eau potable* des échantillons de stériles soumis à l'essai SPLP (tableau adapté de Ecometrix, 2017)**

| Nombre d'échantillons | Dépassements de 10 fois la valeur de potabilité du *Règlement sur la qualité de l'eau potable* |
|---|---|
| 18 | Baryum - 0 % |
| | Cobalt – n. a. |
| | Chrome - 0 % |
| | Cuivre - 0 % |
| | Nickel - n. a. |
| | Plomb - 0 % |

**Tableau 10** **Sommaire des dépassements de la valeur de potabilité du Règlement sur la qualité de l'eau potable des échantillons de stériles soumis à l'essai CTEU-9 (tableau adapté de Ecometrix, 2017)**

| Nombre d'échantillons | Dépassements de la valeur de potabilité du *Règlement sur la qualité de l'eau potable* |
|---|---|
| 18 | Baryum – 0 % |
| | Cobalt - n. a. |
| | Chrome – 0 % |
| | Cuivre – 0 % |
| | Nickel - n. a. |
| | Plomb – 0 % |

## RÉSIDUS

Trois échantillons de résidus ont été analysés. Toutefois, ces échantillons ont été produits à partir de minerai indifférencié provenant des zones Odyssey Nord et Odyssey Sud. Ceux-ci ont été testés pour déterminer leur concentration en métaux totaux et la composition chimique de la roche totale (Whole rock analysis). Le potentiel de génération d'acide statique a également été évalué à l'aide de l'essai ABA et les échantillons ont été soumis à un essai de la capacité de neutralisation. Finalement, le potentiel de lixiviation des résidus a été évalué grâce aux essais TCLP EPA 1311, SPLP EPA 1312 et CTEU-9, réalisés sur deux des trois échantillons de résidus. La description des échantillons et les résultats sont présentés dans le rapport d'Ecometrix, inséré à l'annexe C-1 de ce rapport.

Les résultats des essais de génération d'acide ont été interprétés à l'aide des relations entre les ratios carbonates-RPN (Carb/RPN) et le ratio carbone/soufre (C/S). Ecometrix a déterminé que cette méthode est plus représentative pour les roches du gisement, d'après les corrélations linéaires observées. Cette méthode a permis de déterminer que le minerai présentant des valeurs de Carb/RPN supérieures à 2 est NPGA, alors que le minerai présentant un ratio Carb/RPN inférieur à 1 est PGA. Le minerai présentant un ratio compris entre 1 et 2 présente un potentiel de génération d'acide incertain. Ainsi, selon cette étude, environ 67 % des résidus des deux zones Odyssey sont considérés NPGA, alors que 33 % de ceux-ci sont dans la zone d'incertitude.

Pour ce qui est des métaux extractibles totaux, au moins un échantillon a présenté un dépassement des critères génériques « A » pour l'argent et le plomb, alors que les valeurs moyennes des échantillons sont toutes inférieures aux critères génériques « A », excepté pour le plomb dont la valeur moyenne est égale aux critères génériques « A ».

En regard des résultats obtenus aux essais de lixiviation TCLP, 100 % des résidus seraient considérés lixiviables en baryum et/ou en plomb selon la D019. Les résultats des essais SPLP et CTEU-9 ont quant à eux été comparés à la valeur de potabilité du *Règlement sur la qualité de l'eau potable* (CTEU-9) et à 10 fois cette valeur (SPLP). Aucun dépassement de ces critères n'a été obtenu aux essais SPLP et CTEU-9.

Toutefois, il convient de note que si les résultats avaient été comparés aux critères RES, des dépassements pour l'argent seraient observés à l'essai CTEU-9.

Les tableaux 11 à 15 présentent un sommaire des résultats, interprétés selon les critères considérés par Ecometrix. Les dépassements des critères considérés sont indiqués par des cases grisées dans les tableaux 12 à 15.

**Tableau 11 Sommaire du potentiel de génération d'acide des résidus des zones Odyssey Nord et Sud (tableau adapté de Ecometrix, 2017)**

| | Nombre d'échantillons analysés | PGA Carb-RPN < 1 | Zone d'incertitude 1 ≤ Carb-RPN < 2 | NPGA Carb-RPN ≥ 2 |
|---|---|---|---|---|
| Résidus | 3 | 0 % | 33 % | 67 % |

**Tableau 12 Sommaire des résultats des échantillons de résidus pour les paramètres pour lesquels plus de 10 % des échantillons excédaient les critères génériques « A » du MELCC (tableau adapté de Ecometrix, 2017)**

| Paramètres | | Critères génériques « A »' | Résidus miniers |
|---|---|---|---|
| | | | 3 |
| Moyenne (mg/kg) | Baryum | 240 | 124 |
| | Cobalt | 30 | 7,7 |
| | Chrome | 100 | 34 |
| | Nickel | 50 | 21 |
| | Plomb | 40 | 40 |
| | Molybdène | 8 | 2,0 |
| | Argent | 0,5 | 0,4 |
| Min (mg/kg) | Baryum | 240 | 82 |
| | Cobalt | 30 | 6,9 |
| | Chrome | 100 | 27 |
| | Nickel | 50 | 16 |
| | Plomb | 40 | 27 |
| | Molybdène | 8 | 1,8 |
| | Argent | 0,5 | 0,3 |
| Max (mg/kg) | Baryum | 240 | 160 |
| | Cobalt | 30 | 9,0 |

| Paramètres | | Critères génériques « A »' | Résidus miniers |
|---|---|---|---|
| | | | 3 |
| | Chrome | 100 | 39 |
| | Nickel | 50 | 24 |
| | Plomb | 40 | 49 |
| | Molybdène | 8 | 2,2 |
| | Argent | 0,5 | 0,5 |

**Tableau 13 Sommaire des résultats des critères RES et des recommandations de la D019 des échantillons de résidus soumis à l'essai TCLP (tableau adapté de Ecometrix, 2017)**

| Paramètres | | Critères | | Nombre d'échantillons /Résultats |
|---|---|---|---|---|
| | | Résurgence dans l'eau de surface | Tableau 1 de l'annexe II Directive 019 | |
| | | | | 2 |
| Moyenne (mg/L) | Baryum | 0,6 | 100 | 2,2 |
| | Cobalt | 0,37 | -- | 0,006 |
| | Chrome | 1 | 5 | 0,009 |
| | Nickel | 0,26 | -- | 0,02 |
| | Plomb | 0,034 | 5 | 0,1 |
| | Molybdène | 29 | -- | 0,003 |
| | Argent | 0,00062 | -- | 0,0005 |
| Minimum (mg/L) | Baryum | 0,6 | 100 | 1,3 |
| | Cobalt | 0,37 | -- | 0,005 |
| | Chrome | 1 | 5 | 0,009 |
| | Nickel | 0,26 | -- | 0,02 |
| | Plomb | 0,034 | 5 | 0,1 |
| | Molybdène | 29 | -- | 0,002 |
| | Argent | 0,00062 | -- | 0,0005 |
| Maximum (mg/L) | Baryum | 0,6 | 100 | 3,1 |
| | Cobalt | 0,37 | -- | 0,007 |
| | Chrome | 1 | 5 | 0,010 |
| | Nickel | 0,26 | -- | 0,03 |
| | Plomb | 0,034 | 5 | 0,2 |
| | Molybdène | 29 | -- | 0,003 |
| | Argent | 0,00062 | -- | 0,0005 |

**Tableau 14 Sommaire des résultats de 10 fois la valeur de potabilité du *Règlement sur la qualité de l'eau potable* des échantillons de résidus soumis à l'essai SPLP (tableau adapté de Ecometrix, 2017)**

| **Paramètres** | | **10 fois le *Règlement sur la qualité de l'eau potable*** | **Nombre d'échantillons /Résultats** |
|---|---|---|---|
| | | | 2 |
| Moyenne (mg/L) | Baryum | 10 | 0,3 |
| | Cobalt | -- | 0,0003 |
| | Chrome | 0,5 | 0,0003 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,1 | 0,00004 |
| | Molybdène | -- | 0,0008 |
| | Argent | -- | 0,00005 |
| Minimum (mg/L) | Baryum | 10 | 0,07 |
| | Cobalt | -- | 0,0003 |
| | Chrome | 0,5 | 0,0002 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,1 | 0,00002 |
| | Molybdène | -- | 0,0007 |
| | Argent | -- | 0,00005 |
| Maximum (mg/L) | Baryum | 10 | 0,5 |
| | Cobalt | -- | 0,0003 |
| | Chrome | 0,5 | 0,0004 |
| | Nickel | -- | 0,0001 |
| | Plomb | 0,1 | 0,00006 |
| | Molybdène | -- | 0,0008 |
| | Argent | -- | 0,00005 |

**Tableau 15 Sommaire des résultats de la valeur de potabilité du *Règlement sur la qualité de l'eau potable* des échantillons de résidus soumis à l'essai CTEU-9 (tableau adapté de Ecometrix, 2017)**

| Paramètres | | 10 fois le *Règlement sur la qualité de l'eau potable* | Nombre d'échantillons /Résultats |
|---|---|---|---|
| | | | 2 |
| Moyenne (mg/L) | Baryum | 1 | 0,2 |
| | Cobalt | -- | 0,002 |
| | Chrome | 0,05 | 0,00007 |
| | Nickel | -- | 0,0003 |
| | Plomb | 0,01 | 0,0001 |
| | Molybdène | -- | 0,02 |
| | Argent | -- | 0,002 |
| Minimum (mg/L) | Baryum | 1 | 0,1 |
| | Cobalt | -- | 0,001 |
| | Chrome | 0,05 | 0,0001 |
| | Nickel | -- | 0,0002 |
| | Plomb | 0,01 | 0,0001 |
| | Molybdène | -- | 0,01 |
| | Argent | -- | 0,0007 |
| Maximum (mg/L) | Baryum | 1 | 0,2 |
| | Cobalt | -- | 0,002 |
| | Chrome | 0,05 | 0,00007 |
| | Nickel | -- | 0,0003 |
| | Plomb | 0,01 | 0,0001 |
| | Molybdène | -- | 0,02 |
| | Argent | -- | 0,002 |

### 2.6.4.2 CARACTÉRISATION GÉOCHIMIQUE DES GISEMENTS EAST MALARTIC ET SHEEHAN

Une caractérisation géochimique du minerai et des stériles des zones East Malartic et Sheehan a été réalisée par EcoMetrix Incorporated en 2019. Un sommaire des résultats pour la zone East Malartic, ainsi qu'un sommaire de la classification des matériaux selon leur interprétation, est présenté dans les sous-sections qui suivent.

## MINERAI

Au total, 10 échantillons de minerai provenant de la zone East Malartic, soit cinq échantillons de métasédiments, deux échantillons de roches ultramafiques et trois échantillons de schiste, ont été testés pour déterminer leur concentration en métaux totaux et la composition chimique de la roche totale (Whole rock analysis). Le potentiel de génération d'acide statique a également été évalué à l'aide de l'essai Acid Base Accounting (ABA) et les échantillons ont également été soumis à un essai de la capacité de neutralisation. Finalement, le potentiel de lixiviation du minerai a été évalué grâce aux essais TCLP EPA 1311, SPLP EPA 1312 et CTEU-9. La description des échantillons et les résultats sont présentés dans le rapport d'Ecometrix Incorporated, inséré à l'annexe C-2 de ce rapport.

Les résultats des essais de génération d'acide ont été interprétés à l'aide des relations entre les ratios carbonates-RPN et le ratio carbone/soufre (C/S). Ecometrix a déterminé que cette méthode est plus représentative pour les roches du gisement, d'après les corrélations linéaires observées. Cette technique a permis de déterminer que le minerai présentant des valeurs de C/S supérieures à 0,68 est NPGA, alors que le minerai présentant un ratio C/S inférieur à 0,39 est PGA. Le minerai présentant un ratio compris entre 0,39 et 0,68 présente un potentiel de génération d'acide incertain. Ainsi, selon cette étude, environ 50 % du minerai caractérisé est NPGA.

De plus, en comparant les résultats des essais de lixiviation au TCLP, comme prescrit dans la D019, 100 % du minerai serait considéré lixiviable, principalement en baryum, manganèse et plomb. Toutefois, une alternative d'interprétation a été utilisée par Ecometrix (présentée à la figure 2). Ainsi, les échantillons présentant un ratio C/S supérieur à 0,68 et respectant les critères du Règlement sur la qualité de l'eau potable (critère utilisé par Ecometrix pour la comparaison) à l'essai CTEU-9 et 10 fois les critères du Règlement sur la qualité de l'eau potable à l'essai SPLP ont également été considérés à faibles risques. Ainsi, il a été calculé que 42,5 % du minerai serait considéré à faible risque.

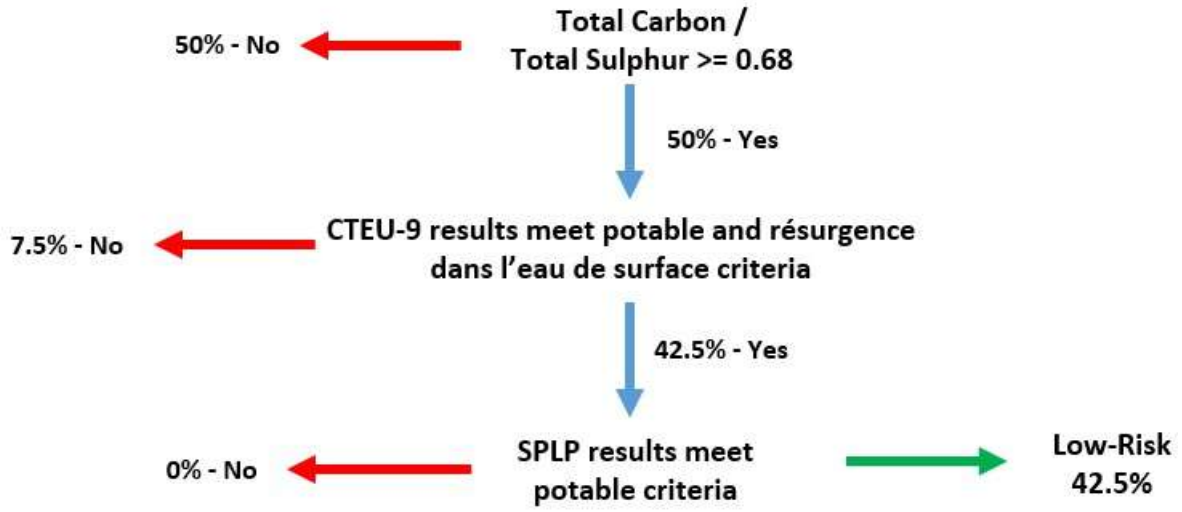


**Figure 3** **Alternative d'interprétation utilisée par Ecometrix pour la classification du minerai (figure tirée de Ecometrix, 2019)**

Les tableaux 16 à 20 présentent un sommaire des résultats, interprétés selon les critères considérés par Ecometrix.

**Tableau 16 Sommaire du potentiel de génération d'acide du minerai de la zone East Malartic (tableau adapté de Ecometrix, 2019)**

| Zone | Nombre d'échantillons | Potentiel de génération d'acide évalué/Nombre d'échantillons/Proportion (%) | | |
|---|---|---|---|---|
| | | PGA (C/S < 0.39) | PGA incertain 0.39 ≥ C/S > 0.68 | NPGA (C/S ≥ 0.68) |
| East Malartic | 10 | 2 | 3 | 5 |
| | | 20 % | 30 % | 50 % |

**Tableau 17 Sommaire des dépassements des échantillons de minerai de la zone East Malartic, pour les paramètres pour lesquels plus de 10 % des échantillons excédaient les critères génériques « A » du MELCC (tableau adapté de Ecometrix, 2019)**

| Paramètre | Proportion d'échantillons présentant un dépassement des critères génériques « A » dans la fraction solide |
|---|---|
| Argent | 70 % |
| Baryum | 30 % |
| Cobalt | 50 % |
| Chrome | 80 % |
| Manganèse | 20 % |
| Molybdène | 30 % |
| Nickel | 80 % |
| Plomb | 20 % |

**Tableau 18 Sommaire des dépassements des critères RES et des recommandations de la D019 des échantillons de minerai de la zone East Malartic soumis à l'essai TCLP (tableau adapté de Ecometrix, 2019)**

| Zone | Paramètres | Dépassements des critères RES du MELCC | Dépassement des recommandations du tableau 1 de l'annexe II de la D019 |
|---|---|---|---|
| East Malartic (nombre d'échantillons=5) | Argent | 0 % | - |
| | Baryum | 60 % | 0 % |
| | Cobalt | 0 % | - |
| | Chrome | 0 % | 0 % |
| | Molybdène | 0 % | - |
| | Manganèse | 100 % | - |
| | Nickel | 0 % | - |
| | Plomb | 80 % | 0 % |

**Tableau 19 Sommaire des dépassements des critères du Règlement sur la qualité de l'eau potable et des critères RES des échantillons de minerai de la zone East Malartic soumis à l'essai SPLP (tableau adapté de Ecometrix, 2019)**

| Zone | Paramètres | Dépassements de 10 fois les critères du *Règlement sur la qualité de l'eau potable* | Dépassements des critères RES du MELCC |
|---|---|---|---|
| East Malartic (nombre d'échantillons=5) | Argent | -- | 0 % |
| | Baryum | 0% | 20 % |
| | Cobalt | -- | 0 % |
| | Chrome | 20% | 0 % |
| | Molybdène | -- | 0 % |
| | Manganèse | -- | 0 % |
| | Nickel | -- | 0 % |
| | Plomb | 0% | 0 % |

**Tableau 20 Sommaire des dépassements du Règlement sur la qualité de l'eau potable et des critères RES des échantillons de minerai de la zone East Malartic soumis à l'essai CTEU-9 (tableau adapté de Ecometrix, 2019)**

| Zone | Paramètres | Dépassements des critères du *Règlement sur la qualité de l'eau potable* | Dépassements des critères RES du MELCC |
|---|---|---|---|
| East Malartic (nombre d'échantillons=5) | Argent | -- | 0 % |
| | Baryum | 0% | 0 % |
| | Cobalt | -- | 0 % |
| | Chrome | 0% | 0 % |
| | Molybdène | -- | 20 % |
| | Manganèse | -- | 0 % |
| | Nickel | -- | 0 % |
| | Plomb | 0% | 0 % |

## STÉRILES

Dix échantillons de roches stériles des épontes de la zone East Malartic, soit quatre échantillons de métasédiments, quatre échantillons de schiste, un échantillon de roches ultramafiques et un échantillon de porphyre, ainsi que 12 échantillons de roches stériles des zones de développement, soit cinq échantillons de métasédiments, quatre échantillons de schiste et un de roches ultramafiques, ainsi que trois échantillon de porphyre ont été testés pour déterminer leur concentration en métaux totaux et la composition chimique de la roche totale (Whole Rock Analysis). La description des échantillons et les résultats sont présentés dans le rapport d'Ecometrix Incorporated, inséré à l'annexe C-2 de ce rapport.

Les résultats des essais de génération d'acide ont été interprétés à l'aide des relations entre les ratios carbonates-RPN et le ratio carbone/soufre (C/S). Ecometrix a déterminé que cette méthode est plus représentative pour les roches du gisement d'après les corrélations linéaires observées. Cette technique a permis de déterminer que les stériles présentant des valeurs de C/S supérieures à 0,68 sont NPGA, alors que les stériles présentant un ratio C/S inférieur à 0,39 sont PGA. Les stériles présentant un ratio compris entre 0,39 et 0,68 présentent un potentiel de génération d'acide incertain. Ainsi, selon cette étude, environ 40 % des stériles caractérisés sont estimés NPGA. Les roches PGA sont principalement issues de l'unité de roches métasédimentaires.

De plus, en comparant les résultats des essais de lixiviation au TCLP, comme prescrit dans la D019, 100 % des stériles seraient considérés lixiviables, principalement en baryum et en manganèse. Toutefois, une alternative d'interprétation a été utilisée par Ecometrix (présentée à la figure 3). Ainsi, les échantillons présentant un ratio C/S supérieur à 0,68, et respectant les critères du Règlement sur la qualité de l'eau potable (critère utilisé par Ecometrix) à l'essai CTEU-9 et 10 fois les critères du Règlement sur la qualité de l'eau potable à l'essai SPLP ont également été considérés à faibles risques. Il a ainsi été estimé qu'environ 60 % des stériles seraient lixiviables, et 40 % seraient considérés à faibles risques.

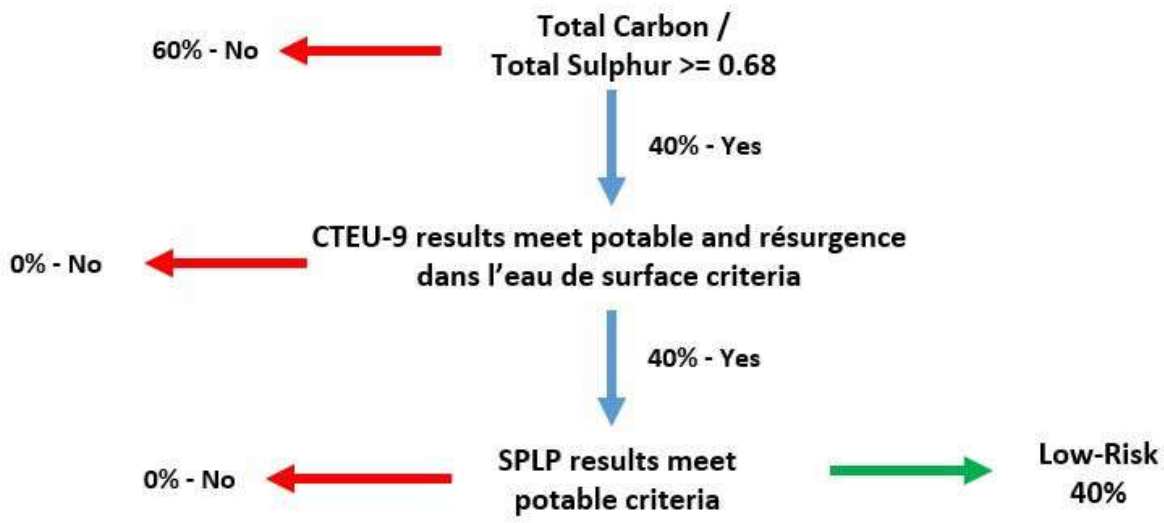


**Figure 4** **Alternative d'interprétation utilisée par Ecometrix pour la classification des stériles de la zone East Malartic (figure tirée de Ecometrix, 2019)**

Les tableaux 21 à 24 présentent un sommaire des résultats, interprétés selon les critères considérés par Ecometrix.

**Tableau 21 Sommaire du potentiel de génération d'acide des stériles de la zone East Malartic (tableau adapté de Ecometrix, 2019)**

| Zone | | Nombre d'échantillons | Potentiel de génération d'acide évalué/Nombre d'échantillons/Proportion (%) | | |
|---|---|---|---|---|---|
| | | | PGA (C/S < 0.39) | PGA incertain 0.39 ≥ C/S > 0.68 | NPGA (C/S ≥ 0.68) |
| East Malartic | Développement | 5 | 60 % | 40 % | 0 % |
| | Dilution – Éponte supérieure | 5 | 20 % | 40 % | 40 % |
| | Dilution – Éponte inférieure | 5 | 20 % | 0 % | 80 % |
| | Total stériles | 15 | 33 % | 27 % | 40 % |

**Tableau 22 Sommaire des dépassements du Règlement sur la qualité de l'eau potable et des critères RES des échantillons de stériles de la zone East Malartic soumis à l'essai TCLP (tableau adapté de Ecometrix, 2019)**

| | Paramètres | Dépassements des critères RES du MELCC | Dépassement des recommandations du tableau 1 de l'annexe II de la D019 |
|---|---|---|---|
| East Malartic (nombre d'échantillons=7) | Argent | 0 % | -- |
| | Baryum | 43 % | 0 % |
| | Cobalt | 0 % | -- |
| | Chrome | 0 % | 0 % |
| | Cuivre | 14 % | -- |
| | Manganèse | 86 % | -- |
| | Nickel | 0 % | -- |
| | Zinc | 0 % | -- |

**Tableau 23 Sommaire des dépassements du Règlement sur la qualité de l'eau potable et des critères RES des échantillons de stériles de la zone East Malartic soumis à l'essai SPLP (tableau adapté de Ecometrix, 2019)**

| | Paramètres | Dépassements de 10 fois les critères du *Règlement sur la qualité de l'eau potable* | Dépassements des critères RES du MELCC |
|---|---|---|---|
| East Malartic (nombre d'échantillons=7) | Argent | -- | 0 % |
| | Baryum | 0% | 0 % |
| | Cobalt | -- | 0 % |
| | Chrome | 0% | 0 % |
| | Cuivre | 0% | 0 % |
| | Manganèse | -- | 0 % |
| | Nickel | -- | 0 % |
| | Zinc | -- | 0 % |

**Tableau 24 Sommaire des dépassements des critères RES et des recommandations de la D019 des échantillons de stériles de la zone East Malartic soumis à l'essai CTEU-9 (tableau adapté de Ecometrix, 2019)**

| | Paramètres | Dépassements des critères du *Règlement sur la qualité de l'eau potable* | Dépassements des critères RES du MELCC |
|---|---|---|---|
| East Malartic (nombre d'échantillons=7) | Argent | -- | 0 % |
| | Baryum | 0% | 0 % |
| | Cobalt | -- | 0 % |
| | Chrome | 0% | 0 % |
| | Cuivre | 0% | 0 % |
| | Manganèse | -- | 0 % |
| | Nickel | -- | 0 % |
| | Zinc | -- | 0 % |

## 2.7 AUTORISATIONS DIVERSES

CMGP est en processus de demande de modification des décrets 914-2009, 388-2017 et 1370-2018 de la mine Canadian Malartic afin d'intégrer les nouvelles zones souterraines du projet Odyssey à celui-ci. Les autorisations nécessaires à la construction et à l'exploitation du projet Odyssey seront obtenues subséquemment tel que prévu dans le processus standard.

Certaines autorisations ont déjà été obtenues pour le site et sont listées à l'annexe D. Une copie du bail de location de surface se trouve également à l'annexe D.

# 3 DESCRIPTION DU SITE

L'information contenue aux sections suivantes a majoritairement été tirée des informations et précisions fournies par CMGP dans le cadre de la demande de décret actuel et de certaines informations provenant des demandes de modification des décrets 914-2009, 388-2017 et 1370-2018 de la mine Canadian Malartic.

## 3.1 MÉTHODE D'EXPLOITATION ET TRAITEMENT DU MINERAI

Le scénario envisagé et évalué à l'heure actuelle pour l'exploitation des différentes zones du projet Odyssey considère l'aménagement d'une rampe avec portail et d'un puits.

Ainsi, il est envisagé d'exploiter les zones East Gouldie, Odyssey Nord et la portion comprise sous 600 m de profondeur de la zone East Malartic à l'aide d'un puits d'accès, alors que la zone Odyssey Sud et la portion entre 90 m et 600 m de profondeur de la zone East Malartic seront exploitées à l'aide d'une rampe d'accès munie d'un portail. L'exploitation se fera par des galeries et chantiers souterrains. Un plan du développement souterrain est présenté à la figure 5. La séquence prévue pour le développement du projet est la suivante :

- 2020 à 2021 : Développement de la rampe vers Odyssey Sud;
- 2022 à 2027 : Fonçage des puits, construction du chevalement et installation des treuils de production;
- 2023 : Mise en production d'Odyssey Sud;
- 2023 : Construction de la première usine de remblai en pâte;
- 2027 : Début de la production de East Gouldie;
- 2028 : Construction de la deuxième usine de remblai en pâte ou agrandissement de la première;
- 2029 : Mise en production de la zone East Malartic 0-600 m.

La rampe d'accès vers la zone Odyssey Sud sera développée au tout début du projet, alors que la rampe vers East Malartic sera développée environ cinq ans plus tard. Les zones minéralisées sont situées à une profondeur de 90 m à 540 m pour Odyssey Sud et entre 90 m et 600 m pour la zone East Malartic. Le halage du minerai et des stériles vers la surface sera effectué par des camions d'une capacité de 60 tonnes. Les taux d'extraction anticipés pour la mine souterraine Odyssey sont présentés au tableau 25. Lors de la mise en production de la zone East Gouldie, le treuil du puits aura une capacité de hissage de 20 000 tonnes par jour. Deux installations de concassage et trémie de chargement seront aménagées sous terre, l'une desservant les zones Odyssey Nord et East Gouldie, l'autre la zone East Gouldie uniquement.

Les stériles et le minerai extraits par la rampe transiteront par une halde à stériles et une halde à minerai temporaires, d'une capacité respective de 10 000 et 20 000 tonnes, puis seront acheminés jusqu'aux installations de la mine Canadian Malartic. Le miserai hissé par le puits sera accumulé dans un silo attenant au puits, et des camions de 240 tonnes seront chargés directement à partir du silo. Les stériles hissés par le treuil seront déposés au sol à proximité du chevalement puis rechargés dans des camions. Ce minerai et ces stériles seront également acheminés jusqu'aux installations de la mine Canadian Malartic.

Aucun procédé de traitement du minerai ne sera réalisé sur le site du projet Odyssey. Tout le minerai extrait du projet Odyssey sera traité au concentrateur de la mine Canadian Malartic. Les résidus issus du traitement du minerai seront également gérés au lieu de disposition des résidus de la mine Canadian Malartic.

Finalement, CMGP estime qu'environ 200 000 $m^3$ de dépôts meubles seront excavés pour l'aménagement des infrastructures minières, soit principalement au niveau du puits et des bâtiments des treuils. Ces dépôts meubles seront acheminés sur les haldes à dépôts meubles de la mine Canadian Malartic et seront remplacés par des matériaux compétents, lorsque requis pour l'aménagement des infrastructures.

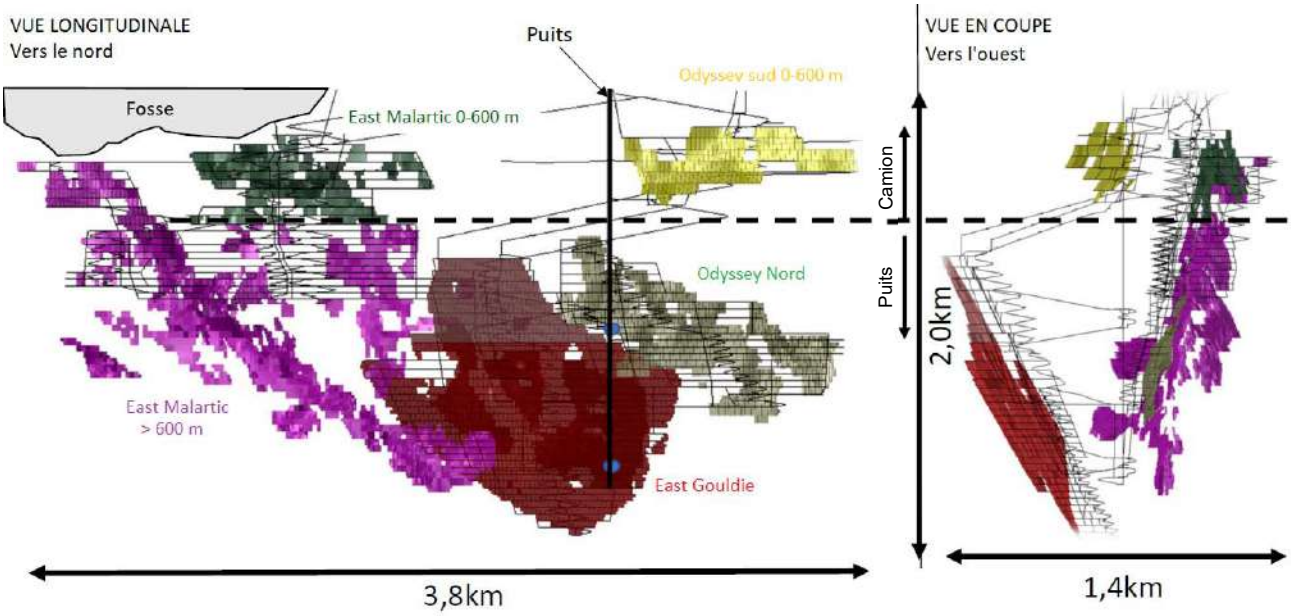


**Figure 5 Plan de développement souterrain anticipé**

**Tableau 25 Production selon la durée de l'exploitation de la mine souterraine du projet Odyssey**

| Production | | Année de production | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **2021** | **2022** | **2023** | **2024** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | **2033** | **2034** | **2035** | **2036** | **2037** | **2038** | **2039** | **2040** |
| Nombre de jours de production | (jours) | 365 | 365 | 365 | 366 | 365 | 365 | 365 | 366 | 365 | 365 | 365 | 366 | 365 | 365 | 365 | 366 | 365 | 365 | 365 | 365 |
| Odyssey | | | | | | | | | | | | | | | | | | | | | |
| Tonnage annuel minerai | (t. m.) | 0 | 0 | 306 109 | 1 148 497 | 1 128 253 | 1 134 554 | 1 658 192 | 3 085 261 | 4 083 793 | 5 734 586 | 6 831 399 | 7 113 547 | 6 858 954 | 7 310 357 | 7 649 203 | 7 483 698 | 7 054 888 | 5 512 592 | 6 765 758 | 3 212 206 |
| Tonnage journalier minerai | (t. m./j) | - | - | 839 | 3138 | 3091 | 3108 | 4543 | 8430 | 11 188 | 15 711 | 18 716 | 19 436 | 18 792 | 20 028 | 20 957 | 20 447 | 19 328 | 15 103 | 18 536 | 8 777 |
| Tonnage journalier stériles | (t. m.) | 389 | 1404 | 1744 | 1987 | 1568 | 2892 | 3801 | 5736 | 4894 | 4327 | 4601 | 5685 | 4978 | 3920 | 3058 | 2392 | 1137 | 792 | 276 | 69 |

# 3.2 BÂTIMENTS ET INFRASTRUCTURES

## 3.2.1 BÂTIMENTS ET INFRASTRUCTURES DE SURFACE

Les infrastructures de surface relatives au projet Odyssey seront les suivantes :

- Aires de stationnements;
- Aires d'entreposage;
- Guérite;
- Deux bâtiments administratifs (dont un déjà aménagé);
- Garages d'entretien mécanique, dont un pour les entrepreneurs;
- Bâtiment des compresseurs;
- Mégas dômes d'entreposage;
- Sous-station électrique 120 kV et ligne électrique;
- Tapis de mise à la terre;
- Un poste de distribution de carburant, comprenant des pompes distributrices, un réservoir d'entreposage de diesel (capacité d'au moins 50 000 litres) et un réservoir d'entreposage d'essence (capacité d'au moins 1 000 litres);
- Portail de la rampe souterraine (déjà aménagé);
- Chevalement et bâtiment des treuils;
- Deux réservoirs de diesel d'une capacité de 40 000 litres et un réservoir de transfert d'une capacité de 3 000 litres situés près de la salle des treuils;
- Monteries de ventilation en air frais (trois en plus du puits) et sorties d'air vicié (quatre en plus du portail);
- Deux usines de remblai en pâte pour le remblayage souterrain (ou agrandissement de la première);
- Aire de chargement des camions 240 tonnes;
- Halde à minerai temporaire de 20 000 tonnes;
- Halde à stériles temporaire de 10 000 tonnes;
- Fossé de drainage des eaux vers le bassin nord-est (fossé Odyssey);
- Une usine de production d'eau potable et un puits d'eau potable (déjà aménagés);

- Système de traitement des eaux usées (Ecoflow)
- Deux sorties de secours.

La carte 3 montre l'aménagement général des installations qui seront présentes sur le site du projet. Il est à noter que du remblai a déjà été mis en place sur le site afin de prévoir l'aménagement des futures installations. De plus, le bâtiment administratif ainsi que le portail de la rampe ont déjà été aménagés. L'usine de production d'eau potable ainsi que le système de traitement des eaux usées domestiques sont également déjà aménagés.

Des dépôts à explosifs et à détonateurs seront aménagés sous terre. Deux usines de remblai en pâte, qui serviront à consolider les ouvertures souterraines, seront construites sur le site. Le remblai sera composé d'un mélange de résidus miniers et de liant. Les résidus miniers requis pour ce mélange proviendront de l'usine de traitement du minerai de la mine Canadian Malartic, lesquels seront pompés vers les installations d'Odyssey.

Environ jusqu'à 14 800 t de résidus par jour seront pompées de l'usine de traitement de minerai de la mine Canadian Malartic, jusqu'aux usines de remblai en pâte situées sur le site d'Odyssey. Le remblai en pâte produit sera acheminé vers les chantiers par un réseau de conduites.

## 3.2.2 INFRASTRUCTURES ÉLECTRIQUES, DE TRANSPORT ET DE SOUTIEN

### 3.2.2.1 INFRASTRUCTURES ÉLECTRIQUES

Il est estimé que la consommation en énergie sur la durée de vie du projet variera d'environ 24 à 286 MW.

L'approvisionnement en électricité sera assuré par une ligne aérienne reliée au poste de transformation de la mine Canadian Malartic, d'une longueur approximative de 10 km. Afin d'assurer une capacité de production d'électricité adéquate, un nouveau poste de transformateur sera ajouté sur le site et aura une capacité d'environ 120 kV.

### 3.2.2.2 INFRASTRUCTURES DE TRANSPORT

Il est prévu qu'un chemin d'accès reliera le site Odyssey directement à la route 117. De plus, des voies de circulation secondaires seront aménagées entre les bâtiments et les infrastructures du projet Odyssey. L'ensemble des voies de circulation secondaires qui seront aménagées totalisera environ 2,5 km.

L'assise de certaines voies de circulation a déjà été mise en place sur le site. Selon l'autorisation 7610-08-01-70167-75 (401591998), Mine Canadian Malartic est autorisée à valoriser ses stériles comme matériaux de construction sur son site. Ainsi, des stériles NPGA et non lixiviables ont déjà été utilisés comme matériel de fondation de chemins d'accès sur le site Odyssey. Des stériles utilisés comme matériaux de construction seront ajoutés sur le site au fur et à mesure du développement de ce dernier afin de servir de matériel de remblai pour divers secteurs et comme couche de roulement au niveau des chemins d'accès, selon les besoins.

### 3.2.2.3 INFRASTRUCTURES DE SOUTIEN

Plusieurs équipements miniers seront requis durant l'exploitation de la mine. Le nombre de chacun des équipements variera selon la production et les besoins au cours de la vie de la mine. Les types d'équipements qui seront utilisés sur le site lors de l'exploitation sont détaillés au tableau 26.

**Tableau 26 Liste des équipements miniers**

| | |
|---|---|
| Jumbos | Sandvick IH307 |
| LHD Sandvik LH517 et LH621 | Niveleuses |
| Camions de 50 tonnes Sandvik TH 551 et 631 | Chargeuses |
| Élévatrices | Chariots élévateurs |
| Boulonneuses | Véhicules de support électrique |
| Chargeuses à émulsion de développement et de production | Véhicules de support mécanique |
| Foreuses Blockhole | Véhicule d'approvisionnement en carburant |
| Foreuses de production ITH | Véhicule de secourisme minier |
| Pompe à ciment projeté portable | Véhicules tout-terrain Toyota LandCruiser |
| Camions-flèches | Camions (pick-up) |
| Backhoe Kubota | Autobus pour le transport de personnel (10 passagers) |
| Kubota R630 | Canons à eau |

# 3.3 AIRES D'ACCUMULATION

## 3.3.1 HALDES À DÉPÔTS MEUBLES ET SOL VÉGÉTAL

Il est estimé qu'environ 200 000 $m^3$ de dépôts meubles seront excavés pour l'aménagement des infrastructures minières, soit principalement au niveau du puits et des bâtiments des treuils. Ces dépôts meubles seront acheminés sur les haldes à dépôts meubles de la mine Canadian Malartic.

## 3.3.2 AIRE D'ACCUMULATION DU MINERAI

Une aire d'entreposage du minerai transitoire sera aménagée à proximité du portail de la rampe, et servira à entreposer temporairement le minerai extrait par la rampe. Cette aire d'accumulation transitoire pourra donc accueillir 20 000 t de minerai et couvrira une superficie d'environ 4 000 $m^2$. Le minerai y sera entreposé temporairement, puis sera chargé dans des camions afin d'être transporté jusqu'à l'usine de la mine Canadian Malartic. Le minerai hissé par le puits sera entreposé dans un silo attenant au chevalement et les camions y seront chargés directement via une chute présente sous le silo.

Une étude a été réalisée par Golder afin de déterminer le taux de percolation des matériaux constituant l'assise de la halde à minerai (Golder Associés, 2020a) et est présentée à l'annexe E. Considérant que la halde à minerai au site Odyssey ne servira qu'à de l'entreposage temporaire et que les matériaux constituant le substrat de celle-ci possèdent une perméabilité inférieure au débit limite de 3,3 L/$m^2$/j définie dans la D019 pour les mesures d'étanchéité de niveau A (Golder Associés, 2020a), aucune mesure de protection ne sera mise en place sous la halde. Une analyse de stabilité de la halde temporaire a été réalisée par Golder (Golder Associés, 2020b).

Étant donné la proximité de la halde à minerai et de la halde à stériles temporaires, l'analyse de stabilité a été réalisée en considérant qu'elles formaient un seul empilement. L'analyse de stabilité a été utilisée afin de déterminer la configuration appropriée des haldes, et un calcul de tassement a également été réalisé afin de déterminer l'amplitude des tassements anticipés. Cette étude est présentée à l'annexe F.

### 3.3.3 AIRE D'ACCUMULATION DES STÉRILES

Une aire d'entreposage transitoire des stériles sera aménagée à proximité du portail de la rampe, et servira à entreposer temporairement les stériles extraits par la rampe. Cette aire d'accumulation transitoire pourra accueillir 10 000 t de stériles et couvrira une superficie d'environ 2 500 $m^2$. Les stériles y seront chargés dans des camions à l'aide d'une chargeuse sur roues, puis acheminés jusqu'aux installations de la mine Canadian Malartic. Les stériles hissés par le puits seront mis en pile temporairement à côté du chevalement puis acheminés jusqu'aux installations de la mine Canadian Malartic.

Une étude a été réalisée par Golder afin de déterminer le taux de percolation des matériaux constituant l'assise de la halde à minerai (Golder Associés, 2020a) est présentée à l'annexe E. La halde à stériles au site Odyssey sera temporaire et les matériaux constituant le substrat de cette dernière possèdent une perméabilité inférieure au débit limite de 3,3 L/$m^2$/j, telle que définie dans la D019 pour les mesures d'étanchéité de niveau A (Golder Associés, 2020b). Ainsi, aucune mesure de protection ne sera mise en place sous la halde.

Tel que mentionné à la section 3.3.2, une analyse de stabilité a été réalisée en considérant que la halde à minerai et la halde à stériles formaient un seul empilement (Golder Associés, 2020b). Cette étude est présentée à l'annexe F.

## 3.4 GESTION DES EAUX SUR LE SITE

### 3.4.1 EAUX D'EXHAURE

Les eaux d'exhaure seront récupérées sous terre puis pompées à la surface. Le volume d'eaux d'exhaure traité annuellement variera au cours de la vie de la mine. Une étude de modélisation hydrogéologique, présentée à l'annexe G, a été réalisée par Golder (Golder, 2020c), et a permis d'estimer le débit d'infiltration des eaux souterraines s'infiltrant dans les ouvertures souterraines dénoyées du projet Odyssey, ce qui constitue une portion des eaux d'exhaure. Ainsi, le débit d'infiltration associé au projet Odyssey est estimé entre 11 700 $m^3$/j (scénario réaliste) et 17 300 $m^3$/j (scénario prudent).

Les eaux d'exhaure des zones exploitées via la rampe souterraine seront traitées par un système de traitement de type MUDWIZARD, installé directement à l'intérieur de la mine souterraine. Pour le moment, le mode de traitement des eaux d'exhaure des zones minées via le puits (zones Odyssey Nord et East-Gouldie) n'est pas encore défini. Cette information sera raffinée lors de l'avancement de l'ingénierie du projet.

Les boues issues du traitement seront retournées dans les ouvertures souterraines de la mine, alors que les eaux clarifiées seront pompées vers le bassin Nord-Est. L'eau accumulée dans ce bassin pourra être utilisée pour les besoins de la mine souterraine. Advenant le cas où le temps de résidence ne permettrait pas d'abaisser suffisamment les concentrations de matières en suspension (MES), un traitement complémentaire pourrait être appliqué en surface.

### 3.4.2 SOURCE D'APPROVISIONNEMENT EN EAU POTABLE

Les installations du projet Odyssey seront approvisionnées en eau potable par un puits. Ce dernier a été aménagé en 2018, et sa capacité sera suffisante de façon à approvisionner les besoins journaliers en eau potable de 200 travailleurs.

La consommation unitaire est estimée à 140 L par personne, soit 28 000 L au total, en considérant 200 travailleurs. En incluant 10 % de fuites et un facteur de sécurité de 2, la consommation totale quotidienne est de 61 600 L, pour un débit équivalent de 43 L/min. Des essais de pompage supplémentaires ont été effectués récemment (octobre 2020) afin de confirmer la capacité réelle du puits. Suivant ces essais, l'étude hydrogéologique est actuellement en cours de rédaction et les considérations au niveau de l'approvisionnement en eau potable seront revues conséquemment. Des sources supplémentaires d'eau potable pourront être ajoutées en fonction de l'augmentation des besoins du projet.

Un système de traitement de l'eau potable a été mis en place et comporte les éléments suivants :

- Chaîne de traitement comportant un filtre média catalytique pour l'enlèvement du fer, du manganèse et des sulfures, un filtre au charbon pour l'enlèvement du chlore et du goût;
- Échangeur anionique pour la réduction des carbones organiques (COT), de la couleur et des SDS-THM;
- Adoucisseur pour la réduction de la dureté de l'eau;
- Deux filtres à cartouche 5 microns;
- Réacteur UV à 80 mJ/cm$^2$ avec redondance;
- Dosage des produits chimiques pour l'oxydation et la post-chloration.

### 3.4.3 EAUX USÉES DOMESTIQUES

Un système de traitement des eaux usées domestiques est déjà aménagé pour les besoins du site. Les eaux usées domestiques seront traitées sur place.

Les infrastructures de traitement sont les suivantes :

- Un réseau collecteur gravitaire des eaux sanitaires provenant des différents bâtiments (bâtiment administratif, guérite, garage, entrepôt);
- Une fosse septique;
- Un bassin d'égalisation et de dosage;
- Un système de traitement EcoFlow en série avec rejet dans le bassin Nord-Est.

Lorsqu'il sera prévu que le débit journalier d'origine domestique dépassera la capacité du traitement actuel, des alternatives de gestion des eaux usées seront analysées. À l'heure actuelle, les options possibles envisagées sont l'installation d'une station de pompage sanitaire qui acheminerait l'eau vers le réseau municipal, ou l'ajout d'un système de traitement complémentaire.

### 3.4.4 EAUX DE RUISSELLEMENT

Les eaux de ruissellement de surface seront recueillies par un fossé (fossé Odyssey) et acheminées vers le bassin Nord-Est (carte 3). Le fossé Odyssey, bordant le site au nord est le fossé principal qui recueillera les eaux de ruissellement. Ce fossé est déjà aménagé sur le site. Le fossé Odyssey est présenté sur la carte 3. Un autre fossé borde le site au sud, mais ce dernier n'est pas inclus dans le projet Odyssey. Une analyse hydrologique et une étude de conception préliminaire des structures de gestion des eaux de surface ont été réalisées par Golder Associés (2020b) et sont présentées à l'annexe C du rapport de Golder Associés joint à l'annexe F du présent plan de restauration.

### 3.4.5 EFFLUENT FINAL ET QUALITÉ DES EAUX SOUTERRAINES

Les eaux d'exhaure traitées, de même que les eaux de ruissellement de surface, seront acheminées vers le bassin Nord-Est. L'eau décantée à la sortie du bassin Nord-Est sera incorporée à l'effluent final de la mine Canadian Malartic.

Une étude de l'état initial de la qualité des eaux souterraines, du taux de percolation et de modélisation de la qualité des eaux du site a été réalisée par Golder (Golder, 2020a) et est présentée à l'annexe F. De plus, une étude de modélisation hydrogéologique (Golder, 2020c), présentée à l'annexe G, a permis d'évaluer l'impact de la présence des infrastructures de la Mine Canadian Malartic, et plus précisément le parc à résidus de l'Extension, sur la qualité des eaux souterraines et d'exhaure du projet Odyssey. Étant donné la distance (0,5 à 1 km) séparant le parc à résidus de l'Extension des ouvertures souterraines du projet Odyssey, il faudrait environ 250 ans avant que les concentrations en cyanures associées aux résidus soient détectées dans le roc de surface au niveau d'Odyssey (Golder, 2020c).

## 3.5 LIEUX D'ENTREPOSAGE ET D'ÉLIMINATION

### 3.5.1 PRODUITS CHIMIQUES, PÉTROLIERS ET EXPLOSIFS

Un floculant standard pourra être utilisé afin de traiter les matières en suspension (MES) dans les eaux de dénoyage, au besoin. De plus, un poste de distribution de carburant sera présent sur le site et comprendra un réservoir de diesel d'une capacité à déterminer (minimalement de 50 000 L), un réservoir d'essence d'une capacité à déterminer (minimalement de 1000 L) ainsi qu'un conteneur d'entreposage des huiles neuves. De plus, deux réservoirs de diesel d'une capacité de 40 000 litres chacun et un réservoir de transfert d'une capacité de 3 000 litres seront également situés près de la salle des treuils.

Des dépôts d'explosifs et de détonateurs distincts seront aménagés sous terre, et aucun entreposage d'explosifs et de détonateurs ne sera réalisé en surface lors de l'exploitation. La quantité d'explosifs qui sera entreposée n'est toutefois pas définie à l'heure actuelle.

En cas de déversement d'un produit chimique ou pétrolier, la situation sera gérée conformément à la procédure en cas de déversement de CMGP.

### 3.5.2 MATIÈRES RÉSIDUELLES NON DANGEREUSES

Les matières résiduelles non dangereuses consisteront principalement en des déchets domestiques. Ces déchets domestiques seront collectés et envoyés au site d'enfouissement de Val-d'Or. Pour ce qui est des autres rebus, notamment ceux issus de la construction (bois, métal, plastique, etc.), ils sont disposés dans des conteneurs identifiés et retirés du site par une firme spécialisée.

### 3.5.3 MATIÈRES RÉSIDUELLES DANGEREUSES

Les matières résiduelles dangereuses telles que les huiles usées ou autres matières définies dans le *Règlement sur les matières dangereuses* seront entreposées temporairement dans le garage ou dans des conteneurs étanches, distincts et identifiés à proximité du garage. Celles-ci seront retirées du site régulièrement par un transporteur autorisé, puis acheminées vers un lieu autorisé à les recevoir.

### 3.5.4 SOLS CONTAMINÉS

Dans l'éventualité où des sols deviendraient contaminés en hydrocarbures pétroliers, ceux-ci ainsi que le matériel d'intervention contaminé seront entreposés dans des contenants étanches, distincts et identifiés, puis seront acheminés vers un lieu autorisé à les recevoir.

# 4 MESURES DE RÉAMÉNAGEMENT ET DE RESTAURATION

Les travaux de restauration seront menés en conformité avec les règles applicables du Guide de préparation du plan de réaménagement et de restauration des sites miniers au Québec (MERN, 2016), de la D019 sur l'industrie minière (MDDEP[4], 2012) et de toute autre disposition applicable, comme le Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés (MELCC, 2019) et le *Règlement sur la protection et la réhabilitation des terrains* (c. Q-2, r. 37).

Les mesures de protection, de réaménagement et de restauration présentées ci-dessous ont pour objectif de remettre le site minier dans un état satisfaisant, c'est-à-dire :

- éliminer les risques inacceptables pour la santé et assurer la sécurité des personnes;
- limiter la production et la propagation de substances susceptibles de porter atteinte au milieu récepteur et, à long terme, viser à éliminer toute forme d'entretien et de suivi;
- remettre le site dans un état visuellement acceptable pour la collectivité;
- remettre les infrastructures du site dans un état compatible avec l'usage futur.

Toutes les aires affectées par les activités d'exploration et d'exploitation seront restaurées. Les surfaces considérées dans l'estimation des coûts de restauration sont montrées à la carte 4.

## 4.1 IMPACT DES CHANGEMENTS CLIMATIQUES

L'impact des changements climatiques est pris en compte lors de la conception des infrastructures sur le site et des méthodes de restauration. La concrétisation de ces changements ne devrait donc pas avoir d'impacts inattendus. Par ailleurs, aucun ouvrage de retenue d'eau, halde à stériles ou parc à résidus ne demeureront sur le site du projet Odyssey après la fermeture. En période de restauration, puisque les installations du site seront démantelées, y compris les bassins d'accumulation des eaux, aucun impact des changements climatiques n'est appréhendé.

À noter que la restauration du bassin Nord-Est est incluse dans le plan de restauration de la mine Canadian Malartic.

## 4.2 SÉCURITÉ DES LIEUX

### *4.2.1 SÉCURITÉ DES OUVERTURES AUX JOURS*

À la fin des opérations d'extraction minière, le pompage des eaux de mine cessera.

4 Ministère du Développement durable, de l'Environnement et des Parcs, maintenant devenu le ministère de l'Environnement et de la Lutte contre des changements climatiques (MELCC).

Les galeries ainsi que la rampe de la mine souterraine Odyssey seront lentement ennoyées par la remontée de la nappe phréatique. L'ouverture du portail de la rampe sera entièrement remblayée à l'aide de stériles miniers. Les ouvertures du puits, des monteries de ventilation et des sorties de secours seront condamnées par une dalle de béton armée qui respectera les spécifications des articles 100 à 102 du R*èglement sur les substances minérales autres que le pétrole, gaz naturel et la saumure* (M-13.1, r.2). Des panneaux de signalisation « Danger » seront installés à l'endroit de l'accès aux monteries de ventilation, en conformité avec l'article 104 du *Règlement sur les substances minérales autres que le pétrole, gaz naturel et la saumure* (M-13.1, r.2).

### 4.2.2 STABILITÉ DES PILIERS DE SURFACE

Une étude de la stabilité du pilier de surface de la rampe a été réalisée par Golder en 2020, et est présentée à l'annexe H.

### 4.2.3 STABILITÉ DES HALDES

Une analyse de stabilité des haldes temporaires en période d'exploitation a été réalisée en 2020 (Golder Associés, 2020b). Comme ces haldes seront temporaires et qu'aucune halde permanente ne sera aménagée sur le site du projet Odyssey, aucun stérile, minerai ou mort-terrain ne sera laissé sur le site à la fin de la phase d'exploration ou à la fin des opérations minières spécifiques au projet Odyssey. Ainsi, aucune analyse de stabilité des haldes en période de post-fermeture n'a été réalisée.

## 4.3 DÉMANTÈLEMENT DES BÂTIMENTS ET DES INFRASTRUCTURES

À la fin de l'exploitation du projet Odyssey, tous les bâtiments et toutes les infrastructures qui ne seront pas utiles pour la réalisation des suivis post-exploitation et post-fermeture seront transportés hors site ou démantelés par un entrepreneur certifié.

Au moment du démantèlement des bâtiments et des infrastructures, les travaux de restauration comporteront les activités suivantes :

- Les bâtiments seront démantelés;
- Les dalles de béton seront cassées et remblayées;
- Les matériaux et équipements récupérables seront mis en réserve et donnés ou vendus sur les marchés de la récupération et de l'usagé;
- L'empreinte au sol des infrastructures démantelées sera d'abord scarifiée pour faciliter le drainage et la reprise de la végétation, puis végétalisée;
- L'empreinte des aires d'accumulation à stériles et à minerai temporaires sera scarifiée pour faciliter le drainage et la reprise de la végétation, puis revégétalisée;
- Tout équipement de services, comme les réservoirs, les conduites et les pompes, sera vidangé et nettoyé. Les eaux de nettoyage seront collectées et traitées (sédimentation et séparation eau-huile, si nécessaire) avant leur rejet vers l'environnement;

- Tout équipement contenant des huiles ou tout autre liquide à potentiel de contamination, comme les équipements électriques et les véhicules, sera vidangé de ses liquides avant d'être éliminé;
- La gestion de tous produits chimiques, matières résiduelles et matières dangereuses se fera de façon sécuritaire dans le respect des normes et de la règlementation en vigueur. Tout matériau solide, liquide, pulpeux et boueux se trouvant à l'intérieur des bâtiments sera caractérisé, si nécessaire, et le lieu de leur disposition sera approuvé par le représentant de la gestion environnementale sur le site;
- Les secteurs susceptibles de présenter une contamination feront l'objet d'analyses. Les sols contaminés seront enlevés et gérés conformément à la règlementation en vigueur;
- Les conduites d'eau et les pompes seront démantelées. Les conduites en bonne condition seront vendues ou conservées pour réutilisation future. Celles dont la vie utile est terminée seront éliminées en conformité avec les dispositions du *Règlement sur l'enfouissement et l'incinération de matières résiduelles* (REIMR);
- Les conduites de surface du système d'approvisionnement en eau potable seront enlevées alors que les conduites souterraines seront laissées en place. Les pompes et contrôles électriques seront retirés et, en fonction de leur condition, seront soit vendus, conservés pour réutilisation future ou éliminés;
- Les installations de collecte d'eaux usées domestiques seront démantelées et celles en bonne condition seront vendues ou conservées pour réutilisation future. Celles dont la vie utile est terminée seront éliminées en conformité avec les dispositions du REIMR;
- Les infrastructures routières nécessaires au suivi post restauration du site seront maintenues en place. Comme convenu dans l'entente avec le MTQ, l'accès au site via la route 117 sera démantelé au plus tard 24 mois suivant la fin de l'exploitation de la mine. Toujours selon la même entente, GMCP avisera le MTQ dans les 60 jours qui suivent la fin de l'exploitation souterraine. Les infrastructures routières qui ne seront plus utilisées seront scarifiées et ensemencées.

## 4.4 GESTION DES ÉQUIPEMENTS ET DE LA MACHINERIE LOURDE

Tant à la fin de la phase d'exploration avancée qu'à la cessation des opérations minières, les équipements mobiles seront retirés du site une fois les activités minières complétées.

Les équipements mécaniques, électriques et hydrauliques, mobiles ou fixes, seront démantelés.

## 4.5 AIRES D'ACCUMULATION

La halde à stériles et la halde à minerai constitueront des points de transit pour le minerai et les stériles qui seront acheminés aux installations de la mine Canadian Malartic pour leur entreposage permanent. Ainsi, à la cessation des activités, aucun stérile ni minerai ne sera laissé sur place, le tout ayant auparavant été acheminé aux installations de la mine Canadian Malartic.

L'empreinte des haldes temporaires sera scarifiée et mise en végétation. Avant d'être restaurée, l'empreinte des haldes sera caractérisée et les sols et remblais contaminés seront gérés selon la réglementation en vigueur, s'il y a lieu.

## 4.6 INFRASTRUCTURES DE GESTION DES EAUX

À la cessation des activités d'exploitation, les stations de traitement installées sous terre seront démantelées, puis transportées hors site. Le fossé Odyssey sera remblayé, nivelé, régalé et végétalisé par ensemencement.

Les eaux accumulées dans le bassin Nord-Est seront pompées vers le bassin Sud-Est de la mine Canadian Malartic. Les boues s'étant accumulées au fond des bassins seront excavées puis envoyées sous terre ou dans la fosse MCM. Advenant le cas où les boues étaient conformes en vertu de tous les règlements applicables, ces dernières seraient laissées en place, puis le bassin serait remblayé.

Il est à noter que la restauration du bassin Nord-Est du projet Extension de la mine Canadian Malartic a été considérée dans le plan de restauration de mine Canadian Malartic, approuvé en 2017. Pour cette raison, la restauration du bassin Nord-Est est exclue du présent plan de restauration.

Une étude de l'état initial de la qualité des eaux souterraines, du taux de percolation et de modélisation de la qualité des eaux du site a été réalisée par Golder (Golder, 2020a) et est présentée à l'annexe F.

## 4.7 INFRASTRUCTURES DE TRANSPORT

À la fermeture du site, les infrastructures routières encore utilisées par CMGP dans le cadre du programme de suivi postrestauration du site et de celui de la Mine Canadian Malartic seront maintenues en place. L'accès à la route 117 sera démantelé (présenté sur la carte 4). Les infrastructures routières qui ne seront plus utilisées seront scarifiées et ensemencées.

Tel que mentionné à la section 3.2.2.2, CMGP est autorisé à valoriser ses stériles comme matériaux de construction sur son site selon l'autorisation 7610-08-01-70167-75 (401591998). Ainsi, des stériles NPGA et non lixiviables ont déjà été utilisés comme matériel de fondation de chemins d'accès sur le site Odyssey. Des stériles utilisés comme matériaux de construction seront ajoutés sur le site au fur et à mesure du développement de ce dernier, selon les besoins du site. La provenance de ces stériles, à l'intérieur du gisement de la mine Canadian Malartic, est inconnue. Ainsi, les risques pour l'environnement associés à la présence de ces stériles sur le site seront évalués à la fin de la vie de la mine, et des méthodes de mitigation seront mises en place au besoin.

## 4.8 PRODUITS PÉTROLIERS ET CHIMIQUES ET MATIÈRES RÉSIDUELLES DANGEREUSES ET NON DANGEREUSES

Le réservoir de diesel, le réservoir d'essence ainsi que leur tuyauterie de surface et les pompes de distribution seront retirés en conformité avec les dispositions du Code de construction (c. B-1.1, r.0.01.01) et du Code de sécurité (c. B-1.1, r.0.01.01.1). Les réservoirs seront vendus, conservés pour réutilisation future, éliminés ou retournés à leur propriétaire, en s'assurant de respecter les dispositions du Code de construction (c. B-1.1, r.0.01.01) à cet égard.

Advenant le cas où les réservoirs ne seraient pas réutilisables, ils seront éliminés en conformité avec les dispositions du *Règlement sur l'enfouissement et l'incinération de matières résiduelles* (REIMR) ou du *Règlement sur les matières dangereuses* (RMD).

À la fin de l'exploitation du site, tous les bâtiments seront démantelés. Malgré qu'une grande quantité de matériaux soit récupérable, le démantèlement des bâtiments et des infrastructures nécessitera l'élimination d'un volume de débris de toutes sortes.

De façon générale, les matériaux issus de la démolition d'un immeuble ou d'infrastructures ne sont pas des matières dangereuses au sens du RMD (c.Q-2, r.32 ;), sauf s'ils sont contaminés en surface par des matières dangereuses au sens de l'article 4 de ce règlement. Ainsi, si les matériaux issus de la démolition d'un immeuble ou d'infrastructures ne sont pas des matières dangereuses ou « assimilées » à des matières dangereuses au sens du RMD, ils seront gérés en tant que matières résiduelles en vertu du REIMR (c.Q-2, r.6.02).

Il est important de préciser qu'un nettoyage adéquat devra être réalisé aux matériaux de démantèlement « assimilés à des matières dangereuses » afin de les décontaminer si requis. Les matériaux jugés décontaminés selon les normes ou critères prescrits pourront être réemployés, recyclés ou valorisés à certaines conditions. Les matériaux encore contaminés devront être considérés comme des matériaux assimilés à des matières dangereuses et seront éliminés dans un centre autorisé par le MELCC.

Enfin, la manutention et le transport hors site des matières résiduelles et des matières résiduelles dangereuses s'effectueront conformément aux lois et règlements en vigueur.

## 4.9 RÉHABILITATION DES TERRAINS

À la cessation des activités minières, une étude de caractérisation du terrain sera réalisée comme prescrit par l'article 31.51 de la LQE. CMGP prendra les mesures nécessaires en conformité avec les dispositions de la LQE et le *Règlement sur la protection et la réhabilitation des terrains* (c. Q-2, r.18.1.01) dans le cas où cette caractérisation révélerait la présence de contaminants au-delà des critères établis par la réglementation.

Comme mentionné à la section 4.7, CMGP est autorisé à valoriser ses stériles comme matériaux de construction sur son site selon l'autorisation 7610-08-01-70167-75 (401591998). Ainsi, les risques pour l'environnement associés à la présence de ces stériles sur le site seront évalués à la fin de la vie de la mine et des méthodes de mitigation seront mises en place au besoin.

# 5 PROGRAMME DE CONTRÔLE ET SUIVI POSTRESTAURATION

Le programme de suivi post-restauration est présenté ci-après. Le détail du programme sera soumis avec le plan de restauration final. Le programme de surveillance sera instauré à la suite des travaux de restauration. Il est proposé de réaliser ce programme sur une période de 10 ans, comme recommandé dans la D019 pour des aires d'accumulation de rejets miniers lixiviables et potentiellement acidogènes. Les coordonnées du responsable des programmes de suivi sont les suivantes :


| | |
|---|---|
| Personne responsable : | Monsieur Martin Duclos<br>Directeur Développement durable et Environnement<br>Courriel : mduclos@canadianmalartic.com |
| Téléphone : | 819 757-2225 |
| Télécopieur : | 819 759-2351 |


## 5.1 CONTRÔLE DE L'INTÉGRATION DES OUVRAGES

Les seuls ouvrages qui demeureront sur le site après la restauration sont les vestiges de la mine souterraine, soit le portail de la rampe condamné, de même que les accès condamnés au puits, aux monteries de ventilation et aux sorties de secours.

Un suivi de l'intégrité de ces ouvrages sera effectué, consistant en une inspection réalisée annuellement pendant un minimum de cinq ans. L'objectif de l'inspection sera de s'assurer de l'intégrité des dalles de béton couvrant les accès au puits, aux monteries de ventilation et aux sorties de secours, ainsi que de l'intégrité du portail remblayé. À la suite de l'inspection du site, un rapport sera transmis au MERN annuellement sur une période de cinq ans. À la suite de ce délai, s'il y a lieu, une demande afin de cesser ce suivi sera adressée au MERN.

## 5.2 SUIVI AGRONOMIQUE

Le suivi agronomique durant la période post-restauration se poursuivra durant un minimum de cinq ans sous forme d'inspections annuelles. Les inspections consisteront principalement en une évaluation visuelle de différents paramètres, comme la condition des plants, le pourcentage des aires montrant une reprise végétative, l'érosion des sols, etc. Le cas échéant, des engrais de rappel seront épandus et des reprises d'ensemencement seront effectuées.

À la suite de l'inspection du site, un rapport sera transmis au MERN annuellement sur une période de cinq ans. À la suite de ce délai, s'il y a lieu, une demande de cesser ce suivi sera effectuée auprès du MERN.

## 5.3 SUIVI ENVIRONNEMENTAL

Le principal objectif du suivi environnemental sera de vérifier la qualité des eaux souterraines puisqu'il n'y aura pas d'effluent sur le site minier Odyssey. Le programme visera aussi à s'assurer de l'efficacité des mesures de restauration.

CMGP s’engage à effectuer un suivi des eaux souterraines deux fois par année pour toute la période post-exploitation, actuellement estimée à trois ans, tel que recommandé dans la D019 pour des résidus miniers et du minerai potentiellement acidogènes. De plus, CMGP s’engage à réaliser un suivi des eaux souterraines deux fois par année pour une durée minimale de 10 ans, tel que prescrit par la D019 pour des résidus miniers lixiviables et potentiellement acidogènes.

Un minimum de trois puits d’observation sera utilisé afin de vérifier la qualité des eaux souterraines aux abords des aménagements à risque, comme les aires d’accumulation et les garages. La position exacte des puits d’observation n’a toutefois pas été définie à l’heure actuelle. Le positionnement des puits d’observation se fera en respect avec la D019, et ceux-ci seront implantés en aval et en amont des aménagements à risque. Les paramètres suivis seront ceux présentés dans la D019. Les résultats du suivi environnemental seront transmis au MERN chaque année sous forme de rapport annuel.

# 6 PLAN D'URGENCE

Un plan de prévention et de réponses aux urgences est en cours d'élaboration spécifiquement pour le projet Odyssey; une copie de ce dernier sera présentée au MERN lorsqu'il sera disponible. Le plan de prévention et de réponses aux urgences sera mis en place et diffusé pendant les activités minières, puis sera adapté aux travaux de fermeture et de restauration et finalement aux activités post-fermeture. Ce plan identifiera, d'une part, les incidents possibles, les seuils et procédures d'alerte, les procédures de réponse pour chacun des incidents potentiels et les responsabilités à chacune des étapes. D'autre part, ce plan présentera les ressources, les listes d'équipements et de matériaux disponibles, les modes de communication pendant et après un événement ainsi que des procédures post-mortem.

Le responsable du plan d'urgence sera le responsable en santé et sécurité du chantier de fermeture pour la période des travaux; la responsabilité du plan d'urgence sera ensuite transférée au responsable des suivis environnementaux. Le plan sera révisé régulièrement afin que l'information transmise soit toujours à jour selon l'évolution du projet (changement de responsabilité, de poste, secteurs plus à risque, etc.).

En période de fermeture et de restauration, les principaux risques d'incident actuellement identifiés sont :

- Le risque de chute près du puits, des monteries de ventilation ou des empilements, avant que ces structures ne seront pas condamnées;
- Le risque d'effondrement de chantiers souterrains et/ou de piliers de surface;
- Le risque de collisions ou de renversements d'équipements mobiles;
- Le risque qu'un équipement prenne feu;
- Le risque de déversement ou de fuite de produits pétroliers.

Si un des événements cités ci-dessus devait survenir, les mesures du plan d'urgence seraient mises en application.

En période post-restauration, les risques d'accident seront réduits. En effet, comme il n'y aura plus d'activité régulière sur le site, tous les accidents causés par l'intervention humaine auront une très faible probabilité d'occurrence. Les principaux incidents actuellement identifiés sont :

- Le vandalisme;
- Le risque d'effondrement de chantiers souterrains et/ou de piliers de surface.

Si ces événements se produisaient, une alerte locale serait lancée. La communication pourra se faire via le responsable du suivi environnemental, mais devra ultimement être dirigée vers le coordonnateur de gestion de crises de Mine Canadian Malartic, lequel nommera un chargé d'intervention sur le site.

Les coordonnées du responsable en santé et sécurité sont les suivantes :

| | |
|---|---|
| Représentant autorisé : | M. Jude Boucher, surintendant des mesures d'urgence |
| Téléphone : | 819 757-2225 |
| Courriel : | jboucher@canadianmalartic.com |

# 7 MESURES EN CAS D'ARRÊT TEMPORAIRE DES ACTIVITÉS

En vertu des articles 224 et 226 de la *Loi sur les mines*, lors d'une suspension temporaire des activités d'une durée de six mois ou plus, le MERN et le MELCC seront avisés et CMGP s'engage à transmettre, dans les quatre mois suivant la suspension des activités, des copies certifiées des plans des ouvrages miniers.

Conformément au Guide du MERN, lors d'une suspension temporaire des activités de six mois et plus, CMGP mettra en place des mesures de sécurité. Ces mesures visent à restreindre l'accès au site minier et aux différentes installations ainsi qu'à maintenir le contrôle de la qualité de l'effluent et à assurer la stabilité physique et chimique des différentes aires d'accumulation et d'entreposage. Les mesures suivantes seront appliquées lors d'un arrêt temporaire des activités minières :

- L'accès au site sera interdit. Des blocs seront mis en place à l'entrée des différentes installations sur le site et permettront de veiller à la sécurité du site;
- Des plaques en acier seront installées sur les installations permettant d'accéder aux monteries de ventilation;
- Les panneaux de signalisation « Danger » seront installés à l'endroit des monteries de ventilation;
- Un programme de suivi environnemental sera réalisé, comprenant des échantillonnages et des analyses conformément aux exigences de la LQE;
- Les piles de transit pour le minerai et les stériles seront entièrement transportées vers les installations permanentes de CMGP.

En cas d'arrêt temporaire des activités, M. Serge Blais, directeur général, sera responsable de coordonner les activités de fermeture temporaire.

# 8 CONSIDÉRATIONS ÉCONOMIQUES ET TEMPORELLES

## 8.1 ÉVALUATION DES COÛTS DE LA RESTAURATION

Une modification à l'article 111 du *Règlement sur les substances minérales autres que le pétrole, le gaz naturel et la saumure* (chapitre M-13.1, r. 2) a été adoptée le 23 juillet 2013 (décret 838-2013). Ainsi, l'exploitant de la propriété du projet Odyssey doit maintenant fournir une garantie financière dont le montant correspond aux coûts anticipés pour la réalisation de l'ensemble des travaux prévus à son plan de réaménagement et de restauration des sites.

Cette section présente l'estimation des coûts de restauration du site minier Odyssey selon la description du projet présentée dans le présent plan de restauration.

### *8.1.1 COÛTS DE FERMETURE*

Les coûts en capital sont détaillés au tableau 27 et les coûts sommaires, incluant les honoraires pour l'ingénierie ainsi que les coûts de suivis et la contingence appliquée, sont résumés au tableau 28.

### *8.1.2 COÛTS D'OPÉRATION POST-RESTAURATION*

Les coûts de suivi et d'entretien post-exploitation et post-restauration sont liés au suivi de l'intégrité des ouvrages ainsi qu'au suivi agronomique et environnemental post-exploitation et post-restauration (inspections annuelles des ouvrages, préparation de rapports annuels, suivi de la reprise d'ensemencement, échantillonnage et analyses des eaux souterraines). Ces activités se poursuivront durant toute la durée du suivi post-restauration, c'est-à-dire pendant 10 ans. Le suivi environnemental post-exploitation sera quant à lui réalisé pendant toute la période de fermeture du site, actuellement évaluée à trois ans.

Les coûts de suivi et d'entretien post-exploitation et post-restauration sont inclus dans le tableau 28.

## 8.2 CALCUL DE LA GARANTIE FINANCIÈRE

Les coûts totaux de restauration du site du projet Odyssey sont présentés aux tableaux 27 et 28.

Comme mentionné précédemment, le montant de la garantie financière correspond aux coûts anticipés pour la réalisation de tous les travaux prévus dans le plan de réaménagement et de restauration du site, soit d'environ 13 025 352 $ CAD[5]. Ces coûts incluent les frais d'ingénierie (30 %), les coûts de suivi ainsi qu'une contingence de 15 %.

5 En dollars 2021.

## 8.3 TYPE DE GARANTIE FINANCIÈRE

La garantie financière sera déposée sous forme de lettre de crédit, soit une des formes présentées dans le Guide du MERN et respectera les conditions présentées aux articles 116 à 199 du *Règlement sur les substances minérales autres que le pétrole, le gaz naturel et la saumure*.

### 8.3.1 DURÉE DE LA GARANTIE

La garantie financière de CMGP sera maintenue en vigueur tant que celle-ci sera propriétaire du site ou jusqu'à l'émission d'un certificat de libération.

### 8.3.2 VERSEMENT DE LA GARANTIE FINANCIÈRE

Conformément au *Règlement sur les substances minérales autres que le pétrole, le gaz naturel et la saumure* (chapitre M-13.1, r. 2, a. 112), CMGP se doit de soumettre sa garantie financière au MERN avant le début des travaux d'exploitation.

Dans le cas de travaux d'exploitation, le versement de la garantie financière doit être effectué en conformité avec les nouvelles exigences du *Règlement sur les substances minérales autres que le pétrole, le gaz naturel et la saumure*.

L'article 113 stipule que :

- la garantie sera fournie en trois versements;
- le premier versement sera fourni dans les 90 jours de la réception de l'approbation du plan de restauration;
- chaque versement subséquent sera fourni à la date anniversaire de l'approbation du plan de restauration;
- le premier versement représente 50 % du montant total de la garantie;
- les deuxième et troisième versements seront de 25 % du montant total de la garantie chacun.

## 8.4 CALENDRIER DE RÉALISATION DES TRAVAUX DE RESTAURATION

Le calendrier de réalisation des travaux de restauration est montré au tableau 29. Celui-ci a été élaboré en fonction des informations existantes et de la planification actuelle de la mine. Il sera révisé périodiquement en fonction de l'avancement des travaux et des changements pouvant survenir.

| | Partenariat Canadian Malartic<br>Plan de restauration \| Projet minier Odyssey<br>Tableau 27 :<br>Estimation des coûts directs de fermeture et de restauration<br>N° Projet: 171-08287-03 | Révision<br>0 | Date<br>2020-12-14 | MINE CANADIAN MALARTIC |
|---|---|---|---|---|

| | Description | Unité | Coût unitaire A | Quantité B' | Montant calculé (A X B') |
|---|---|---|---|---|---|
| **1.0** | **Sécurisation du site minier** | | | | |
| 1.1 | Remblayage complet du portail[1] | $m^3$ | 8,11 $ | 1 710 | 13 872 $ |
| 1.2 | Sécurisation (installation de dalles en béton) des sept monteries de ventilation(trois d'air frais et quatre d'air vicié) et des deux sorties de secours [2] | Forfait | 20 100 $ | 9 | 180 900 $ |
| 1.3 | Sécurisation (installation de dalles en béton) du puits[2] | Forfait | 35 000 $ | 1 | 35 000 $ |
| 1.4 | Installation de panneaux de signalisation " Danger " à l'endroit des monteries et du puits [3] | Unité | 208 $ | 2 | 420 $ |
| 1.5 | Obstruction du chemin d'accès à l'aide de jersey en béton[4] | Unité | 150 $ | 13 | 1 950 $ |
| | | | | **Sous total 1.0** | **232 142 $** |
| **2.0** | **Démantèlement des bâtiments et des infrastructures** | | | | |
| 2.1 | Bureaux phase I | Forfait | 423 250 $ | 1 | 423 250 $ |
| 2.2 | Bureaux phase II | Forfait | 1 334 450 $ | 1 | 1 334 450 $ |
| 2.3 | Garages | Forfait | 431 500 $ | 1 | 431 500 $ |
| 2.4 | Mégadômes | Forfait | 374 000 $ | 1 | 374 000 $ |
| 2.5 | Usines de remblai en pâte et conduites | Forfait | 448 400 $ | 1 | 448 400 $ |
| 2.6 | Chevalement et salle des treuils | Forfait | 2 430 400 $ | 1 | 2 430 400 $ |
| 2.7 | Sous-station électrique, MALT et ligne aérienne | Forfait | 1 600 300 $ | 1 | 1 600 300 $ |
| 2.8 | Monteries de ventilation | Forfait | 81 000 $ | 1 | 81 000 $ |
| 2.9 | Équipements extérieurs et souterrains (réservoirs, poste de distribution d'essence, machinerie, etc.) | Forfait | 331 975 $ | 1 | 331 975 $ |
| 2.10 | Usine de traitement des eaux | Forfait | 58 000 $ | 1 | 58 000 $ |
| 2.11 | Services (eau potable/eau usée) | Forfait | 16 000 $ | 1 | 16 000 $ |
| 2.12 | Guérite | Forfait | 4 275 $ | 1 | 4 275 $ |
| | | | | **Sous total 2.0** | **7 533 550 $** |
| **3.0** | **Restauration de l'empreinte des portails, des bâtiments, des aires d'entreposage, et des voies de circulation[5]** | | | | |
| 3.1 | Scarification des surfaces et aires à revégéter | $m^2$ | 0,21 $ | 227 134 | 47 240 $ |
| 3.2 | Ensemencement des aires | $m^2$ | 1,05 $ | 227 134 | 238 490 $ |
| | | | | **Sous total 3.0** | **285 730 $** |
| **4.0** | **Restauration de l'empreinte de la halde à minerai et à stérile temporaire** | | | | |
| 4.1 | Préparation de la surface (nivelage) et scarification | $m^2$ | 1,77 $ | 6 500 | 11 490 $ |
| 4.2 | Ensemencement des aires | $m^2$ | 1,05 $ | 6 500 | 6 830 $ |
| | | | | **Sous total 4.0** | **18 320 $** |
| **5.0** | **Restauration des fossés de gestion des eaux (fossés Odyssey)** | | | | |
| 5.1 | Remblayage, nivellement et régalage de la surface[6] | $m^3$ | 8,11 $ | 26 040 | 211 240 $ |
| 5.2 | Ensemencement des aires | $m^2$ | 1,05 $ | 17 005 | 17 860 $ |
| | | | | **Sous total 5.0** | **229 100 $** |
| **6.0** | **Programme de caractérisation des sols** | | | | |
| 6.1 | Caractérisation environnementale du site[7] | Forfait | 50 000 $ | 1 | 50 000 $ |
| 6.2 | Enlèvement et disposition des sols contaminés aux hydrocarbures[8] | Forfait | 18 260 $ | 1 | 18 260 $ |
| 6.3 | Gestion des sols contaminés en métaux[9] | $m^3$ | 8,11 $ | 1 048 | 8 500 $ |
| 6.4 | Caractérisation géochimique des stériles utilisés comme matériaux de construction | Forfait | 171 400 $ | 1 | 171 400 $ |
| | | | | **Sous total 6.0** | **248 160 $** |
| | | | | **Total des coûts** | **8 547 002 $** |

| | |
|---|---|
| **Préparé par :** | Fannie McMurray Pinard, ing. |
| | Chanez Daouzli, M. Sc., CEC, AEÉCQ |
| **Révisé par :** | Simon Latulippe, ing. |
| | Barney Ross, ECCQ, PQS |

Notes:

1) Le remblayage complet de la sturcture du portail et du tunnel jusqu'au commencement de la rampe a été considéré. Une section de 5 m par 6 m sur une distance de 200 m a été estimée pour le remblayage du tunnel. Pour ce qui est du remblayage de la structure du portail, il a été considéré qu'elle serait recouverte de 1 m de remblai.

2) La mise en place de couverts de béton de conformes au RSMPGS a été considérée afin de sécuriser l'accès aux monteries d'air frais et d'air vicié et au puits.

3) L'installation d'un panneau de signalisation tous les 30 m autour de la clôture du portail ainsi qu'à l'endroit des monteries de ventilation a été considérée.

4) Il a été considéré q'une largeur d'environ 13 m sera bloquée à l'aide de glissières New-Jersey de 36” de long.

5) Les superficies qui seront restaurées et qui ont été considérées dans l'estimation des coûts sont montrées à la carte 5.

6) Le remblayage de fossés typiques de 2H:1V ayant 1 m de profond et 2 m de large à la base a été considéré. Il a été considéré qu'environ 3400 mètres linéraires de fossés seraient à remblayer. Il a été considéré que le matériel de remblai proviendrait de la mine Canadian Malartic. Il est à noter que la restauration du bassin Nord-Est a été considérée dans le plan de restauration de la mine Canadian Malartic; c'est pourquoi ce dernier n'a pas été inclus dans la présente estimation.

7) Le coût de la caractérisation varie selon l'aire à caractériser et la localisation du site. Il est basé sur des projets similaires réalisés par WSP.

8) À titre préliminaire, il a été considéré qu'un total de 200 $m^3$ de sols autour des garages et des réservoirs du poste de distribution d'essence aura subi une contamination en hydrocarbures pétroliers. Il a été considéré d'excaver et de disposer des sols affectés par les hydrocarbures pétroliers dans un site autorisé. Il a aussi été considéré que 15 % de l'aire des installations de surface aura été affectée par les métaux sur 150 mm. Il est prévu de relocaliser les sols affectés par les métaux sur les installations de la mine Canadian Malartic.

| | Partenariat Canadian Malartic (CMGP)<br>Plan de restauration \| Phase d'exploration avancée et d'exploitation<br>Projet minier Odyssey<br>Tableau 28<br>Sommaire des coûts de fermeture et de restauration -<br>À la suite de l'exploitation<br>N° Projet: 171-08287-03 | Révision<br>0 | Date<br>2020-12-14 | MINE CANADIAN MALARTIC |
|---|---|---|---|---|

| | | |
|---|---|---|
| **1.0** | **Estimation des coûts de fermeture et de restauration directs** | |
| | Total des coûts directs sans contingence (Items 1 à 6 du tableau 2) | 8 547 002 $ |
| | **Sous total 1.0 (coûts directs )** | **8 547 002 $** |
| **2.0** | **Estimation des coûts de fermeture et de restauration indirects** | |
| 2.1 | Suivi postrestauration | |
| | Suivi annuel sur l'intégrité et la stabilité de l'ouvrage sur 5 ans | 21 120 $ |
| | Suivi agronomique annuel sur 5 ans | 16 430 $ |
| | Suivi environnemental postexploitation sur 3 ans | 29 550 $ |
| | Suivi environnemental postrestauration sur 10 ans | 98 510 $ |
| | | |
| | **Sous total 2.1** | **165 610 $** |
| 2.2 | Ingénierie | |
| | Plans, devis et supervision - 30 % des coûts directs minimum (MERN) | 2 613 780 $ |
| | **Sous total 2.2** | **2 613 780 $** |
| | | |
| | **Sous total 2.0 (coûts indirects)** | **2 779 390 $** |
| **3.0** | **TOTAL - Coûts de fermeture et de restauration directs et indirects** | |
| | Sans contingence | 11 326 392 $ |
| | Contingence - 15 % minimum (MERN) | 1 698 960 $ |
| | **TOTAL avec contingence** | **13 025 352 $** |

| | |
|---|---|
| **Préparé par :** | Fannie McMurray Pinard, ing. |
| | Chanez Daouzli, M. Sc., CEC, AEÉCQ |
| **Révisé par :** | Simon Latulippe, ing. |
| | Barney Ross, ECCQ, PQS |

**Tableau 29 Calendrier de réalisation des travaux de restauration**

| Activités | Période de fermeture | | | Période post-restauration | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Années | | | | | | | | | | | | |
| | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Études environnementales (caractérisation, plan de réhabilitation, plan de démolition et de démantèlement, permis, etc.) | | | | | | | | | | | | | |
| Enlèvement ou démolition des installations de surface | | | | | | | | | | | | | |
| Nettoyage et vidange des équipements de services | | | | | | | | | | | | | |
| Sécurisation du site | | | | | | | | | | | | | |
| Retrait des lignes électriques et équipements associés | | | | | | | | | | | | | |
| Excavation, élimination et/ou traitement des sols contaminés et des matières résiduelles excavées | | | | | | | | | | | | | |
| Excavation et disposition des boues des bassins | | | | | | | | | | | | | |
| Démantèlement et remplissage des bassins | | | | | | | | | | | | | |
| Restauration de l'empreinte des haldes à minerai et stériles | | | | | | | | | | | | | |
| Profilage final du site | | | | | | | | | | | | | |
| Ajout de couvert végétal et ensemencement de l'ensemble du site | | | | | | | | | | | | | |
| Suivi de l'intégrité des ouvrages, suivi environnemental et agronomique post-restauration | | | | | | | | | | | | | |

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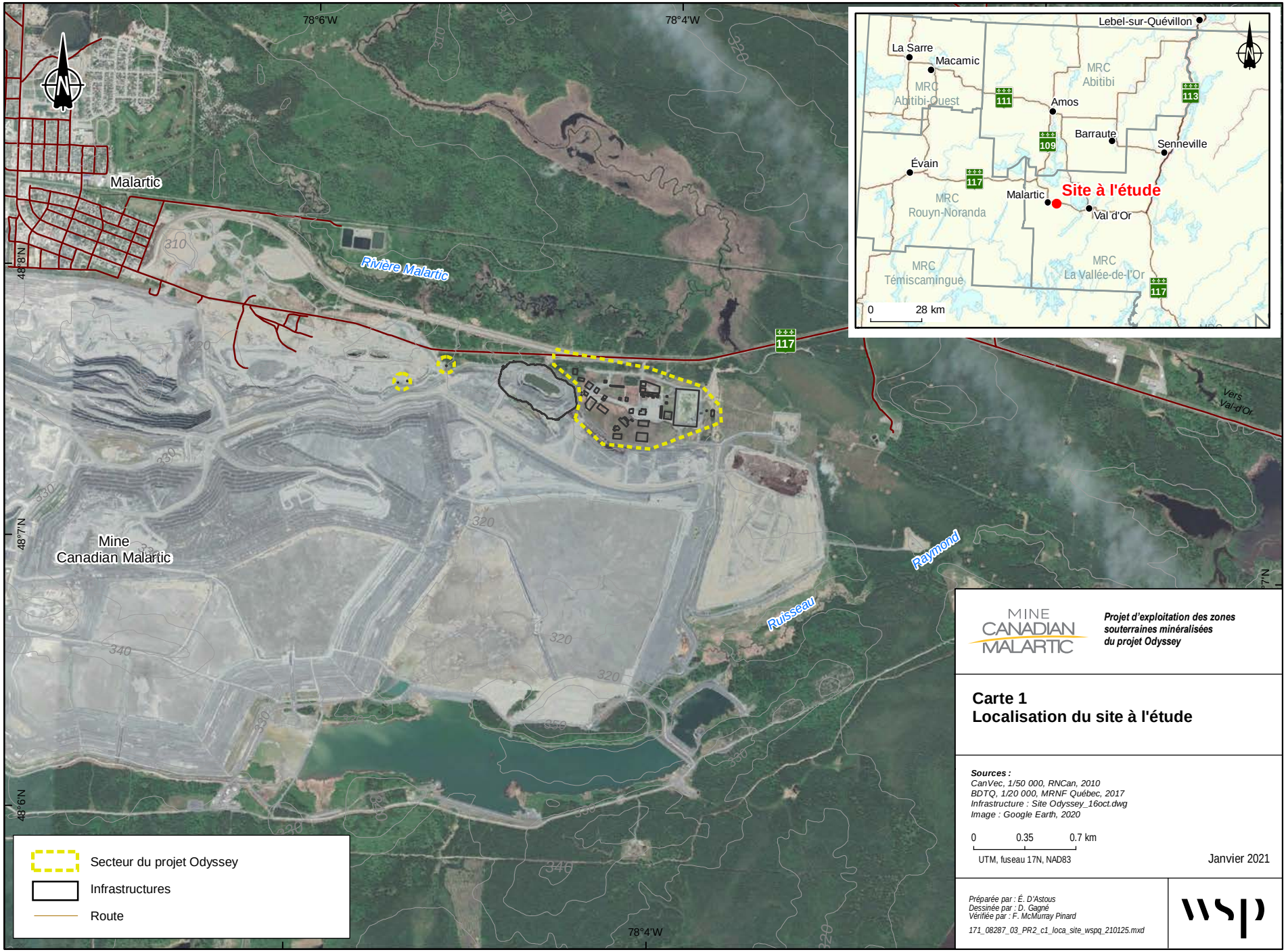
# CARTES




MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey***

## Carte 1
## Localisation du site à l'étude

***Sources :***
*CanVec, 1/50 000, RNCan, 2010*
*BDTQ, 1/20 000, MRNF Québec, 2017*
*Infrastructure : Site Odyssey_16oct.dwg*
*Image : Google Earth, 2020*

0 0.35 0.7 km

UTM, fuseau 17N, NAD83

Janvier 2021

*Préparée par : É. D'Astous*
*Dessinée par : D. Gagné*
*Vérifiée par : F. McMurray Pinard*

*171_08287_03_PR2_c1_loca_site_wspq_210125.mxd*

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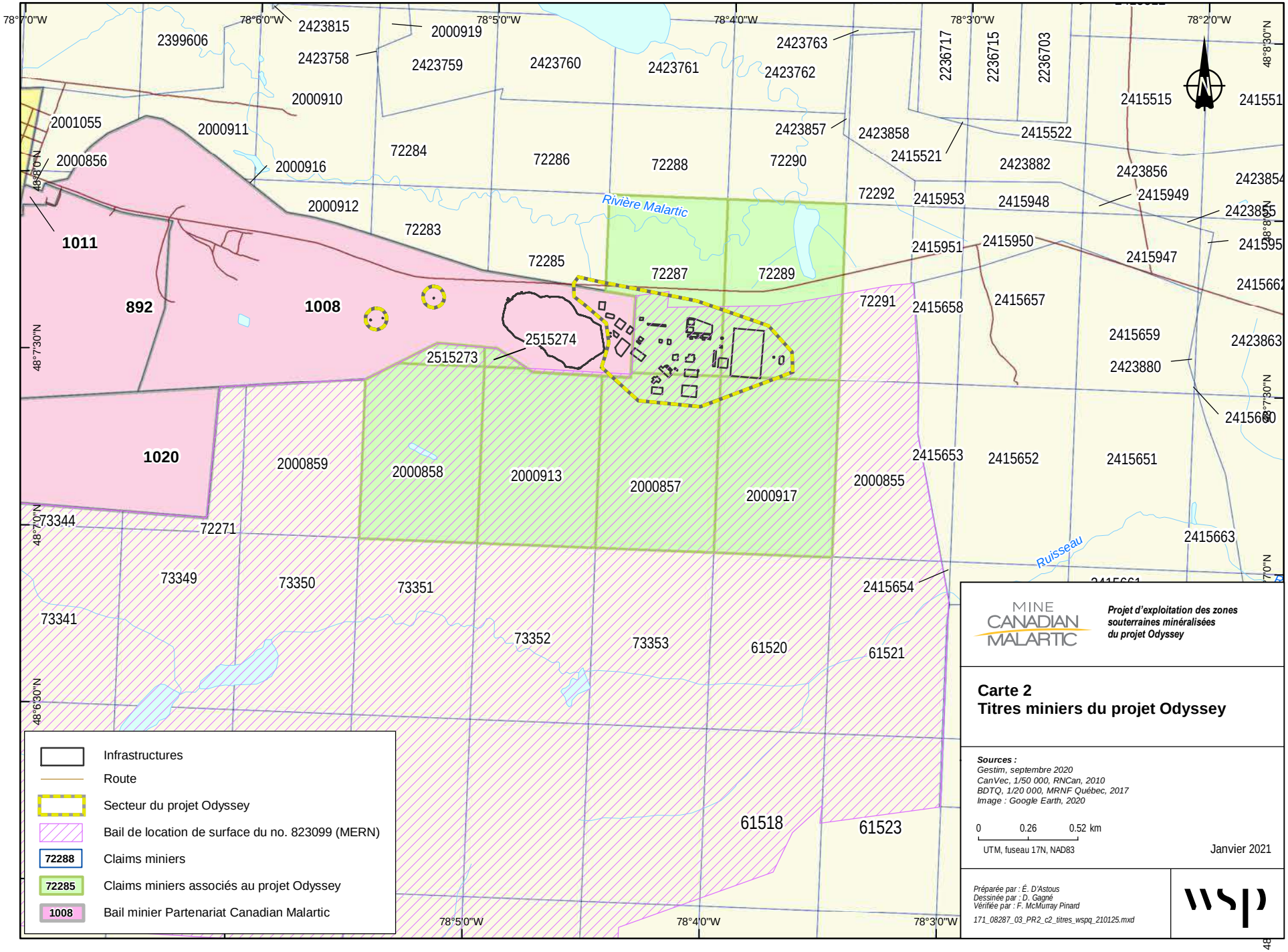
78°7'0"W
78°6'0"W
78°5'0"W
78°4'0"W
78°3'0"W
78°2'0"W
48°8'30"N
48°8'0"N
48°7'30"N
48°7'0"N
48°6'30"N
2399606
2423815
2000919
2423758
2423759
2423760
2423761
2423762
2423763
2236717
2236715
2236703
2415515
241551
2000910
2001055
2000911
2423857
2423858
2415522
2000856
2000916
72284
72286
72288
72290
2415521
2423882
2423856
2423854
2000912
72283
Rivière Malartic
72292
2415953
2415948
2415949
2423855
1011
72285
72287
72289
2415951
2415950
2415947
241595
241566
892
1008
72291
2415658
2415657
2515274
2515273
2415659
2423863
2423880
241566
1020
2000859
2000858
2000913
2000857
2000917
2415653
2415652
2415651
2000855
73344
72271
2415663
Ruisseau
73349
73350
73351
2415654
73341
73352
73353
61520
61521
61518
61523
78°5'0"W
78°4'0"W
78°3'0"W
Infrastructures
Route
Secteur du projet Odyssey
Bail de location de surface du no. 823099 (MERN)
72288
Claims miniers
72285
Claims miniers associés au projet Odyssey
1008
Bail minier Partenariat Canadian Malartic
MINE CANADIAN MALARTIC
Projet d'exploitation des zones souterraines minéralisées du projet Odyssey
Carte 2
Titres miniers du projet Odyssey
Sources :
Gestim, septembre 2020
CanVec, 1/50 000, RNCan, 2010
BDTQ, 1/20 000, MRNF Québec, 2017
Image : Google Earth, 2020
0
0.26
0.52 km
UTM, fuseau 17N, NAD83
Janvier 2021
Préparée par : É. D'Astous
Dessinée par : D. Gagné
Vérifiée par : F. McMurray Pinard
171_08287_03_PR2_c2_titres_wspq_210125.mxd
wsp

78°5'30"W
78°5'0"W
78°4'30"W
78°4'0"W
48°7'50"N
48°7'40"N
48°7'30"N
48°7'20"N
48°7'10"N
117

1. Aire d'attente pour camion
2. Air vicié
3. Bureaux
4. Bureau - Phase 2
5. Champ d'épuration
6. Chevalement
7. Compresseur
8. Entreposage
9. Garage
10. Garage des entrepreneurs
11. Matelas de la mise à la terre
12. Monterie d'air frais
13. Pile de minerai
14. Pile de stérile
15. Portail de la rampe
16. Puits d'eau potable
17. Réservoir et poste de distribution de carburant
17. Réservoir de carburant
18. Salle des treuils
19. Sortie de secours
20. Station 120 kV
21. Usine de remblai en pâte - Phase I
22. Usine de remblai en pâte - Phase II
23. Usine eau potable
24. Mégadome
25. Fosse Jeffrey (Remblayée)
26. Bassin de pompage Nord-Est (bassin Odyssey)

- Fosse Jeffrey remblayée
- Fossé Odyssey
- Fossé sud
- Bâtiment
- Stationnement
- Autres infrastructures
- Entreposage
- Surface de dépôt
- Bassin
- Voies de circulation

MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey***

**Carte 3**
**Infrastructures de surface du projet Odyssey**

***Sources :***
*Site Odyssey_16oct.dwg*
*Image : Google Earth, 2020*

0 60 120 m
UTM, fuseau 17N, NAD83

Janvier 2021

*Préparée par : É. D'Astous*
*Dessinée par : D. Gagné*
*Vérifiée par : É. D'Astous*
*171_08287_03_PR2_c3_infra_wspq_210125.mxd*

wsp

*La précision des limites et les mesures montrées sur ce document ne doivent pas servir à des fins d'ingénierie ou de délimitation foncière. Aucune analyse foncière n'a été effectuée par un arpenteur-géomètre.*

78°5'30"W
78°5'0"W
78°4'30"W
78°4'0"W
48°7'50"N
48°7'40"N
48°7'30"N
48°7'20"N
48°7'10"N

La restauration du bassin Nord-Est est comprise dans le plan de restauration de la Mine Canadian Malartic et non dans celui du projet Odyssey

117

1. Aire d'attente pour camion
2. Air vicié
3. Bureaux
4. Bureau - Phase 2
5. Champ d'épuration
6. Chevalement
7. Compresseur
8. Entreposage
9. Garage
10. Garage des entrepreneurs
11. Matelas de la mise à la terre
12. Monterie d'air frais
13. Pile de minerai
14. Pile de stérile
15. Portail de la rampe
16. Puits d'eau potable
17. Réservoir et poste de distribution de carburant
17. Réservoir de carburant
18. Salle des treuils
19. Sortie de secours
20. Station 120 kV
21. Usine de remblai en pâte - Phase I
22. Usine de remblai en pâte - Phase II
23. Usine eau potable
24. Mégadome
25. Fosse Jeffrey (Remblayée)
26. Bassin de pompage Nord-Est (bassin Odyssey)

- Fosse Jeffrey remblayée
- Fossé Odyssey
- Fossé sud
- Chemin d'accès à conserver
- Dalle de béton armé
- Démantèlement de l'accès à la route 117
- Portail remblayé
- Remblayage et végétalisation
- Scarification et végétalisation

MINE CANADIAN MALARTIC

***Projet d'exploitation des zones souterraines minéralisées du projet Odyssey***

## Carte 4
## Restauration et sécurisation

***Sources :***
*Site Odyssey_16oct.dwg*
*Image : Google Earth, 2020*

0 60 120 m
UTM, fuseau 17N, NAD83

Janvier 2021

*Préparée par : É. D'Astous*
*Dessinée par : D. Gagné*
*Vérifiée par : É. D'Astous*
*171_08287_03_PR2_c4_restauration_wspq_210125.mxd*

wsp

# ANNEXE

# A GRILLE DE VALIDATION

**A – Projet d'exploitation minière**

| Projet d'exploitation minière | ✓* | S.O.** | Renseignements disponibles (référence)*** |
|---|---|---|---|
| **Renseignements généraux** | | | |
| Résumé du plan de restauration | ✓ | | |
| Identification du requérant | ✓ | | |
| Résolution du conseil d'administration | ✓ | | |
| Emplacement du terrain avec plans annexés | ✓ | | |
| Géologie et minéralogie, notamment :<br>> Tests pour la teneur en métaux, le DMA et le DNC, tableaux des résultats annexés et interprétation des résultats | ✓ | | |
| Historique du site visé par le plan de restauration | ✓ | | |
| Autorisations diverses | ✓ | | |
| **Description du site** | | | |
| Description générale et nature des activités d'exploitation actuelles et à venir, notamment :<br>> Taux moyen d'extraction et de traitement de minerai<br>> Durée de vie estimée<br>> Taux de production des résidus<br>> Superficie des aires d'accumulation | ✓ | | |
| Description des bâtiments et des infrastructures de surface et plans annexés, notamment :<br>> Bâtiments et infrastructures d'extraction<br>> Description de l'usine de traitement de minerai | ✓ | | |
| Description des infrastructures électriques, de transport et de soutien | ✓ | | |
| Description des autres bâtiments (bâtiments administratifs et d'hébergement, cafétéria, etc.) | ✓ | | |
| Aires d'accumulation | ✓ | | |
| > Description des haldes de stériles et des haldes de mort-terrain | ✓ | | |
| > Description du parc à résidus miniers | | ✓ | |
| Description de la gestion de l'eau sur le site, notamment :<br>> Système hydrologique et bassin versant<br>> Bilan hydrique des aires d'accumulation et de l'usine<br>> Schéma de gestion des eaux et emplacement de l'effluent final<br>> Qualité des eaux souterraines | ✓ | | |
| Description du site de traitement des eaux usées, notamment:<br>> Procédés de traitement des eaux usées<br>> Description des bassins de sédimentation<br>> Station d'échantillonnage à l'effluent | ✓ | | |
| Lieux d'entreposage et d'élimination | ✓ | | |
| > Produits chimiques, pétroliers et explosifs | ✓ | | |
| > Matières résiduelles non dangereuses | ✓ | | |
| > Matières résiduelles dangereuses | ✓ | | |
| **Mesures de protection, de réaménagement et de restauration** | | | |
| Sécurité des aires de travail, des ouvertures au jour et des piliers de surface | ✓ | | |
| Démantèlement des bâtiments et des infrastructures de surface, notamment :<br>> Bâtiments et infrastructures d'extraction<br>> Description de l'usine de traitement de minerai | ✓ | | |
| Démantèlement des infrastructures électriques, de transport et de soutien | ✓ | | |

**A – Projet d'exploitation minière (suite)**

| Projet d'exploitation minière | ✓* | S.O.** | Renseignements disponibles (référence)*** |
|---|---|---|---|
| **Mesures de protection, de réaménagement et de restauration (suite)** | | | |
| Démantèlement des autres bâtiments (bâtiments administratifs et d'hébergement, cafétéria, etc.) | ✓ | | |
| Disposition des équipements et de la machinerie lourde | ✓ | | |
| Restauration des aires d'accumulation, notamment :<br>> Analyse comparative des scénarios de restauration<br>> Scénario de restauration choisi | ✓ | | |
| Infrastructure de gestion des eaux | ✓ | | |
| Réhabilitation du terrain (terrains contaminés) | ✓ | | |
| Gestion et élimination des produits pétroliers, des produits chimiques et des matières résiduelles dangereuses et non dangereuses | ✓ | | |
| Changements climatiques | ✓ | | |
| **Programme de suivi et d'entretien postrestauration, le cas échéant** | | | |
| Suivi et entretien de l'intégrité des ouvrages | ✓ | | |
| Suivi environnemental | ✓ | | |
| Suivi et entretien agronomique | ✓ | | |
| **Considérations économiques et temporelles** | | | |
| Évaluation détaillée des coûts des travaux de restauration | ✓ | | |
| Calendrier de réalisation des travaux de restauration | ✓ | | |
| **Plan d'urgence** | ✓ | | |
| **Mesures applicables en cas de cessation temporaire des activités d'exploitation** | ✓ | | |

* Élément inclus
** Sans objet
*** Si les renseignements ne sont pas inclus dans la révision du plan de restauration soumis, indiquer l'endroit où ils peuvent être trouvés (référence et page).

# ANNEXE

# B

## RÉSOLUTION DU CONSEIL D'ADMINISTRATION

# CANADIAN MALARTIC GP

## OPÉRATIONS CANADIENNES

À qui de droit,

**CONSIDÉRANT** que Canadian Malartic GP (le « **Partenariat** ») effectue des opérations minières, ainsi que des travaux d'exploration et de développement au Canada;

**CONSIDÉRANT** qu'il est nécessaire, de temps à autre, pour le Partenariat d'obtenir ou de modifier des permis, licences, certificats, autorisations, droits miniers et autres titres (collectivement, les « **Permis** ») auprès du gouvernement du Canada, du gouvernement de la province de Québec, de toute ville, municipalité ou de leurs organismes, d'un organisme gouvernemental ou de toute autre autorité, agence ou organisme de réglementation, ainsi que leurs représentants (collectivement, les « **Autorités** »);

**CONSIDÉRANT** qu'il peut s'avérer plus pratique que les requêtes et les démarches visant l'obtention ou la modification de ces Permis soient effectuées par, ou sous la responsabilité du personnel affecté aux propriétés, projets, ou, le cas échéant, aux sites miniers, bureaux régionaux ou divisionnaires, ou autres installations à l'égard desquels lesdits Permis sont requis;

**CONSIDÉRANT** qu'il est nécessaire, de temps à autre, pour le Partenariat de négocier et de conclure toute convention relativement à la mise en œuvre et à la gestion de ses opérations (collectivement, les « **Conventions** ») avec les Autorités ou avec toute tierce partie;

**CONSIDÉRANT** qu'il peut s'avérer plus pratique que les négociations, la conclusion et la signature de toute Convention soient effectuées par, ou sous la responsabilité du personnel affecté aux propriétés, projets, ou, le cas échéant, aux sites miniers, bureaux régionaux ou divisionnaires, ou autres installations à l'égard desquels lesdites Conventions sont requises;

**NOUS SOUSSIGNÉS** Éric Labbé et Vanessa Laplante, respectivement secrétaire et trésorière du Partenariat, dûment autorisés à agir aux présentes en vertu d'une résolution des membres votants du comité exécutif (*Management Committee*) du Partenariat adoptée le 13 janvier 2020, dont un extrait est annexé aux présentes, autorisons et mandatons, par les présentes, monsieur Martin Duclos, Directeur environnement et développement durable, à signer et à exécuter, pour et au nom du Partenariat:

- tout document, demande, instrument ou formulaire aux fins d'obtenir ou de modifier tout Permis auprès des Autorités, nécessaire aux opérations canadiennes du Partenariat, et à prendre toute autre mesure connexe qui peut être nécessaire ou utile, de temps à autre, pour obtenir ou modifier ledit Permis, le maintenir en vigueur et s'assurer que le Partenariat agisse continuellement en conformité avec celui-ci, le tout en conformité, le cas échéant, avec les différents programmes d'exploration et de développement et/ou avec toute décision ou recommandation dûment adoptée ou arrêtée par le Partenariat; et

- toute Convention requérant la signature du Partenariat, concernant notamment l'acquisition et l'aliénation de biens meubles et immeubles, excluant toutefois:

  a) toute Convention **portant sur la cession, le transfert ou toute disposition de titres miniers**;

  b) toute Convention dont la valeur individuelle **excède la somme de Can 150 000 $**.

Le présent mandat est strictement restreint aux fins ci-dessus mentionnées et est valide jusqu'au 31 décembre 2021, inclusivement.

Montréal, le 1er janvier 2021

**CANADIAN MALARTIC GP**

Par: _____
Éric Labbé
Secrétaire

Par: _____
Vanessa Laplante
Trésorière

**CERTIFIED EXTRACT OF A SPECIAL RESOLUTION OF THE VOTING MANAGEMENT COMMITTEE MEMBERS OF CANADIAN MALARTIC CORPORATION (THE "CORPORATION") ON BEHALF OF CANADIAN MALARTIC GP (THE "PARTNERSHIP") ADOPTED ON JANUARY 13, 2020**

"**GRANTING OF AUTHORITY**

Subject to any restrictions or requirements set forth in the Unanimous Shareholders Agreement and Partnership Agreement, as amended from time to time, **BE IT UNANIMOUSLY RESOLVED:**

**[...] 5.** **THAT** any two (2) members of the Management Committee or any two (2) officers of the Corporation or the Partnership, acting jointly and representing each Yamana Gold Inc. and Agnico Eagle Mines Limited, be, provided that the value of the commitment made on behalf of the Corporation does not exceed two hundred and fifty thousand Canadian dollars (CDN$250,000), authorized, from time to time, to delegate authority in writing to one or more employees, contractors or other delegatees to execute and to deliver such agreements, instruments, amendments, certificates and other documents and to do such other acts or things or to make such filings, applications or other communications with any governmental or regulatory authority, including any or all of the actions described in the foregoing resolutions, as they may determine to be necessary or advisable in relation to the business, assets, properties, land, claims or other interests held directly or indirectly by or on behalf of the Partnership, and such delegation may be for either a limited or unlimited period of time, the execution of any such written grant of authority being conclusive evidence of such delegation of authority."

---

I, the undersigned, Éric Labbé, General Counsel and Secretary of Canadian Malartic GP, hereby certify that the foregoing is a true copy of an extract of a special resolution duly adopted by the Voting Management Committee members of Canadian Malartic Corporation on behalf of Canadian Malartic GP, on January 13th, 2020, which special resolution is, as at the date hereof, in full force and effect, and unamended.

**DATED AND SIGNED** in Montréal, this 1st day of January 2021.

Éric Labbé
General Counsel and Secretary

# ANNEXE

# C CARACTÉRISATIONS GÉOCHIMIQUES

ANNEXE

# C-1 *PREMIÈRE ÉTUDE*

# ODYSSEY PROJECT - GEOCHEMICAL CHARACTERIZATION

Report prepared for:

MINE CANADIAN MALARTIC
100 chemin du Lac Mourier
Malartic, QC
J0Y 1Z0

Report prepared by:

ECOMETRIX INCORPORATED
6800 Campobello Road
Mississauga, Ontario
L5N 2L8

Ref. 17-2350
December 2017

# ODYSSEY PROJECT – GEOCHEMICAL CHARACTERIZATION

Daniel Skruch, M.Eng.
Principal Investigator

R.V. (Ron) Nicholson, Ph.D., P.Geo. (ON)
Project Principal and Reviewer

# EXECUTIVE SUMMARY

The Mine Canadian Malartic (MCM) is located approximately 25 km west of Val-d'Or and 80 km east of Rouyn-Noranda, Quebec. The property lies within the Municipality of Malartic and straddles the townships of Fournière, Malartic, and Surimau.

To the east of the existing MCM open pit operations lie the Odyssey North and Odyssey South zones. These zones are being explored to assess the opportunity for new potential sources of ore for the MCM mill. The Odyssey zones are approximately 1.5 km east of the MCM open pit. EcoMetrix Incorporated (EcoMetrix) was retained by MCM to complete a geochemical characterization of the deposit based on samples selected and collected by experienced MCM geologists.

The Odyssey zones are composed of multiple mineralized bodies spatially associated with a porphyritic intrusion close to the contact of the Pontiac Group sediments and the Piché Group of volcanic rocks. Odyssey North covers a length of approximately 1.5 km and has been traced from depths of 600 to 1,300 metres below surface. Odyssey South is approximately 500 m long and has been located between approximately 200 and 550 metres below surface (Agnico-Eagle, 2017a).

This report details the geochemical characteristics of the samples recovered from both the Odyssey North and the Odyssey South zones representing potential mine rock, ore, and tailings from the deposits. The geochemical characteristics of the materials were interpreted in the context of an ARD/ML risk assessment as well as protocols and guidance presented in *Directive 019* and Price (2009) to identify the preferred management strategies for these materials.

*Directive 019* is a guidance document from the Ministère du Développement durable, l'Environnement et de la Lutte contre les changements climatiques (MDDELLC, 2012) presenting requirements for various mining activities with the purposes of environmental protection. *Directive 019* provides risk-classification information on mine materials and was applied in this assessment. *Directive 019* provides criteria related to the potential for acid generation, metals contents, and leachability to classify mine materials as low-risk.

Samples were selected and collected from the Odyssey North and Odyssey South deposits for geochemical testing in 2017 by experienced MCM staff. These samples included 51 samples representing waste rock, 26 samples representing ore, and three tailings samples produced from metallurgical testing. The sampling protocol was performed as presented in Proposition d'échantillonnage pour les tests environnementaux du projet Odyssey (MCM, 2016). Samples were processed and submitted for analyses including: acid base accounting (ABA), solid contents analysis, whole rock analysis, Rietveld XRD analysis, neutralization capacity, CTEU-9 leach testing, SPLP leach testing, and TCLP leach testing.

### Odyssey Mine Rock – Geochemical Summary

Consistent with historical findings for mine materials from the MCM deposit, the waste rock samples from the Odyssey zones show an excellent linear correlation between the neutralization potential based on carbonate content (Carb-NP) and the neutralization potential measured by the Sobek method (Sobek-NP) with a linear correlation coefficient ($R^2$) of 0.98. Additionally, the waste rock Carb-NP values are typically more conservative, or slightly less, than the Sobek-NP values. In consideration of the Carb-NP effectiveness and the observed results a carbonate NP to acid potential ratio (Carb-NP/AP or Carb-NPR) of 2 is a more conservative criterion than the Sobek neutralization potential to acid potential ratio (Sobek-NPR) criterion of 3 as presented in *Directive 019*. Therefore, all samples that have Carb-NPR values greater than 2 also have Sobek-NPR values greater than 3.

Further, Carb-NPR can be estimated from the $carbon_{total}$/$sulphur_{total}$ (C/S) ratios in mine materials in which total carbon (C) is a surrogate for carbonate and total sulphur (S) is a surrogate for sulphide. Comparing the Carb-NPR results versus the C/S ratios over a range of values that is meaningful for characterizing potentially acid generating (PAG) and non-potentially acid generating (non-PAG) materials presents a very strong linear trend. The data show that a C/S ratio of approximately 0.81 equates a Carb-NPR value of 2 that can be used for non-PAG material identification. A C/S ratio of 0.81 is very similar to the value of 0.9 used at MCM to identify non-PAG mine rock. Similarly, a C/S ratio of approximately 0.42 equates a Carb-NPR value of 1 that can be used to identify PAG materials. Mine rock with C/S values between 0.42 and 0.81 would be classified as having an uncertain potential for acid generation and would be of lower risk than PAG materials that have a C/S ratio less than 0.42.

This geochemical characterization study identified that 92% of the Odyssey mine rock samples were classified as non-PAG, with Carb-NPR values greater than 2, compared to an estimated 25% of the mine rock from the MCM operation that has Carb-NPR values greater than 2. Additionally, the proportion of non-PAG materials is very consistent across the Odyssey waste rock zones (North vs. South) and the sample locations (hanging wall, footwall, development).

The characterization of the Odyssey mine rock also identified that:

- Mine rock from both Odyssey North and South is elevated in barium, cobalt, chromium, copper, and nickel compared to « *Critères Génériques pour les Sols* » – *'A'*;
- Lead is only elevated in the Odyssey North Zone mine rock;
- Rietveld XRD analyses showed that the mine rock is dominated by quartz and aluminosilicates and that:
    - Three carbonate minerals were present in the rock: ankerite ($Ca,Fe(CO_3)_2$), calcite ($CaCO_3$), and dolomite ($Ca,Mg(CO_3)_2$). The relative quantities of iron carbonate, that do not provide effective neutralization, were low and the vast majority of the carbonate content is represented by calcium and magnesium carbonates and will provide effective neutralization,
    - Pyrite ($FeS_2$) was the only source of sulphide,

- The results of the aggressive TCLP tests show that barium and lead can leach at elevated concentrations under acidic conditions compared to the « *résurgence dans l'eau de surface criteria* »;
    - All values of lead that exceeded the criteria in the TCLP tests were associated with samples from the Odyssey North Zone, and a higher proportion of results from the Odyssey North samples also exceeded the barium criteria.
- CTEU-9 and SPLP test results, tests that better represent actual storage conditions, did not exhibit elevated concentrations in leachate.

In summation, 36% of the Odyssey mine rock samples met the *Directive 019* low-risk criteria. Barium and lead concentrations in the TCLP leachate tests were the principal controlling factors for excluding samples from the low-risk classification. The vast majority of mine rock samples are non-PAG and satisfy the Carb-NPR and Sobek-NPR criteria. The Odyssey mine rock typically has a greater proportion of low risk material than that at the MCM operation where only 7.5% of the mine rock met the *Directive 019* low-risk criteria (EcoMetrix, 2017).

The results from the Odyssey mine rock characterization demonstrate that seepage and runoff water quality from the temporary Odyssey mine rock storage pile is expected to be of good quality and acceptable for release without mitigation. Further, no additional management measures are required for incorporating the Odyssey mine rock into the MCM operation. The Odyssey mine rock can be safely managed within the existing MCM mine rock storage areas under existing mine management procedures.

**Odyssey Tailings – Geochemical Summary**

The same principles pertaining to mine rock acid-base-accounting were also applied to tailings and ore characterization. The ore samples will represent tailings after milling and removal of gold.

As with the mine rock, the Carb-NP values are a more conservative measure of the effective-NP in ore and tailings. Approximately 76% of the tailings and ore samples have Carb-NPR values greater than 2 and would be classified as non-PAG. Approximately 21% have Carb-NPR values between 1 and 2 and have an uncertain PAG and only one of the 29 samples, or 3% of the ore and tailings samples was classified as PAG.

The results of the characterization program showed that:

- North Zone ore samples were 88% non-PAG whereas South Zone ore samples were 60% non-PAG;
- Tailings and ore are elevated in barium, cobalt, chromium, nickel, lead, molybdenum, and silver compared to « *Critères Génériques pour les Sols* » - *'A'* standards;
- Rietveld XRD analyses showed that the tailings and ore are dominated by quartz and aluminosilicates and that:
    - Two carbonate minerals were identified: ankerite ($Ca,Fe(CO_3)_2$) and calcite ($CaCO_3$). The iron carbonates, those that do not provide effective neutralization,

represented only 6% of the total carbonate content in the ore samples. More than 20% of the carbonates in tailings were represented by iron carbonates.

- All tailings or ore samples exceeded at least one of the « *résurgence dans l'eau de surface* » TCLP criteria for barium and lead; and
- No CTEU-9 or SPLP test concentrations exceeded either the « *règlement sur la qualité de l'eau potable* » or the ten times « *règlement sur la qualité de l'eau potable* » criteria, respectively.

The results of this geochemical characterization study identified that the Odyssey tailings and ore samples had substantially higher proportions of non-PAG material than those from the ongoing MCM operation. However, no tailings or ore samples were considered low-risk because they exceeded the *Directive 019* criteria for the TCLP test results for a few constituents.

These results show that seepage and runoff quality from the temporary Odyssey ore storage pile is expected to be good quality and acceptable for release without mitigation. The ore samples are surrogates of tailings and this testing shows that the Odyssey tailings and ore samples are similar to the existing MCM tailings that are managed as potentially acid generating. No additional management measures will be required for incorporating Odyssey tailings into the MCM operation. The Odyssey tailings can be safely managed within existing MCM tailings storage areas under current mine management procedures.

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# ACRONYM LIST

**ABA** **Acid Base Accounting**
*A series of chemical analyses and calculated values to estimate the magnitude of the acid generation potential and acid neutralization potential of a sample.*

**AP** **Acid Potential**
*The total acid a material is capable of generating. Analyses of sulphur species are used to estimate acid potential. Calculated as sulphide sulphur (%S) multiplied by 31.25 assuming that all sulphide reacts like pyrite ($FeS_2$). Reported in units of $kg_{CaCO3}/tonne_{rock}$*

**ARD** **Acid Rock Drainage**
*Acidic pH drainage derived from materials with an insufficient capacity to neutralize acidic products of sulphide, elemental sulphur oxidation, the dissolution of acidic minerals, and the dissolution of amorphous materials.*

**C** **Carbon**
*The carbon content of the material. Can potentially be correlated to, and used as a surrogate for, the carbonate neutralization potential.*

**Carb-NP** **Carbonate Neutralization Potential**
*The maximum neutralization capacity that would be available if all the carbonate minerals in a sample reacted like calcite ($CaCO_3$). Reported in units of $kg_{CaCO3}/tonne_{rock}$*

**Carb-NPR** **Carbonate Neutralization Potential Ratio**
*The ratio of the Carb-NP divided by the AP. Unitless. Calculated as part of Acid Base Accounting.*

**CTEU-9**
*A water leach extraction test. Described in MA. 100 – Lix.com 1.1.*

**CTEU-10**
*An acetic acid leach extraction test. . Described in MA. 100 – Lix.com 1.1*

**ML** **Metal Leaching**
*The extraction of soluble metals by percolating solvents.*

**NP** **Neutralization Potential**
*The total acid a material is capable of neutralizing. Estimated from laboratory analyses. Reported in units of $kg_{CaCO3}/tonne_{rock}$.*

**NNP** **Net Neutralization Potential**
*Neutralization potential minus acid potential. Calculated as part of Acid Base Accounting. Reported in units of $kg_{CaCO3}/tonne_{rock}$.*

**NPR** **Neutralization Potential Ratio**
*Neutralization potential divided by acid potential. Calculated as part of Acid Base Accounting. Unitless.*

**PAG** **Potentially Acid Generating**
*Materials predicted to potentially generate acidity in the future if exposed to air and water at the earth's surface. Materials that are net neutral or alkaline will become acidic in the future if the rate of acid neutralization is unable to keep up with the addition of acidity.*

**S** **Sulphur**
*The sulphur content of the material. Can potentially be correlated to, and used as a surrogate for, the acid potential.*

**Sobek-NP** **Sobek Neutralization Potential**
*A standard NP test in which a strong acid is added to a sample to attain a pH below 2, it is allowed to react, and then the remaining acid is measured to determine the amount of acid consumed*

**Sobek-NPR** **Sobek Neutralization Potential Ratio**
*The ratio of the Sobek-NP divided by the AP. Unitless.*

**SPLP** **Synthetic Precipitation Leaching Procedure**
*A leach test to simulate the effects of acid rainfall. Described in MA. 100 – Lix.com 1.1.*

**TCLP** **Toxicity Characteristic Leaching Procedure**
*A leach test to assess the mobility of inorganic species.*

# 1.0 INTRODUCTION

The Mine Canadian Malartic (MCM) mine is located approximately 25 km west of Val-d'Or and 80 km east of Rouyn-Noranda, Quebec (**Figure 1-1**). The property lies within the Municipality of Malartic and straddles the townships of Fournière, Malartic, and Surimau.

**Figure 1-1: Location of the Malartic Mine**

## 1.1 Historical Mining at Malartic

Mining in the Malartic area began in the 1930s, including both underground and open pit operations. The underground mines included the Canadian Malartic, Eastern Malartic, and the Malartic Goldfields. The Canadian Malartic and Malartic Goldfields closed in 1965 followed by the closure of the Barnat and East Malartic mines in 1980. The underground mines, in operation until the 1980s, stored tailings in several facilities at the sites, including Cellules 1, 2 and 3, and the East Malartic tailings, with little to no waste rock stored on site (Golder, 2009).

Osisko Mining discovered new deposits in the area and completed evaluations of the project in 2009. Osisko Mining received approval from the Quebec government to develop an open pit mine at Canadian Malartic in 2009, with operations commencing in 2011. The feasibility study completed in 2008 indicated a proven and probable reserve of 6.28 Moz and an estimated mine life of 10 years. The 2008 mine plan included the production of 326 Mt of waste rock and 183 Mt of tailings.

Definition drilling of the eastern extension of the Canadian Malartic deposit was completed in 2009. In January 2010, this new extension was added to the Canadian Malartic mine and a new proven and probable reserve of 8.97 Moz of gold was determined.

In June 2014, Agnico Eagle Mines Limited (AEM) and Yamana Gold Incorporated (Yamana), completed the acquisition of the Osisko Mining Corporation including the Canadian Malartic mine, to form the Canadian Malartic Partnership.

Mine life at Canadian Malartic is expected to last through 2026 and the Government of Quebec has authorized the proposed extension of the Canadian Malartic mine and the diversion of Highway 117 in Malartic. Additional deposits to the east of the existing open pit are being explored.

## 1.2 Odyssey Deposits

To the east of the existing MCM open pit lie the Odyssey North and Odyssey South zones. These zones are being explored to assess the opportunity for new potential sources of ore for the MCM mill. The Odyssey zones are approximately 1.5 km east of the MCM open pit, **Figure 1-2**.

The Odyssey zones are composed of multiple mineralized bodies spatially associated with a porphyritic intrusion close to the contact of the Pontiac Group sediments and the Piché Group of volcanic rocks. Odyssey North covers a length of approximately 1.5 km and has been traced from depths of 600 to 1,300 metres below surface. Odyssey South is approximately 500 m long and has been located between approximately 200 and 550 metres below surface (Agnico-Eagle, 2017a).

This report details the geochemical characteristics of the samples recovered from both the Odyssey North and the Odyssey South zones representing potential mine rock, tailings, and ore from the deposits. The *Directive 019* (MDDELCC, 2012) classification process was used as guidance for sample analysis and interpretation to complement the principles presented in Price (2009) for the prediction of acid rock drainage and metal leaching (ARD/ML) for mine materials.

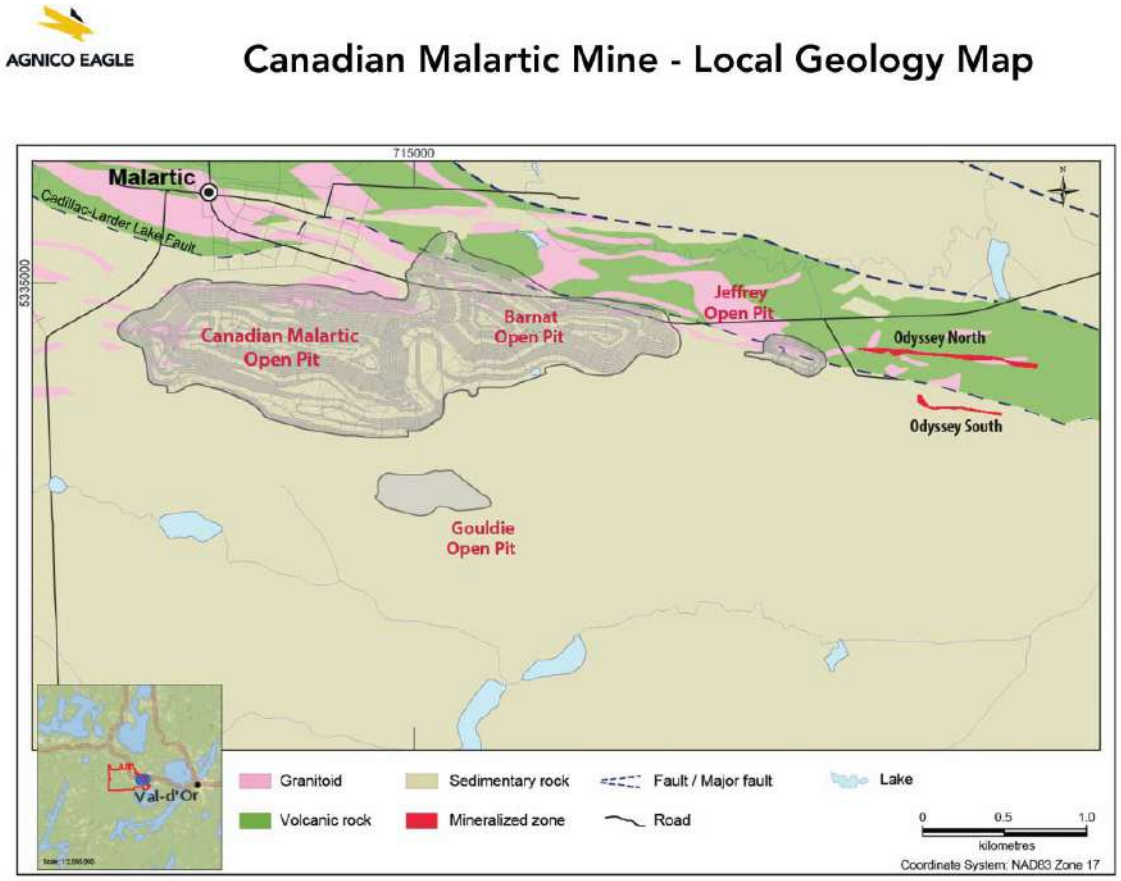



**Figure 1-2: Location of Odyssey North and Odyssey South Deposits (Agnico Eagle, 2017b)**

## 1.3 Objectives and Scope

The scope of this investigation was to characterize the mine rock and tailings materials expected to be produced from the Odyssey deposit and to identify how those materials should be managed.

The testing procedures used to characterize these materials are presented in **Table 1-1**.

The geochemical characteristics of the materials from the Odyssey North and Odyssey South zones were interpreted in the context of an ARD/ML risk assessment as well as protocols and guidance presented in *Directive 019* and Price (2009) to identify the preferred management strategies for these materials.

**Table 1-1: Odyssey North and South Zone - Characterization Procedures**

| Test Completed | Criteria for Evaluation |
|---|---|
| Acid Base Accounting (includes NP, AP, C & S species) | *Directive 019* & Price (2009) |
| Solids Content Analysis | Critères génériques pour les sols |
| Whole Rock Analysis | Qualitative Analysis |
| Rietveld Analysis | Qualitative Analysis |
| Neutralization Capacity | 3 eq/kg benchmark |
| CTEU-9 Testing | Règlement sur la qualité de l'eau potable |
| SPLP Testing | 10x Règlement sur la qualité de l'eau potable |
| TCLP Testing | Low-Risk Criteria: résurgence dans l'eau de surface |
| | Elevated risk criteria: D019 Annexe II Tableau 1 |

# 2.0 MINE WASTE MATERIALS SAMPLING

Samples were collected from the Odyssey North and Odyssey South deposits for geochemical testing in 2017 by Mine Canadian Malartic (MCM). These samples included 51 samples representing waste rock, 26 ore samples, and three tailings samples produced from metallurgical testing. Many of the samples evaluated, but not all, consisted of composites made from up to five individual drill core fragments – a listing of the sample IDs and composite sample components is included in **Appendix A**. Ore samples are considered to be reasonable surrogates for tailings because sulphide and carbonate minerals will not be removed from the ore during the milling process.

The set of mine rock, tailings, and ore samples submitted to the laboratory for analysis that are analyzed in this report were selected by Canadian Malartic and are assumed to be representative of the mine rock, tailings, and ore from the Odyssey North and South zones. The sampling protocol was performed as presented in Proposition d'échantillonnage pour les tests environnementaux du projet Odyssey (MCM, 2016).

Samples from Odyssey North included 27 waste rock samples from the hanging wall, footwall, and development areas, in addition to 16 ore samples from the Mineralized Zone. Samples from Odyssey South included 24 waste rock samples from the hanging wall, footwall, and development areas in addition to 10 ore samples from the Mineralized Zone. The three tailings samples were not attributed to materials from either the North or South zones. A variety of lithologies and alterations were sampled from each area. A summary of the sample IDs, lithologies, and alterations are provided in **Appendix A**.

All samples were submitted to SGS Laboratories for solids content, ABA, and whole rock analysis. A subset of 24 samples, including two tailings, four ore, nine waste rock samples from Odyssey North, and nine waste rock samples from Odyssey South were analyzed further. Additional analyses performed at SGS Laboratories (Lakefield, ON) included neutralization capacity, SPLP, CTEU-9, and TCLP leachability tests and the Acisol 1.0 ABA test. The testing by SGS was performed in accordance with Centre d'expertise en Analyse Environmentale du Québec (CEAE) methods. Rietveld XRD analysis was further performed on 17 of these samples. The laboratory data are presented in full in **Appendix B** and the laboratory chain of custody forms are presented in **Appendix C**.

## 2.1 Odyssey North - Sample Selection

Samples from Odyssey North represented the Mineralized Zone (e.g. ore), the Hanging Wall, the Footwall, and the Development Zone.

### 2.1.1 Mineralized Zone

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey North Mineralized Zone are presented in **Table 2-1**.

The lithologies submitted as part of Odyssey North Mineralized Zone sampling program represent approximately 99% of the lithology encountered. Over 90% of the lithology in this area is represented by porphyry.

**Table 2-1: Lithology Distribution at the Odyssey North - Mineralized Zone**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Amphibolite | 1.0% |
| Gabbro | 0.6% |
| Intermediate Intrusive | 2.3% |
| Mafic Intrusive | 0.9% |
| Porphyry | 90.5% |
| Schist | 1.9% |
| Ultramafic | 2.7% |
| Quartz Vein | 0.1% |

### 2.1.2 Hanging Wall

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey North Hanging Wall are presented in **Table 2-2**.

The lithologies submitted as part of Odyssey North Hanging Wall sampling program represent approximately 98% of the lithology encountered. Over 90% of the lithology in this zone is represented by porphyry.

**Table 2-2: Lithology Distribution at the Odyssey North – Hanging Wall**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Gabbro | 0.5% |
| Mafic Intrusive | 2.5% |
| Porphyry | 91.9% |
| Sedimentary | 1.2% |
| Ultramafic | 3.9% |

### 2.1.3 Footwall

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey North Footwall are presented in **Table 2-3**.

The lithologies submitted as part of Odyssey North Footwall sampling program represent approximately 98% of the lithology encountered. The dominant lithology is ultramafic representing over 50% of the lithology encountered.

**Table 2-3: Lithology Distribution at the Odyssey North – Footwall**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Gabbro | 3.5% |
| Intermediate Intrusive | 4.9% |
| Mafic Intrusive | 5.1% |
| Porphyry | 12.2% |
| Trachyte Porphyry | 0.5% |
| Schist | 20.7% |
| Talc | 1.8% |
| Ultramafic | 51.5% |

### 2.1.4 Development Zone

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey North Development Zone are presented in **Table 2-4**.

The lithologies submitted as part of Odyssey North Development Zone sampling program represent approximately 97% of the lithology encountered. Over 90% of the lithology at this area is represented by porphyry.

**Table 2-4: Lithology Distribution at the Odyssey North – Development Zone**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Aplite | 0.4% |
| Gabbro | 2.0% |
| Intermediate Intrusive | 0.3% |
| Mafic Intrusive | 1.8% |
| Porphyry | 90.9% |
| Sedimentary | 2.7% |
| Ultramafic | 1.3% |
| Other | 0.5% |

## 2.2 Odyssey South - Sample Selection

Samples from Odyssey South represented the Mineralized Zone (e.g. ore), the Hanging Wall, the Footwall, and the Development Zone.

### 2.2.1 Mineralized Zone

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey South Mineralized Zone are presented in **Table 2-5**.

The lithologies submitted as part of Odyssey South Mineralized Zone sampling program represent approximately 95% of the lithology encountered. Over 75% of the lithology is represented by porphyry and over 10% is sedimentary rock.

**Table 2-5: Lithology Distribution at the Odyssey South - Mineralized Zone**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Aplite | 4.3% |
| Basalt | 0.2% |
| Intermediate Intrusive | 0.1% |
| Mafic Intrusive | 1.6% |
| Porphyry | 78.4% |
| Sedimentary | 10.9% |
| Schist | 1.3% |
| Ultramafic | 1.6% |
| Quartz | 1.5% |

### 2.2.2 Hanging Wall

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey South Hanging Wall are presented in **Table 2-6**.

The lithologies submitted as part of Odyssey South Hanging Wall sampling program represent approximately 98% of the lithology encountered. Nearly 75% of the lithology is represented sedimentary rock.

**Table 2-6: Lithology Distribution at the Odyssey South – Hanging Wall**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Aplite | 1.8% |
| Basalt | 4.9% |
| Mafic Intrusive | 3.1% |
| Porphyry | 13.8% |
| Sedimentary | 74.9% |
| Schist | 1.4% |

### 2.2.3 Footwall

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey South Footwall are presented in **Table 2-7**.

The lithologies submitted as part of Odyssey South Footwall sampling program represent approximately 91% of the lithology encountered. Nearly 90% of the lithology at this area is represented by porphyry rock.

**Table 2-7: Lithology Distribution at the Odyssey South – Footwall**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Intermediate Intrusive | 3.2% |
| Mafic Intrusive | 2.2% |
| Porphyry | 88.0% |
| Schist | 4.4% |
| Ultramafic | 2.2% |

### 2.2.4 Development Zone

The distribution of lithologies encountered through drill holes as a percentage of total drill core at the Odyssey South Development Zone are presented in **Table 2-8**.

The lithologies submitted as part of Odyssey South Development Zone sampling program represent approximately 97% of the lithology encountered. Nearly 90% of the lithology is represented by porphyry rock.

**Table 2-8: Lithology Distribution at the Odyssey South – Development Zone**

| Lithology | Drill Core Percentage (by length) |
|---|---|
| Amphibolite | 0.1% |
| Aplite | 0.1% |
| Gabbro | 1.6% |
| Intermediate Intrusive | 1.0% |
| Mafic Intrusive | 1.1% |
| Porphyry | 89.6% |
| Schist | 0.7% |
| Talc | 0.2% |
| Ultramafic | 5.4% |
| Other | 0.2% |

# 3.0 MINE MATERIALS PRINCIPLES & CLASSIFICATION

## 3.1 Geochemistry Background and Criteria for ABA Characterization

The ABA characteristics that are used to determine the potential risk of acid generation in mine materials include the acid potential (AP) that is calculated from the sulphide-sulphur content and the neutralization potential (NP) that can be estimated in several ways. Both AP and NP are presented in units of kg-$CaCO_3$/tonne that represent the kilograms of calcium carbonate equivalent per tonne of rock. The NP is commonly measured using some modification of the Sobek method that includes addition of a strong acid to a sample, allowing time to react and then measuring the remaining acid to determine the amount of acid consumed. Another method to estimate NP is to measure carbonate ($CO_3$) in the sample and calculate the equivalent $CaCO_3$ content.

The ratio of NP/AP is then used to determine if the material has adequate NP to consume the acid produced if all the sulphide-sulphur is oxidized. If the AP exceeds the NP, resulting in an NP/AP ratio less than 1, the material is classified as potentially acid generating (PAG).

Theoretically, one unit of AP (as S) will produce 2 units of acid ($H^+$). Also, theoretically, one unit of NP (as $CaCO_3$) will consume either 1 or 2 units of acid, depending on the physio-chemical conditions when the neutralization reactions occur (Price, 2009). Therefore, as a conservative measure, it is assumed that 2 units of NP will be required to neutralize the acid from 1 unit of AP in order to maintain neutral conditions in the mine material indefinitely and to classify the material as non-potentially acid generating (non-PAG). This means the ratio of NP/AP should be greater than 2 to maintain neutral conditions, theoretically.

However, in the acid rock drainage guidelines originally presented by Price (1997), it was acknowledged that there was some uncertainty in the estimation of the NP by the Sobek method and in order to address this uncertainty, an NP/AP ratio greater than 3 was recommended. The *Directive 019* criterion for low-risk material that is based on the original Price (1997) guidelines is an NP/AP ratio greater than 3.

However, the Sobek-NP can be a poor estimate for of the actually available “effective” NP in some materials. The more recent approach of interpreting NP (Price, 2009) utilizes an NPR of greater than 2 to represent non-PAG materials if the NP is known to be “effective” (e.g. carbonate). If the effectiveness of the NP is known then an NP/AP value of 2 is the appropriate lower value for non-PAG determination. Whereas when using effective-NP values materials having NPR values between 1 and 2 can be classified as having an “uncertain” potential for acid generation. A common precautionary approach is to assume that materials classified as uncertain are conservatively treated as PAG.

### 3.1.1 Comparison of Neutralization Potential Estimation Methods on Historical MCM and Odyssey Mine Rock (Sobek-NP vs Carb-NP)

Prior investigations at MCM demonstrated that the carbonate neutralization potential (Carb-NP) was well correlated with the modified Sobek neutralization potential (Sobek-NP) in the waste rock. For reference, the historical relationships between Carb-NP and Sobek-NP in waste rock samples from MCM (EcoMetrix, 2015) is shown in **Figure 3-1**. The linear correlation is excellent ($r^2$=0.97) and the Carb-NP values are typically somewhat less than, and therefore more conservative than, the Sobek-NP values below about 150 kg-$CaCO_3$/t. The Carb-NP values were calculated from the measured carbonate contents (as $CO_3$). The sulphide species were measured and the sulphide contents were used to evaluate the acid potential (AP) of the waste rock.

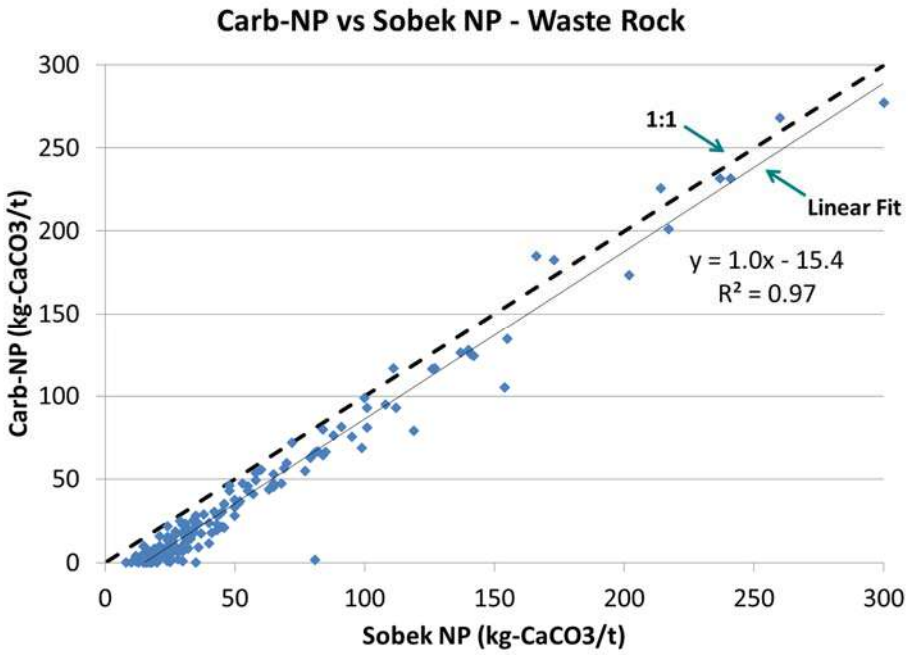



**Figure 3-1: Relationship between Carb-NP and Sobek-NP for historical MCM Waste Rock Samples**

Consistent with historical trends at the MCM deposit, the waste rock samples from the Odyssey zones show an excellent linear correlation between Carb-NP and Sobek-NP ($R^2$=0.98), **Figure 3-2**. The Carb-NP values continue to be less than, and therefore more conservative than, the Sobek-NP values below approximately 150 kg-$CaCO_3$/tonne.

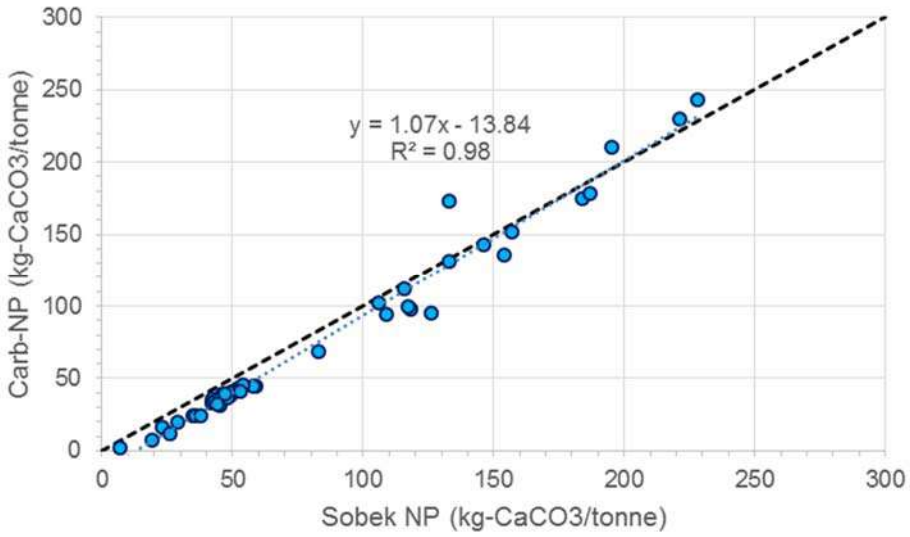



**Figure 3-2: Relationship between Carb-NP and Sobek-NP for Odyssey Waste Rock Samples (n=51)**

An additional NP measurement approach was evaluated in this investigation. The Acisol NP (MA. 110 – ACISOL 1.0 in CEAE, 2014) was evaluated and it was determined that this approach routinely yields NP values that were higher, and less conservative than even the Sobek-NP approach, see **Appendix D**. In consideration of these results the Carb-NP was identified to be the preferred and more conservative measure of NP for acid generation potential assessment.

The ratio represented by the Sobek-NP divided by the AP calculated from the sulphide-sulphur in %S is referred to as the Sobek neutralization potential ratio (Sobek-NPR). The ratio represented by the Carb-NP divided by the AP calculated from the sulphide-sulphur (%S) is referred to as the carbonate neutralization potential ratio (Carb-NPR).

With Carb-NP being more conservative than Sobek-NP the Carb-NPR is a more conservative estimate of NPR than Sobek-NPR in waste rock. The most current guideline for prediction of acid generation presented by Price (2009) also recommend the use of “effective” NP for ABA characterization. Carbonate minerals, excluding iron and manganese carbonates, are considered to represent effective-NP because they consume acid and maintain a neutral pH drainage or contact water. **Figure 3-3** shows that when the Carb-NPR ratio was greater than 2 in Odyssey mine rock, then the Sobek-NPR ratio will be greater than 3 and will therefore meet the *Directive 019* criterion. This relationship is consistent with the results from more than 200 samples from the Canadian Malartic and Barnat deposits that were previously assessed (EcoMetrix, 2015). Therefore, in consideration of the Carb-NP effectiveness, the Carb-NP/AP ratio of 2 was used as a more conservative criterion than the Sobek-NPR criterion of 3 as presented in *Directive 019*.

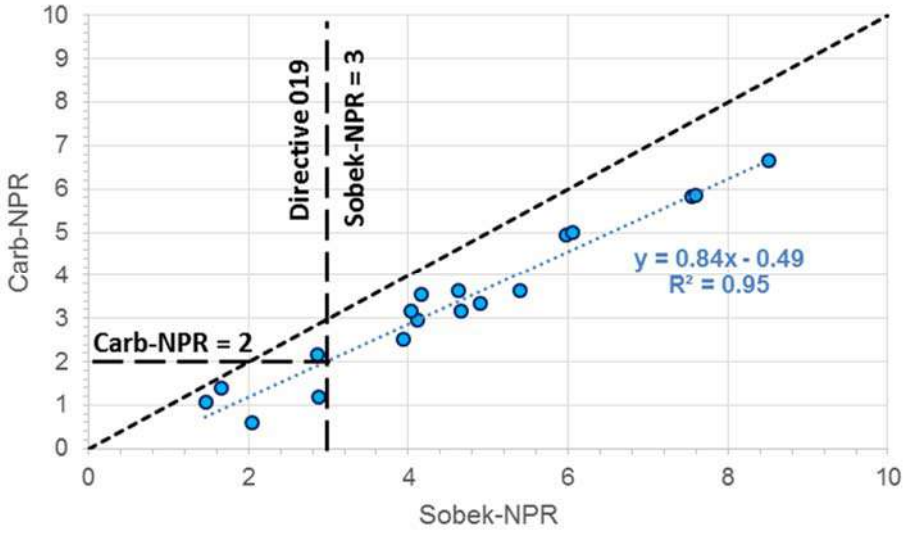
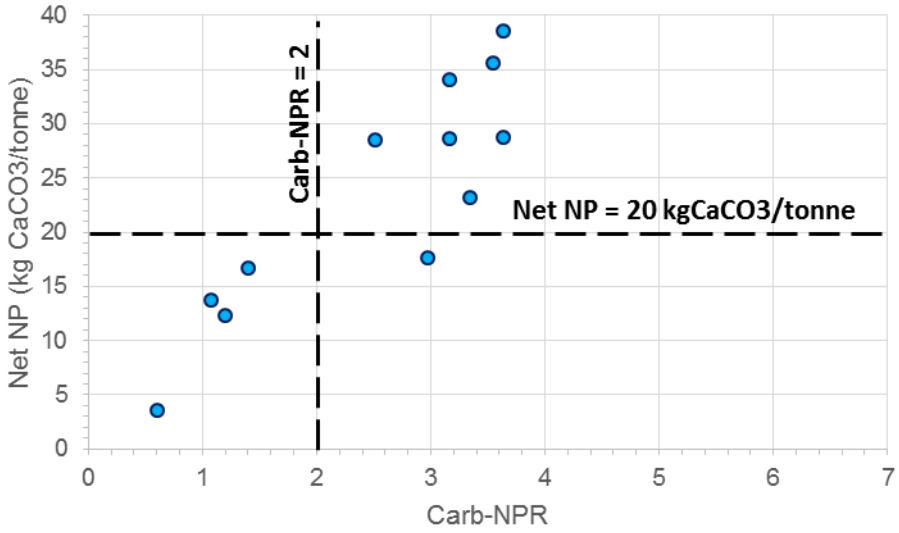



**Figure 3-3: Relationship between Carb-NPR and Sobek-NPR for Waste Rock Samples with Carb-NPR less than 7**

### 3.1.2 Net Neutralization Potential

An additional ABA consideration presented in *Directive 019* is that the net neutralization potential (NNP), the difference between the neutralization potential and the acid generation potential (NNP=NP-AP), should exceed 20 kg $CaCO_3$/tonne. As shown in **Figure 3-4**, except for one sample from the Odyssey waste rock dataset, all rock with a Carb-NPR greater than 2 had NNP values greater than 20 kg $CaCO_3$/tonne. This sample with an NNP value of less than 20 kg $CaCO_3$/tonne had a total sulphur content of only 0.246% sulphur and would not be considered as potentially acid generating as per *Directive 019* that identifies 0.3% total sulphur as a criterion for acid generation risk classification. The Carb-NP/AP ratio of 2 in Odyssey rock is therefore considered to be an effective criterion that satisfies the *Directive 019* ABA criteria and is also consistent with the Price (2009) prediction guidelines.




**Note:** No samples with Carb-NPR > 7 had Net NP less than 20 kg CaCO3/tonne

**Figure 3-4: Relationship between Net NP and Carb-NPR for Waste Rock Samples with Carb-NPR less than 7**

#### 3.1.2.1 Use of $carbon_{total}/sulphur_{total}$ (C/S) ratios for Mine Rock ABA Classification at Odyssey

The Carb-NPR can be estimated from the $carbon_{total}/sulphur_{total}$ (C/S) ratio in which total carbon (C) is a surrogate for carbonate and total sulphur (S) is a surrogate for sulphide. The C/S ratio is plotted versus the Carb-NPR in **Figure 3-5.** In **Figure 3-5** there appear to be outliers for Carb-NPR values greater than 15 and when placing a linear trendline through all data points, the C/S ratios and Carb-NPR are not correlated particularly well ($r^2$=0.39). Much of the reason for this relatively poor correlation is due to the effect of the outliers with large Carb-NPR values. The samples with Carb-NPR values that are much greater than 2 are clearly non-PAG and are not relevant when it comes to PAG or non-PAG classification.

Interpreting this dataset over a Carb-NPR range that is meaningful for PAG and non-PAG identification presents a very strong linear trend. **Figure 3-6** presents the relationship between C/S and Carb-NPR for samples with Carb-NPR less than 7 and identifies a very strong correlation ($r^2$ = 0.99) in this range of values. Within this subset a C/S ratio of approximately 0.81 equates a Carb-NPR value of 2 that can be used for non-PAG material identification. A C/S ratio of 0.81 is very similar to the value of 0.9 used at MCM to identify non-PAG mine rock. Similarly, a C/S ratio of approximately 0.42 equates a Carb-NPR value of 1 that can be used to identify PAG materials. Mine rock with C/S values between 0.42 and 0.81 would be classified as having an uncertain potential for acid generation and would be of lower risk than PAG materials.

A C/S value of 0.81 was developed from the characteristics of the Odyssey waste rock discussed above and allows for the practical measuring of total carbon and total sulphur on samples to classify non-acid generating mine rock. This ABA classification approach is more conservative than the *Directive 019* approach in that materials of all sulphur contents, not only those greater than 0.3% total sulphur (per *Directive 019* guidance) are evaluated.

Note that this criteria applies strictly to the mine rock and is not necessarily valid for tailings materials. Tailings ABA is discussed in **Section 4.2.1**.

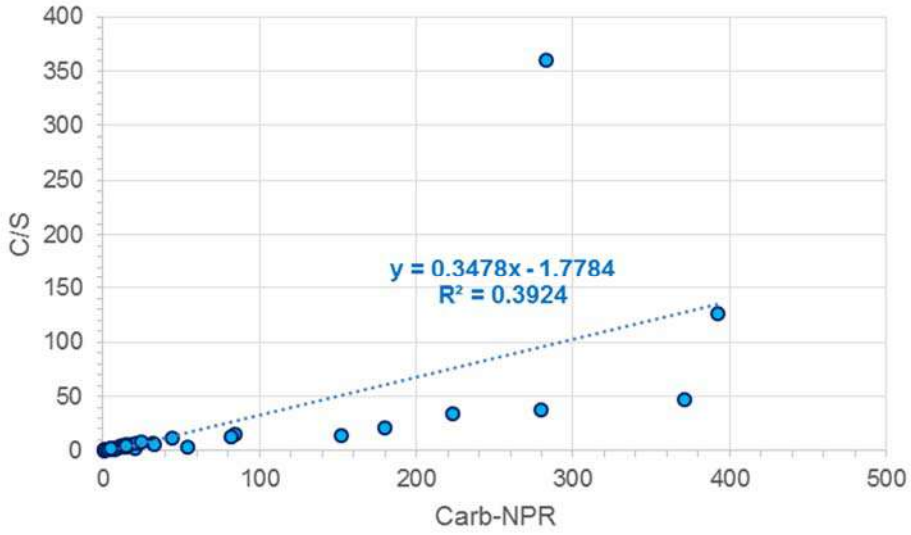



**Figure 3-5: Total Carbon/Total Sulphur ratios in relation to Carb-NPR values for Odyssey Mine Rock (n=51)**

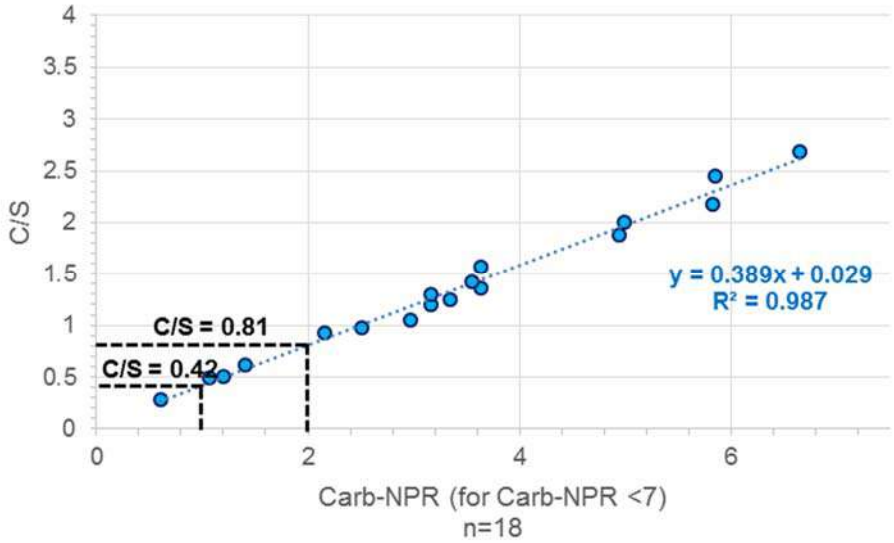



**Figure 3-6: Total Carbon/Total Sulphur ratios in relation to Carb-NPR values less than 7 for Odyssey Mine Rock (n=18)**

## 3.2 Directive 019

*Directive 019* is a guidance document from the Ministère du Développement durable, l'Environnement et de la Lutte contre les changements climatiques (MDDELLC, 2012) presenting requirements for various mining activities with the purposes of environmental protection.

The *Directive 019* guidance document provides risk-classification information on mine materials and is applied in this assessment. To classify mine materials as low-risk according to the *Directive 019* criteria there are restrictions based on the quality of the mine materials that include limitations on the material's potential for acid generation, metals contents, and leachability criteria.

*Directive 019* also contains guidance regarding cyanide contents, organic compounds, ionizing radiation, and flammability. These specific criteria are not relevant to the mine rock at the Odyssey site and were not evaluated further for material classification purposes.

The *Directive 019* evaluation criteria are summarized in **Appendix E**.

# 4.0 GEOCHEMICAL TEST RESULTS

The results from the Odyssey sampling program are presented in the following sections. Discussions are typically limited to those parameters identified in mine rock or tailings that have solids contents greater than « *critères génériques pour les sols* » level 'A' generic soils criteria. The complete listing of all analytical data for waste rock, ore, and tailings is provided in **Appendix B**.

## 4.1 Waste Rock

### 4.1.1 ABA Analyses

As identified in **Section 3.1.2.1** a C/S ratio of 0.81 or greater can be used to identify Odyssey mine rock as non-PAG and a C/S ratio of 0.42 or lower can be used to identify Odyssey mine rock as PAG. Mine rock with an uncertain potential for acid generation would be of lower risk than PAG materials. The potential for acid generation for the Odyssey sampling zones are classified in **Table 4-1**. The Odyssey North Zone C/S values are plotted in **Figure 4-1** and Odyssey South Zone C/S values in **Figure 4-2**.

**Table 4-1: Odyssey Mine Rock – Potential for Acid Generation Summary**

| Location | | PAG C/S < 0.42 | Uncertain 0.42 ≥ C/S > 0.81 | Non-PAG C/S ≥ 0.81 |
|---|---|---|---|---|
| North Zone | All | 0% | 7% | 93% |
| | Footwall | 0% | 0% | 100% |
| | Hanging Wall | 0% | 11% | 89% |
| | Development | 0% | 11% | 89% |
| South Zone | All | 4% | 4% | 92% |
| | Footwall | 11% | 0% | 89% |
| | Hanging Wall | 0% | 11% | 89% |
| | Development | 0% | 0% | 100% |
| All Rock | | 2% | 6% | 92% |

The proportion of non-PAG materials is very consistent across the waste rock zones (North vs. South) and the sample locations (hanging wall, footwall, development). The non-PAG proportion from each group was approximately 90% though both the North Zone footwall samples and South Zone development samples were 100% non-PAG.

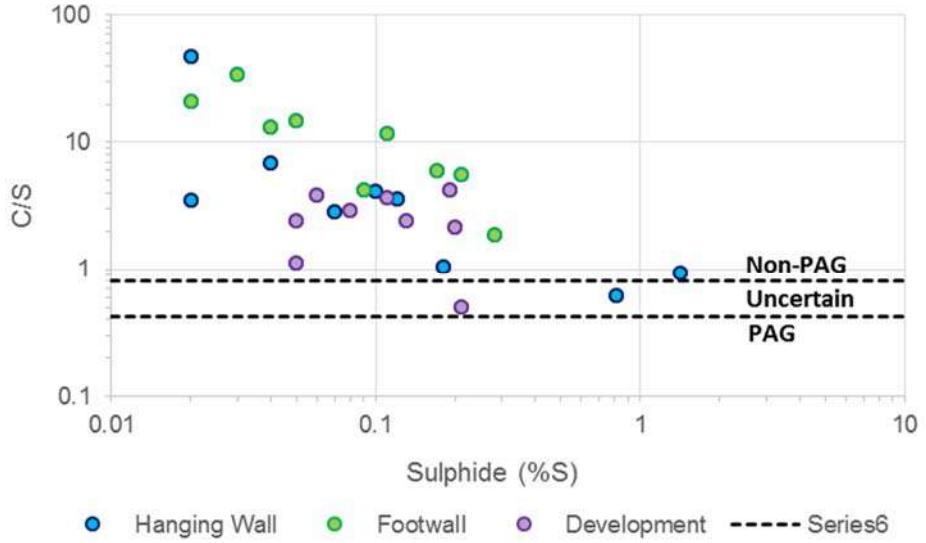



**Figure 4-1: C/S vs. Sulphide (%S) for Odyssey North Zone Waste Rock (n=27)**

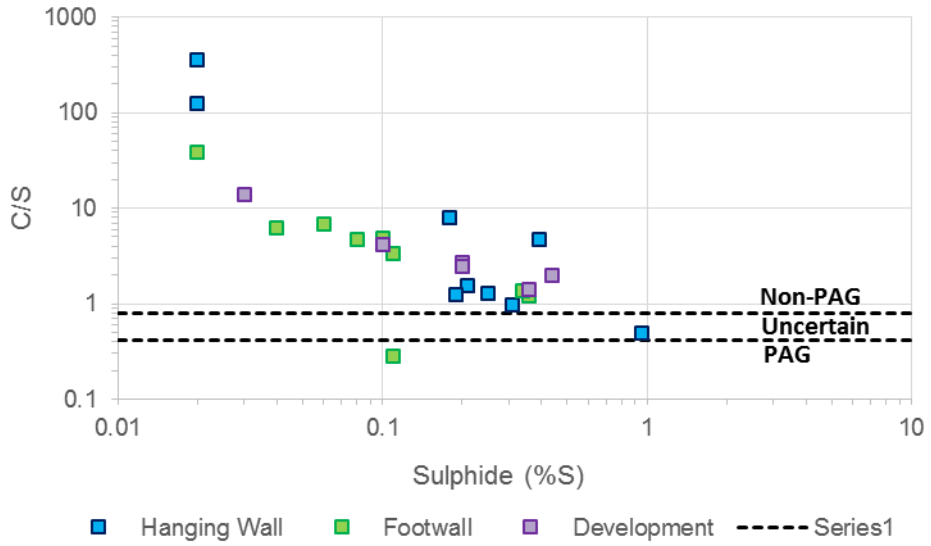



**Figure 4-2: C/S vs. Sulphide (%S) for Odyssey South Zone Waste Rock (n=24)**

The potential for acid generation in the rock samples is summarized by lithology in **Table 4-2**. Only 1 of 27 porphyry samples were identified as PAG, whereas 2 of 27 porphyry samples and 1 of 5 sedimentary samples have an uncertain potential for acid generation. All other mine rock samples were non-PAG.

**Table 4-2: Odyssey Mine Rock – Potential for Acid Generation by Lithology**

| Lithology | Count | PAG C/S < 0.42 | Uncertain 0.42 ≤ C/S ≥ 0.8 | Non-PAG C/S ≥ 0.8 |
|---|---|---|---|---|
| Basalt | 2 | 0% | 0% | 100% |
| Gabbro | 3 | 0% | 0% | 100% |
| Intermediate Intrusive | 2 | 0% | 0% | 100% |
| Mafic Intrusive | 3 | 0% | 0% | 100% |
| Porphyry | 27 | 4% | 7% | 89% |
| Sedimentary | 5 | 0% | 20% | 80% |
| Schist | 3 | 0% | 0% | 100% |
| Ultramafic | 6 | 0% | 0% | 100% |

### 4.1.2 Solids Contents

As per *Directive 019* guidance, solids contents were compared to the « *critères génériques pour les sols* » 'A' level standards. If more than 10% of samples exceed these standards for a particular parameter then that parameter is identified as a parameter of concern that will be examined in the leachate criteria analyses. More than 10% of samples exceeded the 'A' level standards for barium, cobalt, chromium, copper, nickel, and lead, as shown in **Table 4-3**. Level 'A' standard exceedances for barium, cobalt, chromium, copper, and nickel were reported at each of the Odyssey North and South zones; however, lead exceedances were only measured in North Zone samples.

**Table 4-3: Odyssey Mine Rock - Parameters with more than 10% of Samples Exceeding Critères Génériques pour les Sols – 'A' Standards**

| Parameter | Critères génériques pour les sols-A Exceedance Percentage |
|---|---|
| Barium | 16% |
| Cobalt | 25% |
| Chromium | 25% |
| Copper | 12% |
| Nickel | 37% |
| Lead | 12% |

**Note:**
Silver, arsenic, and molybdenum had some exceedances, but in fewer than 10% of all samples.

The solids contents for these parameters are summarized for each zone and location in **Table 4-4**. In general, the North Zone mine rock had higher solids contents than samples from the South Zone. These elevated solids contents were most frequent in the footwall and

development locations. The South Zone footwall samples generally had the lowest solids contents.

**Table 4-4: Odyssey Mine Rock – Solids Contents by Zone and Location**

| Parameter | | Critères génériques pour les sols-'A' | North Zone (n=27) | | | South Zone (n=24) | | |
|---|---|---|---|---|---|---|---|---|
| | | | Footwall | Hanging Wall | Development | Footwall | Hanging Wall | Development |
| | | | n=9 | n=9 | n=9 | n=9 | n=9 | n=6 |
| Barium | Median Content (mg/kg) | 240 | 110 | 170 | **230** | 160 | 140 | 150 |
| | Average Content (mg/kg) | | 104 | 166 | **266** | 169 | 168 | 152 |
| | Critères génériques pour les sols-'A' Exceedance Percentage | | 0% | 11% | 44% | 22% | 11% | 0% |
| Cobalt | Median Content (mg/kg) | 30 | **33** | 6.2 | 6.5 | 6.4 | 22 | 6.9 |
| | Average Content (mg/kg) | | **28** | 11 | 14 | 6.9 | 24 | 16 |
| | Critères génériques pour les sols-'A' Exceedance Percentage | | 67% | 11% | 22% | 0% | 22% | 33% |
| Chromium | Median Content (mg/kg) | 100 | **650** | 21 | 18 | 17 | 87 | 14.5 |
| | Average Content (mg/kg) | | **466** | 81 | 124 | 35 | 191 | 134 |
| | Critères génériques pour les sols-'A' Exceedance Percentage | | 56% | 11% | 22% | 11% | 33% | 17% |
| Copper | Median Content (mg/kg) | 65 | 29 | 5.6 | 8.7 | 6.8 | **39** | 8.05 |
| | Average Content (mg/kg) | | **44** | 29 | 19 | 6.8 | 36 | 30 |
| | Critères génériques pour les sols-'A' Exceedance Percentage | | 22% | 11% | 11% | 0% | 11% | 17% |
| Nickel | Median Content (mg/kg) | 50 | **240** | 12 | 10 | 9.4 | 68 | 10 |
| | Average Content (mg/kg) | | **177** | 36 | 63 | 13 | 102 | 49 |
| | Critères génériques pour les sols-'A' Exceedance Percentage | | 56% | 22% | 33% | 0% | 89% | 17% |
| Lead | Median Content (mg/kg) | 40 | 11 | 23 | **30** | 8.6 | 5.5 | 11 |
| | Average Content (mg/kg) | | 11 | 24 | **35** | 12 | 6.8 | 10 |
| | Critères génériques pour les sols-'A' Exceedance Percentage | | 0% | 33% | 33% | 0% | 0% | 0% |

**Note:**
Shaded values indicate the location with the highest average and median concentrations

### Solids Content by Lithology

The average solids contents for barium, cobalt, chromium, copper, nickel, and lead for different lithologies are summarized in **Table 4-5**. In summary, compared to other rock types:

- Barium is elevated in basalt;
- Cobalt is low in the porphyry;
- Chromium is elevated in the schist and ultramafic;
- Copper is elevated in gabbro and mafic intrusive;
- Nickel is elevated in the basalt, schist, and ultramafic; and
- Lead is elevated in the gabbro.

## Table 4-5: Odyssey Mine Rock – Average Solids Content by Lithology

| Parameter | Critères génériques pour les sols-A | All rock | Basalt | Gabbro | Intermediate Intrusive | Mafic Intrusive | Porphyry | Sediment | Schist | Ultramafic |
|---|---|---|---|---|---|---|---|---|---|---|
| **Count** | -- | 51 | 2 | 3 | 2 | 3 | 27 | 5 | 3 | 6 |
| Barium (mg/kg) | 240 | 172 | **290** | 211 | 82 | 128 | 181 | 157 | 85 | 182 |
| Cobalt (mg/kg) | 30 | 17 | 31 | 32 | 12 | **36** | 6 | 20 | 31 | 34 |
| Chromium (mg/kg) | 100 | 174 | 178 | 31 | 109 | 60 | 16 | 102 | **817** | 770 |
| Copper (mg/kg) | 65 | 27 | 20 | 93 | 7 | **136** | 7 | 44 | 21 | 31 |
| Nickel (mg/kg) | 50 | 73 | 135 | 42 | 32 | 53 | 10 | 70 | 273 | **293** |
| Lead (mg/kg) | 40 | 17 | 6 | **35** | 9 | 8 | 21 | 18 | 5 | 7 |

**Note:**
Shaded values indicate the rock type with the highest average concentrations.

### Whole Rock Analysis

The whole rock analysis contents for the North and South Zone Footwall, Hanging Wall, and Development zones are summarized in **Table 4-6**. In general $SiO_2$ and $Al_2O_3$ dominate the mine rock. Both the North Zone Footwall and the South Zone Hanging Wall samples had lower contents of $SiO_2$ than the other areas. These two areas each had a low percentage of porphyry rock (e.g. 12% in North Zone Footwall and 14% in South Zone Hanging Wall), in comparison to the other locations that were on average over 85% porphyry. Full analyses are available in **Appendix B**.

**Table 4-6: Odyssey Mine Rock – Average Whole Rock Analysis Results by Zone and Location**

| Parameter | | North Zone | | | | South Zone | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | All | Footwall | Hanging Wall | Development | All | Footwall | Hanging Wall | Development |
| Count | | 27 | 9 | 9 | 9 | 24 | 9 | 9 | 6 |
| SiO2 | % | 56.67 | 48.32 | 61.52 | 60.17 | 59.05 | 64.87 | 53.79 | 58.23 |
| Al2O3 | % | 11.95 | 9.25 | 12.81 | 13.77 | 13.82 | 14.31 | 13.67 | 13.30 |
| Fe2O3 | % | 6.66 | 9.73 | 4.71 | 5.54 | 5.65 | 3.45 | 7.12 | 6.74 |
| MgO | % | 7.28 | 13.25 | 4.39 | 4.21 | 4.44 | 1.70 | 6.90 | 4.86 |
| CaO | % | 4.64 | 6.61 | 3.49 | 3.81 | 4.34 | 3.53 | 5.13 | 4.38 |
| Na2O | % | 3.69 | 2.08 | 3.89 | 5.12 | 3.46 | 4.25 | 2.36 | 3.93 |
| K2O | % | 3.28 | 2.68 | 4.14 | 3.02 | 3.34 | 3.31 | 3.52 | 3.11 |
| TiO2 | % | 0.63 | 0.72 | 0.52 | 0.65 | 0.56 | 0.48 | 0.50 | 0.76 |
| P2O5 | % | 0.15 | 0.10 | 0.15 | 0.19 | 0.17 | 0.22 | 0.10 | 0.20 |
| MnO | % | 0.09 | 0.15 | 0.06 | 0.07 | 0.08 | 0.05 | 0.11 | 0.09 |
| Cr2O3 | % | 0.08 | 0.16 | 0.04 | 0.04 | 0.04 | 0.01 | 0.06 | 0.05 |
| V2O5 | % | 0.03 | 0.04 | 0.02 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 |
| LOI | % | 4.49 | 6.84 | 3.94 | 2.69 | 4.63 | 3.41 | 6.32 | 3.94 |
| Sum | % | 99.62 | 99.92 | 99.66 | 99.29 | 99.60 | 99.58 | 99.63 | 99.60 |

### Rietveld Analysis

The Rietveld analysis contents for the North and South Zone Footwalls, Hanging Walls, and Development Zones are summarized in **Table 4-7**. Full analyses are available in **Appendix B**.

In general, the mine rock is dominated by quartz and aluminosilicates, including albite and microcline. The sole source of sulphur is pyrite with pyrite contents reaching up to 0.6% in the mine rock. Additionally, three sources of carbonates were identified: ankerite, calcite, and dolomite. The quantity of carbonates in these sources are very strongly correlated with the carbonate contents determined via the ABA analyses.

The calcium and magnesium carbonates of calcite and dolomite are considered to be 100% effective at providing neutralization potential; however, the iron carbonates of the ankerite do not provide effective neutralization. The quantity of iron carbonates was examined and it is found that in the mine rock samples approximately 5% of the carbonates are ankerite iron carbonates and that the majority of the carbonates will provide effective neutralization.

## Table 4-7: Odyssey Mine Rock – Average Rietveld Analysis Results by Zone and Location

| Parameter | | | North Zone | | | | South Zone | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | All | Footwall | Hanging Wall | Development | All | Footwall | Hanging Wall | Development |
| Count | | | 7 | 3 | 2 | 2 | 7 | 2 | 2 | 3 |
| Quartz - $SiO_2$ | | % | 15 | 10 | 20 | 17 | 21 | 21 | 21 | 20 |
| Aluminosilicates | Albite - $NaAlSi_3O_8$ | % | 35 | 16 | 46 | 52 | 28 | 37 | 23 | 27 |
| | Anorthite - $CaAl_2Si_2O_8$ | % | 5.7 | 5.9 | 6.6 | 4.4 | 4.1 | 4.3 | 3.9 | 4.1 |
| | Chlorite - $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | % | 5.8 | 12 | 1.7 | 1.4 | 7 | 3.3 | 17 | 4 |
| | Biotite - $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | % | 8 | 13 | 4.4 | 3.9 | 9.0 | 3.2 | 12 | 11 |
| | Microcline - $KAlSi_3O_8$ | % | 11 | 10 | 12 | 12 | 4.7 | 7.9 | 2.6 | 4.1 |
| | Muscovite - $KAl_2(AlSi_3O_{10})(OH)_2$ | % | 3.5 | 2.9 | 3.8 | 4.0 | 13 | 18 | 8.7 | 12 |
| Silicate | Talc - $Mg_3Si_4O_{10}(OH)_2$ | % | 3 | 7 | 0 | 0 | 3 | 0 | 0 | 8 |
| | Actinolite - $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ | % | 5 | 12 | 0 | 0 | 1.3 | 0 | 0 | 3 |
| Carbonates | Ankerite - $CaFe(CO_3)_2$ | % | 0.4 | 0.6 | 0.3 | 0.3 | 0.2 | 0.1 | 0.1 | 0.4 |
| | Calcite - $CaCO_3$ | % | 5.7 | 6.9 | 4.9 | 4.9 | 6.6 | 4.6 | 12 | 4.3 |
| | Dolomite - $CaMg(CO_3)_2$ | % | 1.5 | 3.6 | 0 | 0 | 1 | 0 | 0 | 2.5 |
| Sulphides | Pyrite - $FeS_2$ | % | 0.4 | 0.4 | 0.4 | 0.6 | 0.3 | 0.5 | 0.4 | 0.2 |

### 4.1.3 Leachability

A suite of leachability tests were performed on the mine rock, tailings, and ore samples to further characterize the materials. *Directive 019* classification applies TCLP testing and comparative criteria to classify materials. In addition to TCLP testing this investigation also includes CTEU-9 testing (7-day neutral water leach extraction) and SPLP (synthetic precipitation leaching procedure) testing for characterizing the mine materials. The full leachability results from this testing program are shown in **Appendix B**.

Two tailings, four ore, and 18 mine rock samples were evaluated. The mine rock samples included nine samples from the North Zone and nine from the South Zone. The North Zone and South Zone each included three samples from the footwall, three from the hanging wall, and three from the development areas.

The parameters evaluated in the leachability testing are those where more than 10% of solids samples exceeded the « *critères génériques pour les sols* » *'A'* standards. For mine rock these parameters include barium, cobalt, chromium, copper, nickel, and lead.

#### Neutralization Capacity Testing

The neutralization capacity test (MA. 110 – C. neu 1.0) is performed to determine the buffering capacity of the mine rock and serves as an indicator of the potential mobility of relevant constituents. The results of the neutralization capacity test do not directly determine mine rock classification but instead identify the preferred leachability test for subsequent classification.

Samples evaluated to have neutralization capacities of less than 3 eq/kg are recommended for TCLP testing whereas samples with neutralization capacities of 3 eq/kg or greater are recommended for CTEU-10 (*Lixiviation pour la valorisation de résidus*) testing.

All samples evaluated had neutralization capacities of less than 3 eq/kg and TCLP testing was performed.

#### TCLP

The TCLP testing (MA. 100 – Lix.com. 1.1) uses prepared acetic acid solutions having pH values as low as 2.9. Low pH conditions like this are not expected for the non-potentially acid generating mine rock, with C/S ratios greater than 0.81 and therefore, the TCLP testing is considered to be an extreme test for the Odyssey materials to assess leachability of constituents.

The *Directive 019* categorization process applies the TCLP test with two sets of comparative criteria. These criteria are applied to identify materials that can be classified as low-risk, with

results compared to « *résurgence dans l'eau de surface* » values, or classified as elevated risk with results compared to the « *Directive 019 Annexe II Tableau 1* » criteria.

The TCLP leachate concentrations for the barium, cobalt, chromium, copper, nickel, and lead were compared with the *Directive 019* low-risk criteria, « *résurgence dans l'eau de surface* » criteria of Annexe 7 of the *Guide d'intervention* (MDDELCC, 2016), in **Table 4-8**.

The results of this conservative TCLP assessment show that 50% of the samples exceed the barium criteria thresholds and 17% exceed the lead criteria threshold. Two thirds of samples from the North Zone exceeded the barium criteria and one third of the samples from the South Zone exceeded the barium criteria. All lead exceedances were associated with samples from the Odyssey North Zone.

No samples exceeded any of the *Directive 019* elevated risk criteria (*Directive 019 Annexe II Tableau 1*).

**Table 4-8: Odyssey Mine Rock – TCLP Leachability Categorization, Directive 019 Criteria**

| Mine Rock Sample Count | Constituent and Groundwater Criteria Exceedance Percentage (Résurgence dans l'eau de surface) | Constituent and Elevated Risk Criteria Exceedance Percentage (Directive 019 - Annexe II Tableau 1) |
|---|---|---|
| 18 | Barium - 50% | Barium - 0% |
| | Cobalt - 0% | Cobalt - 0% |
| | Chromium - 0% | Chromium - 0% |
| | Copper - 0% | Copper - 0% |
| | Nickel - 0% | Nickel - 0% |
| | Lead - 17% | Lead - 0% |

### CTEU-9

The CTEU-9 testing involves leaching with neutral water (pH 7.0) over a period of 7 days and are expected to better represent conditions that mine rock would encounter in the environment. The CTEU-9 test results were compared with potable water criteria (*Règlement sur la qualité de l'eau potable, Q-2 r. 40*) for mine rock categorization. The results of the CTEU-9 leachate categorization process are summarized in **Table 4-9**. No constituents exceeded the « *règlement sur la qualité de l'eau potable* » criteria.

**Table 4-9: Odyssey Mine Rock – CTEU-9 Leachability Categorization, *Règlement sur la qualité de l'eau potable* Criteria**

| Mine Rock Sample Count | Constituent and CTEU9 Criteria Exceedance Percentage |
|---|---|
| 18 | Barium - 0% |
| | Cobalt[1] - N/A |
| | Chromium - 0% |
| | Copper - 0% |
| | Nickel[1] - N/A |
| | Lead - 0% |

**Note:**
1) N/A – not applicable, there are no potable water criteria for cobalt and nickel.

**SPLP**

The SPLP testing involves leaching with prepared solutions of pH 4.2. The SPLP test results were compared with concentrations ten times the potable water criteria (*Règlement sur la qualité de l'eau potable, Q-2 r. 40*) for sample categorization. The results of the SPLP leachate categorization process are summarized in **Table 4-10**. No constituents exceeded ten times the « *règlement sur la qualité de l'eau potable* » criteria in the mine rock samples.

**Table 4-10: Odyssey Mine Rock – SPLP Leachability Categorization, Ten Times *Règlement sur la qualité de l'eau potable* Criteria**

| Mine Rock Sample Count | Constituent and SPLP Criteria Exceedance Percentage |
|---|---|
| 18 | Barium - 0% |
| | Cobalt[1] - N/A |
| | Chromium - 0% |
| | Copper - 0% |
| | Nickel[1] - N/A |
| | Lead - 0% |

**Note:**
1) N/A – not applicable, there are no potable water criteria for cobalt and nickel.

## 4.2 Ore and Tailings

The *Directive 019* classification processes are principally applied to categorize mine materials for management purposes. The ABA, solids contents, and leachability information for the ore and tailings are presented herein.

### 4.2.1 Ore and Tailings - ABA

The same principles pertaining to mine rock ABA are also applied to tailings and ore characterization. As with the mine rock, described in **Section 3.1.1**, the Carb-NP values were compared to the Sobek-NP values, as illustrated in **Figure 4-3**. These results are very similar to those observed for the mine rock. The Carb-NP values are lower than the Sobek-NP values for the majority of samples, with the slope of the line approximately one and the intercept equal to 10 $kg_{CaCO_3}$/tonne. As with the waste rock, the Sobek-NP test results likely overestimate the effective-NP of the tailings and the Carb-NP values are a more conservative measure of the ore and tailings effective-NP.

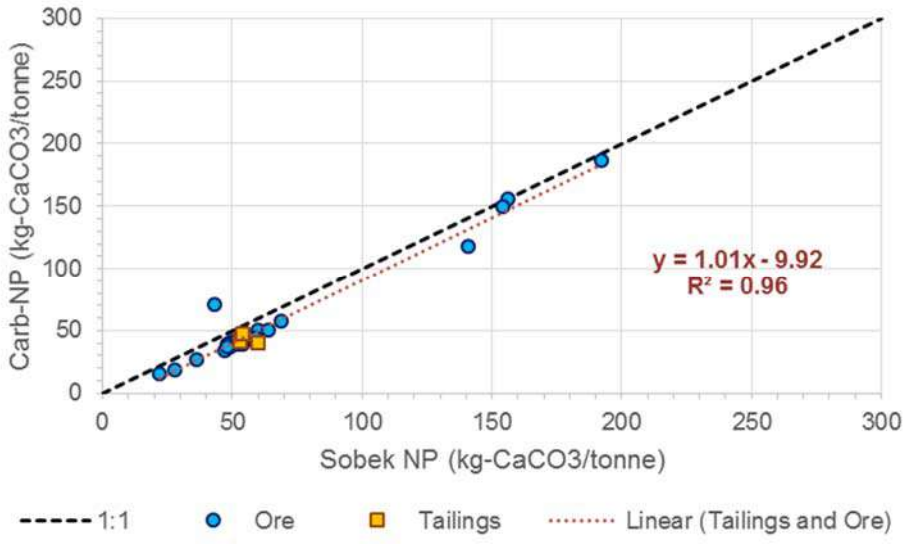



**Figure 4-3: Carb-NP vs. Sobek NP for Odyssey Ore and Tailings (n=29)**

The relationship between Carb-NPR values and sulphide contents for the ore and tailings samples is presented in **Figure 4-4**. Approximately 76% of the tailings and ore samples have Carb-NPR values greater than 2 and would be classified as non-PAG. Approximately 21% have Carb-NPR values between 1 and 2 and have an uncertain PAG and only one of the 29 samples, or 3% is classified as PAG.

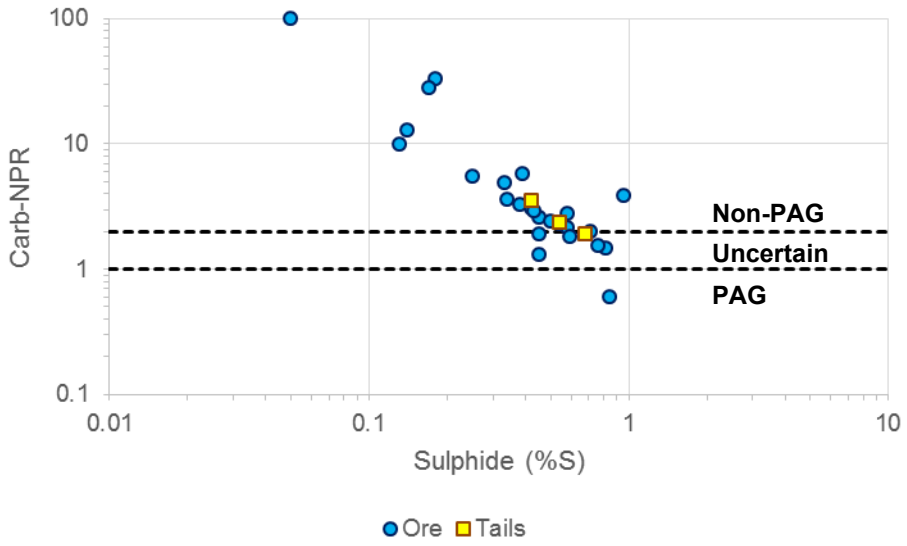



**Figure 4-4: Carb-NPR vs. Sulphide (%S) for Odyssey Ore and Tailings (n=29)**

As shown in **Table 4-11** and **Figure 4-5** nearly 90% of ore samples from the North Zone were non-PAG whereas 60% of ore samples from the South Zone were non-PAG.

**Table 4-11: Odyssey Ore and Tailings – Acid Generation Potential Summary**

| Sample Type | Count | PAG<br>Carb-NPR < 1 | Uncertain<br>1 ≤ Carb-NPR < 2 | Non-PAG<br>Carb-NPR ≥ 2 |
|---|---|---|---|---|
| All Tailings & Ore | 29 | 3% | 21% | 76% |
| Tailings | 3 | 0% | 33% | 67% |
| North Zone Ore | 16 | 0% | 13% | 88% |
| South Zone Ore | 10 | 10% | 30% | 60% |

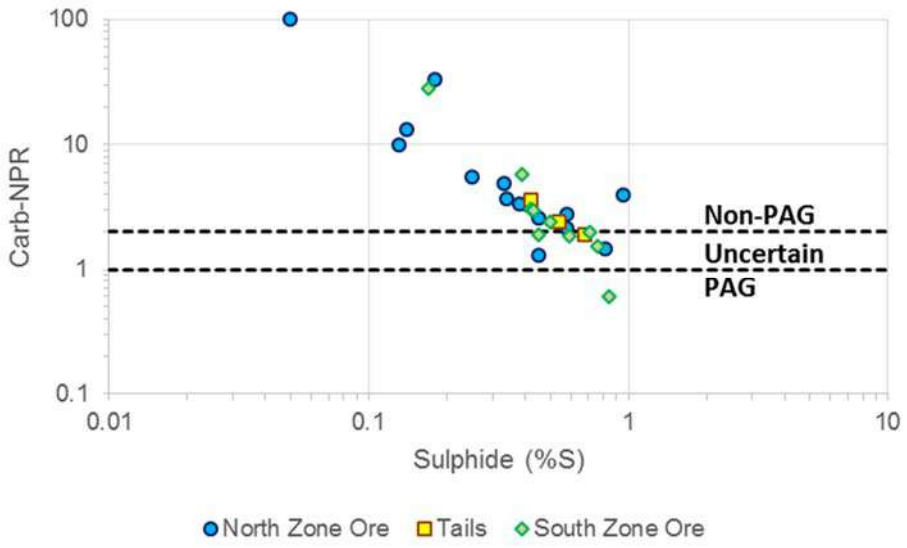



**Figure 4-5: Carb-NPR vs. Sulphide (%S) for Odyssey Ore and Tailings**

### 4.2.2 Solids Contents

The solids contents were compared to the « *critères génériques pour les sols* » 'A' standards to provide a consistent comparative metric between the mine rock and the tailings. As with the mine rock if more than 10% of samples exceed these standards for a particular parameter then that parameter is identified as a parameter of concern that will be discussed more detail in the leachate criteria analyses. For the ore and tailings barium, cobalt, chromium, nickel, lead, molybdenum, and silver each had more than 10% of samples exceed the 'A' level standards, **Table 4-12**.

With the exception of the extent of the silver exceedances, that is substantially higher in the ore and tailings than in the mine rock, this parameter list and the exceedance percentages are generally very similar to that observed in the mine rock as shown in **Table 4-3**.

**Table 4-12: Odyssey Ore and Tailings - Parameters with more than 10% of Samples Exceeding Critères Génériques pour les Sols – 'A' Standards**

| Parameter | Critères Génériques pour les Sols-'A' Exceedance Percentage |
|---|---|
| Barium | 14% |
| Cobalt | 17% |
| Chromium | 14% |
| Nickel | 17% |
| Lead | 17% |
| Molybdenum | 10% |
| Silver | 55% |

**Note:**
Arsenic and copper had some exceedances, but fewer than 10% of all samples.

The solids contents for this list of parameters are summarized for tailings, and the North and South Zones in **Table 4-13**. The solids contents of the ore from the North and South Zones were generally similar to one another though the North Zone did show higher lead and barium contents whereas the South Zone had higher molybdenum contents. The solids contents of the tailings samples were generally similar to the ore samples though they did have lower cobalt and chromium contents.

**Table 4-13: Odyssey Ore and Tailings – Solids Content Summary**

| Parameter | | Critères Génériques pour les Sols-'A' | All Tailings & Ore | Tailings | North Zone Ore | South Zone Ore |
|---|---|---|---|---|---|---|
| Sample Count | | | 29 | 3 | 16 | 10 |
| Average (mg/kg) | Barium | 240 | 142 | 124 | 173 | 99 |
| | Cobalt | 30 | 12 | 7.7 | 13 | 12 |
| | Chromium | 100 | 128 | 34 | 155 | 113 |
| | Nickel | 50 | 57 | 21 | 69 | 49 |
| | Lead | 40 | 29 | 40 | 35 | 16 |
| | Molybdenum | 8 | 4.3 | 2.0 | 3.3 | 6.5 |
| | Silver | 0.5 | 0.6 | 0.4 | 0.6 | 0.8 |
| Min (mg/kg) | Barium | 240 | 29 | 82 | 47 | 29 |
| | Cobalt | 30 | 5.5 | 6.9 | 5.7 | 5.5 |
| | Chromium | 100 | 10 | 27 | 14 | 10 |
| | Nickel | 50 | 8.2 | 16 | 8.4 | 8.2 |
| | Lead | 40 | 2.6 | 27 | 8.3 | 2.6 |
| | Molybdenum | 8 | 0.4 | 1.8 | 0.4 | 0.5 |
| | Silver | 0.5 | 0.1 | 0.3 | 0.2 | 0.1 |
| Max (mg/kg) | Barium | 240 | 350 | 160 | 350 | 200 |
| | Cobalt | 30 | 41 | 9.0 | 36 | 41 |
| | Chromium | 100 | 910 | 39 | 910 | 890 |
| | Nickel | 50 | 360 | 24 | 360 | 310 |
| | Lead | 40 | 200 | 49 | 200 | 47 |
| | Molybdenum | 8 | 23 | 2.2 | 19 | 23 |
| | Silver | 0.5 | 2.2 | 0.5 | 2.2 | 1.7 |

### Whole Rock Analysis

The whole rock analysis contents for the tailings and North and South zone ore samples are summarized in **Table 4-14**. As with the mine rock, $SiO_2$ and $Al_2O_3$ dominate the tailings and ore contents. In general, both the North and the South mineralized zones consist of similar materials and this is unsurprising because with over 90% of North Zone being porphyry and over 75% of the South Zone being porphyry. Full analysis results are presented in **Appendix B**.

**Table 4-14: Odyssey Tailings and Ore – Average Whole Rock Analysis Results**

| Parameter | | | Tailings & Ore | Tailings | Ore | |
|---|---|---|---|---|---|---|
| | | | | | North Zone | South Zone |
| Count | | | 3 | 1 | 1 | 1 |
| Quartz - $SiO_2$ | | % | 24 | 25 | 20 | 26 |
| Aluminosilicates | Albite - $NaAlSi_3O_8$ | % | 35 | 34 | 28 | 42 |
| | Anorthite - $CaAl_2Si_2O_8$ | % | 4.1 | 3.8 | 2.8 | 5.6 |
| | Chlorite - $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | % | 2.6 | 1.7 | 2.6 | 3.4 |
| | Biotite - $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | % | 2.5 | 3.0 | 3.3 | 1.1 |
| | Microcline - $KAlSi_3O_8$ | % | 23 | 25 | 34 | 11 |
| | Muscovite - $KAl_2(AlSi_3O_{10})(OH)_2$ | % | 3.3 | 2.0 | 2.6 | 5.4 |
| Silicate | Talc - $Mg_3Si_4O_{10}(OH)_2$ | % | 0 | 0 | 0 | 0 |
| | Actinolite - $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ | % | 0 | 0 | 0 | 0 |
| Carbonates | Ankerite - $CaFe(CO_3)_2$ | % | 0.6 | 1.2 | 0.3 | 0.3 |
| | Calcite - $CaCO_3$ | % | 4.7 | 3.9 | 5.9 | 4.4 |
| | Dolomite - $CaMg(CO_3)_2$ | % | 0 | 0 | 0 | 0 |
| Sulphides | Pyrite - $FeS_2$ | % | 0.7 | 0.7 | 0.7 | 0.7 |

### Rietveld Analysis

The Rietveld analysis contents for a single tailings sample, a single North Zone ore sample, and a single South Zone ore sample are shown in **Table 4-15**. Full analyses are available in **Appendix B**.

In general the ore and tailings are dominated by quartz and aluminosilicates, including albite and microcline. The South Zone ore sample had a larger proportion of albite and a substantially greater amount of microcline than the North Zone ore sample.

The sole source of sulphur in all samples is pyrite with pyrite contents of 0.7% measured in each sample.

Ankerite and calcite were the only carbonates detected. Calcite is considered to be 100% effective at providing neutralization potential; however, the iron carbonates of the ankerite do not provide effective neutralization. The iron carbonates in the ore samples were similar to other mine rock samples evaluated where only approximately 6% of the carbonates were iron carbonates; however, over 20% of the tailings sample's carbonates were iron carbonates. In consideration of the limited quantity of samples evaluated it is unknown if the comparatively elevated iron carbonate proportion in tailings is reflective of a tendency or is an anomaly of the single tailings sample characterized.

**Table 4-15: Odyssey Tailings and Ore – Average Rietveld Analysis Results by Zone and Location**

| Parameter | | | Tailings & Ore | Tailings | Ore | |
|---|---|---|---|---|---|---|
| | | | | | North Zone | South Zone |
| Count | | | 3 | 1 | 1 | 1 |
| Quartz - $SiO_2$ | | % | 24 | 25 | 20 | 26 |
| Aluminosilicates | Albite - $NaAlSi_3O_8$ | % | 35 | 34 | 28 | 42 |
| | Anorthite - $CaAl_2Si_2O_8$ | % | 4.1 | 3.8 | 2.8 | 5.6 |
| | Chlorite - $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | % | 2.6 | 1.7 | 2.6 | 3.4 |
| | Biotite - $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | % | 2.5 | 3.0 | 3.3 | 1.1 |
| | Microcline - $KAlSi_3O_8$ | % | 23 | 25 | 34 | 11 |
| | Muscovite - $KAl_2(AlSi_3O_{10})(OH)_2$ | % | 3.3 | 2.0 | 2.6 | 5.4 |
| Silicate | Talc - $Mg_3Si_4O_{10}(OH)_2$ | % | 0 | 0 | 0 | 0 |
| | Actinolite - $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ | % | 0 | 0 | 0 | 0 |
| Carbonates | Ankerite - $CaFe(CO_3)_2$ | % | 0.6 | 1.2 | 0.3 | 0.3 |
| | Calcite - $CaCO_3$ | % | 4.7 | 3.9 | 5.9 | 4.4 |
| | Dolomite - $CaMg(CO_3)_2$ | % | 0 | 0 | 0 | 0 |
| Sulphides | Pyrite - $FeS_2$ | % | 0.7 | 0.7 | 0.7 | 0.7 |

### 4.2.3 Leachability

The TCLP, CTEU-9, and SPLP leachability tests were also performed on the tailings and ore samples. The results of these tests are summarized in **Table 4-16**, **Table 4-17**, and **Table 4-18** for barium, cobalt, chromium, nickel, lead, molybdenum, and silver. Full leachability results are presented in **Appendix B**.

As with the mine rock, only barium and lead exceeded the *Directive 019* « *résurgence dans l'eau de surface* » TCLP criteria. Both tailings samples analyzed exceeded the barium and lead criteria whereas all ore samples exceeded the barium criteria.

No samples exceeded the *Directive 019* elevated risk criteria (*Directive 019 Annexe II Tableau 1*).

No CTEU-9 or SPLP test concentrations exceeded either the « *règlement sur la qualité de l'eau potable* » or the ten times « *règlement sur la qualité de l'eau potable* » criteria, respectively.

Many parameters demonstrated similar concentrations between the ore samples and the tailings samples in the leachability tests; however, the following differences were observed:

- Nickel and lead concentrations are higher in the TCLP leachate of the tailings than the ore;
- The CTEU-9 concentrations for cobalt, molybdenum, and silver were higher in the tailings than in the ore; and

- The SPLP concentrations for cobalt and molybdenum were higher in the tailings than in the ore.

**Table 4-16: Odyssey Ore and Tailings – TCLP Test Summary**

| Constituent | | Criteria | | TCLP | | |
|---|---|---|---|---|---|---|
| | | Résurgence dans l'eau de surface | Elevated Risk Directive 019 Annexe II Tableau 1 | Ore & Tails | Ore | Tails |
| Count | | | | 6 | 4 | 2 |
| Average (mg/L) | Barium | 0.6 | 100 | **2.4** | **2.5** | **2.2** |
| | Cobalt | 0.37 | -- | 0.004 | 0.002 | 0.006 |
| | Chromium | 1 | 5 | 0.003 | 0.0003 | 0.009 |
| | Nickel | 0.26 | -- | 0.009 | 0.002 | 0.02 |
| | Lead | 0.034 | 5 | **0.04** | 0.006 | **0.1** |
| | Molybdenum | 29 | -- | 0.002 | 0.001 | 0.003 |
| | Silver | 0.00062 | -- | 0.0005 | 0.0005 | 0.0005 |
| Min (mg/L) | Barium | 0.6 | 100 | **1.1** | **1.1** | **1.3** |
| | Cobalt | 0.37 | -- | 0.001 | 0.001 | 0.005 |
| | Chromium | 1 | 5 | 0.0003 | 0.0003 | 0.009 |
| | Nickel | 0.26 | -- | 0.002 | 0.002 | 0.02 |
| | Lead | 0.034 | 5 | 0.004 | 0.004 | **0.1** |
| | Molybdenum | 29 | -- | 0.001 | 0.001 | 0.002 |
| | Silver | 0.00062 | -- | 0.0005 | 0.0005 | 0.0005 |
| Max (mg/L) | Barium | 0.6 | 100 | **4.3** | **4.3** | **3.1** |
| | Cobalt | 0.37 | -- | 0.007 | 0.003 | 0.007 |
| | Chromium | 1 | 5 | 0.010 | 0.0004 | 0.010 |
| | Nickel | 0.26 | -- | 0.030 | 0.003 | 0.03 |
| | Lead | 0.034 | 5 | **0.16** | 0.010 | **0.2** |
| | Molybdenum | 29 | -- | 0.003 | 0.002 | 0.003 |
| | Silver | 0.00062 | -- | 0.0005 | 0.0005 | 0.0005 |

**Note:**
Concentrations greater than *Directive 019* low-risk criteria, « *résurgence dans l'eau de surface* », shown **bold** and shaded.
No concentrations were greater than the *Directive 019* Elevated Risk criteria « *Directive 019 Annexe II Tableau 1* ».

**Table 4-17: Odyssey Ore and Tailings – CTEU-9 Test Summary**

| Constituent | | Criteria | CTEU9 | | |
|---|---|---|---|---|---|
| | | Règlement sur la qualité de l'eau potable | Ore + Tails | Ore | Tails |
| Count | | | 6 | 4 | 2 |
| Average (mg/L) | Barium | 1 | 0.3 | 0.3 | 0.2 |
| | Cobalt | -- | 0.0005 | 0.00003 | 0.002 |
| | Chromium | 0.05 | 0.0001 | 0.0001 | 0.00007 |
| | Nickel | -- | 0.0002 | 0.0001 | 0.0003 |
| | Lead | 0.01 | 0.0001 | 0.00009 | 0.0001 |
| | Molybdenum | -- | 0.01 | 0.007 | 0.02 |
| | Silver | -- | 0.0006 | 0.0002 | 0.002 |
| Min (mg/L) | Barium | 1 | 0.1 | 0.2 | 0.1 |
| | Cobalt | -- | 0.00002 | 0.00002 | 0.001 |
| | Chromium | 0.05 | 0.00006 | 0.00009 | 0.0001 |
| | Nickel | -- | 0.0001 | 0.0001 | 0.0002 |
| | Lead | 0.01 | 0.00006 | 0.00006 | 0.0001 |
| | Molybdenum | -- | 0.002 | 0.002 | 0.01 |
| | Silver | -- | 0.00005 | 0.00005 | 0.0007 |
| Max (mg/L) | Barium | 1 | 0.4 | 0.4 | 0.2 |
| | Cobalt | -- | 0.002 | 0.00004 | 0.002 |
| | Chromium | 0.05 | 0.0001 | 0.0001 | 0.00007 |
| | Nickel | -- | 0.0003 | 0.0002 | 0.0003 |
| | Lead | 0.01 | 0.0001 | 0.0001 | 0.0001 |
| | Molybdenum | -- | 0.02 | 0.01 | 0.02 |
| | Silver | -- | 0.002 | 0.0004 | 0.002 |

**Note:**
No concentrations were greater than « *règlement sur la qualité de l'eau potable* » criteria.

**Table 4-18: Odyssey Ore and Tailings – SPLP Test Summary**

| Constituent | | Criteria | SPLP | | |
|---|---|---|---|---|---|
| | | 10x Règlement sur la qualité de l'eau potable | Ore + Tails | Ore | Tails |
| Count | | | 6 | 4 | 2 |
| Average (mg/L) | Barium | 10 | 0.4 | 0.4 | 0.3 |
| | Cobalt | -- | 0.0001 | 0.000006 | 0.0003 |
| | Chromium | 0.5 | 0.0002 | 0.00007 | 0.0003 |
| | Nickel | -- | 0.0001 | 0.0001 | 0.0001 |
| | Lead | 0.1 | 0.00003 | 0.00003 | 0.00004 |
| | Molybdenum | -- | 0.0004 | 0.0003 | 0.0008 |
| | Silver | -- | 0.00005 | 0.00005 | 0.00005 |
| Min (mg/L) | Barium | 10 | 0.07 | 0.1 | 0.07 |
| | Cobalt | -- | 0.000004 | 0.000004 | 0.0003 |
| | Chromium | 0.5 | 0.00004 | 0.00004 | 0.0002 |
| | Nickel | -- | 0.0001 | 0.0001 | 0.0001 |
| | Lead | 0.1 | 0.00001 | 0.00001 | 0.00002 |
| | Molybdenum | -- | 0.0001 | 0.0001 | 0.0007 |
| | Silver | -- | 0.00005 | 0.00005 | 0.00005 |
| Max (mg/L) | Barium | 10 | 1.0 | 1.0 | 0.5 |
| | Cobalt | -- | 0.0003 | 0.00001 | 0.0003 |
| | Chromium | 0.5 | 0.0004 | 0.0002 | 0.0004 |
| | Nickel | -- | 0.0001 | 0.0001 | 0.0001 |
| | Lead | 0.1 | 0.00006 | 0.00004 | 0.00006 |
| | Molybdenum | -- | 0.0008 | 0.0004 | 0.0008 |
| | Silver | -- | 0.00005 | 0.00005 | 0.00005 |

**Note:**
No concentrations were greater than ten times « *règlement sur la qualité de l'eau potable* » criteria.

# 5.0 MINE MATERIALS CHARACTERIZATION

The waste rock, tailings, and ore samples from this investigation were evaluated according to the *Directive 019* characterization approach, as detailed in **Appendix E**, and the results of these characterizations are presented herein.

## 5.1 Mine Rock – Directive 019 Classification

As per the *Directive 019* materials classification approach, **Appendix E**, materials meeting low-risk criteria are considered acceptable for on-site and select off-site construction purposes. Moderate and higher-risk materials are not acceptable for construction. Low-risk materials must satisfy ABA requirements and also meet either the soil criteria for the solids or the groundwater protection criteria for the TCLP leach.

The results of the *Directive 019* low-risk material classification process using the C/S values and the TCLP results of the mine rock samples analyzed is shown schematically in **Figure 5-1**. With this conservative approach, approximately 36% of the site mine rock will meet low-risk classification standards. Barium and lead concentrations in the TCLP leachate were the principal controlling factors in low-risk sample exclusion as the vast majority of mine rock samples are non-PAG and satisfy the C/S criterion. The remaining materials, approximately 64% of the mine rock, do not meet low-risk classification standards and should be managed as higher risk material.

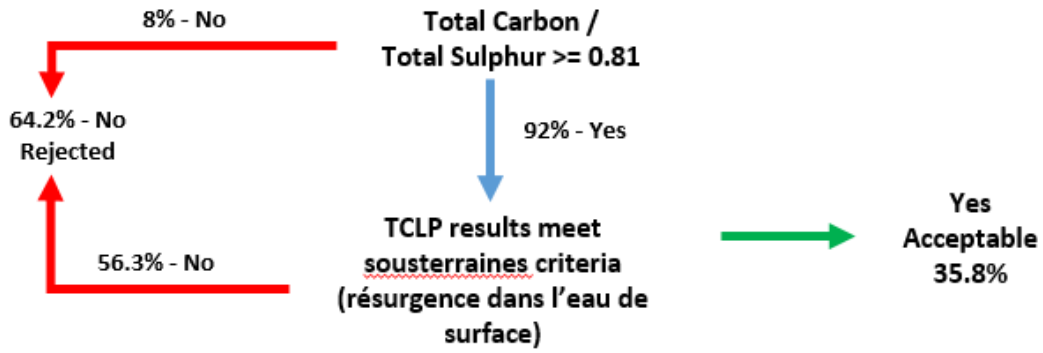



**Figure 5-1: Directive 019 Low-Risk Odyssey North and South Zone Mine Rock Classification**

## 5.2 Tailings and Ore – Directive 019 Classification

The Odyssey North and Odyssey South Zone tailings and ore materials were approximately 75% non-PAG in total; however, ore samples from the North Zone were 88% non-PAG whereas South Zone ore samples were 60% non-PAG. The South Zone had fewer non-PAG

ore samples as these samples tended to have slightly higher sulphide contents than their North Zone counterparts, see **Figure 4-5**.

However, all tailings and ore samples exceeded at least one of the conservative TCLP criteria « *résurgence dans l'eau de surface* » for either barium or lead. Both tailings samples analyzed exceeded the barium and lead criteria whereas all ore samples exceeded the barium criteria.

Due to the TCLP criteria exceedances no tailings or ore samples meet the *Directive 019* low-risk criteria.

# 6.0 MANAGEMENT RECOMMENDATIONS AND SUMMARY

## 6.1 Management Recommendations

### 6.1.1 Odyssey Mine Rock

This geochemical characterization study identified that the Odyssey mine rock has substantially higher proportions of non-PAG and low risk material than that from the ongoing Canadian Malartic operation. For example, only 25% of the Canadian Malartic mine rock was non-PAG and only 7.5% of the Canadian Malartic mine rock met the *Directive 019* low-risk criteria (EcoMetrix, 2017). Conversely, 92% of the Odyssey mine is non-PAG and 36% of the mine rock meets the *Directive 019* low-risk criteria based on the TCLP results.

The short-term CTEU-9 and SPLP results indicate that seepage and runoff water quality from the temporary Odyssey mine rock storage pile is expected to be of good quality. No constituents from these leach tests exceeded their comparative criteria.

Though some waste rock samples did have TCLP leachate concentrations exceed the barium and lead TCLP comparative criteria these exceedances do not represent a risk for the temporary waste rock stockpile as the acidic TCLP test conditions are not reflective of the expected neutral pH conditions for the temporary waste rock stockpile. The waste rock stockpile contains over 90% non-PAG materials and abundant carbonate contents. The pH of the drainage water in the temporary piles will not decrease to the levels evaluated in the TCLP test. Further, even if the stockpile contained substantial amounts of PAG materials, the temporary waste rock storage pile will not exist for a sufficient time to deplete the NP of the rock before the materials are permanently transitioned to the Canadian Malartic waste rock storage facility.

Therefore, the seepage and runoff water quality from the short-term Odyssey mine rock storage pile is expected to be of good quality and acceptable for release without mitigation.

In consideration of the Odyssey mine rock quality no additional management measures are required for incorporating the Odyssey mine rock into the Canadian Malartic operation. The Odyssey mine rock can be safely managed within the existing Canadian Malartic mine rock storage areas under existing mine management procedures.

### 6.1.2 Odyssey Ore and Tailings

Characterization of the ore and tailings identifies that though these Odyssey materials do not meet the *Directive 019* low-risk criteria, due to the barium and lead concentrations in the TCLP leachate, a much greater proportion of the Odyssey materials is expected to be non-

PAG (75%) than the Canadian Malartic materials (0% to 20%) as reported in EcoMetrix, (2015).

Consistent with the mine rock results, the Odyssey ore and tailings short-term CTEU-9 and SPLP leachability testing indicates that seepage and runoff water quality from the temporary Odyssey ore storage pile is expected to be of good quality. No constituents from these tests exceeded either the CTEU-9 or SPLP comparative criteria. Some ore samples did have TCLP concentrations exceed the barium and lead TCLP comparative criteria; however, these exceedances do not represent a practical risk for the temporary ore stockpile water quality as the acidic TCLP test conditions are not reflective of the expected neutral pH conditions for the ore stockpile. Though some of the materials in the ore stockpile are expected to contain uncertain and PAG materials the temporary ore stockpile will not exist for a sufficient time to deplete the NP of the ore before the materials are utilized at the Canadian Malartic mill.

Therefore, the seepage and runoff water quality from the short-term Odyssey mine rock storage pile is expected to be of good quality and acceptable for release without mitigation.

With ore samples acting as reasonable surrogates of tailings and knowing that existing Canadian Malartic storage management procedures handle all tailings as potentially acid generating then no additional management measures are required for incorporating Odyssey tailings into the Canadian Malartic operation. The Odyssey tailings can be safely managed within existing Canadian Malartic tailings storage areas under current mine management procedures.

## 6.2 Characterization Summary

### 6.2.1 Odyssey Mine Rock

Geochemical testing of mine rock from Odyssey North and South identified that:

- Approximately 36% of the mine rock for Odyssey North and South is low-risk material according to *Directive 019* criteria. The remaining mine rock does not meet the low-risk classification based on the TCLP test criteria for a few constituents.

Additionally, the investigation identified that ABA characteristics of mine rock are similar at both the Odyssey North and Odyssey South deposits. At each deposit the Carb-NP is a preferred conservative estimate of NP and that when the Carb-NPR was greater than 2 in the Odyssey mine rock then the Sobek-NPR is also greater than 3. Further, to support a practical and effective means of classifying the acid generation characteristics of mine rock it was found that Carb-NPR can be estimated from the $carbon_{total}$/$sulphur_{total}$ (C/S) ratio in which total carbon (C) is a surrogate for carbonate and total sulphur (S) is a surrogate for sulphide. Using this approach it was found that mine rock with C/S values greater than 0.81 are non-PAG, samples with C/S values lower than 0.42 are PAG, and samples with values between 0.42 and 0.81 have an uncertain potential for acid generation.

The characterization of the Odyssey mine rock identified that:

- Mine rock from both Odyssey North and South is elevated in barium, cobalt, chromium, copper, and nickel compared to « *Critères Génériques pour les Sols* » – *'A'*;
- Lead is only elevated in the Odyssey North Zone mine rock;
- Rietveld XRD analyses show that the mine rock is dominated by quartz and aluminosilicates and that:
    - Three carbonate minerals were identified: ankerite ($Ca,Fe(CO_3)_2$), calcite ($CaCO_3$), and dolomite ($Ca,Mg(CO_3)_2$). The relative quantities of iron carbonate, that do not provide effective neutralization, is low and the vast majority of the carbonate content is represented by calcium and magnesium carbonates and will provide effective neutralization.
    - Pyrite ($FeS_2$) is the only source of sulphide
- Leachability testing via the aggressive TCLP test shows that barium and lead can leach at elevated concentrations under acidic conditions compared to the « *résurgence dans l'eau de surface criteria* »;
    - All lead exceedances were associated with samples from the Odyssey North Zone, and a higher proportion of samples from Odyssey North also exceeded the barium criteria.
- CTEU-9 and SPLP test results do not exhibit elevated concentrations in leachate.

### 6.2.2 Odyssey Ore and Tailings

Geochemical testing of tailings and ore from the Odyssey deposit identified that:

- None of the tailings and ore is considered low-risk according to *Directive 019* in consideration of the TCLP results for a few constituents.

Characterization of the Odyssey tailings and ore identified that:

- North Zone ore samples were 88% non-PAG whereas South Zone ore samples were 60% non-PAG;
- Tailings and ore are elevated in barium, cobalt, chromium, nickel, lead, molybdenum, and silver compared to « *Critères Génériques pour les Sols* » - *'A'* standards;
- Rietveld XRD analyses show that the tailings and ore are dominated by quartz and aluminosilicates and that:
    - Two carbonate minerals were identified: ankerite ($Ca,Fe(CO_3)_2$) and calcite ($CaCO_3$). The quantity of the iron carbonates, those that do not provide

effective neutralization, was low in the ore (6% of the carbonates). However, over 20% of the carbonates in tailings were iron carbonates.

- All tailings or ore samples exceeded at least one of the « *résurgence dans l'eau de surface* » TCLP criteria for barium and lead; and
- No CTEU-9 or SPLP test concentrations exceeded either the « *règlement sur la qualité de l'eau potable* » or the ten times « *règlement sur la qualité de l'eau potable* » criteria, respectively.

# 7.0 REFERENCES

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# APPENDIX A

## Sample List

| Composite ID | Composite Subsamples | Canadian Malartic Borehole ID | Original Canadian Malartic Sample ID | Odyssey Zone | Material Type | Sample Location | Lithology Code | Alteration Code |
|---|---|---|---|---|---|---|---|---|
| ODY-ENV-001 | ODY-ENV-001.1 | ODY14-2486A | D538581 | North | Ore | Mineralized Zone | PO | SR |
| | ODY-ENV-001.2 | | D538586 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-001.3 | | D538593 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-001.4 | | D538598 | North | Ore | Mineralized Zone | | |
| ODY-ENV-002 | ODY-ENV-002.1 | ODY15-5070 | D148566 | North | Ore | Mineralized Zone | PO | AK |
| | ODY-ENV-002.2 | | D087881 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-002.3 | | D148572 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-002.4 | | D148575 | North | Ore | Mineralized Zone | | |
| ODY-ENV-003 | ODY-ENV-003.1 | ODY16-5040A | D176121 | North | Ore | Mineralized Zone | PO | BT |
| | ODY-ENV-003.2 | | D176124 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-003.3 | | D176127 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-003.4 | | D176131 | North | Ore | Mineralized Zone | | |
| ODY-ENV-004 | ODY-ENV-004.1 | ODY15-2500A | D538294 | North | Ore | Mineralized Zone | PO | BT |
| | ODY-ENV-004.2 | | D538296 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-004.3 | | D538298 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-004.4 | | D538301 | North | Ore | Mineralized Zone | | |
| ODY-ENV-005 | ODY-ENV-005.1 | ODY16-5056 | D168108 | North | Ore | Mineralized Zone | PO | BT |
| | ODY-ENV-005.2 | | D168114 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-005.3 | | D168121 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-005.4 | | D168127 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-005.5 | | D168132 | North | Ore | Mineralized Zone | | |
| ODY-ENV-006 | ODY-ENV-006.1 | ODY14-2485 | D112749 | North | Ore | Mineralized Zone | AM | CH |
| | ODY-ENV-006.2 | | D112783 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-006.3 | | D112782 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-006.4 | | D112754 | North | Ore | Mineralized Zone | | |
| ODY-ENV-007 | ODY-ENV-007.1 | ODY14-2487A | D535467 | North | Ore | Mineralized Zone | II | AK |
| | ODY-ENV-007.2 | | D535472 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-007.3 | | D535470 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-007.4 | | D535481 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-007.5 | | D535484 | North | Ore | Mineralized Zone | | |
| ODY-ENV-008 | ODY-ENV-008.1 | ODY16-5046AA | D536909 | North | Ore | Mineralized Zone | PO | BT |
| | ODY-ENV-008.2 | | D536905 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-008.3 | | D536907 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-008.4 | | D536911 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-008.5 | | D536912 | North | Ore | Mineralized Zone | | |
| ODY-ENV-009 | ODY-ENV-009.2 | ODY16-5064 | D178092 | North | Ore | Mineralized Zone | GA | CB |
| | ODY-ENV-009.3 | | D178091 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-009.4 | | D178093 | North | Ore | Mineralized Zone | | |

| Composite ID | Composite Subsamples | Canadian Malartic Borehole ID | Original Canadian Malartic Sample ID | Odyssey Zone | Material Type | Sample Location | Lithology Code | Alteration Code |
|---|---|---|---|---|---|---|---|---|
| ODY-ENV-010 | ODY-ENV-010.1 | ODY16-5044 | D146772 | North | Ore | Mineralized Zone | PO | BT |
| | ODY-ENV-010.2 | | D146777 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-010.3 | | D146783 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-010.4 | | D146788 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-010.5 | | D146791 | North | Ore | Mineralized Zone | | |
| ODY-ENV-011 | ODY-ENV-011.1 | ODY15-5010 | D127256 | North | Ore | Mineralized Zone | PO | SR |
| | ODY-ENV-011.2 | | D127262 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-011.3 | | D127266 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-011.4 | | D127268 | North | Ore | Mineralized Zone | | |
| ODY-ENV-012 | ODY-ENV-012.1 | ODY16-5051 | D167109 | North | Ore | Mineralized Zone | UM | CH |
| | ODY-ENV-012.2 | | D167111 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-012.3 | | D167110 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-012.4 | | D167115 | North | Ore | Mineralized Zone | | |
| ODY-ENV-013 | ODY-ENV-013.1 | ODY16-5039 | D146086 | North | Ore | Mineralized Zone | PO | HM |
| | ODY-ENV-013.2 | | D146090 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-013.3 | | D146094 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-013.4 | | D146087 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-013.5 | | D146099 | North | Ore | Mineralized Zone | | |
| ODY-ENV-014 | ODY-ENV-014.1 | ODY16-5059 | D168856 | North | Ore | Mineralized Zone | II | BT |
| | ODY-ENV-014.2 | | D168858 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-014.3 | | D168854 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-014.4 | | D168857 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-014.5 | | D168861 | North | Ore | Mineralized Zone | | |
| ODY-ENV-015 | ODY-ENV-015.1 | ODY16-5058 | D550926 | North | Ore | Mineralized Zone | PO | AK |
| | ODY-ENV-015.2 | | D550928 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-015.3 | | D550932 | North | Ore | Mineralized Zone | | |
| | ODY-ENV-015.4 | | D550937 | North | Ore | Mineralized Zone | | |
| ODY-ENV-069 | ODY-ENV-069.1 | ODY16-5057 | D177529 | North | Ore | Mineralized Zone | SH | TC |
| | ODY-ENV-069.2 | | D177530 | North | Ore | Mineralized Zone | | |
| ODY-ENV-016 | ODY-ENV-016.1 | ODY16-5064 | D178094 | North | Mine Rock | Footwall | GA | CB |
| | ODY-ENV-016.2 | | D178095 | North | Mine Rock | Footwall | | |
| ODY-ENV-017 | ODY-ENV-017.1 | ODY16-5043 | D172145 | North | Mine Rock | Footwall | IM | BT |
| | ODY-ENV-017.2 | | D172146 | North | Mine Rock | Footwall | | |
| ODY-ENV-018 | ODY-ENV-018.1 | ODY16-5059 | D168863 | North | Mine Rock | Footwall | II | BT |
| | ODY-ENV-018.2 | | D168862 | North | Mine Rock | Footwall | | |
| ODY-ENV-019 | ODY-ENV-019.1 | ODY14-2486A | D538601 | North | Mine Rock | Footwall | PO | SI |
| | ODY-ENV-019.2 | | D538602 | North | Mine Rock | Footwall | | |
| ODY-ENV-020 | ODY-ENV-020.1 | ODY15-5058 | D550941 | North | Mine Rock | Footwall | UM | CH |
| | ODY-ENV-020.2 | | D550939 | North | Mine Rock | Footwall | | |

| Composite ID | Composite Subsamples | Canadian Malartic Borehole ID | Original Canadian Malartic Sample ID | Odyssey Zone | Material Type | Sample Location | Lithology Code | Alteration Code |
|---|---|---|---|---|---|---|---|---|
| ODY-ENV-021 | ODY-ENV-021.1 | ODY16-5056 | D168135 | North | Mine Rock | Footwall | UM | BT/AM |
| | ODY-ENV-021.2 | | D168136 | North | Mine Rock | Footwall | | |
| ODY-ENV-022 | ODY-ENV-022.1 | CD10-12 | D117830 | North | Mine Rock | Footwall | UM | TC |
| | ODY-ENV-022.2 | | D117829 | North | Mine Rock | Footwall | | |
| ODY-ENV-023 | ODY-ENV-023.1 | ODY15-5025A | D147849 | North | Mine Rock | Footwall | SH | CH |
| | ODY-ENV-023.2 | | D147850 | North | Mine Rock | Footwall | | |
| ODY-ENV-024 | ODY-ENV-024.1 | ODY16-5057 | D177542 | North | Mine Rock | Footwall | SH | TC |
| | ODY-ENV-024.2 | | D177543 | North | Mine Rock | Footwall | | |
| ODY-ENV-025 | ODY-ENV-025.1 | ODY16-5047 | D175792 | North | Mine Rock | Hanging Wall | UM | TC |
| ODY-ENV-026 | ODY-ENV-026.1 | ODY14-2491B | D142933 | North | Mine Rock | Hanging Wall | PO | AK |
| ODY-ENV-027 | ODY-ENV-027.1 | ODY16-5042 | D152109 | North | Mine Rock | Hanging Wall | PO | BT |
| ODY-ENV-028 | ODY-ENV-028.1 | ODY15-5024 | D129581 | North | Mine Rock | Hanging Wall | PO | AK |
| ODY-ENV-029 | ODY-ENV-029.1 | ODY14-2480A | D550418 | North | Mine Rock | Hanging Wall | PO | BT |
| ODY-ENV-030 | ODY-ENV-030.1 | ODY16-5043 | D172122 | North | Mine Rock | Hanging Wall | PO | HM |
| ODY-ENV-031 | ODY-ENV-031.1 | ODY16-5059 | D168846 | North | Mine Rock | Hanging Wall | PO | SI |
| ODY-ENV-032 | ODY-ENV-032.1 | ODY16-5054C | D546531 | North | Mine Rock | Hanging Wall | PO | BT |
| ODY-ENV-070 | ODY-ENV-070.1 | ODY16-5054B | D545997 | North | Mine Rock | Hanging Wall | IM | CB |
| ODY-ENV-056 | ODY-ENV-056.1 | ODY14-2486A | D538552 | North | Mine Rock | Development | PO | SI |
| | ODY-ENV-056.2 | | D538559 | North | Mine Rock | Development | | |
| | ODY-ENV-056.3 | | D538565 | North | Mine Rock | Development | | |
| | ODY-ENV-056.4 | | D538571 | North | Mine Rock | Development | | |
| | ODY-ENV-056.5 | | D538577 | North | Mine Rock | Development | | |
| ODY-ENV-057 | ODY-ENV-057.1 | ODY15-5029 | D134597 | North | Mine Rock | Development | PO | AK |
| | ODY-ENV-057.2 | | D134606 | North | Mine Rock | Development | | |
| | ODY-ENV-057.3 | | D134612 | North | Mine Rock | Development | | |
| | ODY-ENV-057.4 | | D134621 | North | Mine Rock | Development | | |
| | ODY-ENV-057.5 | | D134633 | North | Mine Rock | Development | | |
| ODY-ENV-058 | ODY-ENV-058.1 | ODY15-2500A | D538255 | North | Mine Rock | Development | PO | BT |
| | ODY-ENV-058.2 | | D538262 | North | Mine Rock | Development | | |
| | ODY-ENV-058.3 | | D538269 | North | Mine Rock | Development | | |
| | ODY-ENV-058.4 | | D538277 | North | Mine Rock | Development | | |
| | ODY-ENV-058.5 | | D538284 | North | Mine Rock | Development | | |
| ODY-ENV-059 | ODY-ENV-059.1 | ODY14-2487A | D535418 | North | Mine Rock | Development | GA | LX |
| | ODY-ENV-059.2 | | D535426 | North | Mine Rock | Development | | |
| | ODY-ENV-059.3 | | D535436 | North | Mine Rock | Development | | |
| | ODY-ENV-059.4 | | D535444 | North | Mine Rock | Development | | |

| Composite ID | Composite Subsamples | Canadian Malartic Borehole ID | Original Canadian Malartic Sample ID | Odyssey Zone | Material Type | Sample Location | Lithology Code | Alteration Code |
|---|---|---|---|---|---|---|---|---|
| ODY-ENV-060 | ODY-ENV-060.1 | ODY16-5064 | D178052 | North | Mine Rock | Development | PO | BT |
| | ODY-ENV-060.2 | | D178059 | North | Mine Rock | Development | | |
| | ODY-ENV-060.3 | | D178067 | North | Mine Rock | Development | | |
| | ODY-ENV-060.4 | | D178073 | North | Mine Rock | Development | | |
| | ODY-ENV-060.5 | | D178079 | North | Mine Rock | Development | | |
| ODY-ENV-061 | ODY-ENV-061.1 | ODY16-5057 | D177466 | North | Mine Rock | Development | PO | BT |
| | ODY-ENV-061.2 | | D177477 | North | Mine Rock | Development | | |
| | ODY-ENV-061.3 | | D177484 | North | Mine Rock | Development | | |
| | ODY-ENV-061.4 | | D177492 | North | Mine Rock | Development | | |
| | ODY-ENV-061.5 | | D177509 | North | Mine Rock | Development | | |
| ODY-ENV-062 | ODY-ENV-062.1 | ODY16-5054C | D546482 | North | Mine Rock | Development | PO | BT |
| | ODY-ENV-062.2 | | D546490 | North | Mine Rock | Development | | |
| | ODY-ENV-062.3 | | D546498 | North | Mine Rock | Development | | |
| | ODY-ENV-062.4 | | D546510 | North | Mine Rock | Development | | |
| | ODY-ENV-062.5 | | D546518 | North | Mine Rock | Development | | |
| ODY-ENV-071 | ODY-ENV-071.1 | ODY14-2485 | D112722 | North | Mine Rock | Development | SE | BT |
| | ODY-ENV-071.2 | | D112730 | North | Mine Rock | Development | | |
| | ODY-ENV-071.3 | | D112741 | North | Mine Rock | Development | | |
| | ODY-ENV-071.4 | | D112766 | North | Mine Rock | Development | | |
| | ODY-ENV-071.5 | | D112772 | North | Mine Rock | Development | | |
| ODY-ENV-072 | ODY-ENV-072.1 | ODY14-2487A | D535446 | North | Mine Rock | Development | UM | CH |
| | ODY-ENV-072.2 | | D535449 | North | Mine Rock | Development | | |
| | ODY-ENV-072.3 | | D087207 | North | Mine Rock | Development | | |
| | ODY-ENV-072.4 | | D535455 | North | Mine Rock | Development | | |
| | ODY-ENV-072.5 | | D535458 | North | Mine Rock | Development | | |
| ODY-ENV-033 | ODY-ENV-033.1 | ODY14-2480A | D550028 | South | Ore | Mineralized Zone | PO | SR |
| | ODY-ENV-033.2 | | D550032 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-033.3 | | D550039 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-033.4 | | D550050 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-033.5 | | D550055 | South | Ore | Mineralized Zone | | |
| ODY-ENV-034 | ODY-ENV-034.1 | ODY15-5026 | D143098 | South | Ore | Mineralized Zone | PO | SR |
| | ODY-ENV-034.2 | | D143105 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-034.3 | | D143109 | South | Ore | Mineralized Zone | | |
| ODY-ENV-035 | ODY-ENV-035.1 | ODY16-5038 | D171071 | South | Ore | Mineralized Zone | PO | SR |
| | ODY-ENV-035.2 | | D171076 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-035.3 | | D171079 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-035.4 | | D171083 | South | Ore | Mineralized Zone | | |
| ODY-ENV-036 | ODY-ENV-036.1 | ODY16-5089 | D179870 | South | Ore | Mineralized Zone | SE | BT |
| | ODY-ENV-036.2 | | D179872 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-036.3 | | D179871 | South | Ore | Mineralized Zone | | |

| Composite ID | Composite Subsamples | Canadian Malartic Borehole ID | Original Canadian Malartic Sample ID | Odyssey Zone | Material Type | Sample Location | Lithology Code | Alteration Code |
|---|---|---|---|---|---|---|---|---|
| ODY-ENV-037 | ODY-ENV-037.1 | ODY14-2488 | D105317 | South | Ore | Mineralized Zone | PO | HM |
| | ODY-ENV-037.2 | | D105318 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-037.3 | | D105322 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-037.4 | | D105323 | South | Ore | Mineralized Zone | | |
| ODY-ENV-038 | ODY-ENV-038.1 | ODY15-5009 | D141194 | South | Ore | Mineralized Zone | PO | SI |
| | ODY-ENV-038.2 | | D141204 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-038.3 | | D141210 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-038.4 | | D141211 | South | Ore | Mineralized Zone | | |
| ODY-ENV-039 | ODY-ENV-039.1 | ODY15-5002 | D119158 | South | Ore | Mineralized Zone | PO | AK |
| | ODY-ENV-039.2 | | D119161 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-039.3 | | D119163 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-039.4 | | D119168 | South | Ore | Mineralized Zone | | |
| ODY-ENV-040 | ODY-ENV-040.1 | ODY15-2499B | D118429 | South | Ore | Mineralized Zone | PO | SR |
| | ODY-ENV-040.2 | | D118433 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-040.3 | | D118436 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-040.4 | | D118441 | South | Ore | Mineralized Zone | | |
| ODY-ENV-077 | ODY-ENV-077.1 | ODY16-5089 | D179874 | South | Ore | Mineralized Zone | AP | SI |
| | ODY-ENV-077.2 | | D179875 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-077.3 | | D179876 | South | Ore | Mineralized Zone | | |
| ODY-ENV-073 | ODY-ENV-073.1 | ODY16-5017 | D127855 | South | Ore | Mineralized Zone | UM | BT |
| | ODY-ENV-073.2 | | D127856 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-073.3 | | D127857 | South | Ore | Mineralized Zone | | |
| | ODY-ENV-073.4 | | D127858 | South | Ore | Mineralized Zone | | |
| ODY-ENV-041 | ODY-ENV-041.1 | ODY14-2489 | D102765 | South | Mine Rock | Footwall | PO | BT |
| ODY-ENV-042 | ODY-ENV-042.1 | ODY15-5017 | D127862 | South | Mine Rock | Footwall | PO | SI |
| ODY-ENV-043 | ODY-ENV-043.1 | ODY15-5001 | D113375 | South | Mine Rock | Footwall | PO | BT |
| ODY-ENV-044 | ODY-ENV-044.1 | ODY15-5033 | D165734 | South | Mine Rock | Footwall | PO | BT |
| ODY-ENV-045 | ODY-ENV-045.1 | ODY15-5012 | D127390 | South | Mine Rock | Footwall | PO | BT |
| ODY-ENV-046 | ODY-ENV-046.1 | ODY15-5009 | D141213 | South | Mine Rock | Footwall | PO | SR |
| ODY-ENV-068 | ODY-ENV-068.1 | ODY15-5002 | D119173 | South | Mine Rock | Footwall | PO | BT |
| ODY-ENV-047 | ODY-ENV-047.1 | ODY15-2499B | D118792 | South | Mine Rock | Footwall | PO | BT |
| ODY-ENV-074 | ODY-ENV-074.1 | ODY15-5008 | K388606 | South | Mine Rock | Footwall | II | CH |
| ODY-ENV-048 | ODY-ENV-048.1 | ODY15-5026 | D143097 | South | Mine Rock | Hanging Wall | PO | SR |
| ODY-ENV-049 | ODY-ENV-049.1 | ODY14-2491B | D115144 | South | Mine Rock | Hanging Wall | BA | CB |
| ODY-ENV-050 | ODY-ENV-050.1 | ODY16-5038 | D171068 | South | Mine Rock | Hanging Wall | BA | CH |
| ODY-ENV-051 | ODY-ENV-051.1 | ODY16-5089 | D179867 | South | Mine Rock | Hanging Wall | SE | BT |
| ODY-ENV-052 | ODY-ENV-052.1 | ODY14-2488 | D105310 | South | Mine Rock | Hanging Wall | SE | BT |
| ODY-ENV-053 | ODY-ENV-053.1 | ODY15-5002 | D119150 | South | Mine Rock | Hanging Wall | SE | BT |
| ODY-ENV-054 | ODY-ENV-054.1 | ODY16-5041 | D144955 | South | Mine Rock | Hanging Wall | IM | CB |
| ODY-ENV-055 | ODY-ENV-055.1 | ODY15-5009 | D141191 | South | Mine Rock | Hanging Wall | SE | AK |

| Composite ID | Composite Subsamples | Canadian Malartic Borehole ID | Original Canadian Malartic Sample ID | Odyssey Zone | Material Type | Sample Location | Lithology Code | Alteration Code |
|---|---|---|---|---|---|---|---|---|
| ODY-ENV-075 | ODY-ENV-075.1 | ODY15-5012 | D127369 | South | Mine Rock | Hanging Wall | SH | TC |
| ODY-ENV-063 | ODY-ENV-063.1 | ODY15-5026 | D143115 | South | Mine Rock | Development Zone | UM | BT |
| | ODY-ENV-063.2 | | D143136 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-063.3 | | D143141 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-063.4 | | D143131 | South | Mine Rock | Development Zone | | |
| ODY-ENV-064 | ODY-ENV-064.1 | ODY16-5038 | D171087 | South | Mine Rock | Development Zone | PO | BT |
| | ODY-ENV-064.2 | | D171093 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-064.3 | | D171098 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-064.4 | | D171107 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-064.5 | | D171111 | South | Mine Rock | Development Zone | | |
| ODY-ENV-065 | ODY-ENV-065.1 | ODY15-5012 | D127391 | South | Mine Rock | Development Zone | PO | BT |
| | ODY-ENV-065.2 | | D127399 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-065.3 | | D127413 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-065.4 | | D127427 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-065.5 | | D127436 | South | Mine Rock | Development Zone | | |
| ODY-ENV-066 | ODY-ENV-066.1 | ODY15-5002 | D119176 | South | Mine Rock | Development Zone | PO | BT |
| | ODY-ENV-066.2 | | D119184 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-066.3 | | D119191 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-066.4 | | D119199 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-066.5 | | D119208 | South | Mine Rock | Development Zone | | |
| ODY-ENV-067 | ODY-ENV-067.1 | ODY15-2498 | D118445 | South | Mine Rock | Development Zone | PO | SR |
| | ODY-ENV-067.2 | | D118448 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-067.3 | | D118452 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-067.4 | | D118457 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-067.5 | | D118462 | South | Mine Rock | Development Zone | | |
| ODY-ENV-076 | ODY-ENV-076.1 | ODY14-2481 | D097781 | South | Mine Rock | Development Zone | GA | CB |
| | ODY-ENV-076.2 | | D097784 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-076.3 | | D097788 | South | Mine Rock | Development Zone | | |
| | ODY-ENV-076.4 | | D097791 | South | Mine Rock | Development Zone | | |
| Detox Final Tail BL 154-50 | -- | | | | Tailings | -- | | |
| Detox Final Tail BL 154-51 | -- | | | | Tailings | -- | | |
| Detox Final Tail BL 154-52 | -- | | | | Tailings | -- | | |

# APPENDIX B

## Summarized Laboratory Data

# Solids Content, ABA, Whole Rock, and Rietveld Results

| Sample ID | | Detox Final Tail BL 154-50 | Detox Final Tail BL 154-51 | Detox Final Tail BL 154-52 | ODY-ENV-001 | ODY-ENV-002 | ODY-ENV-003 | ODY-ENV-004 | ODY-ENV-005 | ODY-ENV-006 | ODY-ENV-007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Tailings | Tailings | Tailings | Ore | Ore | Ore | Ore | Ore | Ore | Ore |
| **Odyssey Zone** | | -- | -- | -- | North | North | North | North | North | North | North |
| **Sample Location** | | | | | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone |
| **Lithology Code** | | | | | PO | PO | PO | PO | PO | AM | II |
| **Alteration Code** | | | | | SR | AK | BT | BT | BT | CH | AK |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.47 | 0.41 | 0.30 | 0.78 | 0.51 | 0.44 | 0.75 | 0.60 | 0.19 | 2.2 |
| Aluminum | mg/kg | 4300 | 4600 | 5500 | 5800 | 6800 | 4100 | 4800 | 7200 | 17000 | 7100 |
| Arsenic | mg/kg | 1.7 | 2.7 | 2.6 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Boron | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Barium | mg/kg | 160 | 130 | 82 | 240 | 260 | 170 | 260 | 110 | 120 | 350 |
| Beryllium | mg/kg | 0.6 | 0.4 | 0.3 | 0.7 | 0.7 | 0.4 | 0.6 | 0.5 | 0.3 | 0.5 |
| Bismuth | mg/kg | 1.0 | 0.92 | 0.99 | 1.6 | 0.71 | 0.72 | 2.2 | 0.65 | 0.27 | 5.3 |
| Calcium | mg/kg | 16000 | 18000 | 19000 | 19000 | 21000 | 19000 | 20000 | 20000 | 19000 | 20000 |
| Cadmium | mg/kg | 0.32 | 0.14 | 0.09 | 0.26 | 0.06 | 0.18 | 0.14 | 0.15 | 0.07 | 0.13 |
| Cobalt | mg/kg | 6.9 | 7.1 | 9.0 | 5.7 | 6.7 | 6.4 | 5.8 | 6.6 | 33 | 7.7 |
| Chromium | mg/kg | 39 | 27 | 36 | 16 | 37 | 14 | 23 | 19 | 360 | 33 |
| Copper | mg/kg | 44 | 38 | 37 | 11 | 9.3 | 15 | 6.0 | 7.3 | 73 | 56 |
| Iron | mg/kg | 18000 | 17000 | 17000 | 19000 | 17000 | 17000 | 14000 | 18000 | 31000 | 20000 |
| Potassium | mg/kg | 4700 | 4700 | 4300 | 7400 | 7300 | 4300 | 3500 | 7300 | 16000 | 7400 |
| Lithium | mg/kg | 7 | 8 | 6 | 8 | 11 | 5 | 5 | 13 | 26 | 13 |
| Magnesium | mg/kg | 5900 | 5400 | 6100 | 6200 | 7400 | 6600 | 5200 | 6800 | 27000 | 8600 |
| Manganese | mg/kg | 240 | 250 | 270 | 270 | 300 | 320 | 220 | 280 | 480 | 260 |
| Molybdenum | mg/kg | 2.1 | 1.8 | 2.2 | 0.6 | 0.5 | 0.4 | 0.7 | 0.5 | 5.3 | 2.6 |
| Sodium | mg/kg | 100 | 120 | 95 | 510 | 730 | 590 | 780 | 620 | 470 | 690 |
| Nickel | mg/kg | 22 | 16 | 24 | 9.0 | 21 | 10 | 8.4 | 11 | 250 | 21 |
| Phosphorus | mg/kg | 690 | 870 | 780 | 1000 | 1000 | 1200 | 990 | 1200 | 310 | 1100 |
| Lead | mg/kg | 49 | 45 | 27 | 59 | 22 | 23 | 36 | 22 | 12 | 200 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 880 | 850 | 850 | 1200 | 1000 | 610 | 590 | 780 | 1800 | 610 |
| Tin | mg/kg | 0.5 | <0.5 | <0.5 | 0.6 | 0.6 | <0.5 | 0.6 | 0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 440 | 340 | 210 | 970 | 860 | 700 | 740 | 370 | 210 | 290 |
| Titanium | mg/kg | 540 | 530 | 490 | 870 | 940 | 420 | 420 | 870 | 1300 | 870 |
| Thallium | mg/kg | 0.16 | 0.14 | 0.11 | 0.24 | 0.14 | 0.06 | 0.08 | 0.17 | 0.32 | 0.13 |
| Uranium | mg/kg | 0.67 | 0.85 | 0.81 | 1.0 | 0.97 | 1.1 | 0.94 | 1.0 | 0.13 | 0.89 |
| Vanadium | mg/kg | 33 | 32 | 22 | 54 | 54 | 29 | 33 | 43 | 98 | 52 |
| Zinc | mg/kg | 58 | 56 | 49 | 49 | 61 | 52 | 43 | 61 | 37 | 54 |
| Fluoride | mg/kg | <1.0 | -- | <1.0 | 1 | -- | -- | -- | -- | -- | -- |
| Bromide | mg/kg | <1.5 | -- | <1.5 | <1.5 | -- | -- | -- | -- | -- | -- |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 8.33 | 8.31 | 8.05 | 9.96 | 9.69 | 7.01 | 9.71 | 9.29 | 9.46 | 9.18 |
| Fizz Rate | --- | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Sample weight | g | 2.01 | 2.02 | 2.15 | 2.09 | 1.99 | 1.95 | 2.00 | 1.97 | 2.03 | 2.00 |
| HCl Added | mL | 40.00 | 40.00 | 38.10 | 42.00 | 40.00 | 44.00 | 32.00 | 32.00 | 48.00 | 32.00 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 18.70 | 15.92 | 14.85 | 19.46 | 18.78 | 20.49 | 11.38 | 12.53 | 19.83 | 12.27 |
| Final pH | | 1.56 | 1.55 | 1.50 | 1.64 | 1.60 | 1.60 | 1.88 | 1.78 | 1.66 | 1.80 |
| NP | kg CaCO3/t | 53 | 60 | 54 | 54 | 53 | 60 | 52 | 49 | 69 | 49 |

| Sample ID | | Detox Final Tail BL 154-50 | Detox Final Tail BL 154-51 | Detox Final Tail BL 154-52 | ODY-ENV-001 | ODY-ENV-002 | ODY-ENV-003 | ODY-ENV-004 | ODY-ENV-005 | ODY-ENV-006 | ODY-ENV-007 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Tailings | Tailings | Tailings | Ore | Ore | Ore | Ore | Ore | Ore | Ore |
| **Odyssey Zone** | | -- | -- | -- | North | North | North | North | North | North | North |
| **Sample Location** | | | | | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone |
| **Lithology Code** | | | | | PO | PO | PO | PO | PO | AM | II |
| **Alteration Code** | | | | | SR | AK | BT | BT | BT | CH | AK |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 21.2 | 16.9 | 13.1 | 18.1 | 7.81 | 18.1 | 10.6 | 14.1 | 4.38 | 25.3 |
| Net NP | kg CaCO3/t | 31.8 | 42.7 | 41.0 | 35.8 | 45.5 | 42.2 | 41.0 | 35.3 | 65.0 | 24.0 |
| NP/AP | ratio | 2.49 | 3.53 | 4.12 | 2.97 | 6.82 | 3.33 | 4.86 | 3.51 | 15.9 | 1.95 |
| Sulphur (total) | %S | 0.706 | 0.582 | 0.517 | 0.688 | 0.302 | 0.682 | 0.383 | 0.476 | 0.208 | 0.829 |
| Acid Leachable SO4-S | %S | 0.03 | 0.04 | 0.10 | 0.11 | 0.05 | 0.10 | 0.04 | 0.03 | 0.07 | <0.02 |
| Sulphide | %S | 0.68 | 0.54 | 0.42 | 0.58 | 0.25 | 0.58 | 0.34 | 0.45 | 0.14 | 0.81 |
| Carbon (total) | %C | 0.567 | 0.588 | 0.634 | 0.577 | 0.610 | 0.769 | 0.591 | 0.544 | 0.783 | 0.556 |
| Carbonate | %CO3 | 2.44 | 2.42 | 2.81 | 2.32 | 2.58 | 3.02 | 2.33 | 2.21 | 3.43 | 2.22 |
| Carbonate (Calculated) | %C | 0.49 | 0.48 | 0.56 | 0.46 | 0.52 | 0.60 | 0.47 | 0.44 | 0.69 | 0.44 |
| Carb-NP (Calculated) | kg CaCO3/t | 40.70 | 40.37 | 46.88 | 38.70 | 43.04 | 50.38 | 38.87 | 36.87 | 57.22 | 37.03 |
| Carb-NPR (Calculated) | -- | 1.9 | 2.4 | 3.6 | 2.1 | 5.5 | 2.8 | 3.7 | 2.6 | 13.1 | 1.5 |
| C/S | -- | 0.8 | 1.0 | 1.2 | 0.8 | 2.0 | 1.1 | 1.5 | 1.1 | 3.8 | 0.7 |
| Neutralization Capacity | eq/kg | -- | -- | -- | 0.40 | -- | -- | -- | -- | -- | -- |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 67.6 | 65.1 | 65.4 | 67.2 | 65.1 | 65.4 | 64.8 | 64.4 | 44.7 | 66.0 |
| Al2O3 | % | 13.0 | 14.3 | 13.9 | 13.4 | 14.3 | 13.9 | 13.3 | 14.8 | 10.5 | 13.2 |
| Fe2O3 | % | 3.18 | 3.44 | 3.73 | 2.88 | 3.17 | 3.10 | 2.70 | 3.22 | 12.3 | 3.35 |
| MgO | % | 1.40 | 1.36 | 1.78 | 1.07 | 1.57 | 1.20 | 1.05 | 1.33 | 14.2 | 1.46 |
| CaO | % | 2.50 | 2.97 | 3.07 | 2.68 | 3.16 | 2.87 | 2.89 | 2.98 | 9.12 | 2.89 |
| Na2O | % | 3.74 | 5.14 | 3.82 | 4.19 | 5.98 | 4.68 | 5.07 | 5.29 | 1.80 | 6.36 |
| K2O | % | 5.51 | 4.13 | 4.19 | 5.54 | 3.25 | 4.92 | 4.15 | 4.36 | 1.78 | 1.79 |
| TiO2 | % | 0.39 | 0.45 | 0.48 | 0.45 | 0.47 | 0.48 | 0.41 | 0.49 | 0.79 | 0.51 |
| P2O5 | % | 0.19 | 0.22 | 0.20 | 0.23 | 0.20 | 0.24 | 0.21 | 0.24 | 0.07 | 0.23 |
| MnO | % | 0.04 | 0.05 | 0.06 | 0.02 | 0.04 | 0.03 | 0.03 | 0.04 | 0.20 | 0.03 |
| Cr2O3 | % | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.15 | <0.01 |
| V2O5 | % | <0.01 | 0.01 | 0.02 | 0.01 | <0.01 | 0.02 | 0.02 | 0.01 | 0.04 | 0.02 |
| LOI | % | 2.00 | 2.15 | 2.77 | 2.64 | 2.63 | 3.17 | 2.76 | 2.52 | 4.07 | 2.25 |
| Sum | % | 99.6 | 99.3 | 99.5 | 100.3 | 99.9 | 100.0 | 97.4 | 99.7 | 99.7 | 98.1 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | 24.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ankerite | wt % | 1.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Albite | wt % | 34.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anorthite | wt % | 3.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chlorite | wt % | 1.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Biotite | wt % | 3 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcite | wt % | 3.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Microcline | wt % | 24.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Muscovite | wt % | 2 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrite | wt % | 0.7 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Talc | wt % | 0 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Actinolite | wt % | 0 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dolomite | wt % | 0 | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| Sample ID | | ODY-ENV-008 | ODY-ENV-009 | ODY-ENV-010 | ODY-ENV-011 | ODY-ENV-012 | ODY-ENV-013 | ODY-ENV-014 | ODY-ENV-015 | ODY-ENV-069 | ODY-ENV-033 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore |
| **Odyssey Zone** | | North | North | North | North | North | North | North | North | North | South |
| **Sample Location** | | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone |
| **Lithology Code** | | PO | GA | PO | PO | UM | PO | II | PO | SH | PO |
| **Alteration Code** | | BT | CB | BT | SR | CH | HM | BT | AK | TC | SR |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.40 | 0.41 | 0.43 | 0.28 | 0.56 | 0.58 | 0.83 | 0.57 | 0.37 | 0.46 |
| Aluminum | mg/kg | 7400 | 29000 | 7300 | 9600 | 22000 | 7500 | 7600 | 4200 | 20000 | 6200 |
| Arsenic | mg/kg | <0.5 | 1.3 | 1.6 | 10 | 0.6 | <0.5 | 0.5 | <0.5 | 1.1 | <0.5 |
| Boron | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Barium | mg/kg | 240 | 210 | 53 | 160 | 54 | 270 | 67 | 160 | 47 | 150 |
| Beryllium | mg/kg | 0.6 | 0.7 | 0.4 | 0.3 | 1.5 | 0.4 | 0.5 | 0.4 | 2.3 | 0.3 |
| Bismuth | mg/kg | 0.98 | 0.40 | 1.5 | 0.34 | 0.41 | 0.50 | 0.17 | 0.34 | 0.40 | 0.79 |
| Calcium | mg/kg | 20000 | 52000 | 21000 | 11000 | 41000 | 20000 | 18000 | 18000 | 58000 | 20000 |
| Cadmium | mg/kg | 0.08 | 0.12 | 0.07 | 0.04 | 0.08 | 0.08 | 0.04 | 0.26 | 0.07 | 0.06 |
| Cobalt | mg/kg | 5.9 | 36 | 8.1 | 6.6 | 31 | 7.0 | 7.3 | 6.2 | 32 | 6.8 |
| Chromium | mg/kg | 20 | 18 | 50 | 15 | 910 | 26 | 45 | 16 | 870 | 16 |
| Copper | mg/kg | 8.7 | 74 | 12 | 7.6 | 19 | 6.0 | 18 | 9.0 | 11 | 7.6 |
| Iron | mg/kg | 16000 | 70000 | 17000 | 18000 | 34000 | 16000 | 19000 | 16000 | 33000 | 16000 |
| Potassium | mg/kg | 6900 | 29000 | 2100 | 8400 | 24000 | 7900 | 9100 | 4200 | 18000 | 2500 |
| Lithium | mg/kg | 9 | 27 | 6 | 12 | 34 | 15 | 17 | 5 | 21 | 5 |
| Magnesium | mg/kg | 7900 | 25000 | 9000 | 8300 | 42000 | 7000 | 7700 | 6900 | 38000 | 5800 |
| Manganese | mg/kg | 270 | 740 | 230 | 220 | 680 | 300 | 260 | 250 | 700 | 260 |
| Molybdenum | mg/kg | 2.5 | 4.6 | 1.4 | 2.3 | 6.3 | 0.6 | 19 | 1.0 | 4.9 | 1.9 |
| Sodium | mg/kg | 450 | 320 | 660 | 530 | 150 | 610 | 320 | 670 | 120 | 550 |
| Nickel | mg/kg | 15 | 34 | 26 | 16 | 360 | 13 | 24 | 9.7 | 280 | 10 |
| Phosphorus | mg/kg | 750 | 880 | 1100 | 640 | 50 | 1300 | 1100 | 1100 | 19 | 920 |
| Lead | mg/kg | 23 | 16 | 16 | 30 | 34 | 20 | 8.3 | 20 | 11 | 11 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 680 | 4800 | 750 | 1100 | 1200 | 840 | 990 | 810 | 1000 | 520 |
| Tin | mg/kg | <0.5 | 0.6 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 420 | 150 | 160 | 99 | 360 | 540 | 230 | 620 | 540 | 230 |
| Titanium | mg/kg | 680 | 2400 | 370 | 820 | 1000 | 940 | 1000 | 530 | 850 | 300 |
| Thallium | mg/kg | 0.14 | 0.38 | 0.02 | 0.20 | 0.50 | 0.15 | 0.29 | 0.08 | 0.41 | <0.02 |
| Uranium | mg/kg | 1.0 | 0.24 | 1.3 | 0.91 | 0.32 | 0.96 | 0.66 | 0.76 | 0.66 | 0.98 |
| Vanadium | mg/kg | 42 | 250 | 36 | 37 | 150 | 43 | 47 | 32 | 170 | 20 |
| Zinc | mg/kg | 40 | 110 | 32 | 41 | 66 | 55 | 42 | 55 | 94 | 36 |
| Fluoride | mg/kg | 3 | -- | -- | -- | -- | -- | -- | -- | -- | 2 |
| Bromide | mg/kg | <1.5 | -- | -- | -- | -- | -- | -- | -- | -- | <1.5 |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 9.84 | 10.07 | 9.63 | 9.97 | 9.97 | 9.07 | 10.00 | 9.72 | 9.81 | 9.71 |
| Fizz Rate | --- | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 4 | 3 |
| Sample weight | g | 1.98 | 2.06 | 2.00 | 1.99 | 2.09 | 2.06 | 2.01 | 2.02 | 2.01 | 2.01 |
| HCl Added | mL | 32.00 | 101.00 | 32.00 | 20.00 | 85.00 | 32.00 | 32.00 | 45.00 | 114.00 | 32.00 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 11.88 | 42.77 | 11.47 | 8.78 | 19.68 | 11.71 | 12.26 | 19.24 | 36.67 | 12.80 |
| Final pH | | 1.76 | 1.63 | 1.78 | 1.83 | 1.85 | 1.85 | 1.85 | 1.77 | 1.69 | 1.67 |
| NP | kg CaCO3/t | 51 | 141 | 51 | 28 | 156 | 49 | 49 | 64 | 192 | 48 |

| Sample ID | | ODY-ENV-008 | ODY-ENV-009 | ODY-ENV-010 | ODY-ENV-011 | ODY-ENV-012 | ODY-ENV-013 | ODY-ENV-014 | ODY-ENV-015 | ODY-ENV-069 | ODY-ENV-033 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore |
| **Odyssey Zone** | | North | North | North | North | North | North | North | North | North | South |
| **Sample Location** | | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone |
| **Lithology Code** | | PO | GA | PO | PO | UM | PO | II | PO | SH | PO |
| **Alteration Code** | | BT | CB | BT | SR | CH | HM | BT | AK | TC | SR |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 12.8 | 30.0 | 16.9 | 14.1 | 1.56 | 4.06 | 11.9 | 10.3 | 5.62 | 15.6 |
| Net NP | kg CaCO3/t | 38.0 | 111 | 34.4 | 14.1 | 155 | 45.1 | 37.2 | 53.5 | 187 | 32.2 |
| NP/AP | ratio | 3.96 | 4.71 | 3.04 | 2.01 | 100 | 12.1 | 4.13 | 6.19 | 34.2 | 3.06 |
| Sulphur (total) | %S | 0.446 | 0.903 | 0.590 | 0.560 | 0.084 | 0.249 | 0.522 | 0.362 | 0.266 | 0.494 |
| Acid Leachable SO4-S | %S | 0.04 | <0.02 | 0.05 | 0.11 | 0.03 | 0.12 | 0.14 | 0.03 | 0.09 | <0.02 |
| Sulphide | %S | 0.41 | 0.96 | 0.54 | 0.45 | 0.05 | 0.13 | 0.38 | 0.33 | 0.18 | 0.50 |
| Carbon (total) | %C | 0.596 | 1.58 | 0.579 | 0.294 | 1.92 | 0.564 | 0.582 | 0.753 | 2.32 | 0.541 |
| Carbonate | %CO3 | 2.52 | 7.07 | 2.37 | 1.11 | 9.33 | 2.42 | 2.38 | 3.01 | 11.2 | 2.25 |
| Carbonate (Calculated) | %C | 0.50 | 1.41 | 0.47 | 0.22 | 1.87 | 0.48 | 0.48 | 0.60 | 2.24 | 0.45 |
| Carb-NP (Calculated) | kg CaCO3/t | 42.04 | 117.94 | 39.54 | 18.52 | 155.64 | 40.37 | 39.70 | 50.21 | 186.83 | 37.53 |
| Carb-NPR (Calculated) | -- | 3.3 | 3.9 | 2.3 | 1.3 | 99.8 | 9.9 | 3.3 | 4.9 | 33.2 | 2.4 |
| C/S | -- | 1.3 | 1.7 | 1.0 | 0.5 | 22.9 | 2.3 | 1.1 | 2.1 | 8.7 | 1.1 |
| Neutralization Capacity | eq/kg | 0.40 | -- | -- | -- | -- | -- | -- | -- | -- | 0.40 |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 64.4 | 44.3 | 64.7 | 63.3 | 49.9 | 64.6 | 65.0 | 62.7 | 46.2 | 66.9 |
| Al2O3 | % | 13.8 | 11.3 | 14.3 | 16.4 | 6.45 | 14.6 | 13.4 | 13.4 | 7.12 | 13.9 |
| Fe2O3 | % | 2.87 | 16.2 | 3.28 | 3.31 | 7.83 | 3.22 | 3.24 | 2.89 | 7.50 | 3.07 |
| MgO | % | 1.55 | 4.61 | 2.18 | 1.88 | 14.8 | 1.33 | 1.48 | 1.26 | 14.6 | 1.28 |
| CaO | % | 2.93 | 7.94 | 3.11 | 2.78 | 8.31 | 3.07 | 2.56 | 2.58 | 9.00 | 2.92 |
| Na2O | % | 3.46 | 3.17 | 4.96 | 3.33 | 0.24 | 5.50 | 2.19 | 5.36 | 0.26 | 5.00 |
| K2O | % | 6.32 | 3.29 | 3.70 | 4.99 | 3.45 | 3.79 | 7.70 | 3.98 | 3.95 | 2.96 |
| TiO2 | % | 0.46 | 2.27 | 0.49 | 0.54 | 0.31 | 0.49 | 0.51 | 0.44 | 0.31 | 0.47 |
| P2O5 | % | 0.15 | 0.19 | 0.22 | 0.13 | 0.01 | 0.25 | 0.23 | 0.22 | <0.01 | 0.23 |
| MnO | % | 0.04 | 0.23 | 0.02 | 0.04 | 0.12 | 0.04 | 0.03 | 0.04 | 0.11 | 0.04 |
| Cr2O3 | % | <0.01 | <0.01 | <0.01 | <0.01 | 0.21 | 0.01 | <0.01 | <0.01 | 0.20 | <0.01 |
| V2O5 | % | 0.01 | 0.08 | 0.01 | 0.02 | 0.03 | <0.01 | <0.01 | 0.02 | 0.04 | <0.01 |
| LOI | % | 2.72 | 5.52 | 3.37 | 2.16 | 8.43 | 2.16 | 2.25 | 2.98 | 10.5 | 2.79 |
| Sum | % | 98.6 | 99.2 | 100.3 | 98.9 | 100.2 | 99.1 | 98.7 | 95.9 | 99.8 | 99.5 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | 20.2 | -- | -- | -- | -- | -- | -- | -- | -- | 25.9 |
| Ankerite | wt % | 0.3 | -- | -- | -- | -- | -- | -- | -- | -- | 0.3 |
| Albite | wt % | 27.6 | -- | -- | -- | -- | -- | -- | -- | -- | 42.4 |
| Anorthite | wt % | 2.8 | -- | -- | -- | -- | -- | -- | -- | -- | 5.6 |
| Chlorite | wt % | 2.6 | -- | -- | -- | -- | -- | -- | -- | -- | 3.4 |
| Biotite | wt % | 3.3 | -- | -- | -- | -- | -- | -- | -- | -- | 1.1 |
| Calcite | wt % | 5.9 | -- | -- | -- | -- | -- | -- | -- | -- | 4.4 |
| Microcline | wt % | 33.9 | -- | -- | -- | -- | -- | -- | -- | -- | 10.7 |
| Muscovite | wt % | 2.6 | -- | -- | -- | -- | -- | -- | -- | -- | 5.4 |
| Pyrite | wt % | 0.7 | -- | -- | -- | -- | -- | -- | -- | -- | 0.7 |
| Talc | wt % | 0 | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| Actinolite | wt % | 0 | -- | -- | -- | -- | -- | -- | -- | -- | 0 |
| Dolomite | wt % | 0 | -- | -- | -- | -- | -- | -- | -- | -- | 0 |

| Sample ID | | ODY-ENV-034 | ODY-ENV-035 | ODY-ENV-036 | ODY-ENV-037 | ODY-ENV-038 | ODY-ENV-039 | ODY-ENV-040 | ODY-ENV-073 | ODY-ENV-077 | ODY-ENV-016 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Rock |
| **Odyssey Zone** | | South | South | South | South | South | South | South | South | South | North |
| **Sample Location** | | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Footwall |
| **Lithology Code** | | PO | PO | SE | PO | PO | PO | PO | UM | AP | GA |
| **Alteration Code** | | SR | SR | BT | HM | SI | AK | SR | BT | SI | CB |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.49 | 1.2 | 1.7 | 0.64 | 1.1 | 0.67 | 0.73 | 0.09 | 0.62 | 0.28 |
| Aluminum | mg/kg | 6400 | 9200 | 14000 | 5700 | 7500 | 5300 | 5500 | 21000 | 2100 | 14000 |
| Arsenic | mg/kg | 8.8 | 0.8 | 1.8 | <0.5 | 2.2 | 0.6 | 4.2 | 0.7 | 0.8 | <0.5 |
| Boron | mg/kg | 1 | <1.0 | <1.0 | <1.0 | 2 | <1.0 | 2 | <1.0 | <1.0 | <1.0 |
| Barium | mg/kg | 100 | 71 | 76 | 48 | 130 | 91 | 91 | 200 | 29 | 74 |
| Beryllium | mg/kg | 0.3 | 0.3 | 0.5 | 0.4 | 0.3 | 0.3 | 0.2 | 0.5 | 0.1 | 0.3 |
| Bismuth | mg/kg | 0.67 | 5.5 | 1.2 | 0.94 | 0.44 | 0.90 | 0.95 | 0.20 | 1.0 | 0.18 |
| Calcium | mg/kg | 17000 | 31000 | 22000 | 19000 | 14000 | 17000 | 19000 | 37000 | 10000 | 42000 |
| Cadmium | mg/kg | 0.19 | 0.05 | 0.11 | 0.04 | 0.07 | 0.09 | 0.38 | 0.07 | <0.02 | 0.10 |
| Cobalt | mg/kg | 6.6 | 9.2 | 21 | 6.8 | 5.9 | 5.6 | 6.9 | 41 | 5.5 | 31 |
| Chromium | mg/kg | 15 | 25 | 78 | 15 | 11 | 13 | 9.7 | 890 | 60 | 16 |
| Copper | mg/kg | 12 | 15 | 46 | 9.2 | 9.8 | 10 | 11 | 30 | 5.2 | 100 |
| Iron | mg/kg | 14000 | 19000 | 28000 | 16000 | 13000 | 15000 | 15000 | 34000 | 11000 | 46000 |
| Potassium | mg/kg | 4900 | 1500 | 8200 | 1300 | 6100 | 5100 | 5100 | 21000 | 1600 | 15000 |
| Lithium | mg/kg | 7 | 11 | 16 | 5 | 9 | 6 | 4 | 21 | <2.0 | 17 |
| Magnesium | mg/kg | 4700 | 10000 | 13000 | 6200 | 5400 | 5200 | 2800 | 44000 | 1400 | 16000 |
| Manganese | mg/kg | 240 | 400 | 440 | 200 | 200 | 260 | 240 | 730 | 100 | 680 |
| Molybdenum | mg/kg | 9.1 | 2.7 | 5.0 | 0.5 | 6.3 | 2.9 | 6.6 | 7.1 | 23 | 5.3 |
| Sodium | mg/kg | 270 | 350 | 190 | 380 | 330 | 310 | 220 | 110 | 47 | 350 |
| Nickel | mg/kg | 13 | 25 | 74 | 9.8 | 18 | 8.2 | 9.7 | 310 | 9.6 | 27 |
| Phosphorus | mg/kg | 930 | 690 | 440 | 890 | 730 | 880 | 900 | 62 | 630 | 600 |
| Lead | mg/kg | 32 | 7.6 | 7.5 | 7.4 | 29 | 13 | 47 | 5.6 | 2.6 | 18 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | 1.1 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 450 | 600 | 1200 | 440 | 590 | 480 | 570 | 1400 | 330 | 2500 |
| Tin | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 160 | 140 | 130 | 130 | 93 | 390 | 280 | 230 | 54 | 80 |
| Titanium | mg/kg | 300 | 240 | 560 | 160 | 370 | 550 | 340 | 1200 | 26 | 1600 |
| Thallium | mg/kg | 0.05 | <0.02 | 0.20 | <0.02 | 0.06 | 0.14 | 0.07 | 0.45 | <0.02 | 0.22 |
| Uranium | mg/kg | 0.75 | 0.85 | 1.1 | 0.87 | 0.80 | 0.84 | 0.92 | 0.13 | 0.19 | 0.15 |
| Vanadium | mg/kg | 12 | 24 | 30 | 22 | 14 | 21 | 11 | 67 | 7 | 230 |
| Zinc | mg/kg | 62 | 41 | 79 | 30 | 42 | 45 | 94 | 36 | 9.1 | 72 |
| Fluoride | mg/kg | -- | -- | -- | -- | -- | 2 | -- | -- | -- | -- |
| Bromide | mg/kg | -- | -- | -- | -- | -- | <1.5 | -- | -- | -- | -- |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 9.69 | 9.56 | 9.52 | 9.43 | 9.74 | 9.72 | 9.34 | 9.74 | 9.46 | 10.15 |
| Fizz Rate | --- | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 3 |
| Sample weight | g | 2.03 | 2.00 | 2.05 | 2.06 | 1.97 | 2.05 | 1.96 | 2.07 | 2.00 | 1.97 |
| HCl Added | mL | 32.00 | 32.00 | 41.68 | 41.52 | 25.20 | 40.00 | 40.00 | 100.00 | 20.00 | 83.00 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 12.80 | 14.65 | 17.36 | 19.38 | 10.91 | 20.20 | 21.16 | 36.21 | 11.03 | 36.61 |
| Final pH | | 1.67 | 1.59 | 1.66 | 1.51 | 1.63 | 1.53 | 1.51 | 1.58 | 1.44 | 1.59 |
| NP | kg CaCO3/t | 47 | 43 | 59 | 54 | 36 | 48 | 48 | 154 | 22 | 118 |

| Sample ID | | ODY-ENV-034 | ODY-ENV-035 | ODY-ENV-036 | ODY-ENV-037 | ODY-ENV-038 | ODY-ENV-039 | ODY-ENV-040 | ODY-ENV-073 | ODY-ENV-077 | ODY-ENV-016 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Ore | Rock |
| **Odyssey Zone** | | South | South | South | South | South | South | South | South | South | North |
| **Sample Location** | | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Footwall |
| **Lithology Code** | | PO | PO | SE | PO | PO | PO | PO | UM | AP | GA |
| **Alteration Code** | | SR | SR | BT | HM | SI | AK | SR | BT | SI | CB |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 18.4 | 12.2 | 22.2 | 13.1 | 14.1 | 13.4 | 23.8 | 5.31 | 26.2 | 6.56 |
| Net NP | kg CaCO3/t | 28.9 | 31.2 | 37.1 | 40.6 | 22.2 | 34.9 | 24.4 | 149 | -3.85 | 111 |
| NP/AP | ratio | 2.57 | 3.56 | 2.67 | 4.09 | 2.58 | 3.59 | 2.03 | 29.0 | 0.85 | 18.0 |
| Sulphur (total) | %S | 0.707 | 0.397 | 0.720 | 0.494 | 0.481 | 0.499 | 0.812 | 0.237 | 0.938 | 0.229 |
| Acid Leachable SO4-S | %S | 0.12 | <0.02 | <0.02 | 0.07 | 0.03 | 0.07 | 0.05 | 0.07 | 0.10 | <0.02 |
| Sulphide | %S | 0.59 | 0.39 | 0.71 | 0.42 | 0.45 | 0.43 | 0.76 | 0.17 | 0.84 | 0.21 |
| Carbon (total) | %C | 0.508 | 0.955 | 0.636 | 0.562 | 0.402 | 0.575 | 0.560 | 1.95 | 0.261 | 1.28 |
| Carbonate | %CO3 | 2.03 | 4.27 | 2.68 | 2.40 | 1.61 | 2.37 | 2.21 | 9.00 | 0.949 | 5.86 |
| Carbonate (Calculated) | %C | 0.41 | 0.85 | 0.54 | 0.48 | 0.32 | 0.47 | 0.44 | 1.80 | 0.19 | 1.17 |
| Carb-NP (Calculated) | kg CaCO3/t | 33.86 | 71.23 | 44.71 | 40.04 | 26.86 | 39.54 | 36.87 | 150.14 | 15.83 | 97.75 |
| Carb-NPR (Calculated) | -- | 1.8 | 5.8 | 2.0 | 3.1 | 1.9 | 3.0 | 1.5 | 28.3 | 0.6 | 14.9 |
| C/S | -- | 0.7 | 2.4 | 0.9 | 1.1 | 0.8 | 1.2 | 0.7 | 8.2 | 0.3 | 5.6 |
| Neutralization Capacity | eq/kg | -- | -- | -- | -- | -- | 0.40 | -- | -- | -- | -- |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 68.4 | 62.4 | 59.8 | 63.5 | 71.4 | 69.2 | 69.3 | 41.8 | 79.1 | 46.0 |
| Al2O3 | % | 13.2 | 13.6 | 15.8 | 13.6 | 12.7 | 12.6 | 13.2 | 6.38 | 8.73 | 11.7 |
| Fe2O3 | % | 3.01 | 4.29 | 5.64 | 3.02 | 2.82 | 2.69 | 2.89 | 9.89 | 1.84 | 16.7 |
| MgO | % | 1.38 | 2.66 | 3.02 | 1.34 | 1.45 | 1.10 | 1.00 | 20.8 | 0.33 | 4.80 |
| CaO | % | 2.61 | 4.75 | 3.16 | 2.91 | 2.26 | 2.56 | 2.74 | 7.79 | 1.44 | 8.02 |
| Na2O | % | 1.79 | 3.39 | 1.37 | 3.99 | 2.09 | 2.68 | 1.36 | 0.21 | 0.10 | 4.63 |
| K2O | % | 4.41 | 3.12 | 4.62 | 5.13 | 3.16 | 5.81 | 4.50 | 2.21 | 7.01 | 1.65 |
| TiO2 | % | 0.45 | 0.45 | 0.58 | 0.46 | 0.42 | 0.41 | 0.44 | 0.32 | 0.27 | 2.33 |
| P2O5 | % | 0.21 | 0.16 | 0.10 | 0.21 | 0.18 | 0.21 | 0.21 | 0.01 | 0.16 | 0.19 |
| MnO | % | 0.04 | 0.06 | 0.07 | 0.02 | 0.04 | 0.04 | 0.03 | 0.16 | <0.01 | 0.24 |
| Cr2O3 | % | <0.01 | 0.02 | 0.04 | <0.01 | <0.01 | <0.01 | <0.01 | 0.27 | 0.02 | 0.01 |
| V2O5 | % | <0.01 | <0.01 | 0.03 | 0.01 | <0.01 | <0.01 | 0.02 | 0.02 | <0.01 | 0.09 |
| LOI | % | 3.39 | 4.80 | 4.76 | 2.47 | 2.85 | 2.56 | 3.32 | 9.82 | 1.42 | 4.38 |
| Sum | % | 99.0 | 99.7 | 99.0 | 96.7 | 99.4 | 99.8 | 99.0 | 99.8 | 100.4 | 100.7 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Ankerite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Albite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anorthite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chlorite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Biotite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Microcline | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Muscovite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Talc | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Actinolite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dolomite | wt % | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| Sample ID | | ODY-ENV-017 | ODY-ENV-018 | ODY-ENV-019 | ODY-ENV-020 | ODY-ENV-021 | ODY-ENV-022 | ODY-ENV-023 | ODY-ENV-024 | ODY-ENV-025 | ODY-ENV-026 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | North | North | North | North |
| **Sample Location** | | Footwall | Footwall | Footwall | Footwall | Footwall | Footwall | Footwall | Footwall | Hanging Wall | Hanging Wall |
| **Lithology Code** | | IM | II | PO | UM | UM | UM | SH | SH | UM | PO |
| **Alteration Code** | | BT | BT | SI | CH | BT/AM | TC | CH | TC | TC | AK |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.28 | 0.23 | 0.15 | 0.07 | 0.14 | 0.25 | 0.13 | 0.03 | 0.05 | 0.06 |
| Aluminum | mg/kg | 27000 | 7600 | 6900 | 12000 | 23000 | 23000 | 14000 | 14000 | 8600 | 6700 |
| Arsenic | mg/kg | 2.0 | <0.5 | <0.5 | 0.6 | <0.5 | 0.8 | 4.2 | <0.5 | <0.5 | 0.9 |
| Boron | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Barium | mg/kg | 100 | 140 | 140 | 110 | 140 | 110 | 42 | 82 | 250 | 230 |
| Beryllium | mg/kg | 0.3 | 0.4 | 0.8 | 0.4 | 0.5 | 1.5 | 0.5 | 0.6 | 0.4 | 0.4 |
| Bismuth | mg/kg | 0.14 | 0.44 | 0.41 | 0.61 | 0.37 | 0.59 | 0.18 | 0.17 | <0.09 | <0.09 |
| Calcium | mg/kg | 40000 | 21000 | 21000 | 34000 | 25000 | 41000 | 36000 | 45000 | 45000 | 18000 |
| Cadmium | mg/kg | 0.09 | 0.05 | 0.15 | 0.02 | 0.03 | 0.08 | 0.02 | 0.06 | 0.06 | 0.07 |
| Cobalt | mg/kg | 34 | 7.4 | 6.5 | 35 | 38 | 36 | 29 | 33 | 24 | 6.2 |
| Chromium | mg/kg | 50 | 27 | 18 | 650 | 970 | 940 | 850 | 670 | 540 | 24 |
| Copper | mg/kg | 120 | 10 | 4.7 | 45 | 42 | 16 | 29 | 28 | 29 | 4.6 |
| Iron | mg/kg | 60000 | 18000 | 18000 | 22000 | 33000 | 38000 | 23000 | 25000 | 22000 | 14000 |
| Potassium | mg/kg | 25000 | 8500 | 8600 | 11000 | 23000 | 24000 | 4600 | 14000 | 7300 | 6500 |
| Lithium | mg/kg | 31 | 16 | 12 | 12 | 31 | 35 | 15 | 16 | 6 | 11 |
| Magnesium | mg/kg | 23000 | 6900 | 6900 | 33000 | 44000 | 41000 | 31000 | 45000 | 40000 | 6400 |
| Manganese | mg/kg | 820 | 250 | 250 | 870 | 770 | 730 | 660 | 960 | 950 | 250 |
| Molybdenum | mg/kg | 3.0 | 11 | 0.3 | 3.8 | 8.8 | 7.4 | 0.8 | 0.6 | 0.1 | 0.3 |
| Sodium | mg/kg | 250 | 470 | 510 | 73 | 150 | 190 | 120 | 94 | 50 | 670 |
| Nickel | mg/kg | 39 | 18 | 9.6 | 250 | 380 | 340 | 240 | 290 | 200 | 12 |
| Phosphorus | mg/kg | 430 | 1000 | 910 | 66 | 91 | 190 | 97 | 54 | 77 | 910 |
| Lead | mg/kg | 12 | 13 | 22 | 2.3 | 11 | 9.1 | 5.4 | 5.0 | 4.1 | 23 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | 1.5 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 4200 | 970 | 1900 | 420 | 970 | 1000 | 370 | 600 | 520 | 390 |
| Tin | mg/kg | <0.5 | <0.5 | 0.7 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 45 | 400 | 970 | 350 | 140 | 400 | 210 | 150 | 720 | 410 |
| Titanium | mg/kg | 3000 | 970 | 1100 | 540 | 1500 | 1300 | 300 | 670 | 390 | 730 |
| Thallium | mg/kg | 0.25 | 0.22 | 0.24 | 0.30 | 0.61 | 0.34 | 0.06 | 0.34 | 0.14 | 0.11 |
| Uranium | mg/kg | 0.094 | 0.69 | 0.76 | 0.016 | 0.033 | 0.14 | 0.061 | 0.025 | <0.002 | 0.95 |
| Vanadium | mg/kg | 250 | 39 | 64 | 60 | 100 | 160 | 55 | 65 | 48 | 42 |
| Zinc | mg/kg | 66 | 56 | 73 | 18 | 37 | 75 | 25 | 32 | 14 | 64 |
| Fluoride | mg/kg | -- | -- | 1 | -- | -- | 3 | 3 | -- | -- | -- |
| Bromide | mg/kg | -- | -- | <1.5 | -- | -- | <1.5 | <1.5 | -- | -- | -- |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 10.07 | 9.81 | 10.17 | 9.63 | 9.90 | 9.91 | 9.69 | 9.73 | 9.70 | 9.96 |
| Fizz Rate | --- | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 |
| Sample weight | g | 2.03 | 2.00 | 1.96 | 2.00 | 2.00 | 1.97 | 2.07 | 2.00 | 2.01 | 2.08 |
| HCl Added | mL | 75.00 | 32.00 | 44.00 | 83.20 | 71.50 | 97.00 | 68.00 | 125.00 | 132.00 | 32.00 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 30.73 | 11.13 | 20.84 | 30.02 | 29.04 | 35.20 | 19.95 | 47.12 | 43.08 | 13.71 |
| Final pH | | 1.69 | 1.92 | 1.62 | 1.56 | 1.55 | 1.55 | 1.70 | 1.55 | 1.56 | 1.59 |
| NP | kg CaCO3/t | 109 | 52 | 59 | 133 | 106 | 157 | 116 | 195 | 221 | 44 |

| Sample ID | | ODY-ENV-017 | ODY-ENV-018 | ODY-ENV-019 | ODY-ENV-020 | ODY-ENV-021 | ODY-ENV-022 | ODY-ENV-023 | ODY-ENV-024 | ODY-ENV-025 | ODY-ENV-026 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | North | North | North | North |
| **Sample Location** | | Footwall | Footwall | Footwall | Footwall | Footwall | Footwall | Footwall | Footwall | Hanging Wall | Hanging Wall |
| **Lithology Code** | | IM | II | PO | UM | UM | UM | SH | SH | UM | PO |
| **Alteration Code** | | BT | BT | SI | CH | BT/AM | TC | CH | TC | TC | AK |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 5.31 | 8.75 | 2.81 | 1.56 | 1.25 | 3.44 | 0.62 | 0.94 | 0.62 | 3.12 |
| Net NP | kg CaCO3/t | 104 | 43.4 | 56.3 | 131 | 105 | 153 | 115 | 194 | 221 | 40.9 |
| NP/AP | ratio | 20.5 | 5.97 | 21.0 | 85.1 | 84.9 | 45.6 | 186 | 208 | 354 | 14.1 |
| Sulphur (total) | %S | 0.204 | 0.327 | 0.149 | 0.110 | 0.099 | 0.167 | 0.069 | 0.073 | 0.059 | 0.121 |
| Acid Leachable SO4-S | %S | 0.03 | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.04 | 0.04 | <0.02 |
| Sulphide | %S | 0.17 | 0.28 | 0.09 | 0.05 | 0.04 | 0.11 | 0.02 | 0.03 | 0.02 | 0.10 |
| Carbon (total) | %C | 1.21 | 0.615 | 0.627 | 1.64 | 1.29 | 1.96 | 1.43 | 2.51 | 2.77 | 0.503 |
| Carbonate | %CO3 | 5.66 | 2.59 | 2.69 | 7.86 | 6.13 | 9.09 | 6.69 | 12.6 | 13.8 | 2.15 |
| Carbonate (Calculated) | %C | 1.13 | 0.52 | 0.54 | 1.57 | 1.23 | 1.82 | 1.34 | 2.52 | 2.76 | 0.43 |
| Carb-NP (Calculated) | kg CaCO3/t | 94.42 | 43.21 | 44.87 | 131.12 | 102.26 | 151.64 | 111.60 | 210.19 | 230.21 | 35.87 |
| Carb-NPR (Calculated) | -- | 17.8 | 4.9 | 16.0 | 84.0 | 81.8 | 44.1 | 180.0 | 223.6 | 371.3 | 11.5 |
| C/S | -- | 5.9 | 1.9 | 4.2 | 14.9 | 13.0 | 11.7 | 20.7 | 34.4 | 46.9 | 4.2 |
| Neutralization Capacity | eq/kg | -- | -- | 0.40 | -- | -- | 0.40 | 0.40 | -- | -- | -- |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 47.1 | 64.1 | 64.3 | 40.9 | 42.6 | 47.6 | 43.2 | 39.1 | 37.6 | 64.9 |
| Al2O3 | % | 12.1 | 14.6 | 14.3 | 5.20 | 6.36 | 8.07 | 6.07 | 4.85 | 4.73 | 15.6 |
| Fe2O3 | % | 14.7 | 3.14 | 3.09 | 10.6 | 11.0 | 8.12 | 10.4 | 9.83 | 10.3 | 3.06 |
| MgO | % | 5.68 | 1.29 | 1.16 | 24.1 | 21.5 | 14.1 | 22.0 | 24.6 | 25.5 | 1.23 |
| CaO | % | 7.64 | 2.96 | 2.90 | 7.42 | 7.65 | 8.32 | 7.66 | 6.92 | 6.61 | 3.04 |
| Na2O | % | 3.21 | 4.31 | 5.10 | 0.08 | 0.26 | 0.57 | 0.46 | 0.07 | 0.04 | 6.37 |
| K2O | % | 2.89 | 5.25 | 4.99 | 1.13 | 2.53 | 3.84 | 0.46 | 1.40 | 0.73 | 2.63 |
| TiO2 | % | 1.42 | 0.50 | 0.49 | 0.33 | 0.44 | 0.31 | 0.35 | 0.30 | 0.31 | 0.50 |
| P2O5 | % | 0.13 | 0.24 | 0.23 | 0.02 | 0.02 | 0.05 | 0.03 | 0.01 | 0.02 | 0.22 |
| MnO | % | 0.22 | 0.04 | 0.03 | 0.17 | 0.17 | 0.14 | 0.15 | 0.16 | 0.16 | 0.03 |
| Cr2O3 | % | 0.01 | <0.01 | 0.01 | 0.32 | 0.29 | 0.18 | 0.31 | 0.29 | 0.30 | <0.01 |
| V2O5 | % | 0.06 | <0.01 | 0.02 | 0.03 | 0.03 | 0.04 | 0.03 | 0.02 | 0.03 | <0.01 |
| LOI | % | 4.67 | 2.36 | 2.29 | 9.85 | 7.38 | 8.40 | 9.26 | 13.0 | 14.2 | 2.05 |
| Sum | % | 99.9 | 98.8 | 98.9 | 100.2 | 100.2 | 99.7 | 100.4 | 100.5 | 100.6 | 99.6 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | -- | -- | 12.9 | -- | -- | 15 | 1.9 | -- | -- | -- |
| Ankerite | wt % | -- | -- | 0.4 | -- | -- | 0.8 | 0.5 | -- | -- | -- |
| Albite | wt % | -- | -- | 44.7 | -- | -- | 1.7 | 2.8 | -- | -- | -- |
| Anorthite | wt % | -- | -- | 3.8 | -- | -- | 10.4 | 3.6 | -- | -- | -- |
| Chlorite | wt % | -- | -- | 1 | -- | -- | 5.6 | 28.3 | -- | -- | -- |
| Biotite | wt % | -- | -- | 5.8 | -- | -- | 21.3 | 10.8 | -- | -- | -- |
| Calcite | wt % | -- | -- | 5.3 | -- | -- | 6.4 | 9 | -- | -- | -- |
| Microcline | wt % | -- | -- | 24 | -- | -- | 3.5 | 3 | -- | -- | -- |
| Muscovite | wt % | -- | -- | 1.6 | -- | -- | 7 | 0.2 | -- | -- | -- |
| Pyrite | wt % | -- | -- | 0.4 | -- | -- | 0.7 | 0 | -- | -- | -- |
| Talc | wt % | -- | -- | 0 | -- | -- | 4.9 | 17 | -- | -- | -- |
| Actinolite | wt % | -- | -- | 0 | -- | -- | 14.5 | 20.4 | -- | -- | -- |
| Dolomite | wt % | -- | -- | 0 | -- | -- | 8.2 | 2.5 | -- | -- | -- |

| Sample ID | | ODY-ENV-027 | ODY-ENV-028 | ODY-ENV-029 | ODY-ENV-030 | ODY-ENV-031 | ODY-ENV-032 | ODY-ENV-070 | ODY-ENV-056 | ODY-ENV-057 | ODY-ENV-058 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | North | North | North | North |
| **Sample Location** | | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Development | Development | Development |
| **Lithology Code** | | PO | PO | PO | PO | PO | PO | IM | PO | PO | PO |
| **Alteration Code** | | BT | AK | BT | HM | SI | BT | CB | SI | AK | BT |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.21 | 0.33 | 0.34 | 0.12 | 0.54 | 0.33 | 2.1 | 0.20 | 0.14 | 0.49 |
| Aluminum | mg/kg | 7500 | 5200 | 7400 | 2400 | 5800 | 7800 | 41000 | 6900 | 7600 | 6300 |
| Arsenic | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 1.0 | <0.5 | 1.3 | <0.5 |
| Boron | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Barium | mg/kg | 170 | 230 | 170 | 120 | 42 | 230 | 54 | 380 | 220 | 200 |
| Beryllium | mg/kg | 0.5 | 0.7 | 0.4 | 0.1 | 0.4 | 0.4 | 1.0 | 0.7 | 0.4 | 0.4 |
| Bismuth | mg/kg | 0.28 | 0.13 | 0.89 | 0.70 | 1.4 | 1.1 | 0.94 | 0.42 | 0.33 | 1.2 |
| Calcium | mg/kg | 19000 | 19000 | 19000 | 9500 | 14000 | 19000 | 46000 | 22000 | 20000 | 18000 |
| Cadmium | mg/kg | 0.17 | 0.39 | 0.07 | <0.02 | 0.04 | 0.08 | 0.06 | 0.19 | 0.08 | 0.11 |
| Cobalt | mg/kg | 6.8 | 5.6 | 6.7 | 2.6 | 4.6 | 6.2 | 36 | 6.2 | 6.5 | 5.8 |
| Chromium | mg/kg | 27 | 16 | 21 | 4.8 | 16 | 19 | 59 | 18 | 19 | 16 |
| Copper | mg/kg | 5.9 | 5.5 | 5.6 | 3.0 | 3.8 | 7.9 | 200 | 6.1 | 4.1 | 8.6 |
| Iron | mg/kg | 16000 | 13000 | 16000 | 5600 | 16000 | 16000 | 87000 | 16000 | 16000 | 14000 |
| Potassium | mg/kg | 7900 | 5700 | 7700 | 1700 | 7300 | 7800 | 40000 | 6500 | 7200 | 6300 |
| Lithium | mg/kg | 10 | 8 | 17 | <2.0 | 8 | 10 | 37 | 10 | 14 | 12 |
| Magnesium | mg/kg | 7200 | 5900 | 7100 | 1200 | 7700 | 6800 | 34000 | 6900 | 6900 | 6400 |
| Manganese | mg/kg | 270 | 240 | 270 | 93 | 180 | 260 | 880 | 290 | 270 | 250 |
| Molybdenum | mg/kg | 0.2 | 0.3 | 0.3 | 1.1 | 0.4 | 0.5 | 7.5 | 0.3 | 0.2 | 0.3 |
| Sodium | mg/kg | 590 | 570 | 650 | 550 | 120 | 640 | 200 | 560 | 660 | 530 |
| Nickel | mg/kg | 15 | 8.9 | 11 | 2.0 | 16 | 10 | 53 | 9.6 | 10 | 9.4 |
| Phosphorus | mg/kg | 950 | 820 | 950 | 440 | 12 | 930 | 460 | 1000 | 950 | 890 |
| Lead | mg/kg | 26 | 15 | 43 | 3.7 | 50 | 42 | 6.3 | 34 | 13 | 41 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 430 | 370 | 340 | 400 | 360 | 660 | 6100 | 620 | 310 | 320 |
| Tin | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.7 | <0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 380 | 840 | 340 | 110 | 220 | 170 | 210 | 1200 | 460 | 390 |
| Titanium | mg/kg | 880 | 580 | 1100 | 32 | 570 | 960 | 3600 | 830 | 760 | 720 |
| Thallium | mg/kg | 0.17 | 0.12 | 0.11 | <0.02 | 0.21 | 0.16 | 0.47 | 0.11 | 0.11 | 0.12 |
| Uranium | mg/kg | 1.4 | 0.95 | 1.0 | 0.67 | 0.37 | 1.2 | 0.13 | 1.2 | 1.1 | 1.0 |
| Vanadium | mg/kg | 53 | 48 | 50 | 6 | 29 | 38 | 200 | 54 | 41 | 34 |
| Zinc | mg/kg | 83 | 70 | 76 | 8.9 | 23 | 72 | 85 | 60 | 75 | 71 |
| Fluoride | mg/kg | -- | 2 | -- | 1 | -- | 3 | -- | 2 | 4 | -- |
| Bromide | mg/kg | -- | <1.5 | -- | <1.5 | -- | <1.5 | -- | <1.5 | <1.5 | -- |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 9.90 | 9.86 | 9.09 | 10.03 | 10.01 | 8.97 | 10.01 | 9.80 | 9.01 | 9.02 |
| Fizz Rate | --- | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 |
| Sample weight | g | 2.03 | 2.07 | 1.98 | 2.00 | 2.04 | 2.00 | 1.94 | 2.01 | 1.96 | 2.04 |
| HCl Added | mL | 32.00 | 32.00 | 32.00 | 20.00 | 28.20 | 32.00 | 91.00 | 40.00 | 32.00 | 30.00 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 13.18 | 10.65 | 15.48 | 10.72 | 11.05 | 14.98 | 42.01 | 16.74 | 12.77 | 11.20 |
| Final pH | | 1.61 | 1.88 | 1.50 | 1.35 | 1.63 | 1.58 | 1.61 | 1.63 | 1.64 | 1.69 |
| NP | kg CaCO3/t | 46 | 52 | 42 | 23 | 42 | 42 | 126 | 58 | 49 | 46 |

| Sample ID | | ODY-ENV-027 | ODY-ENV-028 | ODY-ENV-029 | ODY-ENV-030 | ODY-ENV-031 | ODY-ENV-032 | ODY-ENV-070 | ODY-ENV-056 | ODY-ENV-057 | ODY-ENV-058 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | North | North | North | North |
| **Sample Location** | | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Development | Development | Development |
| **Lithology Code** | | PO | PO | PO | PO | PO | PO | IM | PO | PO | PO |
| **Alteration Code** | | BT | AK | BT | HM | SI | BT | CB | SI | AK | BT |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 1.25 | 3.75 | 2.19 | 5.62 | 25.3 | 0.62 | 44.1 | 3.44 | 1.88 | 2.50 |
| Net NP | kg CaCO3/t | 45.2 | 47.8 | 39.5 | 17.6 | 16.7 | 41.9 | 82.2 | 54.5 | 47.2 | 43.6 |
| NP/AP | ratio | 37.1 | 13.8 | 19.1 | 4.12 | 1.66 | 68.0 | 2.87 | 16.8 | 26.2 | 18.4 |
| Sulphur (total) | %S | 0.077 | 0.163 | 0.159 | 0.246 | 0.852 | 0.132 | 1.45 | 0.166 | 0.140 | 0.176 |
| Acid Leachable SO4-S | %S | 0.04 | 0.04 | 0.09 | 0.07 | 0.04 | 0.11 | 0.04 | 0.06 | 0.08 | 0.10 |
| Sulphide | %S | 0.04 | 0.12 | 0.07 | 0.18 | 0.81 | 0.02 | 1.41 | 0.11 | 0.06 | 0.08 |
| Carbon (total) | %C | 0.527 | 0.581 | 0.457 | 0.258 | 0.529 | 0.469 | 1.35 | 0.615 | 0.539 | 0.516 |
| Carbonate | %CO3 | 2.36 | 2.55 | 1.97 | 1.00 | 2.13 | 2.01 | 5.70 | 2.67 | 2.30 | 2.09 |
| Carbonate (Calculated) | %C | 0.47 | 0.51 | 0.39 | 0.20 | 0.43 | 0.40 | 1.14 | 0.53 | 0.46 | 0.42 |
| Carb-NP (Calculated) | kg CaCO3/t | 39.37 | 42.54 | 32.86 | 16.68 | 35.53 | 33.53 | 95.09 | 44.54 | 38.37 | 34.86 |
| Carb-NPR (Calculated) | -- | 31.5 | 11.3 | 15.0 | 3.0 | 1.4 | 54.1 | 2.2 | 12.9 | 20.4 | 13.9 |
| C/S | -- | 6.8 | 3.6 | 2.9 | 1.0 | 0.6 | 3.6 | 0.9 | 3.7 | 3.9 | 2.9 |
| Neutralization Capacity | eq/kg | -- | 0.40 | -- | 0.40 | -- | 0.00 | -- | 0.40 | 0.40 | -- |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 64.4 | 65.6 | 64.8 | 70.2 | 72.0 | 66.3 | 47.9 | 63.0 | 63.1 | 64.8 |
| Al2O3 | % | 15.2 | 14.0 | 15.0 | 14.9 | 10.5 | 14.7 | 10.7 | 15.0 | 15.3 | 14.9 |
| Fe2O3 | % | 3.28 | 2.81 | 3.21 | 1.20 | 2.25 | 3.17 | 13.1 | 3.42 | 3.33 | 3.00 |
| MgO | % | 1.40 | 1.18 | 1.27 | 0.27 | 1.28 | 1.26 | 6.09 | 1.36 | 1.31 | 1.22 |
| CaO | % | 3.08 | 2.79 | 3.13 | 1.36 | 1.89 | 3.03 | 6.48 | 3.25 | 3.14 | 2.94 |
| Na2O | % | 6.05 | 5.47 | 6.11 | 4.44 | 0.39 | 5.89 | 0.21 | 6.38 | 6.00 | 5.91 |
| K2O | % | 3.09 | 3.96 | 2.80 | 6.10 | 8.55 | 2.64 | 6.79 | 3.05 | 3.08 | 3.27 |
| TiO2 | % | 0.50 | 0.44 | 0.49 | 0.20 | 0.35 | 0.48 | 1.43 | 0.53 | 0.50 | 0.47 |
| P2O5 | % | 0.23 | 0.20 | 0.22 | 0.11 | <0.01 | 0.22 | 0.13 | 0.25 | 0.24 | 0.22 |
| MnO | % | 0.04 | 0.04 | 0.05 | <0.01 | 0.01 | 0.04 | 0.19 | 0.04 | 0.04 | 0.04 |
| Cr2O3 | % | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 |
| V2O5 | % | 0.02 | <0.01 | 0.02 | <0.01 | <0.01 | 0.01 | 0.06 | 0.02 | 0.01 | 0.02 |
| LOI | % | 2.56 | 2.61 | 2.38 | 1.42 | 1.87 | 2.48 | 5.92 | 2.43 | 2.45 | 2.13 |
| Sum | % | 99.8 | 99.0 | 99.5 | 100.2 | 99.0 | 100.2 | 99.0 | 98.7 | 98.6 | 98.9 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | -- | 19 | -- | -- | -- | 20.6 | -- | -- | 15.1 | -- |
| Ankerite | wt % | -- | 0.6 | -- | -- | -- | 0 | -- | -- | 0 | -- |
| Albite | wt % | -- | 42.9 | -- | -- | -- | 49.3 | -- | -- | 52.5 | -- |
| Anorthite | wt % | -- | 6.8 | -- | -- | -- | 6.4 | -- | -- | 4.7 | -- |
| Chlorite | wt % | -- | 1.3 | -- | -- | -- | 2 | -- | -- | 2 | -- |
| Biotite | wt % | -- | 4.5 | -- | -- | -- | 4.3 | -- | -- | 4.5 | -- |
| Calcite | wt % | -- | 5.2 | -- | -- | -- | 4.5 | -- | -- | 5.1 | -- |
| Microcline | wt % | -- | 17.1 | -- | -- | -- | 7.2 | -- | -- | 11.2 | -- |
| Muscovite | wt % | -- | 2.2 | -- | -- | -- | 5.3 | -- | -- | 4.2 | -- |
| Pyrite | wt % | -- | 0.4 | -- | -- | -- | 0.4 | -- | -- | 0.6 | -- |
| Talc | wt % | -- | 0 | -- | -- | -- | 0 | -- | -- | 0 | -- |
| Actinolite | wt % | -- | 0 | -- | -- | -- | 0 | -- | -- | 0 | -- |
| Dolomite | wt % | -- | 0 | -- | -- | -- | 0 | -- | -- | 0 | -- |

| Sample ID | | ODY-ENV-059 | ODY-ENV-060 | ODY-ENV-061 | ODY-ENV-062 | ODY-ENV-071 | ODY-ENV-072 | ODY-ENV-041 | ODY-ENV-042 | ODY-ENV-043 | ODY-ENV-044 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | South | South | South | South |
| **Sample Location** | | Development | Development | Development | Development | Development | Development | Footwall | Footwall | Footwall | Footwall |
| **Lithology Code** | | GA | PO | PO | PO | SE | UM | PO | PO | PO | PO |
| **Alteration Code** | | LX | BT | BT | BT | BT | CH | BT | SI | BT | BT |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.45 | 0.22 | 0.07 | 0.48 | 0.42 | 0.07 | 0.12 | 0.09 | 0.13 | 2.9 |
| Aluminum | mg/kg | 24000 | 5700 | 8200 | 6700 | 22000 | 26000 | 5700 | 3600 | 7800 | 5000 |
| Arsenic | mg/kg | 1.3 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 1.6 | <0.5 | <0.5 |
| Boron | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | 1 | <1.0 | <1.0 |
| Barium | mg/kg | 450 | 170 | 230 | 170 | 290 | 280 | 65 | 140 | 200 | 310 |
| Beryllium | mg/kg | 0.8 | 0.4 | 0.3 | 0.4 | 0.2 | 1.0 | 0.4 | 0.2 | 0.3 | 0.2 |
| Bismuth | mg/kg | 1.2 | 0.53 | 0.14 | 0.62 | 1.8 | 0.26 | 0.21 | 0.18 | <0.09 | 9.7 |
| Calcium | mg/kg | 40000 | 21000 | 19000 | 19000 | 6400 | 7500 | 20000 | 1700 | 20000 | 16000 |
| Cadmium | mg/kg | 0.19 | 0.08 | 0.09 | 0.08 | 0.08 | 0.02 | 0.05 | 0.08 | 0.09 | 0.08 |
| Cobalt | mg/kg | 34 | 6.2 | 7.5 | 6.1 | 20 | 33 | 6.4 | 2.4 | 6.0 | 5.0 |
| Chromium | mg/kg | 48 | 16 | 17 | 18 | 160 | 800 | 15 | 14 | 17 | 17 |
| Copper | mg/kg | 69 | 9.4 | 15 | 8.7 | 42 | 7.0 | 8.4 | 7.7 | 3.3 | 8.1 |
| Iron | mg/kg | 53000 | 13000 | 17000 | 15000 | 37000 | 34000 | 13000 | 4800 | 16000 | 12000 |
| Potassium | mg/kg | 27000 | 4100 | 7800 | 7000 | 21000 | 32000 | 1700 | 2500 | 7700 | 3900 |
| Lithium | mg/kg | 30 | 9 | 14 | 13 | 25 | 67 | 6 | 3 | 8 | 4 |
| Magnesium | mg/kg | 34000 | 5700 | 7200 | 6200 | 17000 | 43000 | 5500 | 1900 | 6300 | 4200 |
| Manganese | mg/kg | 990 | 260 | 290 | 260 | 450 | 430 | 250 | 39 | 270 | 230 |
| Molybdenum | mg/kg | 3.4 | 0.9 | 0.4 | 0.5 | 3.9 | 0.7 | 0.3 | 2.5 | 0.3 | 0.4 |
| Sodium | mg/kg | 300 | 630 | 660 | 560 | 480 | 170 | 510 | 370 | 540 | 490 |
| Nickel | mg/kg | 73 | 9.6 | 11 | 9.7 | 74 | 360 | 9.0 | 7.9 | 9.2 | 9.2 |
| Phosphorus | mg/kg | 580 | 930 | 1000 | 870 | 570 | 120 | 1100 | 210 | 990 | 720 |
| Lead | mg/kg | 85 | 22 | 13 | 30 | 62 | 11 | 10 | 5.6 | 8.6 | 38 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 1700 | 260 | 720 | 430 | 1900 | 190 | 400 | 310 | 460 | 290 |
| Tin | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 420 | 320 | 390 | 360 | 18 | 120 | 180 | 46 | 420 | 270 |
| Titanium | mg/kg | 2300 | 500 | 930 | 790 | 2400 | 1900 | 370 | 45 | 980 | 420 |
| Thallium | mg/kg | 0.73 | 0.06 | 0.11 | 0.14 | 0.40 | 0.77 | <0.02 | <0.02 | 0.15 | 0.05 |
| Uranium | mg/kg | 0.17 | 1.1 | 0.91 | 1.1 | 1.2 | 0.69 | 1.0 | 0.61 | 1.3 | 3.0 |
| Vanadium | mg/kg | 240 | 31 | 34 | 34 | 94 | 120 | 21 | 3 | 30 | 19 |
| Zinc | mg/kg | 150 | 56 | 73 | 70 | 70 | 66 | 44 | 10 | 74 | 47 |
| Fluoride | mg/kg | -- | -- | -- | 3 | -- | -- | 2 | -- | -- | 2 |
| Bromide | mg/kg | -- | -- | -- | <1.5 | -- | -- | <1.5 | -- | -- | <1.5 |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 9.22 | 9.04 | 9.07 | 9.03 | 9.52 | 9.39 | 9.55 | 9.71 | 9.98 | 9.85 |
| Fizz Rate | --- | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 4 | 3 |
| Sample weight | g | 1.98 | 2.06 | 2.03 | 1.99 | 2.00 | 2.00 | 1.97 | 1.97 | 2.02 | 2.04 |
| HCl Added | mL | 79.00 | 31.00 | 31.00 | 30.00 | 20.00 | 20.00 | 30.70 | 20.00 | 40.00 | 31.20 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 32.62 | 10.69 | 12.82 | 11.27 | 12.43 | 9.61 | 11.89 | 17.24 | 20.02 | 13.66 |
| Final pH | | 1.59 | 1.70 | 1.74 | 1.64 | 1.46 | 1.55 | 1.62 | 1.14 | 1.52 | 1.57 |
| NP | kg CaCO3/t | 117 | 49 | 45 | 47 | 19 | 26 | 48 | 7.0 | 50 | 43 |

| Sample ID | | ODY-ENV-059 | ODY-ENV-060 | ODY-ENV-061 | ODY-ENV-062 | ODY-ENV-071 | ODY-ENV-072 | ODY-ENV-041 | ODY-ENV-042 | ODY-ENV-043 | ODY-ENV-044 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | South | South | South | South |
| **Sample Location** | | Development | Development | Development | Development | Development | Development | Footwall | Footwall | Footwall | Footwall |
| **Lithology Code** | | GA | PO | PO | PO | SE | UM | PO | PO | PO | PO |
| **Alteration Code** | | LX | BT | BT | BT | BT | CH | BT | SI | BT | BT |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 5.94 | 4.06 | 1.56 | 6.25 | 6.56 | 1.56 | 2.50 | 3.44 | 1.25 | 3.44 |
| Net NP | kg CaCO3/t | 111 | 45.2 | 43.2 | 40.8 | 12.3 | 24.4 | 45.2 | 3.56 | 48.2 | 39.6 |
| NP/AP | ratio | 19.7 | 12.1 | 28.7 | 7.54 | 2.88 | 16.6 | 19.1 | 2.04 | 39.6 | 12.5 |
| Sulphur (total) | %S | 0.315 | 0.227 | 0.188 | 0.235 | 0.244 | 0.153 | 0.114 | 0.151 | 0.090 | 0.150 |
| Acid Leachable SO4-S | %S | 0.12 | 0.10 | 0.14 | 0.04 | 0.03 | 0.10 | 0.03 | 0.04 | 0.05 | 0.04 |
| Sulphide | %S | 0.19 | 0.13 | 0.05 | 0.20 | 0.21 | 0.05 | 0.08 | 0.11 | 0.04 | 0.11 |
| Carbon (total) | %C | 1.34 | 0.553 | 0.456 | 0.512 | 0.122 | 0.174 | 0.538 | 0.042 | 0.558 | 0.499 |
| Carbonate | %CO3 | 5.98 | 2.28 | 1.89 | 2.18 | 0.470 | 0.719 | 2.31 | 0.125 | 2.44 | 2.04 |
| Carbonate (Calculated) | %C | 1.20 | 0.46 | 0.38 | 0.44 | 0.09 | 0.14 | 0.46 | 0.03 | 0.49 | 0.41 |
| Carb-NP (Calculated) | kg CaCO3/t | 99.76 | 38.03 | 31.53 | 36.37 | 7.84 | 11.99 | 38.53 | 2.09 | 40.70 | 34.03 |
| Carb-NPR (Calculated) | -- | 16.8 | 9.4 | 20.2 | 5.8 | 1.2 | 7.7 | 15.4 | 0.6 | 32.6 | 9.9 |
| C/S | -- | 4.3 | 2.4 | 2.4 | 2.2 | 0.5 | 1.1 | 4.7 | 0.3 | 6.2 | 3.3 |
| Neutralization Capacity | eq/kg | -- | -- | -- | 0.00 | -- | -- | 0.40 | -- | -- | 0.40 |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 45.0 | 63.9 | 63.0 | 65.4 | 62.9 | 50.4 | 63.4 | 80.0 | 64.6 | 74.1 |
| Al2O3 | % | 10.7 | 15.6 | 15.7 | 14.8 | 16.0 | 5.95 | 15.7 | 11.3 | 15.3 | 10.7 |
| Fe2O3 | % | 15.0 | 3.07 | 3.58 | 2.91 | 5.74 | 9.81 | 3.31 | 1.27 | 3.24 | 2.47 |
| MgO | % | 7.16 | 1.21 | 1.39 | 1.10 | 3.04 | 20.1 | 1.30 | 0.89 | 1.24 | 0.89 |
| CaO | % | 7.10 | 3.25 | 3.39 | 2.90 | 2.58 | 5.77 | 3.02 | 0.40 | 3.09 | 2.44 |
| Na2O | % | 3.47 | 7.09 | 6.20 | 6.01 | 4.42 | 0.56 | 5.74 | 2.01 | 5.58 | 4.07 |
| K2O | % | 3.06 | 1.98 | 2.91 | 2.99 | 3.08 | 3.73 | 3.60 | 2.52 | 3.32 | 2.07 |
| TiO2 | % | 1.81 | 0.49 | 0.55 | 0.45 | 0.59 | 0.44 | 0.54 | 0.21 | 0.50 | 0.35 |
| P2O5 | % | 0.15 | 0.23 | 0.27 | 0.21 | 0.15 | 0.03 | 0.26 | 0.05 | 0.23 | 0.17 |
| MnO | % | 0.23 | 0.03 | 0.03 | 0.03 | 0.07 | 0.15 | 0.04 | 0.02 | 0.04 | 0.04 |
| Cr2O3 | % | 0.03 | 0.01 | <0.01 | <0.01 | 0.03 | 0.22 | <0.01 | <0.01 | <0.01 | <0.01 |
| V2O5 | % | 0.08 | 0.02 | 0.01 | <0.01 | 0.01 | 0.02 | 0.02 | 0.01 | <0.01 | <0.01 |
| LOI | % | 5.76 | 2.65 | 2.70 | 1.96 | 1.23 | 2.91 | 2.59 | 1.50 | 2.45 | 2.11 |
| Sum | % | 99.5 | 99.5 | 99.7 | 98.8 | 99.9 | 100.0 | 99.6 | 100.1 | 99.6 | 99.5 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | -- | -- | -- | 18.3 | -- | -- | 12.5 | -- | -- | -- |
| Ankerite | wt % | -- | -- | -- | 0.5 | -- | -- | 0.2 | -- | -- | -- |
| Albite | wt % | -- | -- | -- | 52 | -- | -- | 46.6 | -- | -- | -- |
| Anorthite | wt % | -- | -- | -- | 4.1 | -- | -- | 5.4 | -- | -- | -- |
| Chlorite | wt % | -- | -- | -- | 0.7 | -- | -- | 5.4 | -- | -- | -- |
| Biotite | wt % | -- | -- | -- | 3.3 | -- | -- | 1.1 | -- | -- | -- |
| Calcite | wt % | -- | -- | -- | 4.7 | -- | -- | 5 | -- | -- | -- |
| Microcline | wt % | -- | -- | -- | 12.2 | -- | -- | 14.7 | -- | -- | -- |
| Muscovite | wt % | -- | -- | -- | 3.7 | -- | -- | 8.5 | -- | -- | -- |
| Pyrite | wt % | -- | -- | -- | 0.5 | -- | -- | 0.6 | -- | -- | -- |
| Talc | wt % | -- | -- | -- | 0 | -- | -- | 0 | -- | -- | -- |
| Actinolite | wt % | -- | -- | -- | 0 | -- | -- | 0 | -- | -- | -- |
| Dolomite | wt % | -- | -- | -- | 0 | -- | -- | 0 | -- | -- | -- |

| Sample ID | | ODY-ENV-045 | ODY-ENV-046 | ODY-ENV-047 | ODY-ENV-068 | ODY-ENV-074 | ODY-ENV-048 | ODY-ENV-049 | ODY-ENV-050 | ODY-ENV-051 | ODY-ENV-052 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | South | South | South | South | South | South | South | South | South | South |
| **Sample Location** | | Footwall | Footwall | Footwall | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall |
| **Lithology Code** | | PO | PO | PO | PO | II | PO | BA | BA | SE | SE |
| **Alteration Code** | | BT | SR | BT | BT | CH | SR | CB | CH | BT | BT |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.14 | 0.19 | 0.11 | 0.13 | 0.03 | 0.36 | 0.15 | 0.02 | 0.17 | 0.38 |
| Aluminum | mg/kg | 7700 | 7900 | 7800 | 7300 | 20000 | 5900 | 40000 | 34000 | 18000 | 19000 |
| Arsenic | mg/kg | <0.5 | 2.2 | 9.4 | <0.5 | <0.5 | 11 | 2.9 | <0.5 | 0.6 | 1.1 |
| Boron | mg/kg | <1.0 | 1 | <1.0 | <1.0 | <1.0 | 1 | <1.0 | <1.0 | <1.0 | <1.0 |
| Barium | mg/kg | 250 | 160 | 230 | 140 | 24 | 78 | 420 | 160 | 140 | 96 |
| Beryllium | mg/kg | 0.4 | 0.3 | 0.3 | 0.3 | 0.8 | 0.2 | 0.5 | 0.7 | 0.3 | 0.4 |
| Bismuth | mg/kg | 0.54 | 0.28 | 0.27 | 0.16 | <0.09 | 0.61 | 0.12 | 0.40 | 0.34 | 2.4 |
| Calcium | mg/kg | 20000 | 18000 | 19000 | 20000 | 74000 | 17000 | 53000 | 68000 | 13000 | 11000 |
| Cadmium | mg/kg | 0.17 | 0.15 | 0.08 | 0.07 | 0.23 | 0.07 | 0.13 | 0.09 | 0.07 | 0.05 |
| Cobalt | mg/kg | 6.1 | 7.2 | 6.7 | 6.4 | 16 | 7.8 | 34 | 27 | 19 | 22 |
| Chromium | mg/kg | 17 | 10.0 | 17 | 14 | 190 | 8.5 | 96 | 260 | 87 | 74 |
| Copper | mg/kg | 6.8 | 13 | 4.6 | 5.0 | 4.7 | 12 | 37 | 2.2 | 39 | 39 |
| Iron | mg/kg | 16000 | 16000 | 16000 | 15000 | 36000 | 16000 | 56000 | 43000 | 30000 | 32000 |
| Potassium | mg/kg | 7900 | 7600 | 7700 | 5100 | 3100 | 3100 | 34000 | 15000 | 17000 | 17000 |
| Lithium | mg/kg | 10 | 10 | 9 | 8 | 22 | 7 | 36 | 39 | 19 | 21 |
| Magnesium | mg/kg | 6100 | 5200 | 5900 | 6000 | 24000 | 4500 | 39000 | 45000 | 14000 | 15000 |
| Manganese | mg/kg | 260 | 270 | 280 | 260 | 750 | 240 | 890 | 820 | 450 | 410 |
| Molybdenum | mg/kg | 1.9 | 1.5 | 0.4 | 0.8 | 2.6 | 9.8 | 2.2 | 6.3 | 2.0 | 2.6 |
| Sodium | mg/kg | 700 | 310 | 540 | 580 | 94 | 320 | 210 | 140 | 370 | 210 |
| Nickel | mg/kg | 9.4 | 10 | 11 | 9.4 | 46 | 13 | 100 | 170 | 68 | 80 |
| Phosphorus | mg/kg | 960 | 1000 | 980 | 940 | 1000 | 920 | 52 | 7 | 560 | 580 |
| Lead | mg/kg | 15 | 16 | 6.6 | 8.1 | 4.4 | 16 | 8.1 | 3.3 | 5.0 | 5.6 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 520 | 610 | 590 | 280 | 770 | 310 | 4000 | 1400 | 1700 | 2300 |
| Tin | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 570 | 180 | 360 | 310 | 340 | 120 | 210 | 200 | 43 | 39 |
| Titanium | mg/kg | 880 | 770 | 830 | 540 | 710 | 310 | 1200 | 810 | 1700 | 1500 |
| Thallium | mg/kg | 0.14 | 0.09 | 0.11 | 0.07 | 0.03 | <0.02 | 0.64 | 0.24 | 0.35 | 0.48 |
| Uranium | mg/kg | 1.2 | 1.2 | 1.0 | 0.98 | 1.3 | 0.95 | 0.042 | 0.080 | 0.92 | 1.2 |
| Vanadium | mg/kg | 27 | 17 | 21 | 24 | 75 | 9 | 110 | 110 | 43 | 40 |
| Zinc | mg/kg | 84 | 68 | 68 | 67 | 93 | 43 | 110 | 110 | 70 | 73 |
| Fluoride | mg/kg | -- | 3 | -- | -- | -- | -- | -- | 5 | 4 | -- |
| Bromide | mg/kg | -- | <1.5 | -- | -- | -- | -- | -- | <1.5 | <1.5 | -- |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 9.88 | 9.90 | 9.73 | 9.87 | 9.28 | 9.60 | 9.86 | 9.17 | 10.03 | 9.94 |
| Fizz Rate | --- | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 3 |
| Sample weight | g | 2.00 | 2.00 | 2.02 | 2.01 | 2.01 | 2.00 | 1.97 | 2.02 | 1.96 | 2.11 |
| HCl Added | mL | 40.00 | 40.00 | 40.00 | 40.00 | 98.00 | 30.50 | 90.00 | 95.00 | 30.00 | 26.00 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 18.99 | 21.88 | 20.15 | 20.34 | 44.47 | 13.01 | 29.20 | 20.52 | 16.10 | 13.73 |
| Final pH | | 1.58 | 1.50 | 1.51 | 1.56 | 1.78 | 1.57 | 1.82 | 1.92 | 1.58 | 1.62 |
| NP | kg CaCO3/t | 52 | 45 | 49 | 49 | 133 | 44 | 154 | 184 | 35 | 29 |

| Sample ID | | ODY-ENV-045 | ODY-ENV-046 | ODY-ENV-047 | ODY-ENV-068 | ODY-ENV-074 | ODY-ENV-048 | ODY-ENV-049 | ODY-ENV-050 | ODY-ENV-051 | ODY-ENV-052 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | South | South | South | South | South | South | South | South | South | South |
| **Sample Location** | | Footwall | Footwall | Footwall | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall |
| **Lithology Code** | | PO | PO | PO | PO | II | PO | BA | BA | SE | SE |
| **Alteration Code** | | BT | SR | BT | BT | CH | SR | CB | CH | BT | BT |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 3.12 | 11.2 | 10.6 | 1.88 | 0.62 | 30.0 | 5.62 | 0.62 | 6.56 | 5.94 |
| Net NP | kg CaCO3/t | 49.4 | 34.0 | 38.5 | 47.0 | 132 | 13.7 | 149 | 184 | 28.8 | 23.2 |
| NP/AP | ratio | 16.8 | 4.03 | 4.62 | 26.1 | 213 | 1.46 | 27.4 | 297 | 5.39 | 4.90 |
| Sulphur (total) | %S | 0.124 | 0.436 | 0.412 | 0.084 | 0.057 | 0.973 | 0.222 | 0.006 | 0.230 | 0.225 |
| Acid Leachable SO4-S | %S | 0.02 | 0.08 | 0.07 | 0.02 | 0.04 | <0.02 | 0.04 | <0.02 | 0.02 | 0.04 |
| Sulphide | %S | 0.10 | 0.36 | 0.34 | 0.06 | 0.02 | 0.96 | 0.18 | <0.02 | 0.21 | 0.19 |
| Carbon (total) | %C | 0.608 | 0.524 | 0.559 | 0.565 | 2.17 | 0.486 | 1.76 | 2.16 | 0.360 | 0.280 |
| Carbonate | %CO3 | 2.49 | 2.12 | 2.31 | 2.42 | 10.4 | 1.93 | 8.16 | 10.5 | 1.43 | 1.19 |
| Carbonate (Calculated) | %C | 0.50 | 0.42 | 0.46 | 0.48 | 2.08 | 0.39 | 1.63 | 2.10 | 0.29 | 0.24 |
| Carb-NP (Calculated) | kg CaCO3/t | 41.54 | 35.37 | 38.53 | 40.37 | 173.49 | 32.20 | 136.12 | 175.16 | 23.85 | 19.85 |
| Carb-NPR (Calculated) | -- | 13.3 | 3.2 | 3.6 | 21.5 | 279.8 | 1.1 | 24.2 | 282.5 | 3.6 | 3.3 |
| C/S | -- | 4.9 | 1.2 | 1.4 | 6.7 | 38.1 | 0.5 | 7.9 | 360.0 | 1.6 | 1.2 |
| Neutralization Capacity | eq/kg | -- | 0.40 | -- | -- | -- | -- | -- | 0.40 | 0.40 | -- |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 64.3 | 65.0 | 64.1 | 64.1 | 44.2 | 66.8 | 41.8 | 39.9 | 63.4 | 57.8 |
| Al2O3 | % | 15.2 | 15.7 | 15.6 | 15.3 | 14.0 | 14.4 | 15.5 | 12.5 | 15.4 | 18.2 |
| Fe2O3 | % | 3.18 | 3.34 | 3.37 | 3.32 | 7.57 | 3.38 | 9.59 | 9.41 | 5.39 | 6.69 |
| MgO | % | 1.23 | 1.43 | 1.35 | 1.26 | 5.69 | 1.36 | 8.19 | 12.1 | 2.80 | 3.32 |
| CaO | % | 3.05 | 2.77 | 3.15 | 3.08 | 10.8 | 2.88 | 8.47 | 10.3 | 2.53 | 2.18 |
| Na2O | % | 5.70 | 3.20 | 5.11 | 5.12 | 1.68 | 3.03 | 1.72 | 1.01 | 2.59 | 1.87 |
| K2O | % | 3.32 | 3.90 | 3.05 | 3.77 | 4.28 | 3.45 | 5.48 | 2.18 | 4.12 | 5.54 |
| TiO2 | % | 0.51 | 0.53 | 0.53 | 0.51 | 0.67 | 0.50 | 0.43 | 0.31 | 0.57 | 0.67 |
| P2O5 | % | 0.24 | 0.26 | 0.24 | 0.25 | 0.26 | 0.25 | 0.02 | <0.01 | 0.14 | 0.14 |
| MnO | % | 0.05 | 0.05 | 0.03 | 0.04 | 0.11 | 0.03 | 0.17 | 0.16 | 0.07 | 0.06 |
| Cr2O3 | % | <0.01 | <0.01 | <0.01 | <0.01 | 0.05 | <0.01 | 0.01 | 0.05 | 0.03 | 0.03 |
| V2O5 | % | 0.01 | 0.02 | 0.01 | 0.02 | 0.03 | 0.01 | 0.05 | 0.05 | 0.02 | 0.04 |
| LOI | % | 2.51 | 3.06 | 2.75 | 2.79 | 10.9 | 3.13 | 8.20 | 12.4 | 2.66 | 3.34 |
| Sum | % | 99.2 | 99.2 | 99.3 | 99.5 | 100.2 | 99.2 | 99.6 | 100.5 | 99.7 | 99.9 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | -- | 30.3 | -- | -- | -- | -- | -- | 13.2 | -- | -- |
| Ankerite | wt % | -- | 0 | -- | -- | -- | -- | -- | 0 | -- | -- |
| Albite | wt % | -- | 26.6 | -- | -- | -- | -- | -- | 8.8 | -- | -- |
| Anorthite | wt % | -- | 3.1 | -- | -- | -- | -- | -- | 3.9 | -- | -- |
| Chlorite | wt % | -- | 1.1 | -- | -- | -- | -- | -- | 32 | -- | -- |
| Biotite | wt % | -- | 5.3 | -- | -- | -- | -- | -- | 12.8 | -- | -- |
| Calcite | wt % | -- | 4.1 | -- | -- | -- | -- | -- | 20.9 | -- | -- |
| Microcline | wt % | -- | 1 | -- | -- | -- | -- | -- | 2.8 | -- | -- |
| Muscovite | wt % | -- | 28 | -- | -- | -- | -- | -- | 5.5 | -- | -- |
| Pyrite | wt % | -- | 0.4 | -- | -- | -- | -- | -- | 0 | -- | -- |
| Talc | wt % | -- | 0 | -- | -- | -- | -- | -- | 0 | -- | -- |
| Actinolite | wt % | -- | 0 | -- | -- | -- | -- | -- | 0 | -- | -- |
| Dolomite | wt % | -- | 0 | -- | -- | -- | -- | -- | 0 | -- | -- |

| Sample ID | | ODY-ENV-053 | ODY-ENV-054 | ODY-ENV-055 | ODY-ENV-075 | ODY-ENV-063 | ODY-ENV-064 | ODY-ENV-065 | ODY-ENV-066 | ODY-ENV-067 | ODY-ENV-076 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | South | South | South | South | South | South | South | South | South | South |
| **Sample Location** | | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Development Zone | Development Zone | Development Zone | Development Zone | Development Zone | Development Zone |
| **Lithology Code** | | SE | IM | SE | SH | UM | PO | PO | PO | PO | GA |
| **Alteration Code** | | BT | CB | AK | TC | BT | BT | BT | BT | SR | CB |
| **Solids Content** | | | | | | | | | | | |
| Mercury | mg/kg | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Silver | mg/kg | 0.19 | 0.33 | 0.34 | 0.01 | 0.07 | 0.10 | 0.14 | 0.26 | 0.12 | 0.43 |
| Aluminum | mg/kg | 17000 | 25000 | 17000 | 19000 | 29000 | 5900 | 6700 | 7900 | 6600 | 11000 |
| Arsenic | mg/kg | 1.6 | 0.8 | 5.5 | 0.8 | 4.4 | 0.6 | 0.7 | 1.4 | 7.1 | 4.4 |
| Boron | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Barium | mg/kg | 160 | 230 | 100 | 130 | 200 | 150 | 150 | 120 | 180 | 110 |
| Beryllium | mg/kg | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 |
| Bismuth | mg/kg | 0.51 | 0.83 | 0.68 | <0.09 | 0.16 | 0.61 | 0.21 | 1.0 | 0.40 | 0.25 |
| Calcium | mg/kg | 13000 | 49000 | 14000 | 50000 | 36000 | 21000 | 19000 | 19000 | 19000 | 32000 |
| Cadmium | mg/kg | 0.06 | 0.14 | 0.09 | 0.08 | 0.05 | 0.09 | 0.11 | 0.09 | 0.15 | 0.06 |
| Cobalt | mg/kg | 18 | 38 | 19 | 30 | 39 | 7.0 | 6.4 | 6.5 | 6.8 | 31 |
| Chromium | mg/kg | 110 | 72 | 81 | 930 | 720 | 14 | 15 | 14 | 13 | 29 |
| Copper | mg/kg | 53 | 87 | 45 | 6.1 | 44 | 8.3 | 7.8 | 5.5 | 5.7 | 110 |
| Iron | mg/kg | 30000 | 55000 | 29000 | 34000 | 41000 | 14000 | 15000 | 17000 | 14000 | 41000 |
| Potassium | mg/kg | 16000 | 21000 | 16000 | 20000 | 27000 | 4100 | 6300 | 7600 | 6300 | 10000 |
| Lithium | mg/kg | 14 | 13 | 21 | 14 | 28 | 7 | 8 | 9 | 8 | 11 |
| Magnesium | mg/kg | 13000 | 37000 | 13000 | 50000 | 47000 | 6000 | 5500 | 6300 | 5000 | 12000 |
| Manganese | mg/kg | 470 | 980 | 380 | 900 | 830 | 270 | 260 | 270 | 260 | 540 |
| Molybdenum | mg/kg | 3.1 | 14 | 4.0 | 0.6 | 7.5 | 0.5 | 1.1 | 0.3 | 2.4 | 2.9 |
| Sodium | mg/kg | 460 | 340 | 410 | 48 | 160 | 540 | 530 | 450 | 430 | 350 |
| Nickel | mg/kg | 64 | 66 | 66 | 290 | 230 | 10 | 10 | 9.4 | 10 | 26 |
| Phosphorus | mg/kg | 530 | 180 | 520 | 52 | 120 | 960 | 860 | 1000 | 900 | 740 |
| Lead | mg/kg | 5.5 | 4.4 | 9.9 | 3.3 | 4.6 | 10 | 11 | 19 | 15 | 2.6 |
| Antimony | mg/kg | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| Selenium | mg/kg | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| Silicon | mg/kg | 2200 | 2500 | 1700 | 1200 | 1600 | 210 | 450 | 520 | 470 | 2300 |
| Tin | mg/kg | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Strontium | mg/kg | 60 | 240 | 27 | 290 | 180 | 360 | 380 | 240 | 290 | 37 |
| Titanium | mg/kg | 1600 | 1200 | 1300 | 1100 | 1400 | 370 | 610 | 820 | 600 | 1200 |
| Thallium | mg/kg | 0.39 | 0.44 | 0.35 | 0.46 | 0.58 | 0.08 | 0.09 | 0.17 | 0.08 | 0.20 |
| Uranium | mg/kg | 1.1 | 0.13 | 1.4 | 0.088 | 0.26 | 1.2 | 0.94 | 1.0 | 1.0 | 0.066 |
| Vanadium | mg/kg | 52 | 130 | 43 | 74 | 98 | 20 | 19 | 26 | 17 | 170 |
| Zinc | mg/kg | 62 | 80 | 67 | 29 | 42 | 57 | 70 | 66 | 71 | 57 |
| Fluoride | mg/kg | 4 | -- | -- | -- | 2 | -- | 3 | -- | 3 | -- |
| Bromide | mg/kg | <1.5 | -- | -- | -- | <1.5 | -- | <1.5 | -- | <1.5 | -- |
| **ABA** | | | | | | | | | | | |
| Paste pH | | 10.02 | 9.58 | 9.90 | 9.69 | 9.38 | 9.75 | 9.78 | 9.88 | 9.45 | 9.55 |
| Fizz Rate | --- | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 |
| Sample weight | g | 1.95 | 2.01 | 1.96 | 2.02 | 1.99 | 1.98 | 2.02 | 2.06 | 2.00 | 2.02 |
| HCl Added | mL | 29.00 | 131.00 | 30.00 | 149.00 | 92.30 | 34.00 | 40.00 | 40.00 | 40.00 | 54.00 |
| HCl | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH | Normality | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH to | pH=8.3 mL | 14.80 | 55.84 | 15.03 | 56.74 | 34.31 | 12.54 | 18.52 | 20.42 | 21.27 | 20.36 |
| Final pH | | 1.60 | 1.58 | 1.61 | 1.57 | 1.56 | 1.64 | 1.58 | 1.55 | 1.51 | 1.73 |
| NP | kg CaCO3/t | 36 | 187 | 38 | 228 | 146 | 54 | 53 | 48 | 47 | 83 |

| Sample ID | | ODY-ENV-053 | ODY-ENV-054 | ODY-ENV-055 | ODY-ENV-075 | ODY-ENV-063 | ODY-ENV-064 | ODY-ENV-065 | ODY-ENV-066 | ODY-ENV-067 | ODY-ENV-076 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | South | South | South | South | South | South | South | South | South | South |
| **Sample Location** | | Hanging Wall | Hanging Wall | Hanging Wall | Hanging Wall | Development Zone | Development Zone | Development Zone | Development Zone | Development Zone | Development Zone |
| **Lithology Code** | | SE | IM | SE | SH | UM | PO | PO | PO | PO | GA |
| **Alteration Code** | | BT | CB | AK | TC | BT | BT | BT | BT | SR | CB |
| **ABA (continued)** | | | | | | | | | | | |
| AP | kg CaCO3/t | 7.81 | 12.2 | 9.69 | 0.62 | 0.94 | 3.12 | 6.25 | 6.25 | 11.2 | 13.8 |
| Net NP | kg CaCO3/t | 28.6 | 175 | 28.5 | 228 | 145 | 51.1 | 47.0 | 41.2 | 35.6 | 69.6 |
| NP/AP | ratio | 4.66 | 15.3 | 3.94 | 368 | 155 | 17.3 | 8.51 | 7.60 | 4.16 | 6.06 |
| Sulphur (total) | %S | 0.286 | 0.510 | 0.410 | 0.023 | 0.129 | 0.161 | 0.229 | 0.210 | 0.392 | 0.458 |
| Acid Leachable SO4-S | %S | 0.04 | 0.12 | 0.10 | 0.02 | 0.10 | 0.06 | 0.03 | <0.02 | 0.03 | <0.02 |
| Sulphide | %S | 0.25 | 0.39 | 0.31 | <0.02 | 0.03 | 0.10 | 0.20 | 0.20 | 0.36 | 0.44 |
| Carbon (total) | %C | 0.370 | 2.40 | 0.401 | 2.90 | 1.79 | 0.665 | 0.615 | 0.514 | 0.556 | 0.918 |
| Carbonate | %CO3 | 1.48 | 10.7 | 1.46 | 14.6 | 8.58 | 2.72 | 2.49 | 2.19 | 2.38 | 4.13 |
| Carbonate (Calculated) | %C | 0.30 | 2.14 | 0.29 | 2.92 | 1.72 | 0.54 | 0.50 | 0.44 | 0.48 | 0.83 |
| Carb-NP (Calculated) | kg CaCO3/t | 24.69 | 178.49 | 24.36 | 243.55 | 143.13 | 45.37 | 41.54 | 36.53 | 39.70 | 68.90 |
| Carb-NPR (Calculated) | -- | 3.2 | 14.6 | 2.5 | 392.8 | 152.3 | 14.5 | 6.6 | 5.8 | 3.5 | 5.0 |
| C/S | -- | 1.3 | 4.7 | 1.0 | 126.1 | 13.9 | 4.1 | 2.7 | 2.4 | 1.4 | 2.0 |
| Neutralization Capacity | eq/kg | 0.40 | -- | -- | -- | 0.40 | -- | 0.40 | -- | 0.40 | -- |
| **Whole Rock Analysis** | | | | | | | | | | | |
| SiO2 | % | 64.5 | 45.4 | 64.6 | 39.9 | 41.8 | 64.4 | 66.0 | 64.7 | 65.9 | 46.6 |
| Al2O3 | % | 14.5 | 12.9 | 14.6 | 5.05 | 8.18 | 15.4 | 14.2 | 15.2 | 14.9 | 11.9 |
| Fe2O3 | % | 5.11 | 10.3 | 4.84 | 9.38 | 10.6 | 3.30 | 3.10 | 3.33 | 3.10 | 17.0 |
| MgO | % | 2.59 | 6.89 | 2.51 | 22.3 | 19.2 | 1.26 | 1.20 | 1.34 | 1.24 | 4.93 |
| CaO | % | 2.67 | 7.36 | 2.66 | 7.12 | 6.59 | 3.17 | 2.91 | 2.98 | 2.96 | 7.65 |
| Na2O | % | 4.04 | 4.09 | 2.85 | 0.04 | 0.41 | 5.45 | 4.64 | 4.36 | 4.39 | 4.33 |
| K2O | % | 2.88 | 2.31 | 3.63 | 2.12 | 3.22 | 3.25 | 3.39 | 4.61 | 3.06 | 1.15 |
| TiO2 | % | 0.52 | 0.66 | 0.53 | 0.29 | 0.40 | 0.53 | 0.47 | 0.52 | 0.49 | 2.13 |
| P2O5 | % | 0.13 | 0.05 | 0.13 | 0.02 | 0.04 | 0.24 | 0.22 | 0.26 | 0.23 | 0.19 |
| MnO | % | 0.07 | 0.19 | 0.06 | 0.15 | 0.14 | 0.04 | 0.04 | 0.03 | 0.03 | 0.25 |
| Cr2O3 | % | 0.03 | 0.02 | 0.04 | 0.30 | 0.24 | <0.01 | <0.01 | 0.01 | <0.01 | <0.01 |
| V2O5 | % | 0.02 | 0.05 | <0.01 | 0.02 | 0.03 | <0.01 | 0.02 | 0.01 | 0.01 | 0.08 |
| LOI | % | 2.06 | 9.04 | 2.56 | 13.5 | 9.23 | 3.03 | 2.77 | 2.58 | 2.87 | 3.15 |
| Sum | % | 99.2 | 99.3 | 99.1 | 100.2 | 100.0 | 100.1 | 99.0 | 99.9 | 99.2 | 99.4 |
| **Rietveld Characterization** | | | | | | | | | | | |
| Quartz | wt % | 27.9 | -- | -- | -- | 4.4 | -- | 29 | -- | 27.5 | -- |
| Ankerite | wt % | 0.2 | -- | -- | -- | 0.1 | -- | 0.7 | -- | 0.3 | -- |
| Albite | wt % | 36.4 | -- | -- | -- | 2.1 | -- | 39 | -- | 39.3 | -- |
| Anorthite | wt % | 3.9 | -- | -- | -- | 5.7 | -- | 3.8 | -- | 2.8 | -- |
| Chlorite | wt % | 2.2 | -- | -- | -- | 10.6 | -- | 0 | -- | 0 | -- |
| Biotite | wt % | 11.2 | -- | -- | -- | 24.9 | -- | 2.8 | -- | 4.8 | -- |
| Calcite | wt % | 3.4 | -- | -- | -- | 4.3 | -- | 4 | -- | 4.7 | -- |
| Microcline | wt % | 2.3 | -- | -- | -- | 1.8 | -- | 8.1 | -- | 2.3 | -- |
| Muscovite | wt % | 11.8 | -- | -- | -- | 5.8 | -- | 12.6 | -- | 17.9 | -- |
| Pyrite | wt % | 0.7 | -- | -- | -- | 0.2 | -- | 0 | -- | 0.5 | -- |
| Talc | wt % | 0 | -- | -- | -- | 23.6 | -- | 0 | -- | 0 | -- |
| Actinolite | wt % | 0 | -- | -- | -- | 9.1 | -- | 0 | -- | 0 | -- |
| Dolomite | wt % | 0 | -- | -- | -- | 7.4 | -- | 0 | -- | 0 | -- |

# TCLP Results

| Sample ID | | Detox Final Tail BL 154-50 | Detox Final Tail BL 154-52 | ODY-ENV-001 | ODY-ENV-008 | ODY-ENV-033 | ODY-ENV-039 | ODY-ENV-019 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | -- | -- | Ore | Ore | Ore | Ore | Rock |
| **Odyssey Zone** | | -- | -- | North | North | South | South | North |
| **Sample Location** | | -- | -- | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Footwall |
| **Lithology Code** | | -- | -- | PO | PO | PO | PO | PO |
| **Alteration Code** | | -- | -- | SR | BT | SR | AK | SI |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| Volume D.I. Water | mL | | | | | | | |
| Ext Volume | mL | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | -- | 4.51 | 4.58 | 6.29 | 6.30 | 6.29 | 5.95 | 6.35 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 2580 | 2770 | 4000 | 4020 | 4150 | 3830 | 5360 |
| Alkalinity | mg/L as CaCO3 | 198 | 241 | 2310 | 2460 | 2360 | 2140 | 2430 |
| Sulphate | mg/L | 26 | 28 | 18 | 10 | 8.8 | 6.6 | 4.6 |
| Chloride | mg/L | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | <0.06 | 0.10 | <0.06 | 0.06 | <0.06 | <0.06 | <0.06 |
| Phosphorus (total reactive) | mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Mercury | mg/L | <0.00001 | <0.00001 | 0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 2.36 | 2.41 | <0.01 | <0.01 | <0.01 | 0.02 | <0.01 |
| Arsenic | mg/L | <0.002 | 0.0064 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Silver | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Barium | mg/L | 3.06 | 1.32 | 4.29 | 2.97 | 1.84 | 1.09 | 1.80 |
| Boron | mg/L | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Beryllium | mg/L | 0.00244 | 0.00107 | 0.00017 | 0.00011 | 0.00007 | 0.00018 | 0.00013 |
| Bismuth | mg/L | 0.00013 | 0.00012 | <0.00007 | <0.00007 | <0.00007 | <0.00007 | <0.00007 |
| Calcium | mg/L | 659 | 852 | 424 | 518 | 520 | 415 | 487 |
| Cadmium | mg/L | 0.00634 | 0.00218 | 0.00480 | 0.00117 | 0.00104 | 0.00152 | 0.00297 |
| Chromium | mg/L | 0.0103 | 0.0086 | <0.0003 | <0.0003 | <0.0003 | 0.0004 | <0.0003 |
| Cobalt | mg/L | 0.00539 | 0.00655 | 0.00213 | 0.00320 | 0.00345 | 0.00071 | 0.00189 |
| Copper | mg/L | 0.689 | 0.472 | 0.0015 | 0.0011 | 0.0010 | 0.0014 | 0.0014 |
| Iron | mg/L | 41.9 | 25.1 | 3.54 | 1.22 | 0.90 | 8.62 | 2.52 |
| Potassium | mg/L | 53.6 | 21.0 | 53.8 | 24.5 | 15.9 | 20.9 | 63.5 |
| Lithium | mg/L | 0.012 | 0.005 | 0.009 | 0.003 | 0.010 | 0.003 | 0.012 |
| Magnesium | mg/L | 47.8 | 30.3 | 6.97 | 4.31 | 3.16 | 7.35 | 6.58 |
| Manganese | mg/L | 7.99 | 8.76 | 4.73 | 5.25 | 4.84 | 4.60 | 5.04 |
| Molybdenum | mg/L | 0.0033 | 0.0020 | 0.0017 | 0.0011 | 0.0012 | 0.0011 | 0.0009 |
| Sodium | mg/L | 2.4 | 2.3 | 1020 | 1110 | 1120 | 1080 | 1010 |
| Nickel | mg/L | 0.017 | 0.030 | 0.002 | 0.002 | 0.003 | 0.002 | 0.002 |
| Phosphorus | mg/L | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Lead | mg/L | 0.164 | 0.0795 | 0.0073 | 0.0043 | 0.0035 | 0.0099 | 0.0035 |
| Antimony | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Selenium | mg/L | 0.0005 | 0.0005 | <0.0004 | <0.0004 | <0.0004 | <0.0004 | <0.0004 |
| Silicon | mg/L | 4.1 | 3.8 | 0.9 | 1.0 | 1.1 | 0.9 | 1.0 |
| Tin | mg/L | 0.0005 | 0.0007 | 0.0001 | 0.0005 | 0.0002 | 0.0002 | 0.0002 |
| Strontium | mg/L | 16.8 | 8.92 | 21.3 | 9.21 | 5.85 | 8.77 | 21.4 |
| Titanium | mg/L | 0.0009 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Thallium | mg/L | 0.00067 | 0.00017 | 0.00167 | 0.00034 | 0.00013 | 0.00034 | 0.00156 |
| Uranium | mg/L | 0.00386 | 0.00490 | 0.00198 | 0.00102 | 0.00107 | 0.00153 | 0.00124 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | 0.14 | 0.09 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |

| Sample ID | | ODY-ENV-022 | ODY-ENV-023 | ODY-ENV-028 | ODY-ENV-030 | ODY-ENV-032 | ODY-ENV-056 | ODY-ENV-057 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | North |
| **Sample Location** | | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall | Development | Development |
| **Lithology Code** | | UM | SH | PO | PO | PO | PO | PO |
| **Alteration Code** | | TC | CH | AK | HM | BT | SI | AK |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 |
| Volume D.I. Water | mL | | | | | | | |
| Ext Volume | mL | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | -- | 4.99 | 4.95 | 6.22 | 5.45 | 6.28 | 4.49 | 6.28 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 4780 | 3590 | 3920 | 4570 | 5470 | 3130 | 5280 |
| Alkalinity | mg/L as CaCO3 | 1690 | 1590 | 2280 | 1750 | 2350 | 283 | 2360 |
| Sulphate | mg/L | <2.0 | <2.0 | 22 | 4.7 | 100 | 30 | 65 |
| Chloride | mg/L | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | 0.08 | 0.07 | <0.06 | <0.06 | 0.07 | 0.08 | 0.09 |
| Phosphorus (total reactive) | mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.69 | 0.54 | <0.01 | 0.12 | <0.01 | 2.25 | <0.01 |
| Arsenic | mg/L | <0.002 | 0.0035 | <0.002 | <0.002 | <0.002 | 0.0035 | <0.002 |
| Silver | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Barium | mg/L | 0.285 | 0.212 | 3.94 | 1.38 | 0.365 | 4.79 | 1.70 |
| Boron | mg/L | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Beryllium | mg/L | 0.00189 | 0.00163 | 0.00015 | 0.00023 | <0.00007 | 0.00135 | <0.00007 |
| Bismuth | mg/L | 0.00043 | 0.00020 | <0.00007 | <0.00007 | <0.00007 | 0.00012 | <0.00007 |
| Calcium | mg/L | 930 | 1290 | 487 | 245 | 542 | 811 | 539 |
| Cadmium | mg/L | 0.00137 | 0.00037 | 0.00727 | 0.00018 | 0.00203 | 0.00595 | 0.00149 |
| Chromium | mg/L | 0.0738 | 0.0735 | <0.0003 | 0.0009 | <0.0003 | 0.0383 | <0.0003 |
| Cobalt | mg/L | 0.01609 | 0.01286 | 0.00136 | 0.00682 | 0.00388 | 0.00559 | 0.00165 |
| Copper | mg/L | 0.0014 | 0.0021 | 0.0010 | 0.0010 | 0.0006 | 0.0011 | 0.0006 |
| Iron | mg/L | 54.5 | 23.1 | 5.62 | 1.82 | 2.72 | 15.7 | 3.17 |
| Potassium | mg/L | 78.1 | 18.3 | 29.7 | 4.73 | 33.3 | 24.7 | 23.0 |
| Lithium | mg/L | 0.014 | 0.005 | 0.004 | 0.001 | 0.004 | 0.005 | 0.004 |
| Magnesium | mg/L | 117 | 58.8 | 4.72 | 1.72 | 2.74 | 7.56 | 3.76 |
| Manganese | mg/L | 12.9 | 17.1 | 5.08 | 1.82 | 4.65 | 8.99 | 5.49 |
| Molybdenum | mg/L | 0.0020 | 0.0008 | 0.0009 | 0.0009 | 0.0009 | 0.0008 | 0.0009 |
| Sodium | mg/L | 1.6 | 2.5 | 1080 | 975 | 1040 | 3.8 | 1110 |
| Nickel | mg/L | 0.081 | 0.056 | 0.001 | 0.001 | 0.001 | 0.006 | 0.001 |
| Phosphorus | mg/L | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | 0.08 | <0.03 |
| Lead | mg/L | 0.0734 | 0.0364 | 0.0221 | 0.0060 | 0.0042 | 0.0868 | 0.0064 |
| Antimony | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Selenium | mg/L | <0.0004 | 0.0005 | <0.0004 | <0.0004 | <0.0004 | <0.0004 | <0.0004 |
| Silicon | mg/L | 2.6 | 2.4 | 0.8 | 0.7 | 1.1 | 2.8 | 1.0 |
| Tin | mg/L | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | <0.0001 |
| Strontium | mg/L | 9.34 | 6.25 | 19.8 | 1.77 | 4.27 | 27.8 | 10.2 |
| Titanium | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.0017 | <0.0005 |
| Thallium | mg/L | 0.00090 | 0.00036 | 0.00069 | 0.00005 | 0.00040 | 0.00042 | 0.00017 |
| Uranium | mg/L | 0.00022 | 0.00029 | 0.00369 | 0.00170 | 0.00200 | 0.00472 | 0.00278 |
| Vanadium | mg/L | 0.0047 | 0.0021 | <0.0001 | 0.0002 | 0.0002 | 0.0091 | 0.0002 |
| Zinc | mg/L | 0.05 | 0.02 | 0.03 | <0.02 | <0.02 | 0.03 | <0.02 |

| Sample ID | | ODY-ENV-062 | ODY-ENV-041 | ODY-ENV-044 | ODY-ENV-046 | ODY-ENV-050 | ODY-ENV-051 | ODY-ENV-053 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | South | South | South | South | South | South |
| **Sample Location** | | Development | Footwall | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall |
| **Lithology Code** | | PO | PO | PO | PO | BA | SE | SE |
| **Alteration Code** | | BT | BT | BT | SR | CH | BT | BT |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| Volume D.I. Water | mL | | | | | | | |
| Ext Volume | mL | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | -- | 6.22 | 6.10 | 6.19 | 6.21 | 5.78 | 6.02 | 5.94 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 5310 | 5180 | 5230 | 5140 | 6360 | 5160 | 5110 |
| Alkalinity | mg/L as CaCO3 | 2330 | 2250 | 2300 | 2330 | 3130 | 2240 | 2140 |
| Sulphate | mg/L | 69 | 6.1 | 4.7 | <2.0 | <2.0 | <2.0 | 2.0 |
| Chloride | mg/L | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 | <20.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | 0.07 | <0.06 | 0.06 | 0.08 | 0.11 | 0.10 | 0.09 |
| Phosphorus (total reactive) | mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | <0.01 | 0.01 | <0.01 | <0.01 | 0.11 | 0.03 | 0.03 |
| Arsenic | mg/L | <0.002 | <0.002 | <0.002 | 0.0021 | <0.002 | <0.002 | <0.002 |
| Silver | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Barium | mg/L | 1.17 | 0.446 | 2.94 | 0.415 | 0.347 | 0.190 | 0.232 |
| Boron | mg/L | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Beryllium | mg/L | 0.00008 | 0.00010 | 0.00008 | 0.00011 | 0.00047 | 0.00014 | 0.00008 |
| Bismuth | mg/L | <0.00007 | <0.00007 | <0.00007 | <0.00007 | <0.00007 | <0.00007 | <0.00007 |
| Calcium | mg/L | 547 | 486 | 487 | 510 | 2060 | 450 | 434 |
| Cadmium | mg/L | 0.00145 | 0.00107 | 0.00170 | 0.00161 | 0.00145 | 0.00102 | 0.00121 |
| Chromium | mg/L | <0.0003 | <0.0003 | <0.0003 | <0.0003 | 0.0009 | 0.0003 | 0.0003 |
| Cobalt | mg/L | 0.00260 | 0.00072 | 0.00454 | 0.00081 | 0.00359 | 0.00167 | 0.00148 |
| Copper | mg/L | 0.0008 | 0.0012 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 |
| Iron | mg/L | 4.68 | 3.14 | 4.78 | 3.55 | 4.53 | 4.04 | 3.91 |
| Potassium | mg/L | 28.0 | 8.16 | 19.4 | 28.3 | 28.8 | 36.1 | 32.5 |
| Lithium | mg/L | 0.004 | 0.002 | 0.002 | 0.004 | 0.008 | 0.006 | 0.004 |
| Magnesium | mg/L | 3.65 | 3.09 | 5.00 | 3.61 | 17.5 | 4.22 | 3.84 |
| Manganese | mg/L | 5.29 | 4.49 | 5.65 | 5.52 | 17.6 | 6.15 | 6.64 |
| Molybdenum | mg/L | 0.0008 | 0.0010 | 0.0009 | 0.0012 | 0.0011 | 0.0010 | 0.0013 |
| Sodium | mg/L | 1100 | 1080 | 1070 | 1060 | 1.6 | 1090 | 1090 |
| Nickel | mg/L | 0.001 | 0.001 | 0.002 | 0.003 | 0.015 | 0.007 | 0.004 |
| Phosphorus | mg/L | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Lead | mg/L | 0.0073 | 0.0076 | 0.0047 | 0.0055 | 0.0048 | 0.0035 | 0.0062 |
| Antimony | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |
| Selenium | mg/L | <0.0004 | <0.0004 | <0.0004 | <0.0004 | <0.0004 | <0.0004 | <0.0004 |
| Silicon | mg/L | 1.0 | 0.9 | 0.9 | 1.3 | 2.7 | 2.6 | 1.8 |
| Tin | mg/L | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0001 | <0.0001 |
| Strontium | mg/L | 7.75 | 3.51 | 6.77 | 4.31 | 5.96 | 1.10 | 1.64 |
| Titanium | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| Thallium | mg/L | 0.00039 | 0.00010 | 0.00022 | 0.00013 | 0.00012 | 0.00013 | 0.00015 |
| Uranium | mg/L | 0.00183 | 0.00129 | 0.00251 | 0.00115 | 0.00002 | 0.00014 | 0.00054 |
| Vanadium | mg/L | 0.0001 | <0.0001 | <0.0001 | <0.0001 | 0.0003 | 0.0004 | 0.0005 |
| Zinc | mg/L | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |

| Sample ID | | ODY-ENV-063 | ODY-ENV-065 | ODY-ENV-067 |
|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock |
| **Odyssey Zone** | | South | South | South |
| **Sample Location** | | Development Zone | Development Zone | Development Zone |
| **Lithology Code** | | UM | PO | PO |
| **Alteration Code** | | BT | BT | SR |
| **Test Parameters** | | | | |
| Sample weight | g | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 1 | 1 | 1 |
| Volume D.I. Water | mL | | | |
| Ext Volume | mL | 800 | 800 | 800 |
| Final pH | -- | 6.09 | 6.22 | 6.27 |
| **Parameters** | | | | |
| Conductivity | µS/cm | 5250 | 5310 | 5280 |
| Alkalinity | mg/L as CaCO3 | 2250 | 2330 | 2380 |
| Sulphate | mg/L | 55 | 7.8 | 9.8 |
| Chloride | mg/L | <20.0 | <20.0 | <20.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | <0.06 | 0.07 | 0.09 |
| Phosphorus (total reactive) | mg/L | <0.3 | <0.3 | <0.3 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | <0.01 | <0.01 | <0.01 |
| Arsenic | mg/L | <0.002 | <0.002 | <0.002 |
| Silver | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Barium | mg/L | 0.533 | 1.50 | 1.11 |
| Boron | mg/L | <0.02 | <0.02 | <0.02 |
| Beryllium | mg/L | <0.00007 | <0.00007 | <0.00007 |
| Bismuth | mg/L | <0.00007 | <0.00007 | <0.00007 |
| Calcium | mg/L | 422 | 522 | 525 |
| Cadmium | mg/L | 0.00047 | 0.00163 | 0.00155 |
| Chromium | mg/L | 0.0003 | <0.0003 | <0.0003 |
| Cobalt | mg/L | 0.00320 | 0.00102 | 0.00091 |
| Copper | mg/L | 0.0006 | 0.0006 | 0.0006 |
| Iron | mg/L | 2.40 | 5.21 | 1.94 |
| Potassium | mg/L | 59.8 | 25.5 | 23.3 |
| Lithium | mg/L | 0.005 | 0.003 | 0.004 |
| Magnesium | mg/L | 16.8 | 6.37 | 5.12 |
| Manganese | mg/L | 5.89 | 5.62 | 5.54 |
| Molybdenum | mg/L | 0.0010 | 0.0008 | 0.0013 |
| Sodium | mg/L | 1020 | 1060 | 1030 |
| Nickel | mg/L | 0.018 | 0.001 | 0.002 |
| Phosphorus | mg/L | <0.03 | <0.03 | <0.03 |
| Lead | mg/L | 0.0014 | 0.0053 | 0.0036 |
| Antimony | mg/L | <0.002 | <0.002 | <0.002 |
| Selenium | mg/L | <0.0004 | <0.0004 | <0.0004 |
| Silicon | mg/L | 1.7 | 1.1 | 1.2 |
| Tin | mg/L | 0.0001 | 0.0011 | 0.0002 |
| Strontium | mg/L | 2.81 | 9.65 | 7.10 |
| Titanium | mg/L | <0.0005 | <0.0005 | <0.0005 |
| Thallium | mg/L | 0.00050 | 0.00018 | 0.00011 |
| Uranium | mg/L | 0.00009 | 0.00206 | 0.00162 |
| Vanadium | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Zinc | mg/L | <0.02 | 0.02 | <0.02 |

# CTEU-9 Results

| Sample ID | | Detox Final Tail BL 154-50 | Detox Final Tail BL 154-52 | ODY-ENV-001 | ODY-ENV-008 | ODY-ENV-033 | ODY-ENV-039 | ODY-ENV-019 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | -- | -- | Ore | Ore | Ore | Ore | Rock |
| **Odyssey Zone** | | -- | -- | North | North | South | South | North |
| **Sample Location** | | -- | -- | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Footwall |
| **Lithology Code** | | -- | -- | PO | PO | PO | PO | PO |
| **Alteration Code** | | -- | -- | SR | BT | SR | AK | SI |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Ext Fluid | #1 or #2 | | | | | | | |
| Volume D.I. Water | mL | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Ext Volume | mL | | | | | | | |
| Final pH | -- | 8.23 | 8.22 | 8.90 | 8.90 | 8.63 | 8.73 | 9.18 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 392 | 428 | 383 | 296 | 297 | 293 | 243 |
| Alkalinity | mg/L as CaCO3 | 53 | 37 | 61 | 46 | 46 | 54 | 49 |
| Sulphate | mg/L | 110 | 150 | 81 | 58 | 68 | 62 | 43 |
| Chloride | mg/L | 2.1 | <2.0 | 2.2 | 4.7 | 7.3 | 3.2 | 4.6 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | 0.08 | 0.19 | 0.19 | 0.56 | 0.36 | 0.28 | 0.15 |
| Phosphorus (total reactive) | mg/L | 0.03 | <0.03 | 0.04 | <0.03 | <0.03 | <0.03 | 0.04 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.055 | 0.070 | 0.094 | 0.181 | 0.187 | 0.203 | 0.224 |
| Arsenic | mg/L | 0.0003 | 0.0003 | 0.0020 | 0.0015 | 0.0015 | 0.0016 | 0.0034 |
| Silver | mg/L | 0.00226 | 0.00074 | 0.00009 | <0.00005 | 0.00028 | 0.00039 | <0.00005 |
| Barium | mg/L | 0.206 | 0.129 | 0.447 | 0.268 | 0.218 | 0.280 | 0.266 |
| Boron | mg/L | 0.005 | 0.006 | 0.020 | 0.011 | 0.037 | 0.037 | 0.045 |
| Beryllium | mg/L | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Bismuth | mg/L | <0.000007 | <0.000007 | 0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Calcium | mg/L | 44.6 | 60.6 | 13.7 | 14.2 | 17.1 | 17.0 | 6.63 |
| Cadmium | mg/L | 0.000008 | 0.000009 | 0.000006 | 0.000003 | <0.000003 | 0.000003 | 0.000004 |
| Chromium | mg/L | 0.00006 | 0.00007 | 0.00011 | 0.00009 | 0.00012 | 0.00013 | 0.00026 |
| Cobalt | mg/L | 0.00146 | 0.00158 | 0.000023 | 0.000019 | 0.000025 | 0.000036 | 0.000014 |
| Copper | mg/L | 0.00096 | 0.00196 | 0.00019 | 0.00052 | 0.00095 | 0.00042 | 0.00029 |
| Iron | mg/L | 0.264 | 0.349 | <0.007 | 0.007 | <0.007 | <0.007 | <0.007 |
| Potassium | mg/L | 22.3 | 14.8 | 49.6 | 36.6 | 15.7 | 28.3 | 29.2 |
| Lithium | mg/L | 0.0076 | 0.0039 | 0.0123 | 0.0032 | 0.0062 | 0.0063 | 0.0118 |
| Magnesium | mg/L | 6.66 | 5.24 | 3.04 | 3.71 | 2.71 | 4.26 | 0.936 |
| Manganese | mg/L | 0.0123 | 0.0143 | 0.00286 | 0.00216 | 0.00410 | 0.00572 | 0.00128 |
| Molybdenum | mg/L | 0.0213 | 0.0149 | 0.00198 | 0.00642 | 0.00832 | 0.0110 | 0.00754 |
| Sodium | mg/L | 9.82 | 11.4 | 24.1 | 13.8 | 24.9 | 12.1 | 21.5 |
| Nickel | mg/L | 0.0003 | 0.0002 | 0.0001 | 0.0002 | <0.0001 | <0.0001 | <0.0001 |
| Phosphorus | mg/L | 0.004 | <0.003 | 0.013 | 0.024 | 0.010 | 0.006 | 0.011 |
| Lead | mg/L | 0.00012 | 0.00010 | 0.00008 | 0.00012 | 0.00009 | 0.00006 | 0.00007 |
| Antimony | mg/L | 0.0014 | 0.0009 | 0.0010 | 0.0013 | 0.0016 | 0.0019 | 0.0013 |
| Selenium | mg/L | 0.00136 | 0.00078 | 0.00080 | 0.00030 | 0.00059 | 0.00076 | 0.00022 |
| Silicon | mg/L | 3.01 | 2.68 | 7.98 | 5.33 | 4.55 | 3.64 | 5.54 |
| Tin | mg/L | 0.00007 | 0.00014 | 0.00007 | 0.00008 | 0.00009 | 0.00009 | 0.00009 |
| Strontium | mg/L | 11.6 | 5.41 | 10.1 | 7.12 | 7.75 | 15.6 | 5.73 |
| Titanium | mg/L | 0.00031 | 0.00014 | 0.00028 | 0.00044 | 0.00035 | 0.00024 | 0.00018 |
| Thallium | mg/L | 0.000016 | 0.000024 | 0.000029 | 0.000018 | 0.000014 | 0.000025 | 0.000026 |
| Uranium | mg/L | 0.000679 | 0.000724 | 0.00172 | 0.00119 | 0.00234 | 0.00192 | 0.00134 |
| Vanadium | mg/L | 0.00006 | 0.00006 | 0.0167 | 0.0127 | 0.00352 | 0.00165 | 0.0105 |
| Zinc | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |

| Sample ID | | ODY-ENV-022 | ODY-ENV-023 | ODY-ENV-028 | ODY-ENV-030 | ODY-ENV-032 | ODY-ENV-056 | ODY-ENV-057 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | North |
| **Sample Location** | | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall | Development | Development |
| **Lithology Code** | | UM | SH | PO | PO | PO | PO | PO |
| **Alteration Code** | | TC | CH | AK | HM | BT | SI | AK |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Ext Fluid | #1 or #2 | | | | | | | |
| Volume D.I. Water | mL | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Ext Volume | mL | | | | | | | |
| Final pH | -- | 9.05 | 9.44 | 9.06 | 9.01 | 8.40 | 9.00 | 8.86 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 265 | 133 | 337 | 259 | 989 | 294 | 530 |
| Alkalinity | mg/L as CaCO3 | 73 | 53 | 45 | 46 | 11 | 35 | 17 |
| Sulphate | mg/L | 20 | 3.9 | 91 | 46 | 500 | 81 | 210 |
| Chloride | mg/L | 5.2 | 2.4 | 4.2 | 6.0 | 4.7 | 4.4 | 2.7 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | 0.62 | 0.55 | 0.33 | 0.23 | 0.40 | 0.24 | 0.69 |
| Phosphorus (total reactive) | mg/L | <0.03 | 0.06 | <0.03 | <0.03 | 0.04 | <0.03 | 0.04 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.060 | 0.073 | 0.151 | 0.270 | 0.134 | 0.190 | 0.120 |
| Arsenic | mg/L | 0.0050 | 0.0304 | 0.0016 | 0.0015 | 0.0005 | 0.0017 | 0.0006 |
| Silver | mg/L | 0.00006 | <0.00005 | 0.00007 | 0.00019 | <0.00005 | <0.00005 | <0.00005 |
| Barium | mg/L | 0.00887 | 0.00570 | 0.378 | 0.103 | 0.0387 | 0.410 | 0.138 |
| Boron | mg/L | 0.017 | 0.023 | 0.031 | 0.028 | 0.018 | 0.030 | 0.010 |
| Beryllium | mg/L | <0.000007 | 0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Bismuth | mg/L | <0.000007 | <0.000007 | <0.000007 | 0.000008 | <0.000007 | 0.000013 | 0.000007 |
| Calcium | mg/L | 6.04 | 3.31 | 11.5 | 8.53 | 178 | 12.3 | 41.9 |
| Cadmium | mg/L | 0.000006 | 0.000004 | 0.000005 | 0.000004 | <0.000003 | 0.000004 | 0.000003 |
| Chromium | mg/L | 0.00349 | 0.00346 | 0.00021 | 0.00018 | 0.00018 | 0.00021 | 0.00021 |
| Cobalt | mg/L | 0.000059 | 0.000172 | 0.000017 | 0.000018 | 0.000036 | 0.000018 | 0.000026 |
| Copper | mg/L | 0.00047 | 0.00045 | 0.00038 | 0.00364 | 0.00025 | 0.00018 | 0.00528 |
| Iron | mg/L | 0.040 | 0.114 | <0.007 | 0.020 | 0.010 | <0.007 | <0.007 |
| Potassium | mg/L | 56.9 | 18.2 | 27.9 | 27.7 | 30.2 | 17.1 | 29.7 |
| Lithium | mg/L | 0.0090 | 0.0002 | 0.0097 | 0.0027 | 0.0119 | 0.0046 | 0.0102 |
| Magnesium | mg/L | 3.71 | 1.54 | 1.84 | 0.826 | 3.75 | 1.34 | 4.61 |
| Manganese | mg/L | 0.00145 | 0.00253 | 0.00189 | 0.00168 | 0.0178 | 0.00208 | 0.00665 |
| Molybdenum | mg/L | 0.0131 | 0.00150 | 0.00991 | 0.0263 | 0.0117 | 0.00760 | 0.00155 |
| Sodium | mg/L | 9.53 | 13.4 | 29.9 | 25.0 | 28.2 | 24.8 | 35.5 |
| Nickel | mg/L | 0.0007 | 0.0023 | <0.0001 | <0.0001 | 0.0001 | <0.0001 | <0.0001 |
| Phosphorus | mg/L | 0.015 | 0.025 | 0.004 | 0.008 | <0.003 | 0.004 | <0.003 |
| Lead | mg/L | 0.00023 | 0.00016 | 0.00009 | 0.00039 | 0.00004 | 0.00009 | 0.00009 |
| Antimony | mg/L | 0.0048 | 0.0026 | 0.0006 | 0.0008 | 0.0006 | 0.0007 | 0.0007 |
| Selenium | mg/L | 0.00207 | 0.00057 | 0.00061 | 0.00054 | 0.00038 | 0.00046 | 0.00040 |
| Silicon | mg/L | 11.2 | 11.9 | 5.89 | 5.62 | 4.80 | 4.44 | 6.65 |
| Tin | mg/L | 0.00015 | 0.00019 | 0.00017 | 0.00019 | 0.00005 | 0.00011 | 0.00061 |
| Strontium | mg/L | 0.198 | 0.0743 | 16.6 | 1.84 | 7.20 | 20.5 | 10.1 |
| Titanium | mg/L | 0.00188 | 0.00142 | 0.00016 | 0.00074 | 0.00024 | 0.00010 | 0.00016 |
| Thallium | mg/L | 0.000035 | 0.000016 | 0.000031 | 0.000023 | 0.000031 | 0.000016 | 0.000010 |
| Uranium | mg/L | 0.000085 | 0.000032 | 0.00174 | 0.00143 | 0.00136 | 0.00113 | 0.000995 |
| Vanadium | mg/L | 0.0425 | 0.0260 | 0.00796 | 0.00232 | 0.00243 | 0.00631 | 0.0109 |
| Zinc | mg/L | <0.002 | 0.017 | <0.002 | 0.003 | <0.002 | <0.002 | <0.002 |

| Sample ID | | ODY-ENV-062 | ODY-ENV-041 | ODY-ENV-044 | ODY-ENV-046 | ODY-ENV-050 | ODY-ENV-051 | ODY-ENV-053 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | South | South | South | South | South | South |
| **Sample Location** | | Development | Footwall | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall |
| **Lithology Code** | | PO | PO | PO | PO | BA | SE | SE |
| **Alteration Code** | | BT | BT | BT | SR | CH | BT | BT |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Ext Fluid | #1 or #2 | | | | | | | |
| Volume D.I. Water | mL | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Ext Volume | mL | | | | | | | |
| Final pH | -- | 8.46 | 9.01 | 8.90 | 8.80 | 9.32 | 9.07 | 9.06 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 762 | 196 | 217 | 196 | 146 | 209 | 217 |
| Alkalinity | mg/L as CaCO3 | 16 | 36 | 55 | 54 | 58 | 60 | 57 |
| Sulphate | mg/L | 340 | 43 | 34 | 22 | <2.0 | 16 | 23 |
| Chloride | mg/L | 4.0 | 3.4 | 4.0 | <2.0 | 2.4 | <2.0 | <2.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | 0.38 | 0.30 | 0.34 | 0.48 | 1.65 | 0.91 | 0.71 |
| Phosphorus (total reactive) | mg/L | <0.03 | 0.03 | <0.03 | <0.03 | <0.03 | 0.04 | 0.04 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.140 | 0.378 | 0.197 | 0.443 | 0.226 | 0.784 | 0.656 |
| Arsenic | mg/L | 0.0006 | 0.0010 | 0.0013 | 0.0080 | 0.0009 | 0.0042 | 0.0042 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 | 0.00016 | <0.00005 | 0.00012 | 0.00018 |
| Barium | mg/L | 0.0873 | 0.0600 | 0.196 | 0.0108 | 0.00916 | 0.00605 | 0.00646 |
| Boron | mg/L | 0.028 | 0.021 | 0.025 | 0.019 | 0.024 | 0.018 | 0.015 |
| Beryllium | mg/L | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | 0.000012 | 0.000010 |
| Bismuth | mg/L | <0.000007 | <0.000007 | <0.000007 | 0.000019 | <0.000007 | 0.000029 | 0.000026 |
| Calcium | mg/L | 116 | 10.4 | 9.77 | 10.3 | 3.08 | 4.50 | 5.41 |
| Cadmium | mg/L | 0.000009 | 0.000005 | 0.000003 | 0.000009 | 0.000005 | 0.000008 | 0.000005 |
| Chromium | mg/L | 0.00010 | 0.00018 | 0.00021 | 0.00022 | 0.00030 | 0.00145 | 0.00153 |
| Cobalt | mg/L | 0.000043 | 0.000028 | 0.000024 | 0.000023 | 0.000023 | 0.000103 | 0.000076 |
| Copper | mg/L | 0.00017 | 0.00068 | 0.00150 | 0.00021 | 0.00040 | 0.00045 | 0.00086 |
| Iron | mg/L | <0.007 | 0.030 | <0.007 | 0.024 | 0.019 | 0.186 | 0.163 |
| Potassium | mg/L | 23.8 | 11.6 | 15.2 | 26.9 | 31.4 | 41.6 | 34.2 |
| Lithium | mg/L | 0.0129 | 0.0013 | 0.0034 | 0.0070 | 0.0003 | 0.0052 | 0.0039 |
| Magnesium | mg/L | 3.45 | 1.37 | 2.61 | 1.05 | 0.780 | 0.817 | 0.989 |
| Manganese | mg/L | 0.0185 | 0.00201 | 0.00317 | 0.00244 | 0.00059 | 0.00316 | 0.00328 |
| Molybdenum | mg/L | 0.00840 | 0.00572 | 0.00810 | 0.00600 | 0.00971 | 0.00697 | 0.00839 |
| Sodium | mg/L | 23.7 | 19.1 | 21.1 | 12.7 | 8.53 | 10.7 | 16.7 |
| Nickel | mg/L | 0.0001 | 0.0002 | 0.0001 | 0.0002 | 0.0001 | 0.0006 | 0.0005 |
| Phosphorus | mg/L | <0.003 | 0.010 | 0.005 | 0.014 | 0.009 | 0.018 | 0.020 |
| Lead | mg/L | 0.00003 | 0.00024 | 0.00010 | 0.00023 | 0.00004 | 0.00036 | 0.00029 |
| Antimony | mg/L | 0.0008 | 0.0006 | 0.0017 | 0.0099 | 0.0016 | 0.0091 | 0.0045 |
| Selenium | mg/L | 0.00049 | 0.00034 | 0.00123 | 0.00036 | 0.00005 | 0.00140 | 0.00151 |
| Silicon | mg/L | 4.40 | 4.07 | 4.93 | 3.26 | 2.42 | 3.32 | 3.51 |
| Tin | mg/L | 0.00009 | 0.00028 | 0.00021 | 0.00009 | 0.00012 | 0.00013 | 0.00015 |
| Strontium | mg/L | 11.5 | 1.98 | 3.54 | 0.304 | 0.159 | 0.0538 | 0.178 |
| Titanium | mg/L | <0.00005 | 0.00170 | 0.00028 | 0.00246 | 0.00063 | 0.0141 | 0.0122 |
| Thallium | mg/L | 0.000022 | 0.000011 | 0.000013 | 0.000014 | 0.000008 | 0.000028 | 0.000025 |
| Uranium | mg/L | 0.00212 | 0.00266 | 0.00631 | 0.00459 | 0.000111 | 0.00145 | 0.00211 |
| Vanadium | mg/L | 0.00176 | 0.00598 | 0.00413 | 0.00417 | 0.00635 | 0.0144 | 0.0152 |
| Zinc | mg/L | <0.002 | 0.002 | <0.002 | 0.004 | <0.002 | <0.002 | <0.002 |

| Sample ID | | ODY-ENV-063 | ODY-ENV-065 | ODY-ENV-067 |
|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock |
| **Odyssey Zone** | | South | South | South |
| **Sample Location** | | Development Zone | Development Zone | Development Zone |
| **Lithology Code** | | UM | PO | PO |
| **Alteration Code** | | BT | BT | SR |
| **Test Parameters** | | | | |
| Sample weight | g | 100 | 100 | 100 |
| Ext Fluid | #1 or #2 | | | |
| Volume D.I. Water | mL | 400 | 400 | 400 |
| Ext Volume | mL | | | |
| Final pH | -- | 8.81 | 8.86 | 8.71 |
| **Parameters** | | | | |
| Conductivity | µS/cm | 607 | 277 | 321 |
| Alkalinity | mg/L as CaCO3 | 31 | 58 | 58 |
| Sulphate | mg/L | 230 | 61 | 76 |
| Chloride | mg/L | <2.0 | 2.2 | 2.4 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | 0.31 | 0.38 | 0.53 |
| Phosphorus (total reactive) | mg/L | <0.03 | <0.03 | <0.03 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.017 | 0.265 | 0.262 |
| Arsenic | mg/L | 0.0012 | 0.0017 | 0.0042 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Barium | mg/L | 0.110 | 0.247 | 0.165 |
| Boron | mg/L | 0.011 | 0.017 | 0.019 |
| Beryllium | mg/L | <0.000007 | <0.000007 | <0.000007 |
| Bismuth | mg/L | <0.000007 | <0.000007 | <0.000007 |
| Calcium | mg/L | 31.2 | 13.2 | 16.0 |
| Cadmium | mg/L | <0.000003 | 0.000008 | 0.000004 |
| Chromium | mg/L | 0.00027 | 0.00021 | 0.00017 |
| Cobalt | mg/L | 0.000028 | 0.000028 | 0.000029 |
| Copper | mg/L | 0.00026 | 0.00050 | 0.00039 |
| Iron | mg/L | <0.007 | 0.010 | <0.007 |
| Potassium | mg/L | 95.7 | 23.0 | 29.6 |
| Lithium | mg/L | 0.0046 | 0.0077 | 0.0092 |
| Magnesium | mg/L | 17.3 | 3.47 | 4.16 |
| Manganese | mg/L | 0.00392 | 0.00384 | 0.00519 |
| Molybdenum | mg/L | 0.00597 | 0.00781 | 0.00997 |
| Sodium | mg/L | 4.05 | 18.4 | 20.7 |
| Nickel | mg/L | 0.0002 | 0.0001 | 0.0001 |
| Phosphorus | mg/L | 0.005 | 0.006 | <0.003 |
| Lead | mg/L | 0.00005 | 0.00011 | 0.00012 |
| Antimony | mg/L | 0.0043 | 0.0019 | 0.0031 |
| Selenium | mg/L | 0.00063 | 0.00029 | 0.00032 |
| Silicon | mg/L | 7.68 | 3.81 | 3.47 |
| Tin | mg/L | 0.00008 | 0.00016 | 0.00019 |
| Strontium | mg/L | 2.98 | 12.5 | 8.24 |
| Titanium | mg/L | 0.00019 | 0.00039 | 0.00034 |
| Thallium | mg/L | 0.000025 | 0.000015 | 0.000017 |
| Uranium | mg/L | 0.000119 | 0.00366 | 0.00287 |
| Vanadium | mg/L | 0.00584 | 0.00252 | 0.00276 |
| Zinc | mg/L | <0.002 | <0.002 | <0.002 |

# SPLP Results

| Sample ID | | Detox Final Tail BL 154-50 | Detox Final Tail BL 154-52 | ODY-ENV-001 | ODY-ENV-008 | ODY-ENV-033 | ODY-ENV-039 | ODY-ENV-019 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Tailings | Tailings | Ore | Ore | Ore | Ore | Rock |
| **Odyssey Zone** | | -- | -- | North | North | South | South | North |
| **Sample Location** | | -- | -- | Mineralized Zone | Mineralized Zone | Mineralized Zone | Mineralized Zone | Footwall |
| **Lithology Code** | | -- | -- | PO | PO | PO | PO | PO |
| **Alteration Code** | | -- | -- | SR | BT | SR | AK | SI |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Volume D.I. Water | mL | | | | | | | |
| Ext Volume | mL | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | -- | 9.35 | 9.27 | 9.85 | 9.72 | 9.56 | 9.65 | 9.82 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 102 | 112 | 88 | 70 | 73 | 71 | 71 |
| Alkalinity | mg/L as CaCO3 | 18 | 16 | 24 | 21 | 21 | 23 | 25 |
| Sulphate | mg/L | 23 | 29 | 14 | 10.0 | 11 | 8.9 | 6.7 |
| Chloride | mg/L | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 | <0.06 |
| Phosphorus (total reactive) | mg/L | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.230 | 0.279 | 0.368 | 0.453 | 0.489 | 0.475 | 0.491 |
| Arsenic | mg/L | 0.0008 | 0.0009 | 0.0011 | 0.0004 | 0.0003 | 0.0010 | 0.0011 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Barium | mg/L | 0.532 | 0.0721 | 0.976 | 0.426 | 0.158 | 0.108 | 0.201 |
| Boron | mg/L | <0.002 | <0.002 | 0.003 | <0.002 | <0.002 | <0.002 | 0.004 |
| Beryllium | mg/L | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Bismuth | mg/L | 0.000010 | <0.000007 | 0.000009 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Calcium | mg/L | 11.7 | 15.2 | 6.73 | 7.36 | 8.02 | 7.75 | 5.96 |
| Cadmium | mg/L | <0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 | 0.000005 |
| Chromium | mg/L | 0.00037 | 0.00024 | 0.00016 | 0.00004 | 0.00005 | 0.00004 | 0.00004 |
| Cobalt | mg/L | 0.000311 | 0.000312 | 0.000010 | 0.000006 | <0.000004 | <0.000004 | <0.000004 |
| Copper | mg/L | 0.00085 | 0.00058 | 0.00015 | 0.00035 | 0.00015 | 0.00061 | 0.00032 |
| Iron | mg/L | 0.155 | 0.182 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 |
| Potassium | mg/L | 5.26 | 2.57 | 7.99 | 5.15 | 2.90 | 4.60 | 7.96 |
| Lithium | mg/L | 0.0011 | 0.0007 | 0.0015 | 0.0006 | 0.0009 | 0.0006 | 0.0019 |
| Magnesium | mg/L | 0.504 | 0.389 | 0.442 | 0.446 | 0.458 | 0.613 | 0.351 |
| Manganese | mg/L | 0.00084 | 0.00123 | 0.00090 | 0.00071 | 0.00072 | 0.00105 | 0.00078 |
| Molybdenum | mg/L | 0.00072 | 0.00081 | 0.00011 | 0.00039 | 0.00022 | 0.00028 | 0.00004 |
| Sodium | mg/L | 1.59 | 1.75 | 1.70 | 1.49 | 2.65 | 1.03 | 2.35 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Phosphorus | mg/L | 0.004 | <0.003 | <0.003 | 0.003 | <0.003 | 0.007 | <0.003 |
| Lead | mg/L | 0.00006 | 0.00002 | 0.00004 | 0.00002 | 0.00001 | 0.00004 | 0.00001 |
| Antimony | mg/L | 0.0006 | 0.0005 | 0.0004 | 0.0003 | 0.0003 | 0.0004 | 0.0004 |
| Selenium | mg/L | 0.00058 | 0.00025 | 0.00010 | 0.00008 | 0.00007 | 0.00006 | <0.00004 |
| Silicon | mg/L | 1.86 | 1.63 | 3.17 | 2.96 | 2.94 | 2.84 | 3.51 |
| Tin | mg/L | 0.00017 | 0.00003 | 0.00002 | 0.00003 | 0.00002 | 0.00002 | 0.00004 |
| Strontium | mg/L | 4.75 | 1.45 | 6.53 | 3.04 | 1.85 | 3.02 | 1.85 |
| Titanium | mg/L | <0.00005 | 0.00009 | 0.00010 | 0.00018 | 0.00020 | 0.00023 | 0.00014 |
| Thallium | mg/L | 0.000012 | 0.000009 | 0.000020 | 0.000005 | <0.000005 | <0.000005 | 0.000010 |
| Uranium | mg/L | 0.000058 | 0.000090 | 0.000101 | 0.000020 | 0.000056 | 0.000076 | 0.000081 |
| Vanadium | mg/L | 0.00045 | 0.00034 | 0.00306 | 0.00394 | 0.00238 | 0.00248 | 0.00379 |
| Zinc | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |

| Sample ID | | ODY-ENV-022 | ODY-ENV-023 | ODY-ENV-028 | ODY-ENV-030 | ODY-ENV-032 | ODY-ENV-056 | ODY-ENV-057 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | North | North | North | North | North | North |
| **Sample Location** | | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall | Development | Development |
| **Lithology Code** | | UM | SH | PO | PO | PO | PO | PO |
| **Alteration Code** | | TC | CH | AK | HM | BT | SI | AK |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Volume D.I. Water | mL | | | | | | | |
| Ext Volume | mL | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | -- | 9.86 | 9.70 | 9.75 | 9.59 | 9.28 | 9.70 | 9.33 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 72 | 51 | 85 | 57 | 233 | 106 | 153 |
| Alkalinity | mg/L as CaCO3 | 28 | 28 | 22 | 17 | 12 | 27 | 14 |
| Sulphate | mg/L | 3.3 | 3.0 | 15 | 7.1 | 91 | 23 | 52 |
| Chloride | mg/L | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | 0.10 | <0.06 | <0.06 | <0.06 | 0.06 | <0.06 | 0.06 |
| Phosphorus (total reactive) | mg/L | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.127 | 0.052 | 0.408 | 0.495 | 0.340 | 0.422 | 0.393 |
| Arsenic | mg/L | 0.0005 | 0.0026 | 0.0006 | 0.0006 | 0.0002 | 0.0008 | 0.0003 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Barium | mg/L | 0.0032 | 0.0043 | 0.878 | 0.144 | 0.0761 | 1.29 | 0.380 |
| Boron | mg/L | 0.002 | 0.004 | 0.003 | <0.002 | <0.002 | 0.003 | <0.002 |
| Beryllium | mg/L | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Bismuth | mg/L | 0.000007 | <0.000007 | <0.000007 | <0.000007 | 0.000010 | <0.000007 | <0.000007 |
| Calcium | mg/L | 4.13 | 5.26 | 7.50 | 7.92 | 36.7 | 7.35 | 20.0 |
| Cadmium | mg/L | <0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 |
| Chromium | mg/L | 0.00038 | 0.00061 | 0.00004 | 0.00008 | 0.00004 | 0.00004 | 0.00005 |
| Cobalt | mg/L | 0.000004 | 0.000009 | <0.000004 | 0.000005 | 0.000006 | 0.000008 | 0.000007 |
| Copper | mg/L | 0.00020 | 0.00062 | 0.00027 | 0.00020 | 0.00059 | 0.00033 | 0.00083 |
| Iron | mg/L | <0.007 | 0.009 | 0.008 | <0.007 | <0.007 | <0.007 | <0.007 |
| Potassium | mg/L | 13.3 | 2.89 | 5.19 | 2.43 | 7.14 | 5.12 | 4.94 |
| Lithium | mg/L | 0.0017 | 0.0002 | 0.0008 | 0.0004 | 0.0014 | 0.0007 | 0.0015 |
| Magnesium | mg/L | 0.709 | 0.899 | 0.485 | 0.170 | 0.528 | 0.380 | 0.684 |
| Manganese | mg/L | 0.00029 | 0.00036 | 0.00159 | 0.00070 | 0.00310 | 0.00124 | 0.00300 |
| Molybdenum | mg/L | 0.00079 | 0.00011 | 0.00005 | 0.00024 | 0.00010 | 0.00007 | 0.00011 |
| Sodium | mg/L | 1.42 | 2.65 | 1.85 | 1.58 | 3.50 | 2.78 | 3.06 |
| Nickel | mg/L | <0.0001 | 0.0003 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Phosphorus | mg/L | <0.003 | <0.003 | <0.003 | 0.004 | <0.003 | <0.003 | <0.003 |
| Lead | mg/L | 0.00022 | 0.00005 | 0.00003 | 0.00003 | 0.00002 | 0.00007 | 0.00014 |
| Antimony | mg/L | 0.0006 | 0.0005 | 0.0003 | 0.0003 | 0.0002 | 0.0002 | 0.0003 |
| Selenium | mg/L | 0.00018 | 0.00018 | 0.00005 | 0.00005 | 0.00006 | <0.00004 | 0.00005 |
| Silicon | mg/L | 3.28 | 3.19 | 2.52 | 3.37 | 2.59 | 2.87 | 2.26 |
| Tin | mg/L | 0.00005 | 0.00015 | <0.00001 | 0.00003 | 0.00003 | 0.00010 | 0.00014 |
| Strontium | mg/L | 0.0714 | 0.0537 | 6.97 | 0.720 | 1.45 | 12.4 | 6.40 |
| Titanium | mg/L | 0.00011 | 0.00015 | 0.00012 | 0.00022 | <0.00005 | 0.00005 | 0.00014 |
| Thallium | mg/L | 0.000009 | 0.000010 | 0.000013 | <0.000005 | 0.000011 | 0.000005 | <0.000005 |
| Uranium | mg/L | 0.000004 | 0.000003 | 0.000352 | 0.000059 | 0.000254 | 0.000062 | 0.000339 |
| Vanadium | mg/L | 0.00969 | 0.0103 | 0.00209 | 0.00168 | 0.00229 | 0.00425 | 0.00214 |
| Zinc | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |

| Sample ID | | ODY-ENV-062 | ODY-ENV-041 | ODY-ENV-044 | ODY-ENV-046 | ODY-ENV-050 | ODY-ENV-051 | ODY-ENV-053 |
|---|---|---|---|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock | Rock | Rock | Rock | Rock |
| **Odyssey Zone** | | North | South | South | South | South | South | South |
| **Sample Location** | | Development | Footwall | Footwall | Footwall | Hanging Wall | Hanging Wall | Hanging Wall |
| **Lithology Code** | | PO | PO | PO | PO | BA | SE | SE |
| **Alteration Code** | | BT | BT | BT | SR | CH | BT | BT |
| **Test Parameters** | | | | | | | | |
| Sample weight | g | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Volume D.I. Water | mL | | | | | | | |
| Ext Volume | mL | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | -- | 9.36 | 9.54 | 9.68 | 9.69 | 9.50 | 9.68 | 9.66 |
| **Parameters** | | | | | | | | |
| Conductivity | µS/cm | 175 | 65 | 62 | 57 | 58 | 62 | 61 |
| Alkalinity | mg/L as CaCO3 | 12 | 21 | 22 | 23 | 24 | 25 | 24 |
| Sulphate | mg/L | 62 | 9.3 | 6.3 | 3.9 | 2.7 | 3.5 | 4.7 |
| Chloride | mg/L | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | <0.06 | <0.06 | <0.06 | <0.06 | 0.19 | 0.10 | 0.06 |
| Phosphorus (total reactive) | mg/L | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.384 | 0.594 | 0.355 | 0.780 | 0.275 | 0.852 | 0.693 |
| Arsenic | mg/L | 0.0006 | 0.0003 | 0.0006 | 0.0032 | 0.0004 | 0.0009 | 0.0007 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 | <0.00005 |
| Barium | mg/L | 0.235 | 0.0218 | 0.292 | 0.0049 | 0.0057 | 0.0016 | 0.0017 |
| Boron | mg/L | <0.002 | 0.002 | <0.002 | <0.002 | 0.003 | 0.002 | <0.002 |
| Beryllium | mg/L | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Bismuth | mg/L | 0.000009 | <0.000007 | 0.000007 | <0.000007 | <0.000007 | <0.000007 | <0.000007 |
| Calcium | mg/L | 25.5 | 8.47 | 7.30 | 7.01 | 6.01 | 5.47 | 6.11 |
| Cadmium | mg/L | <0.000003 | 0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 | <0.000003 |
| Chromium | mg/L | 0.00005 | 0.00006 | 0.00003 | 0.00008 | 0.00030 | 0.00022 | 0.00021 |
| Cobalt | mg/L | 0.000006 | 0.000004 | 0.000004 | <0.000004 | <0.000004 | 0.000007 | <0.000004 |
| Copper | mg/L | 0.00050 | 0.00024 | 0.00039 | 0.00018 | 0.00013 | 0.00022 | 0.00027 |
| Iron | mg/L | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | 0.010 | 0.008 |
| Potassium | mg/L | 5.49 | 1.99 | 2.89 | 5.80 | 5.71 | 9.31 | 6.60 |
| Lithium | mg/L | 0.0015 | 0.0004 | 0.0005 | 0.0012 | 0.0003 | 0.0014 | 0.0010 |
| Magnesium | mg/L | 0.467 | 0.491 | 0.420 | 0.298 | 0.776 | 0.351 | 0.457 |
| Manganese | mg/L | 0.00293 | 0.00060 | 0.00123 | 0.00089 | 0.00045 | 0.00055 | 0.00070 |
| Molybdenum | mg/L | 0.00011 | 0.00010 | 0.00017 | 0.00039 | 0.00072 | 0.00020 | 0.00025 |
| Sodium | mg/L | 2.47 | 2.04 | 1.99 | 1.25 | 1.20 | 1.27 | 2.07 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Phosphorus | mg/L | <0.003 | 0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 |
| Lead | mg/L | 0.00004 | 0.00012 | 0.00003 | 0.00010 | 0.00003 | 0.00001 | 0.00001 |
| Antimony | mg/L | 0.0003 | 0.0002 | 0.0004 | 0.0012 | 0.0006 | 0.0012 | 0.0006 |
| Selenium | mg/L | 0.00010 | <0.00004 | 0.00008 | 0.00004 | <0.00004 | 0.00019 | 0.00023 |
| Silicon | mg/L | 2.37 | 2.56 | 3.08 | 2.98 | 1.61 | 3.57 | 2.91 |
| Tin | mg/L | 0.00010 | 0.00004 | 0.00007 | 0.00002 | <0.00001 | 0.00003 | 0.00001 |
| Strontium | mg/L | 3.47 | 0.448 | 1.06 | 0.0922 | 0.174 | 0.0314 | 0.134 |
| Titanium | mg/L | 0.00012 | 0.00040 | 0.00016 | 0.00064 | 0.00009 | 0.00089 | 0.00048 |
| Thallium | mg/L | 0.000005 | <0.000005 | <0.000005 | <0.000005 | <0.000005 | 0.000005 | <0.000005 |
| Uranium | mg/L | 0.000208 | 0.000111 | 0.000158 | 0.000183 | 0.000005 | 0.000055 | 0.000041 |
| Vanadium | mg/L | 0.00218 | 0.00232 | 0.00235 | 0.00224 | 0.00306 | 0.00515 | 0.00373 |
| Zinc | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 |

| Sample ID | | ODY-ENV-063 | ODY-ENV-065 | ODY-ENV-067 |
|---|---|---|---|---|
| **Material Type** | | Rock | Rock | Rock |
| **Odyssey Zone** | | South | South | South |
| **Sample Location** | | Development Zone | Development Zone | Development Zone |
| **Lithology Code** | | UM | PO | PO |
| **Alteration Code** | | BT | BT | SR |
| **Test Parameters** | | | | |
| Sample weight | g | 40 | 40 | 40 |
| Ext Fluid | #1 or #2 | 1 | 1 | 1 |
| Volume D.I. Water | mL | | | |
| Ext Volume | mL | 800 | 800 | 800 |
| Final pH | -- | 9.53 | 9.72 | 9.65 |
| **Parameters** | | | | |
| Conductivity | µS/cm | 134 | 75 | 77 |
| Alkalinity | mg/L as CaCO3 | 14 | 23 | 21 |
| Sulphate | mg/L | 39 | 11 | 12 |
| Chloride | mg/L | <2.0 | <2.0 | <2.0 |
| Bromide | mg/L | <3.0 | <3.0 | <3.0 |
| Nitrite | as N mg/L | <0.3 | <0.3 | <0.3 |
| Nitrate | as N mg/L | <0.6 | <0.6 | <0.6 |
| Nitrate + Nitrite | as N mg/L | <0.6 | <0.6 | <0.6 |
| Fluoride | mg/L | <0.06 | <0.06 | 0.06 |
| Phosphorus (total reactive) | mg/L | <0.03 | <0.03 | <0.03 |
| Mercury | mg/L | <0.00001 | <0.00001 | <0.00001 |
| Aluminum | mg/L | 0.126 | 0.551 | 0.468 |
| Arsenic | mg/L | 0.0009 | 0.0009 | 0.0034 |
| Silver | mg/L | <0.00005 | <0.00005 | <0.00005 |
| Barium | mg/L | 0.0374 | 0.129 | 0.0313 |
| Boron | mg/L | <0.002 | <0.002 | <0.002 |
| Beryllium | mg/L | <0.000007 | <0.000007 | <0.000007 |
| Bismuth | mg/L | <0.000007 | <0.000007 | <0.000007 |
| Calcium | mg/L | 13.3 | 7.58 | 7.75 |
| Cadmium | mg/L | <0.000003 | <0.000003 | 0.000005 |
| Chromium | mg/L | 0.00027 | 0.00006 | 0.00005 |
| Cobalt | mg/L | 0.000004 | <0.000004 | <0.000004 |
| Copper | mg/L | 0.00021 | 0.00017 | 0.00015 |
| Iron | mg/L | <0.007 | <0.007 | <0.007 |
| Potassium | mg/L | 13.0 | 4.62 | 5.86 |
| Lithium | mg/L | 0.0009 | 0.0010 | 0.0012 |
| Magnesium | mg/L | 1.64 | 0.577 | 0.518 |
| Manganese | mg/L | 0.00087 | 0.00126 | 0.00128 |
| Molybdenum | mg/L | 0.00060 | 0.00019 | 0.00093 |
| Sodium | mg/L | 0.37 | 2.11 | 2.46 |
| Nickel | mg/L | <0.0001 | <0.0001 | <0.0001 |
| Phosphorus | mg/L | <0.003 | 0.004 | <0.003 |
| Lead | mg/L | <0.00001 | 0.00001 | <0.00001 |
| Antimony | mg/L | 0.0009 | 0.0004 | 0.0005 |
| Selenium | mg/L | 0.00028 | 0.00005 | 0.00005 |
| Silicon | mg/L | 2.37 | 2.81 | 2.90 |
| Tin | mg/L | 0.00113 | 0.00003 | 0.00002 |
| Strontium | mg/L | 0.600 | 3.43 | 1.59 |
| Titanium | mg/L | 0.00007 | 0.00019 | 0.00012 |
| Thallium | mg/L | 0.000007 | <0.000005 | <0.000005 |
| Uranium | mg/L | <0.000002 | 0.000301 | 0.000146 |
| Vanadium | mg/L | 0.00376 | 0.00213 | 0.00194 |
| Zinc | mg/L | 0.006 | <0.002 | <0.002 |

# APPENDIX C

## Laboratory Certificates of Analysis

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

29-March-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0,

Phone: 819-757-2225
Fax:

**Date Rec. :** 10 March 2017
**LR Report:** **CA11006-MAR17**
**Reference:** Odyssey

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-51 | 7: Detox Final Tail BL 154-52 |
|---|---|---|---|---|---|---|---|
| Mercury [µg/g] | 16-Mar-17 | 11:49 | 16-Mar-17 | 14:01 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 0.47 | 0.41 | 0.30 |
| Aluminum [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 4300 | 4600 | 5500 |
| Arsenic [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 1.7 | 2.7 | 2.6 |
| Boron [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 160 | 130 | 82 |
| Beryllium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 0.6 | 0.4 | 0.3 |
| Bismuth [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 1.0 | 0.92 | 0.99 |
| Calcium [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 16000 | 18000 | 19000 |
| Cadmium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 0.32 | 0.14 | 0.09 |
| Cobalt [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 6.9 | 7.1 | 9.0 |
| Chromium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 39 | 27 | 36 |
| Copper [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 44 | 38 | 37 |
| Iron [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 18000 | 17000 | 17000 |
| Potassium [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 4700 | 4700 | 4300 |
| Lithium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 7 | 8 | 6 |
| Magnesium [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 5900 | 5400 | 6100 |
| Manganese [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 240 | 250 | 270 |
| Molybdenum [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 2.1 | 1.8 | 2.2 |
| Sodium [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 100 | 120 | 95 |
| Nickel [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:09 | 22 | 16 | 24 |
| Phosphorus [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 690 | 870 | 780 |
| Lead [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 49 | 45 | 27 |
| Antimony [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 14-Mar-17 | 15:50 | 16-Mar-17 | 09:18 | 880 | 850 | 850 |
| Tin [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 440 | 340 | 210 |
| Titanium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 540 | 530 | 490 |
| Thallium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 0.16 | 0.14 | 0.11 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

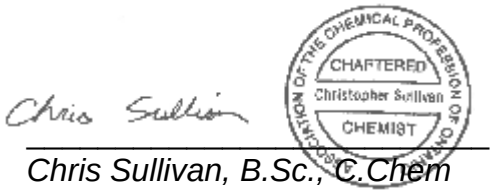
**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA11006-MAR17**

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-51 | 7: Detox Final Tail BL 154-52 |
|---|---|---|---|---|---|---|---|
| Uranium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 0.67 | 0.85 | 0.81 |
| Vanadium [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 33 | 32 | 22 |
| Zinc [µg/g] | 15-Mar-17 | 11:38 | 16-Mar-17 | 09:10 | 58 | 56 | 49 |

## Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| Mercury by CVAAS | ME-CA-[ENV]SPE-LAK-AN-004 | EPA 7471A/EPA 245 | Y |
| Metals, ICP-MS | ME-CA-[ENV]SPE-LAK-AN-007 | MA200_MET.1.2 | Y |
| Metals, ICP-OES | ME-CA-[ENV]SPE-LAK-AN-001 | MA200.MET.1.2/200.7 | Y |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

**SGS Canada Inc.**
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Phone: 705-652-2000 FAX: 705-652-6365



# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Mercury by CVAAS - QCBatchID: EHG0016-MAR17* | | | | | | | | | | | | | |
| Mercury | 0.05 | µg/g | <0.05 | | | ND | 20 | 94 | 80 | 120 | 113 | 70 | 130 |
| *Metals, ICP-MS - QCBatchID: EMS0065-MAR17* | | | | | | | | | | | | | |
| Antimony | 0.8 | µg/g | <0.8 | | | ND | 20 | 99 | 70 | 130 | 123 | 70 | 130 |
| Arsenic | 0.5 | µg/g | <0.5 | | | 1 | 20 | 104 | 70 | 130 | NV | 70 | 130 |
| Barium | 0.01 | µg/g | <0.01 | | | 4 | 20 | 97 | 70 | 130 | 87 | 70 | 130 |
| Beryllium | 0.02 | µg/g | <0.02 | | | 6 | 20 | 101 | 70 | 130 | 109 | 70 | 130 |
| Bismuth | 0.09 | µg/g | <0.09 | | | 6 | 20 | 100 | 70 | 130 | NV | 70 | 130 |
| Boron | 1 | µg/g | <1 | | | ND | 20 | 95 | 70 | 130 | 83 | 70 | 130 |
| Cadmium | 0.02 | µg/g | <0.02 | | | ND | 20 | 98 | 70 | 130 | 102 | 70 | 130 |
| Chromium | 0.5 | µg/g | <0.5 | | | 3 | 20 | 102 | 70 | 130 | 107 | 70 | 130 |
| Cobalt | 0.01 | µg/g | <0.01 | | | 3 | 20 | 101 | 70 | 130 | 99 | 70 | 130 |
| Copper | 0.1 | µg/g | <0.1 | | | 6 | 20 | 100 | 70 | 130 | 97 | 70 | 130 |
| Lead | 0.05 | µg/g | <0.05 | | | 1 | 20 | 100 | 70 | 130 | 99 | 70 | 130 |
| Lithium | 2 | µg/g | <2 | | | 4 | 20 | 99 | 70 | 130 | 107 | 70 | 130 |
| Manganese | 0.1 | µg/g | <0.1 | | | 4 | 20 | 104 | 70 | 130 | 99 | 70 | 130 |
| Molybdenum | 0.1 | µg/g | <0.1 | | | 13 | 20 | 97 | 70 | 130 | 101 | 70 | 130 |
| Nickel | 0.1 | µg/g | <0.1 | | | 6 | 20 | 102 | 70 | 130 | 99 | 70 | 130 |
| Selenium | 0.7 | µg/g | <0.7 | | | ND | 20 | 103 | 70 | 130 | NV | 70 | 130 |
| Silver | 0.01 | µg/g | <0.01 | | | ND | 20 | 100 | 70 | 130 | 129 | 70 | 130 |
| Strontium | 0.02 | µg/g | <0.02 | | | 6 | 20 | 102 | 70 | 130 | 97 | 70 | 130 |
| Thallium | 0.02 | µg/g | <0.02 | | | 1 | 20 | 97 | 70 | 130 | 130 | 70 | 130 |
| Tin | 0.5 | µg/g | <0.5 | | | ND | 20 | 101 | 70 | 130 | NV | 70 | 130 |
| Titanium | 0.1 | µg/g | <0.1 | | | 4 | 20 | 94 | 70 | 130 | NV | 70 | 130 |
| Uranium | 0.002 | µg/g | <0.002 | | | 12 | 20 | 98 | 70 | 130 | 83 | 70 | 130 |
| Vanadium | 1 | µg/g | <1 | | | 6 | 20 | 101 | 70 | 130 | 107 | 70 | 130 |
| Zinc | 0.7 | µg/g | <0.7 | | | 9 | 20 | 100 | 70 | 130 | 106 | 70 | 130 |
| *Metals, ICP-OES - QCBatchID: ESG0054-MAR17* | | | | | | | | | | | | | |
| Aluminum | 1 | µg/g | <1 | | | 2 | 20 | 94 | 80 | 120 | 101 | 70 | 130 |
| Calcium | 1 | µg/g | <1 | | | 3 | 20 | 94 | 80 | 120 | 105 | 70 | 130 |
| Iron | 0.3 | µg/g | <0.3 | | | 3 | 20 | 95 | 80 | 120 | 115 | 70 | 130 |
| Magnesium | 0.1 | µg/g | <0.1 | | | 4 | 20 | 95 | 80 | 120 | 106 | 70 | 130 |
| Phosphorus | 3 | µg/g | <3 | | | 0 | 20 | 95 | 80 | 120 | 92 | 70 | 130 |
| Potassium | 0.3 | µg/g | <0.3 | | | 3 | 20 | 97 | 80 | 120 | 113 | 70 | 130 |
| Silicon | 3 | µg/g | <3 | | | 3 | 20 | 93 | 80 | 120 | NV | 70 | 130 |
| Sodium | 1 | µg/g | <1 | | | 7 | 20 | 95 | 80 | 120 | 87 | 70 | 130 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

**SGS Canada Inc.**
P.O. Box 4300 - 185 Concession St.
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13-April-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier, Malartic
, J0Y 1Z0
Phone: 819-757-2225, Fax:

**Date Rec. :** 27 March 2017
**LR Report:** **CA11023-MAR17**
**Reference:** Odyssey

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 1: Analysis Start Date | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: ODY-ENV-001 | 6: ODY-ENV-002 | 7: ODY-ENV-003 | 8: ODY-ENV-004 | 9: ODY-ENV-005 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | 06-Apr-17 | 07-Apr-17 | 11:07 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 11-Apr-17 | 12-Apr-17 | 09:33 | 0.78 | 0.51 | 0.44 | 0.75 | 0.60 |
| Aluminum [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 5800 | 6800 | 4100 | 4800 | 7200 |
| Arsenic [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Boron [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | 240 | 260 | 170 | 260 | 110 |
| Beryllium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | 0.7 | 0.7 | 0.4 | 0.6 | 0.5 |
| Bismuth [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | 1.6 | 0.71 | 0.72 | 2.2 | 0.65 |
| Calcium [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 19000 | 21000 | 19000 | 20000 | 20000 |
| Cadmium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | 0.26 | 0.06 | 0.18 | 0.14 | 0.15 |
| Cobalt [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | 5.7 | 6.7 | 6.4 | 5.8 | 6.6 |
| Chromium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | 16 | 37 | 14 | 23 | 19 |
| Copper [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:52 | 11 | 9.3 | 15 | 6.0 | 7.3 |
| Iron [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 19000 | 17000 | 17000 | 14000 | 18000 |
| Potassium [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 7400 | 7300 | 4300 | 3500 | 7300 |
| Lithium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 8 | 11 | 5 | 5 | 13 |
| Magnesium [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 6200 | 7400 | 6600 | 5200 | 6800 |
| Manganese [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 270 | 300 | 320 | 220 | 280 |
| Molybdenum [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 0.6 | 0.5 | 0.4 | 0.7 | 0.5 |
| Sodium [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 510 | 730 | 590 | 780 | 620 |
| Nickel [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 9.0 | 21 | 10 | 8.4 | 11 |
| Phosphorus [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 1000 | 1000 | 1200 | 990 | 1200 |
| Lead [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 59 | 22 | 23 | 36 | 22 |
| Antimony [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 07-Apr-17 | 07-Apr-17 | 15:05 | 1200 | 1000 | 610 | 590 | 780 |
| Tin [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 0.6 | 0.6 | < 0.5 | 0.6 | 0.5 |
| Strontium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 970 | 860 | 700 | 740 | 370 |
| Titanium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 870 | 940 | 420 | 420 | 870 |
| Thallium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 0.24 | 0.14 | 0.06 | 0.08 | 0.17 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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**LR Report :** **CA11023-MAR17**

| Analysis | 1: Analysis Start Date | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: ODY-ENV-001 | 6: ODY-ENV-002 | 7: ODY-ENV-003 | 8: ODY-ENV-004 | 9: ODY-ENV-005 |
|---|---|---|---|---|---|---|---|---|
| Uranium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 1.0 | 0.97 | 1.1 | 0.94 | 1.0 |
| Vanadium [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 54 | 54 | 29 | 33 | 43 |
| Zinc [µg/g] | 06-Apr-17 | 07-Apr-17 | 14:51 | 49 | 61 | 52 | 43 | 61 |

| Analysis | 10: ODY-ENV-006 | 11: ODY-ENV-007 | 12: ODY-ENV-008 | 13: ODY-ENV-009 | 14: ODY-ENV-010 | 15: ODY-ENV-011 | 16: ODY-ENV-012 | 17: ODY-ENV-013 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 0.19 | 2.2 | 0.40 | 0.41 | 0.43 | 0.28 | 0.56 | 0.58 |
| Aluminum [µg/g] | 17000 | 7100 | 7400 | 29000 | 7300 | 9600 | 22000 | 7500 |
| Arsenic [µg/g] | < 0.5 | < 0.5 | < 0.5 | 1.3 | 1.6 | 10 | 0.6 | < 0.5 |
| Boron [µg/g] | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 120 | 350 | 240 | 210 | 53 | 160 | 54 | 270 |
| Beryllium [µg/g] | 0.3 | 0.5 | 0.6 | 0.7 | 0.4 | 0.3 | 1.5 | 0.4 |
| Bismuth [µg/g] | 0.27 | 5.3 | 0.98 | 0.40 | 1.5 | 0.34 | 0.41 | 0.50 |
| Calcium [µg/g] | 19000 | 20000 | 20000 | 52000 | 21000 | 11000 | 41000 | 20000 |
| Cadmium [µg/g] | 0.07 | 0.13 | 0.08 | 0.12 | 0.07 | 0.04 | 0.08 | 0.08 |
| Cobalt [µg/g] | 33 | 7.7 | 5.9 | 36 | 8.1 | 6.6 | 31 | 7.0 |
| Chromium [µg/g] | 360 | 33 | 20 | 18 | 50 | 15 | 910 | 26 |
| Copper [µg/g] | 73 | 56 | 8.7 | 74 | 12 | 7.6 | 19 | 6.0 |
| Iron [µg/g] | 31000 | 20000 | 16000 | 70000 | 17000 | 18000 | 34000 | 16000 |
| Potassium [µg/g] | 16000 | 7400 | 6900 | 29000 | 2100 | 8400 | 24000 | 7900 |
| Lithium [µg/g] | 26 | 13 | 9 | 27 | 6 | 12 | 34 | 15 |
| Magnesium [µg/g] | 27000 | 8600 | 7900 | 25000 | 9000 | 8300 | 42000 | 7000 |
| Manganese [µg/g] | 480 | 260 | 270 | 740 | 230 | 220 | 680 | 300 |
| Molybdenum [µg/g] | 5.3 | 2.6 | 2.5 | 4.6 | 1.4 | 2.3 | 6.3 | 0.6 |
| Sodium [µg/g] | 470 | 690 | 450 | 320 | 660 | 530 | 150 | 610 |
| Nickel [µg/g] | 250 | 21 | 15 | 34 | 26 | 16 | 360 | 13 |
| Phosphorus [µg/g] | 310 | 1100 | 750 | 880 | 1100 | 640 | 50 | 1300 |
| Lead [µg/g] | 12 | 200 | 23 | 16 | 16 | 30 | 34 | 20 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 1800 | 610 | 680 | 4800 | 750 | 1100 | 1200 | 840 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | 0.6 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 210 | 290 | 420 | 150 | 160 | 99 | 360 | 540 |
| Titanium [µg/g] | 1300 | 870 | 680 | 2400 | 370 | 820 | 1000 | 940 |
| Thallium [µg/g] | 0.32 | 0.13 | 0.14 | 0.38 | 0.02 | 0.20 | 0.50 | 0.15 |
| Uranium [µg/g] | 0.13 | 0.89 | 1.0 | 0.24 | 1.3 | 0.91 | 0.32 | 0.96 |
| Vanadium [µg/g] | 98 | 52 | 42 | 250 | 36 | 37 | 150 | 43 |
| Zinc [µg/g] | 37 | 54 | 40 | 110 | 32 | 41 | 66 | 55 |

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**LR Report :** **CA11023-MAR17**

| Analysis | 18: ODY-ENV-014 | 19: ODY-ENV-015 | 20: ODY-ENV-016 | 21: ODY-ENV-017 | 22: ODY-ENV-018 | 23: ODY-ENV-019 | 24: ODY-ENV-020 | 25: ODY-ENV-021 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 0.83 | 0.57 | 0.28 | 0.28 | 0.23 | 0.15 | 0.07 | 0.14 |
| Aluminum [µg/g] | 7600 | 4200 | 14000 | 27000 | 7600 | 6900 | 12000 | 23000 |
| Arsenic [µg/g] | 0.5 | < 0.5 | < 0.5 | 2.0 | < 0.5 | < 0.5 | 0.6 | < 0.5 |
| Boron [µg/g] | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 67 | 160 | 74 | 100 | 140 | 140 | 110 | 140 |
| Beryllium [µg/g] | 0.5 | 0.4 | 0.3 | 0.3 | 0.4 | 0.8 | 0.4 | 0.5 |
| Bismuth [µg/g] | 0.17 | 0.34 | 0.18 | 0.14 | 0.44 | 0.41 | 0.61 | 0.37 |
| Calcium [µg/g] | 18000 | 18000 | 42000 | 40000 | 21000 | 21000 | 34000 | 25000 |
| Cadmium [µg/g] | 0.04 | 0.26 | 0.10 | 0.09 | 0.05 | 0.15 | 0.02 | 0.03 |
| Cobalt [µg/g] | 7.3 | 6.2 | 31 | 34 | 7.4 | 6.5 | 35 | 38 |
| Chromium [µg/g] | 45 | 16 | 16 | 50 | 27 | 18 | 650 | 970 |
| Copper [µg/g] | 18 | 9.0 | 100 | 120 | 10 | 4.7 | 45 | 42 |
| Iron [µg/g] | 19000 | 16000 | 46000 | 60000 | 18000 | 18000 | 22000 | 33000 |
| Potassium [µg/g] | 9100 | 4200 | 15000 | 25000 | 8500 | 8600 | 11000 | 23000 |
| Lithium [µg/g] | 17 | 5 | 17 | 31 | 16 | 12 | 12 | 31 |
| Magnesium [µg/g] | 7700 | 6900 | 16000 | 23000 | 6900 | 6900 | 33000 | 44000 |
| Manganese [µg/g] | 260 | 250 | 680 | 820 | 250 | 250 | 870 | 770 |
| Molybdenum [µg/g] | 19 | 1.0 | 5.3 | 3.0 | 11 | 0.3 | 3.8 | 8.8 |
| Sodium [µg/g] | 320 | 670 | 350 | 250 | 470 | 510 | 73 | 150 |
| Nickel [µg/g] | 24 | 9.7 | 27 | 39 | 18 | 9.6 | 250 | 380 |
| Phosphorus [µg/g] | 1100 | 1100 | 600 | 430 | 1000 | 910 | 66 | 91 |
| Lead [µg/g] | 8.3 | 20 | 18 | 12 | 13 | 22 | 2.3 | 11 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 990 | 810 | 2500 | 4200 | 970 | 1900 | 420 | 970 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 0.7 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 230 | 620 | 80 | 45 | 400 | 970 | 350 | 140 |
| Titanium [µg/g] | 1000 | 530 | 1600 | 3000 | 970 | 1100 | 540 | 1500 |
| Thallium [µg/g] | 0.29 | 0.08 | 0.22 | 0.25 | 0.22 | 0.24 | 0.30 | 0.61 |
| Uranium [µg/g] | 0.66 | 0.76 | 0.15 | 0.094 | 0.69 | 0.76 | 0.016 | 0.033 |
| Vanadium [µg/g] | 47 | 32 | 230 | 250 | 39 | 64 | 60 | 100 |
| Zinc [µg/g] | 42 | 55 | 72 | 66 | 56 | 73 | 18 | 37 |

| Analysis | 26: ODY-ENV-022 | 27: ODY-ENV-023 | 28: ODY-ENV-024 | 29: ODY-ENV-025 | 30: ODY-ENV-026 | 31: ODY-ENV-027 | 32: ODY-ENV-028 | 33: ODY-ENV-029 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 0.25 | 0.13 | 0.03 | 0.05 | 0.06 | 0.21 | 0.33 | 0.34 |
| Aluminum [µg/g] | 23000 | 14000 | 14000 | 8600 | 6700 | 7500 | 5200 | 7400 |
| Arsenic [µg/g] | 0.8 | 4.2 | < 0.5 | < 0.5 | 0.9 | < 0.5 | < 0.5 | < 0.5 |
| Boron [µg/g] | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 110 | 42 | 82 | 250 | 230 | 170 | 230 | 170 |
| Beryllium [µg/g] | 1.5 | 0.5 | 0.6 | 0.4 | 0.4 | 0.5 | 0.7 | 0.4 |

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**LR Report :** **CA11023-MAR17**

| Analysis | 26: ODY-ENV-022 | 27: ODY-ENV-023 | 28: ODY-ENV-024 | 29: ODY-ENV-025 | 30: ODY-ENV-026 | 31: ODY-ENV-027 | 32: ODY-ENV-028 | 33: ODY-ENV-029 |
|---|---|---|---|---|---|---|---|---|
| Bismuth [µg/g] | 0.59 | 0.18 | 0.17 | < 0.09 | < 0.09 | 0.28 | 0.13 | 0.89 |
| Calcium [µg/g] | 41000 | 36000 | 45000 | 45000 | 18000 | 19000 | 19000 | 19000 |
| Cadmium [µg/g] | 0.08 | 0.02 | 0.06 | 0.06 | 0.07 | 0.17 | 0.39 | 0.07 |
| Cobalt [µg/g] | 36 | 29 | 33 | 24 | 6.2 | 6.8 | 5.6 | 6.7 |
| Chromium [µg/g] | 940 | 850 | 670 | 540 | 24 | 27 | 16 | 21 |
| Copper [µg/g] | 16 | 29 | 28 | 29 | 4.6 | 5.9 | 5.5 | 5.6 |
| Iron [µg/g] | 38000 | 23000 | 25000 | 22000 | 14000 | 16000 | 13000 | 16000 |
| Potassium [µg/g] | 24000 | 4600 | 14000 | 7300 | 6500 | 7900 | 5700 | 7700 |
| Lithium [µg/g] | 35 | 15 | 16 | 6 | 11 | 10 | 8 | 17 |
| Magnesium [µg/g] | 41000 | 31000 | 45000 | 40000 | 6400 | 7200 | 5900 | 7100 |
| Manganese [µg/g] | 730 | 660 | 960 | 950 | 250 | 270 | 240 | 270 |
| Molybdenum [µg/g] | 7.4 | 0.8 | 0.6 | 0.1 | 0.3 | 0.2 | 0.3 | 0.3 |
| Sodium [µg/g] | 190 | 120 | 94 | 50 | 670 | 590 | 570 | 650 |
| Nickel [µg/g] | 340 | 240 | 290 | 200 | 12 | 15 | 8.9 | 11 |
| Phosphorus [µg/g] | 190 | 97 | 54 | 77 | 910 | 950 | 820 | 950 |
| Lead [µg/g] | 9.1 | 5.4 | 5.0 | 4.1 | 23 | 26 | 15 | 43 |
| Antimony [µg/g] | 1.5 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 1000 | 370 | 600 | 520 | 390 | 430 | 370 | 340 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 400 | 210 | 150 | 720 | 410 | 380 | 840 | 340 |
| Titanium [µg/g] | 1300 | 300 | 670 | 390 | 730 | 880 | 580 | 1100 |
| Thallium [µg/g] | 0.34 | 0.06 | 0.34 | 0.14 | 0.11 | 0.17 | 0.12 | 0.11 |
| Uranium [µg/g] | 0.14 | 0.061 | 0.025 | < 0.002 | 0.95 | 1.4 | 0.95 | 1.0 |
| Vanadium [µg/g] | 160 | 55 | 65 | 48 | 42 | 53 | 48 | 50 |
| Zinc [µg/g] | 75 | 25 | 32 | 14 | 64 | 83 | 70 | 76 |

| Analysis | 34: ODY-ENV-030 | 35: ODY-ENV-031 | 36: ODY-ENV-032 | 37: ODY-ENV-033 | 38: ODY-ENV-034 | 39: ODY-ENV-035 | 40: ODY-ENV-036 | 41: ODY-ENV-037 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 0.12 | 0.54 | 0.33 | 0.46 | 0.49 | 1.2 | 1.7 | 0.64 |
| Aluminum [µg/g] | 2400 | 5800 | 7800 | 6200 | 6400 | 9200 | 14000 | 5700 |
| Arsenic [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | 8.8 | 0.8 | 1.8 | < 0.5 |
| Boron [µg/g] | < 1 | < 1 | < 1 | < 1 | 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 120 | 42 | 230 | 150 | 100 | 71 | 76 | 48 |
| Beryllium [µg/g] | 0.1 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.5 | 0.4 |
| Bismuth [µg/g] | 0.70 | 1.4 | 1.1 | 0.79 | 0.67 | 5.5 | 1.2 | 0.94 |
| Calcium [µg/g] | 9500 | 14000 | 19000 | 20000 | 17000 | 31000 | 22000 | 19000 |
| Cadmium [µg/g] | < 0.02 | 0.04 | 0.08 | 0.06 | 0.19 | 0.05 | 0.11 | 0.04 |
| Cobalt [µg/g] | 2.6 | 4.6 | 6.2 | 6.8 | 6.6 | 9.2 | 21 | 6.8 |
| Chromium [µg/g] | 4.8 | 16 | 19 | 16 | 15 | 25 | 78 | 15 |
| Copper [µg/g] | 3.0 | 3.8 | 7.9 | 7.6 | 12 | 15 | 46 | 9.2 |
| Iron [µg/g] | 5600 | 16000 | 16000 | 16000 | 14000 | 19000 | 28000 | 16000 |

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**LR Report :** **CA11023-MAR17**

| Analysis | 34: ODY-ENV-030 | 35: ODY-ENV-031 | 36: ODY-ENV-032 | 37: ODY-ENV-033 | 38: ODY-ENV-034 | 39: ODY-ENV-035 | 40: ODY-ENV-036 | 41: ODY-ENV-037 |
|---|---|---|---|---|---|---|---|---|
| Potassium [µg/g] | 1700 | 7300 | 7800 | 2500 | 4900 | 1500 | 8200 | 1300 |
| Lithium [µg/g] | < 2 | 8 | 10 | 5 | 7 | 11 | 16 | 5 |
| Magnesium [µg/g] | 1200 | 7700 | 6800 | 5800 | 4700 | 10000 | 13000 | 6200 |
| Manganese [µg/g] | 93 | 180 | 260 | 260 | 240 | 400 | 440 | 200 |
| Molybdenum [µg/g] | 1.1 | 0.4 | 0.5 | 1.9 | 9.1 | 2.7 | 5.0 | 0.5 |
| Sodium [µg/g] | 550 | 120 | 640 | 550 | 270 | 350 | 190 | 380 |
| Nickel [µg/g] | 2.0 | 16 | 10 | 10 | 13 | 25 | 74 | 9.8 |
| Phosphorus [µg/g] | 440 | 12 | 930 | 920 | 930 | 690 | 440 | 890 |
| Lead [µg/g] | 3.7 | 50 | 42 | 11 | 32 | 7.6 | 7.5 | 7.4 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 400 | 360 | 660 | 520 | 450 | 600 | 1200 | 440 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 110 | 220 | 170 | 230 | 160 | 140 | 130 | 130 |
| Titanium [µg/g] | 32 | 570 | 960 | 300 | 300 | 240 | 560 | 160 |
| Thallium [µg/g] | < 0.02 | 0.21 | 0.16 | < 0.02 | 0.05 | < 0.02 | 0.20 | < 0.02 |
| Uranium [µg/g] | 0.67 | 0.37 | 1.2 | 0.98 | 0.75 | 0.85 | 1.1 | 0.87 |
| Vanadium [µg/g] | 6 | 29 | 38 | 20 | 12 | 24 | 30 | 22 |
| Zinc [µg/g] | 8.9 | 23 | 72 | 36 | 62 | 41 | 79 | 30 |

| Analysis | 42: ODY-ENV-038 | 43: ODY-ENV-039 | 44: ODY-ENV-040 | 45: ODY-ENV-041 | 46: ODY-ENV-042 | 47: ODY-ENV-043 | 48: ODY-ENV-044 | 49: ODY-ENV-045 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 1.1 | 0.67 | 0.73 | 0.12 | 0.09 | 0.13 | 2.9 | 0.14 |
| Aluminum [µg/g] | 7500 | 5300 | 5500 | 5700 | 3600 | 7800 | 5000 | 7700 |
| Arsenic [µg/g] | 2.2 | 0.6 | 4.2 | < 0.5 | 1.6 | < 0.5 | < 0.5 | < 0.5 |
| Boron [µg/g] | 2 | < 1 | 2 | < 1 | 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 130 | 91 | 91 | 65 | 140 | 200 | 310 | 250 |
| Beryllium [µg/g] | 0.3 | 0.3 | 0.2 | 0.4 | 0.2 | 0.3 | 0.2 | 0.4 |
| Bismuth [µg/g] | 0.44 | 0.90 | 0.95 | 0.21 | 0.18 | < 0.09 | 9.7 | 0.54 |
| Calcium [µg/g] | 14000 | 17000 | 19000 | 20000 | 1700 | 20000 | 16000 | 20000 |
| Cadmium [µg/g] | 0.07 | 0.09 | 0.38 | 0.05 | 0.08 | 0.09 | 0.08 | 0.17 |
| Cobalt [µg/g] | 5.9 | 5.6 | 6.9 | 6.4 | 2.4 | 6.0 | 5.0 | 6.1 |
| Chromium [µg/g] | 11 | 13 | 9.7 | 15 | 14 | 17 | 17 | 17 |
| Copper [µg/g] | 9.8 | 10 | 11 | 8.4 | 7.7 | 3.3 | 8.1 | 6.8 |
| Iron [µg/g] | 13000 | 15000 | 15000 | 13000 | 4800 | 16000 | 12000 | 16000 |
| Potassium [µg/g] | 6100 | 5100 | 5100 | 1700 | 2500 | 7700 | 3900 | 7900 |
| Lithium [µg/g] | 9 | 6 | 4 | 6 | 3 | 8 | 4 | 10 |
| Magnesium [µg/g] | 5400 | 5200 | 2800 | 5500 | 1900 | 6300 | 4200 | 6100 |
| Manganese [µg/g] | 200 | 260 | 240 | 250 | 39 | 270 | 230 | 260 |
| Molybdenum [µg/g] | 6.3 | 2.9 | 6.6 | 0.3 | 2.5 | 0.3 | 0.4 | 1.9 |
| Sodium [µg/g] | 330 | 310 | 220 | 510 | 370 | 540 | 490 | 700 |
| Nickel [µg/g] | 18 | 8.2 | 9.7 | 9.0 | 7.9 | 9.2 | 9.2 | 9.4 |

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**LR Report :** **CA11023-MAR17**

| Analysis | 42: ODY-ENV-038 | 43: ODY-ENV-039 | 44: ODY-ENV-040 | 45: ODY-ENV-041 | 46: ODY-ENV-042 | 47: ODY-ENV-043 | 48: ODY-ENV-044 | 49: ODY-ENV-045 |
|---|---|---|---|---|---|---|---|---|
| Phosphorus [µg/g] | 730 | 880 | 900 | 1100 | 210 | 990 | 720 | 960 |
| Lead [µg/g] | 29 | 13 | 47 | 10 | 5.6 | 8.6 | 38 | 15 |
| Antimony [µg/g] | 1.1 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 590 | 480 | 570 | 400 | 310 | 460 | 290 | 520 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 93 | 390 | 280 | 180 | 46 | 420 | 270 | 570 |
| Titanium [µg/g] | 370 | 550 | 340 | 370 | 45 | 980 | 420 | 880 |
| Thallium [µg/g] | 0.06 | 0.14 | 0.07 | < 0.02 | < 0.02 | 0.15 | 0.05 | 0.14 |
| Uranium [µg/g] | 0.80 | 0.84 | 0.92 | 1.0 | 0.61 | 1.3 | 3.0 | 1.2 |
| Vanadium [µg/g] | 14 | 21 | 11 | 21 | 3 | 30 | 19 | 27 |
| Zinc [µg/g] | 42 | 45 | 94 | 44 | 10 | 74 | 47 | 84 |

| Analysis | 50: ODY-ENV-046 | 51: ODY-ENV-047 | 52: ODY-ENV-048 | 53: ODY-ENV-049 | 54: ODY-ENV-050 | 55: ODY-ENV-051 | 56: ODY-ENV-052 | 57: ODY-ENV-053 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 0.19 | 0.11 | 0.36 | 0.15 | 0.02 | 0.17 | 0.38 | 0.19 |
| Aluminum [µg/g] | 7900 | 7800 | 5900 | 40000 | 34000 | 18000 | 19000 | 17000 |
| Arsenic [µg/g] | 2.2 | 9.4 | 11 | 2.9 | < 0.5 | 0.6 | 1.1 | 1.6 |
| Boron [µg/g] | 1 | < 1 | 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 160 | 230 | 78 | 420 | 160 | 140 | 96 | 160 |
| Beryllium [µg/g] | 0.3 | 0.3 | 0.2 | 0.5 | 0.7 | 0.3 | 0.4 | 0.3 |
| Bismuth [µg/g] | 0.28 | 0.27 | 0.61 | 0.12 | 0.40 | 0.34 | 2.4 | 0.51 |
| Calcium [µg/g] | 18000 | 19000 | 17000 | 53000 | 68000 | 13000 | 11000 | 13000 |
| Cadmium [µg/g] | 0.15 | 0.08 | 0.07 | 0.13 | 0.09 | 0.07 | 0.05 | 0.06 |
| Cobalt [µg/g] | 7.2 | 6.7 | 7.8 | 34 | 27 | 19 | 22 | 18 |
| Chromium [µg/g] | 10.0 | 17 | 8.5 | 96 | 260 | 87 | 74 | 110 |
| Copper [µg/g] | 13 | 4.6 | 12 | 37 | 2.2 | 39 | 39 | 53 |
| Iron [µg/g] | 16000 | 16000 | 16000 | 56000 | 43000 | 30000 | 32000 | 30000 |
| Potassium [µg/g] | 7600 | 7700 | 3100 | 34000 | 15000 | 17000 | 17000 | 16000 |
| Lithium [µg/g] | 10 | 9 | 7 | 36 | 39 | 19 | 21 | 14 |
| Magnesium [µg/g] | 5200 | 5900 | 4500 | 39000 | 45000 | 14000 | 15000 | 13000 |
| Manganese [µg/g] | 270 | 280 | 240 | 890 | 820 | 450 | 410 | 470 |
| Molybdenum [µg/g] | 1.5 | 0.4 | 9.8 | 2.2 | 6.3 | 2.0 | 2.6 | 3.1 |
| Sodium [µg/g] | 310 | 540 | 320 | 210 | 140 | 370 | 210 | 460 |
| Nickel [µg/g] | 10 | 11 | 13 | 100 | 170 | 68 | 80 | 64 |
| Phosphorus [µg/g] | 1000 | 980 | 920 | 52 | 7 | 560 | 580 | 530 |
| Lead [µg/g] | 16 | 6.6 | 16 | 8.1 | 3.3 | 5.0 | 5.6 | 5.5 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 610 | 590 | 310 | 4000 | 1400 | 1700 | 2300 | 2200 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 180 | 360 | 120 | 210 | 200 | 43 | 39 | 60 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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**LR Report :** **CA11023-MAR17**

| Analysis | 50: ODY-ENV-046 | 51: ODY-ENV-047 | 52: ODY-ENV-048 | 53: ODY-ENV-049 | 54: ODY-ENV-050 | 55: ODY-ENV-051 | 56: ODY-ENV-052 | 57: ODY-ENV-053 |
|---|---|---|---|---|---|---|---|---|
| Titanium [µg/g] | 770 | 830 | 310 | 1200 | 810 | 1700 | 1500 | 1600 |
| Thallium [µg/g] | 0.09 | 0.11 | < 0.02 | 0.64 | 0.24 | 0.35 | 0.48 | 0.39 |
| Uranium [µg/g] | 1.2 | 1.0 | 0.95 | 0.042 | 0.080 | 0.92 | 1.2 | 1.1 |
| Vanadium [µg/g] | 17 | 21 | 9 | 110 | 110 | 43 | 40 | 52 |
| Zinc [µg/g] | 68 | 68 | 43 | 110 | 110 | 70 | 73 | 62 |

| Analysis | 58: ODY-ENV-054 | 59: ODY-ENV-055 | 60: ODY-ENV-056 | 61: ODY-ENV-057 | 62: ODY-ENV-058 | 63: ODY-ENV-059 | 64: ODY-ENV-060 | 65: ODY-ENV-061 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 0.33 | 0.34 | 0.20 | 0.14 | 0.49 | 0.45 | 0.22 | 0.07 |
| Aluminum [µg/g] | 25000 | 17000 | 6900 | 7600 | 6300 | 24000 | 5700 | 8200 |
| Arsenic [µg/g] | 0.8 | 5.5 | < 0.5 | 1.3 | < 0.5 | 1.3 | < 0.5 | < 0.5 |
| Boron [µg/g] | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 230 | 100 | 380 | 220 | 200 | 450 | 170 | 230 |
| Beryllium [µg/g] | 0.3 | 0.4 | 0.7 | 0.4 | 0.4 | 0.8 | 0.4 | 0.3 |
| Bismuth [µg/g] | 0.83 | 0.68 | 0.42 | 0.33 | 1.2 | 1.2 | 0.53 | 0.14 |
| Calcium [µg/g] | 49000 | 14000 | 22000 | 20000 | 18000 | 40000 | 21000 | 19000 |
| Cadmium [µg/g] | 0.14 | 0.09 | 0.19 | 0.08 | 0.11 | 0.19 | 0.08 | 0.09 |
| Cobalt [µg/g] | 38 | 19 | 6.2 | 6.5 | 5.8 | 34 | 6.2 | 7.5 |
| Chromium [µg/g] | 72 | 81 | 18 | 19 | 16 | 48 | 16 | 17 |
| Copper [µg/g] | 87 | 45 | 6.1 | 4.1 | 8.6 | 69 | 9.4 | 15 |
| Iron [µg/g] | 55000 | 29000 | 16000 | 16000 | 14000 | 53000 | 13000 | 17000 |
| Potassium [µg/g] | 21000 | 16000 | 6500 | 7200 | 6300 | 27000 | 4100 | 7800 |
| Lithium [µg/g] | 13 | 21 | 10 | 14 | 12 | 30 | 9 | 14 |
| Magnesium [µg/g] | 37000 | 13000 | 6900 | 6900 | 6400 | 34000 | 5700 | 7200 |
| Manganese [µg/g] | 980 | 380 | 290 | 270 | 250 | 990 | 260 | 290 |
| Molybdenum [µg/g] | 14 | 4.0 | 0.3 | 0.2 | 0.3 | 3.4 | 0.9 | 0.4 |
| Sodium [µg/g] | 340 | 410 | 560 | 660 | 530 | 300 | 630 | 660 |
| Nickel [µg/g] | 66 | 66 | 9.6 | 10 | 9.4 | 73 | 9.6 | 11 |
| Phosphorus [µg/g] | 180 | 520 | 1000 | 950 | 890 | 580 | 930 | 1000 |
| Lead [µg/g] | 4.4 | 9.9 | 34 | 13 | 41 | 85 | 22 | 13 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 2500 | 1700 | 620 | 310 | 320 | 1700 | 260 | 720 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 240 | 27 | 1200 | 460 | 390 | 420 | 320 | 390 |
| Titanium [µg/g] | 1200 | 1300 | 830 | 760 | 720 | 2300 | 500 | 930 |
| Thallium [µg/g] | 0.44 | 0.35 | 0.11 | 0.11 | 0.12 | 0.73 | 0.06 | 0.11 |
| Uranium [µg/g] | 0.13 | 1.4 | 1.2 | 1.1 | 1.0 | 0.17 | 1.1 | 0.91 |
| Vanadium [µg/g] | 130 | 43 | 54 | 41 | 34 | 240 | 31 | 34 |
| Zinc [µg/g] | 80 | 67 | 60 | 75 | 71 | 150 | 56 | 73 |

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**LR Report :** **CA11023-MAR17**

| Analysis | 66: ODY-ENV-062 | 67: ODY-ENV-063 | 68: ODY-ENV-064 | 69: ODY-ENV-065 | 70: ODY-ENV-066 | 71: ODY-ENV-067 | 72: ODY-ENV-068 | 73: ODY-ENV-069 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 0.48 | 0.07 | 0.10 | 0.14 | 0.26 | 0.12 | 0.13 | 0.37 |
| Aluminum [µg/g] | 6700 | 29000 | 5900 | 6700 | 7900 | 6600 | 7300 | 20000 |
| Arsenic [µg/g] | < 0.5 | 4.4 | 0.6 | 0.7 | 1.4 | 7.1 | < 0.5 | 1.1 |
| Boron [µg/g] | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 170 | 200 | 150 | 150 | 120 | 180 | 140 | 47 |
| Beryllium [µg/g] | 0.4 | 0.5 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 2.3 |
| Bismuth [µg/g] | 0.62 | 0.16 | 0.61 | 0.21 | 1.0 | 0.40 | 0.16 | 0.40 |
| Calcium [µg/g] | 19000 | 36000 | 21000 | 19000 | 19000 | 19000 | 20000 | 58000 |
| Cadmium [µg/g] | 0.08 | 0.05 | 0.09 | 0.11 | 0.09 | 0.15 | 0.07 | 0.07 |
| Cobalt [µg/g] | 6.1 | 39 | 7.0 | 6.4 | 6.5 | 6.8 | 6.4 | 32 |
| Chromium [µg/g] | 18 | 720 | 14 | 15 | 14 | 13 | 14 | 870 |
| Copper [µg/g] | 8.7 | 44 | 8.3 | 7.8 | 5.5 | 5.7 | 5.0 | 11 |
| Iron [µg/g] | 15000 | 41000 | 14000 | 15000 | 17000 | 14000 | 15000 | 33000 |
| Potassium [µg/g] | 7000 | 27000 | 4100 | 6300 | 7600 | 6300 | 5100 | 18000 |
| Lithium [µg/g] | 13 | 28 | 7 | 8 | 9 | 8 | 8 | 21 |
| Magnesium [µg/g] | 6200 | 47000 | 6000 | 5500 | 6300 | 5000 | 6000 | 38000 |
| Manganese [µg/g] | 260 | 830 | 270 | 260 | 270 | 260 | 260 | 700 |
| Molybdenum [µg/g] | 0.5 | 7.5 | 0.5 | 1.1 | 0.3 | 2.4 | 0.8 | 4.9 |
| Sodium [µg/g] | 560 | 160 | 540 | 530 | 450 | 430 | 580 | 120 |
| Nickel [µg/g] | 9.7 | 230 | 10 | 10 | 9.4 | 10 | 9.4 | 280 |
| Phosphorus [µg/g] | 870 | 120 | 960 | 860 | 1000 | 900 | 940 | 19 |
| Lead [µg/g] | 30 | 4.6 | 10 | 11 | 19 | 15 | 8.1 | 11 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 430 | 1600 | 210 | 450 | 520 | 470 | 280 | 1000 |
| Tin [µg/g] | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 360 | 180 | 360 | 380 | 240 | 290 | 310 | 540 |
| Titanium [µg/g] | 790 | 1400 | 370 | 610 | 820 | 600 | 540 | 850 |
| Thallium [µg/g] | 0.14 | 0.58 | 0.08 | 0.09 | 0.17 | 0.08 | 0.07 | 0.41 |
| Uranium [µg/g] | 1.1 | 0.26 | 1.2 | 0.94 | 1.0 | 1.0 | 0.98 | 0.66 |
| Vanadium [µg/g] | 34 | 98 | 20 | 19 | 26 | 17 | 24 | 170 |
| Zinc [µg/g] | 70 | 42 | 57 | 70 | 66 | 71 | 67 | 94 |

| Analysis | 74: ODY-ENV-070 | 75: ODY-ENV-071 | 76: ODY-ENV-072 | 77: ODY-ENV-073 | 78: ODY-ENV-074 | 79: ODY-ENV-075 | 80: ODY-ENV-076 | 81: ODY-ENV-077 |
|---|---|---|---|---|---|---|---|---|
| Mercury [ug/g] | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Silver [µg/g] | 2.1 | 0.42 | 0.07 | 0.09 | 0.03 | 0.01 | 0.43 | 0.62 |
| Aluminum [µg/g] | 41000 | 22000 | 26000 | 21000 | 20000 | 19000 | 11000 | 2100 |
| Arsenic [µg/g] | 1.0 | < 0.5 | < 0.5 | 0.7 | < 0.5 | 0.8 | 4.4 | 0.8 |
| Boron [µg/g] | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Barium [µg/g] | 54 | 290 | 280 | 200 | 24 | 130 | 110 | 29 |
| Beryllium [µg/g] | 1.0 | 0.2 | 1.0 | 0.5 | 0.8 | 0.5 | 0.2 | 0.1 |

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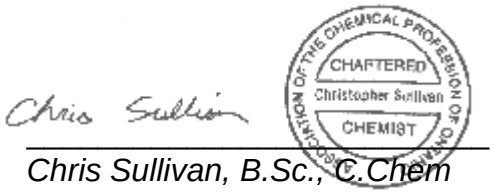
**LR Report :** **CA11023-MAR17**

| Analysis | 74: ODY-ENV-070 | 75: ODY-ENV-071 | 76: ODY-ENV-072 | 77: ODY-ENV-073 | 78: ODY-ENV-074 | 79: ODY-ENV-075 | 80: ODY-ENV-076 | 81: ODY-ENV-077 |
|---|---|---|---|---|---|---|---|---|
| Bismuth [µg/g] | 0.94 | 1.8 | 0.26 | 0.20 | < 0.09 | < 0.09 | 0.25 | 1.0 |
| Calcium [µg/g] | 46000 | 6400 | 7500 | 37000 | 74000 | 50000 | 32000 | 10000 |
| Cadmium [µg/g] | 0.06 | 0.08 | 0.02 | 0.07 | 0.23 | 0.08 | 0.06 | < 0.02 |
| Cobalt [µg/g] | 36 | 20 | 33 | 41 | 16 | 30 | 31 | 5.5 |
| Chromium [µg/g] | 59 | 160 | 800 | 890 | 190 | 930 | 29 | 60 |
| Copper [µg/g] | 200 | 42 | 7.0 | 30 | 4.7 | 6.1 | 110 | 5.2 |
| Iron [µg/g] | 87000 | 37000 | 34000 | 34000 | 36000 | 34000 | 41000 | 11000 |
| Potassium [µg/g] | 40000 | 21000 | 32000 | 21000 | 3100 | 20000 | 10000 | 1600 |
| Lithium [µg/g] | 37 | 25 | 67 | 21 | 22 | 14 | 11 | < 2 |
| Magnesium [µg/g] | 34000 | 17000 | 43000 | 44000 | 24000 | 50000 | 12000 | 1400 |
| Manganese [µg/g] | 880 | 450 | 430 | 730 | 750 | 900 | 540 | 100 |
| Molybdenum [µg/g] | 7.5 | 3.9 | 0.7 | 7.1 | 2.6 | 0.6 | 2.9 | 23 |
| Sodium [µg/g] | 200 | 480 | 170 | 110 | 94 | 48 | 350 | 47 |
| Nickel [µg/g] | 53 | 74 | 360 | 310 | 46 | 290 | 26 | 9.6 |
| Phosphorus [µg/g] | 460 | 570 | 120 | 62 | 1000 | 52 | 740 | 630 |
| Lead [µg/g] | 6.3 | 62 | 11 | 5.6 | 4.4 | 3.3 | 2.6 | 2.6 |
| Antimony [µg/g] | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 | < 0.8 |
| Selenium [µg/g] | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 | < 0.7 |
| Silicon [µg/g] | 6100 | 1900 | 190 | 1400 | 770 | 1200 | 2300 | 330 |
| Tin [µg/g] | 0.7 | 0.6 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 | < 0.5 |
| Strontium [µg/g] | 210 | 18 | 120 | 230 | 340 | 290 | 37 | 54 |
| Titanium [µg/g] | 3600 | 2400 | 1900 | 1200 | 710 | 1100 | 1200 | 26 |
| Thallium [µg/g] | 0.47 | 0.40 | 0.77 | 0.45 | 0.03 | 0.46 | 0.20 | < 0.02 |
| Uranium [µg/g] | 0.13 | 1.2 | 0.69 | 0.13 | 1.3 | 0.088 | 0.066 | 0.19 |
| Vanadium [µg/g] | 200 | 94 | 120 | 67 | 75 | 74 | 170 | 7 |
| Zinc [µg/g] | 85 | 70 | 66 | 36 | 93 | 29 | 57 | 9.1 |

## Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| Mercury by CVAAS | ME-CA-[ENV]SPE-LAK-AN-004 | EPA 7471A/EPA 245 | Y |
| Metals, ICP-MS | ME-CA-[ENV]SPE-LAK-AN-007 | MA200_MET.1.2 | Y |
| Metals, ICP-OES | ME-CA-[ENV]SPE-LAK-AN-001 | MA200.MET.1.2/200.7 | Y |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Mercury by CVAAS - QCBatchID: EHG0005-APR17* | | | | | | | | | | | | | |
| Mercury | 0.05 | ug/g | <0.05 | | | ND | 20 | 100 | 80 | 120 | 96 | 70 | 130 |
| *Metals, ICP-MS - QCBatchID: EMS0009-APR17* | | | | | | | | | | | | | |
| Antimony | 0.8 | µg/g | <0.8 | | | ND | 20 | 100 | 70 | 130 | NV | 70 | 130 |
| Arsenic | 0.5 | µg/g | <0.5 | | | ND | 20 | 99 | 70 | 130 | 119 | 70 | 130 |
| Barium | 0.01 | µg/g | <0.01 | | | 3 | 20 | 97 | 70 | 130 | 93 | 70 | 130 |
| Beryllium | 0.02 | µg/g | <0.02 | | | 0 | 20 | 98 | 70 | 130 | 118 | 70 | 130 |
| Bismuth | 0.09 | µg/g | <0.09 | | | 1 | 20 | 92 | 70 | 130 | NV | 70 | 130 |
| Boron | 1 | µg/g | <1 | | | ND | 20 | 104 | 70 | 130 | 97 | 70 | 130 |
| Cadmium | 0.02 | µg/g | <0.02 | | | 8 | 20 | 102 | 70 | 130 | 106 | 70 | 130 |
| Chromium | 0.5 | µg/g | <0.5 | | | 3 | 20 | 100 | 70 | 130 | 123 | 70 | 130 |
| Cobalt | 0.01 | µg/g | <0.01 | | | 1 | 20 | 98 | 70 | 130 | 101 | 70 | 130 |
| Copper | 0.1 | µg/g | <0.1 | | | 5 | 20 | 96 | 70 | 130 | 105 | 70 | 130 |
| Lead | 0.05 | µg/g | <0.05 | | | 5 | 20 | 102 | 70 | 130 | 117 | 70 | 130 |
| Lithium | 2 | µg/g | <2 | | | 2 | 20 | 99 | 70 | 130 | 113 | 70 | 130 |
| Manganese | 0.1 | µg/g | <0.1 | | | 4 | 20 | 103 | 70 | 130 | 122 | 70 | 130 |
| Molybdenum | 0.1 | µg/g | <0.1 | | | 3 | 20 | 101 | 70 | 130 | 119 | 70 | 130 |
| Nickel | 0.1 | µg/g | <0.1 | | | 1 | 20 | 99 | 70 | 130 | 105 | 70 | 130 |
| Selenium | 0.7 | µg/g | <0.7 | | | ND | 20 | 101 | 70 | 130 | NV | 70 | 130 |
| Strontium | 0.02 | µg/g | <0.02 | | | 0 | 20 | 104 | 70 | 130 | NV | 70 | 130 |
| Thallium | 0.02 | µg/g | <0.02 | | | 8 | 20 | 99 | 70 | 130 | 84 | 70 | 130 |
| Tin | 0.5 | µg/g | <0.5 | | | 11 | 20 | 95 | 70 | 130 | 82 | 70 | 130 |
| Titanium | 0.1 | µg/g | <0.1 | | | 1 | 20 | 101 | 70 | 130 | NV | 70 | 130 |
| Uranium | 0.002 | µg/g | <0.002 | | | 3 | 20 | 100 | 70 | 130 | 83 | 70 | 130 |
| Vanadium | 1 | µg/g | <1 | | | 1 | 20 | 102 | 70 | 130 | 118 | 70 | 130 |
| Zinc | 0.7 | µg/g | <0.7 | | | 1 | 20 | 98 | 70 | 130 | 102 | 70 | 130 |
| *Metals, ICP-MS - QCBatchID: EMS0011-APR17* | | | | | | | | | | | | | |
| Silver | 0.01 | µg/g | <0.01 | | | 1 | 20 | 97 | 70 | 130 | 100 | 70 | 130 |
| *Metals, ICP-OES - QCBatchID: ESG0008-APR17* | | | | | | | | | | | | | |
| Aluminum | 1 | µg/g | <1 | | | 2 | 20 | 96 | 80 | 120 | 105 | 70 | 130 |
| Calcium | 1 | µg/g | <1 | | | 2 | 20 | 96 | 80 | 120 | 105 | 70 | 130 |
| Iron | 0.3 | µg/g | <0.3 | | | 3 | 20 | 96 | 80 | 120 | 118 | 70 | 130 |
| Magnesium | 0.1 | µg/g | <0.1 | | | 2 | 20 | 96 | 80 | 120 | 108 | 70 | 130 |
| Phosphorus | 3 | µg/g | Error! | | | ND | 20 | Error! | 80 | 120 | Error! | 70 | 130 |
| Potassium | 0.3 | µg/g | <0.3 | | | 2 | 20 | 99 | 80 | 120 | 115 | 70 | 130 |
| Silicon | 3 | µg/g | <3 | | | 12 | 20 | 94 | 80 | 120 | NV | 70 | 130 |

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## Quebec MA200-Met 1.2 Digest

**LR Report :** **CA11023-MAR17**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Sodium | 1 | µg/g | Error! | | | ND | 20 | Error! | 80 | 120 | Error! | 70 | 130 |
| *Metals, ICP-OES - QCBatchID: ESG0024-APR17* | | | | | | | | | | | | | |
| Phosphorus | 3 | µg/g | <3 | | | 10 | 20 | 98 | 80 | 120 | 112 | 70 | 130 |
| Silicon | 3 | µg/g | <3 | | | 2 | 20 | 95 | 80 | 120 | NV | 70 | 130 |
| Sodium | 1 | µg/g | <1 | | | 10 | 20 | 98 | 80 | 120 | 113 | 70 | 130 |

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Test method information available upon request. “Temperature Upon Receipt” is representative of the whole shipment and may not reflect the temperature of individual samples.

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23-March-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0,

Phone: 819-757-2225
Fax:

**Date Rec. :** 10 March 2017
**LR Report:** **CA11005-MAR17**
**Reference:** Odyssey

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Partial Report

| Analysis | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-51 | 7: Detox Final Tail BL 154-52 |
|---|---|---|---|
| Sample Date & Time | Date:N/A | Date:N/A | Date:N/A |
| Paste pH | 8.33 | 8.31 | 8.05 |
| Fizz Rate [---] | 3 | 3 | 3 |
| Sample weight [g] | 2.01 | 2.02 | 2.15 |
| HCl Added [mL] | 40.00 | 40.00 | 38.10 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 |
| NaOH to [pH=8.3 mL] | 18.70 | 15.92 | 14.85 |
| Final pH | 1.56 | 1.55 | 1.50 |
| NP [t CaCO3/1000 t] | 53 | 60 | 54 |
| AP [t CaCO3/1000 t] | 21.2 | 16.9 | 13.1 |
| Net NP [t CaCO3/1000 t] | 31.8 | 42.7 | 41.0 |
| NP/AP [ratio] | 2.49 | 3.53 | 4.12 |
| Sulphur (total) [%] | 0.706 | 0.582 | 0.517 |
| Acid Leachable SO4-S [%] | 0.03 | 0.04 | 0.10 |
| Sulphide [%] | 0.68 | 0.54 | 0.42 |
| Carbon (total) [%] | 0.567 | 0.588 | 0.634 |
| Carbonate [%] | 2.44 | 2.42 | 2.81 |

*Brian Graham B.Sc.*
*Project Specialist*
*Environmental Services, Analytical*

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**LR Report :** **CA11005-MAR17**

$$*NP = 50 \times \frac{(N \text{ of HCL} \times \text{Total HCL added} - N \text{ NaOH} \times \text{NaOH added})}{\text{Weight of Sample}}$$

*AP (Acid Potential) = % Sulphide Sulphur x 31.25
*Net NP (Net Neutralization Potential) = NP-AP
NP/AP Ratio = NP/AP
*Results expressed as tonnes CaCO3 equivalent/1000 tonnes of material
Samples with a % Sulphide value of <0.02 will be calculated using a 0.02 value.

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13-April-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier, Malartic
, J0Y 1Z0
Phone: 819-757-2225, Fax:

**Date Rec. :** 27 March 2017
**LR Report:** **CA11022-MAR17**
**Reference:** Odyssey

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 1: Analysis Start Date | 2: Analysis Start Time | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: ODY-ENV-001 | 6: ODY-ENV-002 | 7: ODY-ENV-003 |
|---|---|---|---|---|---|---|---|
| Paste pH | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 9.96 | 9.69 | 7.01 |
| Fizz Rate [---] | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 3 | 3 | 3 |
| Sample weight [g] | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 2.09 | 1.99 | 1.95 |
| HCl_add [mL] | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 42.00 | 40.00 | 44.00 |
| HCl [Normality] | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 19.46 | 18.78 | 20.49 |
| Final pH | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 1.64 | 1.60 | 1.60 |
| NP [t CaCO3/1000 t] | 10-Apr-17 | 08:40 | 11-Apr-17 | 14:52 | 54 | 53 | 60 |
| AP [t CaCO3/1000 t] | --- | --- | --- | --- | 18.1 | 7.81 | 18.1 |
| Net NP [t CaCO3/1000 t] | --- | --- | --- | --- | 35.8 | 45.5 | 42.2 |
| NP/AP [ratio] | --- | --- | --- | --- | 2.97 | 6.82 | 3.33 |
| S [%] | 07-Apr-17 | 10:50 | 07-Apr-17 | 14:45 | 0.688 | 0.302 | 0.682 |
| Acid Leachable SO4-S [%] | --- | --- | --- | --- | 0.11 | 0.05 | 0.10 |
| Sulphide [%] | 07-Apr-17 | 13:25 | 07-Apr-17 | 14:45 | 0.58 | 0.25 | 0.58 |
| C [%] | 07-Apr-17 | 10:50 | 07-Apr-17 | 10:57 | 0.577 | 0.610 | 0.769 |
| CO3 [%] | 06-Apr-17 | 15:17 | 07-Apr-17 | 10:57 | 2.32 | 2.58 | 3.02 |

| Analysis | 8: ODY-ENV-004 | 9: ODY-ENV-005 | 10: ODY-ENV-006 | 11: ODY-ENV-007 | 12: ODY-ENV-008 | 13: ODY-ENV-009 | 14: ODY-ENV-010 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.71 | 9.29 | 9.46 | 9.18 | 9.84 | 10.07 | 9.63 |
| Fizz Rate [---] | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Sample weight [g] | 2.00 | 1.97 | 2.03 | 2.00 | 1.98 | 2.06 | 2.00 |
| HCl_add [mL] | 32.00 | 32.00 | 48.00 | 32.00 | 32.00 | 101.00 | 32.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 11.38 | 12.53 | 19.83 | 12.27 | 11.88 | 42.77 | 11.47 |
| Final pH | 1.88 | 1.78 | 1.66 | 1.80 | 1.76 | 1.63 | 1.78 |

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**LR Report :** **CA11022-MAR17**

| Analysis | 8: ODY-ENV-004 | 9: ODY-ENV-005 | 10: ODY-ENV-006 | 11: ODY-ENV-007 | 12: ODY-ENV-008 | 13: ODY-ENV-009 | 14: ODY-ENV-010 |
|---|---|---|---|---|---|---|---|
| NP [t CaCO3/1000 t] | 52 | 49 | 69 | 49 | 51 | 141 | 51 |
| AP [t CaCO3/1000 t] | 10.6 | 14.1 | 4.38 | 25.3 | 12.8 | 30.0 | 16.9 |
| Net NP [t CaCO3/1000 t] | 41.0 | 35.3 | 65.0 | 24.0 | 38.0 | 111 | 34.4 |
| NP/AP [ratio] | 4.86 | 3.51 | 15.9 | 1.95 | 3.96 | 4.71 | 3.04 |
| S [%] | 0.383 | 0.476 | 0.208 | 0.829 | 0.446 | 0.903 | 0.590 |
| Acid Leachable SO4-S [%] | 0.04 | 0.03 | 0.07 | < 0.02 | 0.04 | < 0.02 | 0.05 |
| Sulphide [%] | 0.34 | 0.45 | 0.14 | 0.81 | 0.41 | 0.96 | 0.54 |
| C [%] | 0.591 | 0.544 | 0.783 | 0.556 | 0.596 | 1.58 | 0.579 |
| CO3 [%] | 2.33 | 2.21 | 3.43 | 2.22 | 2.52 | 7.07 | 2.37 |

| Analysis | 15: ODY-ENV-011 | 16: ODY-ENV-012 | 17: ODY-ENV-013 | 18: ODY-ENV-014 | 19: ODY-ENV-015 | 20: ODY-ENV-016 | 21: ODY-ENV-017 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.97 | 9.97 | 9.07 | 10.00 | 9.72 | 10.15 | 10.07 |
| Fizz Rate [---] | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| Sample weight [g] | 1.99 | 2.09 | 2.06 | 2.01 | 2.02 | 1.97 | 2.03 |
| HCl_add [mL] | 20.00 | 85.00 | 32.00 | 32.00 | 45.00 | 83.00 | 75.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 8.78 | 19.68 | 11.71 | 12.26 | 19.24 | 36.61 | 30.73 |
| Final pH | 1.83 | 1.85 | 1.85 | 1.85 | 1.77 | 1.59 | 1.69 |
| NP [t CaCO3/1000 t] | 28 | 156 | 49 | 49 | 64 | 118 | 109 |
| AP [t CaCO3/1000 t] | 14.1 | 1.56 | 4.06 | 11.9 | 10.3 | 6.56 | 5.31 |
| Net NP [t CaCO3/1000 t] | 14.1 | 155 | 45.1 | 37.2 | 53.5 | 111 | 104 |
| NP/AP [ratio] | 2.01 | 100 | 12.1 | 4.13 | 6.19 | 18.0 | 20.5 |
| S [%] | 0.560 | 0.084 | 0.249 | 0.522 | 0.362 | 0.229 | 0.204 |
| Acid Leachable SO4-S [%] | 0.11 | 0.03 | 0.12 | 0.14 | 0.03 | < 0.02 | 0.03 |
| Sulphide [%] | 0.45 | 0.05 | 0.13 | 0.38 | 0.33 | 0.21 | 0.17 |
| C [%] | 0.294 | 1.92 | 0.564 | 0.582 | 0.753 | 1.28 | 1.21 |
| CO3 [%] | 1.11 | 9.33 | 2.42 | 2.38 | 3.01 | 5.86 | 5.66 |

| Analysis | 22: ODY-ENV-018 | 23: ODY-ENV-019 | 24: ODY-ENV-020 | 25: ODY-ENV-021 | 26: ODY-ENV-022 | 27: ODY-ENV-023 | 28: ODY-ENV-024 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.81 | 10.17 | 9.63 | 9.90 | 9.91 | 9.69 | 9.73 |
| Fizz Rate [---] | 3 | 2 | 2 | 2 | 3 | 2 | 2 |
| Sample weight [g] | 2.00 | 1.96 | 2.00 | 2.00 | 1.97 | 2.07 | 2.00 |
| HCl_add [mL] | 32.00 | 44.00 | 83.20 | 71.50 | 97.00 | 68.00 | 125.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 11.13 | 20.84 | 30.02 | 29.04 | 35.20 | 19.95 | 47.12 |
| Final pH | 1.92 | 1.62 | 1.56 | 1.55 | 1.55 | 1.70 | 1.55 |
| NP [t CaCO3/1000 t] | 52 | 59 | 133 | 106 | 157 | 116 | 195 |
| AP [t CaCO3/1000 t] | 8.75 | 2.81 | 1.56 | 1.25 | 3.44 | 0.62 | 0.94 |

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**LR Report :** **CA11022-MAR17**

| Analysis | 22: ODY-ENV-018 | 23: ODY-ENV-019 | 24: ODY-ENV-020 | 25: ODY-ENV-021 | 26: ODY-ENV-022 | 27: ODY-ENV-023 | 28: ODY-ENV-024 |
|---|---|---|---|---|---|---|---|
| Net NP [t CaCO3/1000 t] | 43.4 | 56.3 | 131 | 105 | 153 | 115 | 194 |
| NP/AP [ratio] | 5.97 | 21.0 | 85.1 | 84.9 | 45.6 | 186 | 208 |
| S [%] | 0.327 | 0.149 | 0.110 | 0.099 | 0.167 | 0.069 | 0.073 |
| Acid Leachable SO4-S [%] | 0.05 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.04 |
| Sulphide [%] | 0.28 | 0.09 | 0.05 | 0.04 | 0.11 | 0.02 | 0.03 |
| C [%] | 0.615 | 0.627 | 1.64 | 1.29 | 1.96 | 1.43 | 2.51 |
| CO3 [%] | 2.59 | 2.69 | 7.86 | 6.13 | 9.09 | 6.69 | 12.6 |

| Analysis | 29: ODY-ENV-025 | 30: ODY-ENV-026 | 31: ODY-ENV-027 | 32: ODY-ENV-028 | 33: ODY-ENV-029 | 34: ODY-ENV-030 | 35: ODY-ENV-031 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.70 | 9.96 | 9.90 | 9.86 | 9.09 | 10.03 | 10.01 |
| Fizz Rate [---] | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| Sample weight [g] | 2.01 | 2.08 | 2.03 | 2.07 | 1.98 | 2.00 | 2.04 |
| HCl_add [mL] | 132.00 | 32.00 | 32.00 | 32.00 | 32.00 | 20.00 | 28.20 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 43.08 | 13.71 | 13.18 | 10.65 | 15.48 | 10.72 | 11.05 |
| Final pH | 1.56 | 1.59 | 1.61 | 1.88 | 1.50 | 1.35 | 1.63 |
| NP [t CaCO3/1000 t] | 221 | 44 | 46 | 52 | 42 | 23 | 42 |
| AP [t CaCO3/1000 t] | 0.62 | 3.12 | 1.25 | 3.75 | 2.19 | 5.62 | 25.3 |
| Net NP [t CaCO3/1000 t] | 221 | 40.9 | 45.2 | 47.8 | 39.5 | 17.6 | 16.7 |
| NP/AP [ratio] | 354 | 14.1 | 37.1 | 13.8 | 19.1 | 4.12 | 1.66 |
| S [%] | 0.059 | 0.121 | 0.077 | 0.163 | 0.159 | 0.246 | 0.852 |
| Acid Leachable SO4-S [%] | 0.04 | < 0.02 | 0.04 | 0.04 | 0.09 | 0.07 | 0.04 |
| Sulphide [%] | 0.02 | 0.10 | 0.04 | 0.12 | 0.07 | 0.18 | 0.81 |
| C [%] | 2.77 | 0.503 | 0.527 | 0.581 | 0.457 | 0.258 | 0.529 |
| CO3 [%] | 13.8 | 2.15 | 2.36 | 2.55 | 1.97 | 1.00 | 2.13 |

| Analysis | 36: ODY-ENV-032 | 37: ODY-ENV-033 | 38: ODY-ENV-034 | 39: ODY-ENV-035 | 40: ODY-ENV-036 | 41: ODY-ENV-037 | 42: ODY-ENV-038 |
|---|---|---|---|---|---|---|---|
| Paste pH | 8.97 | 9.71 | 9.69 | 9.56 | 9.52 | 9.43 | 9.74 |
| Fizz Rate [---] | 3 | 3 | 3 | 3 | 4 | 4 | 3 |
| Sample weight [g] | 2.00 | 2.01 | 2.03 | 2.00 | 2.05 | 2.06 | 1.97 |
| HCl_add [mL] | 32.00 | 32.00 | 32.00 | 32.00 | 41.68 | 41.52 | 25.20 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 14.98 | 12.80 | 12.80 | 14.65 | 17.36 | 19.38 | 10.91 |
| Final pH | 1.58 | 1.67 | 1.67 | 1.59 | 1.66 | 1.51 | 1.63 |
| NP [t CaCO3/1000 t] | 42 | 48 | 47 | 43 | 59 | 54 | 36 |
| AP [t CaCO3/1000 t] | 0.62 | 15.6 | 18.4 | 12.2 | 22.2 | 13.1 | 14.1 |
| Net NP [t CaCO3/1000 t] | 41.9 | 32.2 | 28.9 | 31.2 | 37.1 | 40.6 | 22.2 |
| NP/AP [ratio] | 68.0 | 3.06 | 2.57 | 3.56 | 2.67 | 4.09 | 2.58 |

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**LR Report :** **CA11022-MAR17**

| Analysis | 36: ODY-ENV-032 | 37: ODY-ENV-033 | 38: ODY-ENV-034 | 39: ODY-ENV-035 | 40: ODY-ENV-036 | 41: ODY-ENV-037 | 42: ODY-ENV-038 |
|---|---|---|---|---|---|---|---|
| S [%] | 0.132 | 0.494 | 0.707 | 0.397 | 0.720 | 0.494 | 0.481 |
| Acid Leachable SO4-S [%] | 0.11 | < 0.02 | 0.12 | < 0.02 | < 0.02 | 0.07 | 0.03 |
| Sulphide [%] | 0.02 | 0.50 | 0.59 | 0.39 | 0.71 | 0.42 | 0.45 |
| C [%] | 0.469 | 0.541 | 0.508 | 0.955 | 0.636 | 0.562 | 0.402 |
| CO3 [%] | 2.01 | 2.25 | 2.03 | 4.27 | 2.68 | 2.40 | 1.61 |

| Analysis | 43: ODY-ENV-039 | 44: ODY-ENV-040 | 45: ODY-ENV-041 | 46: ODY-ENV-042 | 47: ODY-ENV-043 | 48: ODY-ENV-044 | 49: ODY-ENV-045 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.72 | 9.34 | 9.55 | 9.71 | 9.98 | 9.85 | 9.88 |
| Fizz Rate [---] | 4 | 4 | 3 | 2 | 4 | 3 | 4 |
| Sample weight [g] | 2.05 | 1.96 | 1.97 | 1.97 | 2.02 | 2.04 | 2.00 |
| HCl_add [mL] | 40.00 | 40.00 | 30.70 | 20.00 | 40.00 | 31.20 | 40.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 20.20 | 21.16 | 11.89 | 17.24 | 20.02 | 13.66 | 18.99 |
| Final pH | 1.53 | 1.51 | 1.62 | 1.14 | 1.52 | 1.57 | 1.58 |
| NP [t CaCO3/1000 t] | 48 | 48 | 48 | 7.0 | 50 | 43 | 52 |
| AP [t CaCO3/1000 t] | 13.4 | 23.8 | 2.50 | 3.44 | 1.25 | 3.44 | 3.12 |
| Net NP [t CaCO3/1000 t] | 34.9 | 24.4 | 45.2 | 3.56 | 48.2 | 39.6 | 49.4 |
| NP/AP [ratio] | 3.59 | 2.03 | 19.1 | 2.04 | 39.6 | 12.5 | 16.8 |
| S [%] | 0.499 | 0.812 | 0.114 | 0.151 | 0.090 | 0.150 | 0.124 |
| Acid Leachable SO4-S [%] | 0.07 | 0.05 | 0.03 | 0.04 | 0.05 | 0.04 | 0.02 |
| Sulphide [%] | 0.43 | 0.76 | 0.08 | 0.11 | 0.04 | 0.11 | 0.10 |
| C [%] | 0.575 | 0.560 | 0.538 | 0.042 | 0.558 | 0.499 | 0.608 |
| CO3 [%] | 2.37 | 2.21 | 2.31 | 0.125 | 2.44 | 2.04 | 2.49 |

| Analysis | 50: ODY-ENV-046 | 51: ODY-ENV-047 | 52: ODY-ENV-048 | 53: ODY-ENV-049 | 54: ODY-ENV-050 | 55: ODY-ENV-051 | 56: ODY-ENV-052 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.90 | 9.73 | 9.60 | 9.86 | 9.17 | 10.03 | 9.94 |
| Fizz Rate [---] | 4 | 4 | 3 | 4 | 4 | 3 | 3 |
| Sample weight [g] | 2.00 | 2.02 | 2.00 | 1.97 | 2.02 | 1.96 | 2.11 |
| HCl_add [mL] | 40.00 | 40.00 | 30.50 | 90.00 | 95.00 | 30.00 | 26.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 21.88 | 20.15 | 13.01 | 29.20 | 20.52 | 16.10 | 13.73 |
| Final pH | 1.50 | 1.51 | 1.57 | 1.82 | 1.92 | 1.58 | 1.62 |
| NP [t CaCO3/1000 t] | 45 | 49 | 44 | 154 | 184 | 35 | 29 |
| AP [t CaCO3/1000 t] | 11.2 | 10.6 | 30.0 | 5.62 | 0.62 | 6.56 | 5.94 |
| Net NP [t CaCO3/1000 t] | 34.0 | 38.5 | 13.7 | 149 | 184 | 28.8 | 23.2 |
| NP/AP [ratio] | 4.03 | 4.62 | 1.46 | 27.4 | 297 | 5.39 | 4.90 |
| S [%] | 0.436 | 0.412 | 0.973 | 0.222 | 0.006 | 0.230 | 0.225 |
| Acid Leachable SO4-S [%] | 0.08 | 0.07 | < 0.02 | 0.04 | < 0.02 | 0.02 | 0.04 |

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**LR Report :** **CA11022-MAR17**

| Analysis | 50: ODY-ENV-046 | 51: ODY-ENV-047 | 52: ODY-ENV-048 | 53: ODY-ENV-049 | 54: ODY-ENV-050 | 55: ODY-ENV-051 | 56: ODY-ENV-052 |
|---|---|---|---|---|---|---|---|
| Sulphide [%] | 0.36 | 0.34 | 0.96 | 0.18 | < 0.02 | 0.21 | 0.19 |
| C [%] | 0.524 | 0.559 | 0.486 | 1.76 | 2.16 | 0.360 | 0.280 |
| CO3 [%] | 2.12 | 2.31 | 1.93 | 8.16 | 10.5 | 1.43 | 1.19 |

| Analysis | 57: ODY-ENV-053 | 58: ODY-ENV-054 | 59: ODY-ENV-055 | 60: ODY-ENV-056 | 61: ODY-ENV-057 | 62: ODY-ENV-058 | 63: ODY-ENV-059 |
|---|---|---|---|---|---|---|---|
| Paste pH | 10.02 | 9.58 | 9.90 | 9.80 | 9.01 | 9.02 | 9.22 |
| Fizz Rate [---] | 3 | 4 | 3 | 4 | 3 | 3 | 4 |
| Sample weight [g] | 1.95 | 2.01 | 1.96 | 2.01 | 1.96 | 2.04 | 1.98 |
| HCl_add [mL] | 29.00 | 131.00 | 30.00 | 40.00 | 32.00 | 30.00 | 79.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 14.80 | 55.84 | 15.03 | 16.74 | 12.77 | 11.20 | 32.62 |
| Final pH | 1.60 | 1.58 | 1.61 | 1.63 | 1.64 | 1.69 | 1.59 |
| NP [t CaCO3/1000 t] | 36 | 187 | 38 | 58 | 49 | 46 | 117 |
| AP [t CaCO3/1000 t] | 7.81 | 12.2 | 9.69 | 3.44 | 1.88 | 2.50 | 5.94 |
| Net NP [t CaCO3/1000 t] | 28.6 | 175 | 28.5 | 54.5 | 47.2 | 43.6 | 111 |
| NP/AP [ratio] | 4.66 | 15.3 | 3.94 | 16.8 | 26.2 | 18.4 | 19.7 |
| S [%] | 0.286 | 0.510 | 0.410 | 0.166 | 0.140 | 0.176 | 0.315 |
| Acid Leachable SO4-S [%] | 0.04 | 0.12 | 0.10 | 0.06 | 0.08 | 0.10 | 0.12 |
| Sulphide [%] | 0.25 | 0.39 | 0.31 | 0.11 | 0.06 | 0.08 | 0.19 |
| C [%] | 0.370 | 2.40 | 0.401 | 0.615 | 0.539 | 0.516 | 1.34 |
| CO3 [%] | 1.48 | 10.7 | 1.46 | 2.67 | 2.30 | 2.09 | 5.98 |

| Analysis | 64: ODY-ENV-060 | 65: ODY-ENV-061 | 66: ODY-ENV-062 | 67: ODY-ENV-063 | 68: ODY-ENV-064 | 69: ODY-ENV-065 | 70: ODY-ENV-066 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.04 | 9.07 | 9.03 | 9.38 | 9.75 | 9.78 | 9.88 |
| Fizz Rate [---] | 3 | 3 | 3 | 4 | 3 | 4 | 4 |
| Sample weight [g] | 2.06 | 2.03 | 1.99 | 1.99 | 1.98 | 2.02 | 2.06 |
| HCl_add [mL] | 31.00 | 31.00 | 30.00 | 92.30 | 34.00 | 40.00 | 40.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 10.69 | 12.82 | 11.27 | 34.31 | 12.54 | 18.52 | 20.42 |
| Final pH | 1.70 | 1.74 | 1.64 | 1.56 | 1.64 | 1.58 | 1.55 |
| NP [t CaCO3/1000 t] | 49 | 45 | 47 | 146 | 54 | 53 | 48 |
| AP [t CaCO3/1000 t] | 4.06 | 1.56 | 6.25 | 0.94 | 3.12 | 6.25 | 6.25 |
| Net NP [t CaCO3/1000 t] | 45.2 | 43.2 | 40.8 | 145 | 51.1 | 47.0 | 41.2 |
| NP/AP [ratio] | 12.1 | 28.7 | 7.54 | 155 | 17.3 | 8.51 | 7.60 |
| S [%] | 0.227 | 0.188 | 0.235 | 0.129 | 0.161 | 0.229 | 0.210 |
| Acid Leachable SO4-S [%] | 0.10 | 0.14 | 0.04 | 0.10 | 0.06 | 0.03 | < 0.02 |
| Sulphide [%] | 0.13 | 0.05 | 0.20 | 0.03 | 0.10 | 0.20 | 0.20 |
| C [%] | 0.553 | 0.456 | 0.512 | 1.79 | 0.665 | 0.615 | 0.514 |

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**LR Report :** **CA11022-MAR17**

| Analysis | 64: ODY-ENV-060 | 65: ODY-ENV-061 | 66: ODY-ENV-062 | 67: ODY-ENV-063 | 68: ODY-ENV-064 | 69: ODY-ENV-065 | 70: ODY-ENV-066 |
|---|---|---|---|---|---|---|---|
| CO3 [%] | 2.28 | 1.89 | 2.18 | 8.58 | 2.72 | 2.49 | 2.19 |

| Analysis | 71: ODY-ENV-067 | 72: ODY-ENV-068 | 73: ODY-ENV-069 | 74: ODY-ENV-070 | 75: ODY-ENV-071 | 76: ODY-ENV-072 | 77: ODY-ENV-073 |
|---|---|---|---|---|---|---|---|
| Paste pH | 9.45 | 9.87 | 9.81 | 10.01 | 9.52 | 9.39 | 9.74 |
| Fizz Rate [---] | 4 | 4 | 4 | 4 | 3 | 3 | 4 |
| Sample weight [g] | 2.00 | 2.01 | 2.01 | 1.94 | 2.00 | 2.00 | 2.07 |
| HCl_add [mL] | 40.00 | 40.00 | 114.00 | 91.00 | 20.00 | 20.00 | 100.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 21.27 | 20.34 | 36.67 | 42.01 | 12.43 | 9.61 | 36.21 |
| Final pH | 1.51 | 1.56 | 1.69 | 1.61 | 1.46 | 1.55 | 1.58 |
| NP [t CaCO3/1000 t] | 47 | 49 | 192 | 126 | 19 | 26 | 154 |
| AP [t CaCO3/1000 t] | 11.2 | 1.88 | 5.62 | 44.1 | 6.56 | 1.56 | 5.31 |
| Net NP [t CaCO3/1000 t] | 35.6 | 47.0 | 187 | 82.2 | 12.3 | 24.4 | 149 |
| NP/AP [ratio] | 4.16 | 26.1 | 34.2 | 2.87 | 2.88 | 16.6 | 29.0 |
| S [%] | 0.392 | 0.084 | 0.266 | 1.45 | 0.244 | 0.153 | 0.237 |
| Acid Leachable SO4-S [%] | 0.03 | 0.02 | 0.09 | 0.04 | 0.03 | 0.10 | 0.07 |
| Sulphide [%] | 0.36 | 0.06 | 0.18 | 1.41 | 0.21 | 0.05 | 0.17 |
| C [%] | 0.556 | 0.565 | 2.32 | 1.35 | 0.122 | 0.174 | 1.95 |
| CO3 [%] | 2.38 | 2.42 | 11.2 | 5.70 | 0.470 | 0.719 | 9.00 |

| Analysis | 78: ODY-ENV-074 | 79: ODY-ENV-075 | 80: ODY-ENV-076 | 81: ODY-ENV-077 |
|---|---|---|---|---|
| Paste pH | 9.28 | 9.69 | 9.55 | 9.46 |
| Fizz Rate [---] | 4 | 4 | 4 | 3 |
| Sample weight [g] | 2.01 | 2.02 | 2.02 | 2.00 |
| HCl_add [mL] | 98.00 | 149.00 | 54.00 | 20.00 |
| HCl [Normality] | 0.10 | 0.10 | 0.10 | 0.10 |
| NaOH [Normality] | 0.10 | 0.10 | 0.10 | 0.10 |
| Vol NaOH to pH=8.3 [mL] | 44.47 | 56.74 | 20.36 | 11.03 |
| Final pH | 1.78 | 1.57 | 1.73 | 1.44 |
| NP [t CaCO3/1000 t] | 133 | 228 | 83 | 22 |
| AP [t CaCO3/1000 t] | 0.62 | 0.62 | 13.8 | 26.2 |
| Net NP [t CaCO3/1000 t] | 132 | 228 | 69.6 | -3.85 |
| NP/AP [ratio] | 213 | 368 | 6.06 | 0.85 |
| S [%] | 0.057 | 0.023 | 0.458 | 0.938 |
| Acid Leachable SO4-S [%] | 0.04 | 0.02 | < 0.02 | 0.10 |
| Sulphide [%] | 0.02 | < 0.02 | 0.44 | 0.84 |
| C [%] | 2.17 | 2.90 | 0.918 | 0.261 |
| CO3 [%] | 10.4 | 14.6 | 4.13 | 0.949 |

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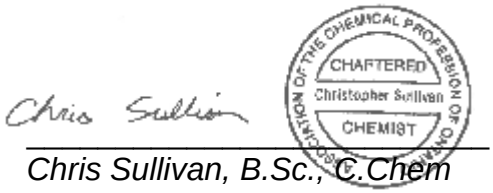
**LR Report :** **CA11022-MAR17**

## Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| Carbon/Sulphur | ME-CA-[ENV]ARD-LAK-AN-019 | ASTM E1915-07A | Y |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | | |
| | | | | | | | % | | Low | High | | Low | High | |
| *Carbon/Sulphur - QCBatchID: ECS0004-APR17* | | | | | | | | | | | | | | |
| Carbonate | 0.025 | % | < 0.005 | | | 1 | 20 | | | | 98 | 70 | 130 | |
| *Carbon/Sulphur - QCBatchID: ECS0005-APR17* | | | | | | | | | | | | | | |
| Sulphide | 0.02 | % | < 0.02 | | | 18 | 20 | 110 | 80 | 120 | | | | |
| *Carbon/Sulphur - QCBatchID: ECS0007-APR17* | | | | | | | | | | | | | | |
| Carbon (total) | 0.005 | % | <0.005 | | | 0 | 20 | | | | 103 | 70 | 130 | |
| Sulphur (total) | 0.005 | % | <0.005 | | | 3 | 20 | | | | 103 | 70 | 130 | |

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16-May-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier, Malartic
, J0Y 1Z0
Phone: 819-757-2225, Fax:

**Date Rec. :** 26 April 2017
**LR Report:** **CA11010-APR17**

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Sample ID | Fluoride µg/g | Bromide µg/g |
|---|---|---|
| 1: Analysis Start Date | 10-May-17 | 04-May-17 |
| 2: Analysis Start Time | 15:23 | 16:54 |
| 3: Analysis Approval Date | 12-May-17 | 05-May-17 |
| 4: Analysis Approval Time | 13:44 | 12:10 |
| 5: Detox Final Tail BL 154-50 | < 1 | < 1.5 |
| 6: Detox Final Tail BL 154-52 | < 1 | < 1.5 |
| 7: ODY-ENV-001 | 1 | < 1.5 |
| 8: ODY-ENV-008 | 3 | < 1.5 |
| 9: ODY-ENV-033 | 2 | < 1.5 |
| 10: ODY-ENV-039 | 2 | < 1.5 |
| 11: ODY-ENV-019 | 1 | < 1.5 |
| 12: ODY-ENV-022 | 3 | < 1.5 |
| 13: ODY-ENV-023 | 3 | < 1.5 |
| 14: ODY-ENV-028 | 2 | < 1.5 |
| 15: ODY-ENV-030 | 1 | < 1.5 |
| 16: ODY-ENV-032 | 3 | < 1.5 |
| 17: ODY-ENV-056 | 2 | < 1.5 |
| 18: ODY-ENV-057 | 4 | < 1.5 |
| 19: ODY-ENV-062 | 3 | < 1.5 |
| 20: ODY-ENV-041 | 2 | < 1.5 |
| 21: ODY-ENV-044 | 2 | < 1.5 |
| 22: ODY-ENV-046 | 3 | < 1.5 |
| 23: ODY-ENV-050 | 5 | < 1.5 |
| 24: ODY-ENV-051 | 4 | < 1.5 |
| 25: ODY-ENV-053 | 4 | < 1.5 |
| 26: ODY-ENV-063 | 2 | < 1.5 |
| 27: ODY-ENV-065 | 3 | < 1.5 |
| 28: ODY-ENV-067 | 3 | < 1.5 |

OnLine LIMS

0001000257



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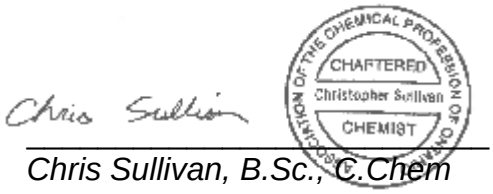
**LR Report :** **CA11010-APR17**

# Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| Anions by IC | ME-CA-[ENV]IC-LAK-AN-001 | EPA300/MA300-Ions1.3 | N |
| Flouride by Specific Ion Electrode | ME-CA-[ENV}EWL-LAK-AN-014 | E3263 | Y |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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**LR Report :** **CA11010-APR17**

# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Anions by IC - QCBatchID: DIO0076-MAY17* | | | | | | | | | | | | | |
| Bromide | 1.5 | µg/g | <1.5 | | | ND | 20 | 101 | 80 | 120 | 98 | 75 | 125 |
| *Anions by IC - QCBatchID: DIO0080-MAY17* | | | | | | | | | | | | | |
| Bromide | 1.5 | µg/g | <1.5 | | | ND | 20 | 101 | 80 | 120 | 98 | 75 | 125 |
| *Flouride by Specific Ion Electrode - QCBatchID: EWL0170-MAY17* | | | | | | | | | | | | | |
| Fluoride | 1 | µg/g | 0.01 | | | ND | 30 | 101 | 80 | 120 | 96 | 70 | 130 |

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16-May-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0,

Phone: 819-757-2225
Fax:

**Date Rec. :** 26 April 2017
**LR Report:** **CA11011-APR17**
**Reference:** TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-52 | 7: ODY-ENV-001 | 8: ODY-ENV-008 | 9: ODY-ENV-033 | 10: ODY-ENV-039 |
|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 08-May-17 | 13:10 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid [#1 or #2] | 08-May-17 | 13:10 | 2 | 2 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 08-May-17 | 13:10 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | 08-May-17 | 13:10 | 4.51 | 4.58 | 6.29 | 6.30 | 6.29 | 5.95 |
| Conductivity [µS/cm] | 10-May-17 | 08:40 | 2580 | 2770 | 4000 | 4020 | 4150 | 3830 |
| Alkalinity [mg/L as CaCO3] | 09-May-17 | 15:11 | 198 | 241 | 2310 | 2460 | 2360 | 2140 |
| Sulphate [mg/L] | 12-May-17 | 09:07 | 26 | 28 | 18 | 10 | 8.8 | 6.6 |
| Chloride [mg/L] | 12-May-17 | 09:06 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| Bromide [mg/L] | 09-May-17 | 11:24 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | 09-May-17 | 11:24 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | 09-May-17 | 11:24 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | 10-May-17 | 07:42 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 10-May-17 | 08:33 | < 0.06 | 0.10 | < 0.06 | 0.06 | < 0.06 | < 0.06 |
| Phosphorus (total reactive) [mg/L] | 09-May-17 | 14:32 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Mercury [mg/L] | 10-May-17 | 10:20 | < 0.00001 | < 0.00001 | 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 11-May-17 | 11:41 | 2.36 | 2.41 | < 0.01 | < 0.01 | < 0.01 | 0.02 |
| Arsenic [mg/L] | 11-May-17 | 11:41 | < 0.002 | 0.0064 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Silver [mg/L] | 11-May-17 | 11:41 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Barium [mg/L] | 11-May-17 | 11:41 | 3.06 | 1.32 | 4.29 | 2.97 | 1.84 | 1.09 |
| Boron [mg/L] | 11-May-17 | 11:41 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Beryllium [mg/L] | 11-May-17 | 11:41 | 0.00244 | 0.00107 | 0.00017 | 0.00011 | 0.00007 | 0.00018 |
| Bismuth [mg/L] | 11-May-17 | 11:41 | 0.00013 | 0.00012 | < 0.00007 | < 0.00007 | < 0.00007 | < 0.00007 |
| Calcium [mg/L] | 11-May-17 | 11:41 | 659 | 852 | 424 | 518 | 520 | 415 |
| Cadmium [mg/L] | 11-May-17 | 11:41 | 0.00634 | 0.00218 | 0.00480 | 0.00117 | 0.00104 | 0.00152 |
| Chromium [mg/L] | 11-May-17 | 11:41 | 0.0103 | 0.0086 | < 0.0003 | < 0.0003 | < 0.0003 | 0.0004 |
| Cobalt [mg/L] | 11-May-17 | 11:41 | 0.00539 | 0.00655 | 0.00213 | 0.00320 | 0.00345 | 0.00071 |
| Copper [mg/L] | 11-May-17 | 11:41 | 0.689 | 0.472 | 0.0015 | 0.0011 | 0.0010 | 0.0014 |
| Iron [mg/L] | 11-May-17 | 11:41 | 41.9 | 25.1 | 3.54 | 1.22 | 0.90 | 8.62 |
| Potassium [mg/L] | 11-May-17 | 11:41 | 53.6 | 21.0 | 53.8 | 24.5 | 15.9 | 20.9 |
| Lithium [mg/L] | 11-May-17 | 11:41 | 0.012 | 0.005 | 0.009 | 0.003 | 0.010 | 0.003 |
| Magnesium [mg/L] | 11-May-17 | 11:41 | 47.8 | 30.3 | 6.97 | 4.31 | 3.16 | 7.35 |
| Manganese [mg/L] | 11-May-17 | 11:41 | 7.99 | 8.76 | 4.73 | 5.25 | 4.84 | 4.60 |
| Molybdenum [mg/L] | 11-May-17 | 11:41 | 0.0033 | 0.0020 | 0.0017 | 0.0011 | 0.0012 | 0.0011 |

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**LR Report : CA11011-APR17**

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-52 | 7: ODY-ENV-001 | 8: ODY-ENV-008 | 9: ODY-ENV-033 | 10: ODY-ENV-039 |
|---|---|---|---|---|---|---|---|---|
| Sodium [mg/L] | 11-May-17 | 11:41 | 2.4 | 2.3 | 1020 | 1110 | 1120 | 1080 |
| Nickel [mg/L] | 11-May-17 | 11:41 | 0.017 | 0.030 | 0.002 | 0.002 | 0.003 | 0.002 |
| Phosphorus [mg/L] | 11-May-17 | 11:41 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Lead [mg/L] | 11-May-17 | 11:41 | 0.164 | 0.0795 | 0.0073 | 0.0043 | 0.0035 | 0.0099 |
| Antimony [mg/L] | 11-May-17 | 11:41 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Selenium [mg/L] | 11-May-17 | 11:41 | 0.0005 | 0.0005 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 |
| Silicon [mg/L] | 11-May-17 | 11:41 | 4.1 | 3.8 | 0.9 | 1.0 | 1.1 | 0.9 |
| Tin [mg/L] | 11-May-17 | 11:41 | 0.0005 | 0.0007 | 0.0001 | 0.0005 | 0.0002 | 0.0002 |
| Strontium [mg/L] | 11-May-17 | 11:41 | 16.8 | 8.92 | 21.3 | 9.21 | 5.85 | 8.77 |
| Titanium [mg/L] | 11-May-17 | 11:41 | 0.0009 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Thallium [mg/L] | 11-May-17 | 11:41 | 0.00067 | 0.00017 | 0.00167 | 0.00034 | 0.00013 | 0.00034 |
| Uranium [mg/L] | 11-May-17 | 11:41 | 0.00386 | 0.00490 | 0.00198 | 0.00102 | 0.00107 | 0.00153 |
| Vanadium [mg/L] | 11-May-17 | 11:41 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Zinc [mg/L] | 11-May-17 | 11:41 | 0.14 | 0.09 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |

| Analysis | 11: ODY-ENV-019 | 12: ODY-ENV-022 | 13: ODY-ENV-023 | 14: ODY-ENV-028 | 15: ODY-ENV-030 | 16: ODY-ENV-032 | 17: ODY-ENV-056 | 18: ODY-ENV-057 |
|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid [#1 or #2] | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 1 |
| Ext Volume [mL] | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | 6.35 | 4.99 | 4.95 | 6.22 | 5.45 | 6.28 | 4.49 | 6.28 |
| Conductivity [µS/cm] | 5360 | 4780 | 3590 | 3920 | 4570 | 5470 | 3130 | 5280 |
| Alkalinity [mg/L as CaCO3] | 2430 | 1690 | 1590 | 2280 | 1750 | 2350 | 283 | 2360 |
| Sulphate [mg/L] | 4.6 | < 2 | < 2 | 22 | 4.7 | 100 | 30 | 65 |
| Chloride [mg/L] | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | < 0.06 | 0.08 | 0.07 | < 0.06 | < 0.06 | 0.07 | 0.08 | 0.09 |
| Phosphorus (total reactive) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | < 0.01 | 0.69 | 0.54 | < 0.01 | 0.12 | < 0.01 | 2.25 | < 0.01 |
| Arsenic [mg/L] | < 0.002 | < 0.002 | 0.0035 | < 0.002 | < 0.002 | < 0.002 | 0.0035 | < 0.002 |
| Silver [mg/L] | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Barium [mg/L] | 1.80 | 0.285 | 0.212 | 3.94 | 1.38 | 0.365 | 4.79 | 1.70 |
| Boron [mg/L] | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Beryllium [mg/L] | 0.00013 | 0.00189 | 0.00163 | 0.00015 | 0.00023 | < 0.00007 | 0.00135 | < 0.00007 |
| Bismuth [mg/L] | < 0.00007 | 0.00043 | 0.00020 | < 0.00007 | < 0.00007 | < 0.00007 | 0.00012 | < 0.00007 |
| Calcium [mg/L] | 487 | 930 | 1290 | 487 | 245 | 542 | 811 | 539 |
| Cadmium [mg/L] | 0.00297 | 0.00137 | 0.00037 | 0.00727 | 0.00018 | 0.00203 | 0.00595 | 0.00149 |
| Chromium [mg/L] | < 0.0003 | 0.0738 | 0.0735 | < 0.0003 | 0.0009 | < 0.0003 | 0.0383 | < 0.0003 |
| Cobalt [mg/L] | 0.00189 | 0.01609 | 0.01286 | 0.00136 | 0.00682 | 0.00388 | 0.00559 | 0.00165 |
| Copper [mg/L] | 0.0014 | 0.0014 | 0.0021 | 0.0010 | 0.0010 | 0.0006 | 0.0011 | 0.0006 |
| Iron [mg/L] | 2.52 | 54.5 | 23.1 | 5.62 | 1.82 | 2.72 | 15.7 | 3.17 |
| Potassium [mg/L] | 63.5 | 78.1 | 18.3 | 29.7 | 4.73 | 33.3 | 24.7 | 23.0 |
| Lithium [mg/L] | 0.012 | 0.014 | 0.005 | 0.004 | 0.001 | 0.004 | 0.005 | 0.004 |
| Magnesium [mg/L] | 6.58 | 117 | 58.8 | 4.72 | 1.72 | 2.74 | 7.56 | 3.76 |
| Manganese [mg/L] | 5.04 | 12.9 | 17.1 | 5.08 | 1.82 | 4.65 | 8.99 | 5.49 |
| Molybdenum [mg/L] | 0.0009 | 0.0020 | 0.0008 | 0.0009 | 0.0009 | 0.0009 | 0.0008 | 0.0009 |
| Sodium [mg/L] | 1010 | 1.6 | 2.5 | 1080 | 975 | 1040 | 3.8 | 1110 |
| Nickel [mg/L] | 0.002 | 0.081 | 0.056 | 0.001 | 0.001 | 0.001 | 0.006 | 0.001 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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**LR Report : CA11011-APR17**

| Analysis | 11: ODY-ENV-019 | 12: ODY-ENV-022 | 13: ODY-ENV-023 | 14: ODY-ENV-028 | 15: ODY-ENV-030 | 16: ODY-ENV-032 | 17: ODY-ENV-056 | 18: ODY-ENV-057 |
|---|---|---|---|---|---|---|---|---|
| Phosphorus [mg/L] | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | 0.08 | < 0.03 |
| Lead [mg/L] | 0.0035 | 0.0734 | 0.0364 | 0.0221 | 0.0060 | 0.0042 | 0.0868 | 0.0064 |
| Antimony [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Selenium [mg/L] | < 0.0004 | < 0.0004 | 0.0005 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 |
| Silicon [mg/L] | 1.0 | 2.6 | 2.4 | 0.8 | 0.7 | 1.1 | 2.8 | 1.0 |
| Tin [mg/L] | 0.0002 | 0.0001 | 0.0002 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | < 0.0001 |
| Strontium [mg/L] | 21.4 | 9.34 | 6.25 | 19.8 | 1.77 | 4.27 | 27.8 | 10.2 |
| Titanium [mg/L] | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | 0.0017 | < 0.0005 |
| Thallium [mg/L] | 0.00156 | 0.00090 | 0.00036 | 0.00069 | 0.00005 | 0.00040 | 0.00042 | 0.00017 |
| Uranium [mg/L] | 0.00124 | 0.00022 | 0.00029 | 0.00369 | 0.00170 | 0.00200 | 0.00472 | 0.00278 |
| Vanadium [mg/L] | < 0.0001 | 0.0047 | 0.0021 | < 0.0001 | 0.0002 | 0.0002 | 0.0091 | 0.0002 |
| Zinc [mg/L] | < 0.02 | 0.05 | 0.02 | 0.03 | < 0.02 | < 0.02 | 0.03 | < 0.02 |

| Analysis | 19: ODY-ENV-062 | 20: ODY-ENV-041 | 21: ODY-ENV-044 | 22: ODY-ENV-046 | 23: ODY-ENV-050 | 24: ODY-ENV-051 | 25: ODY-ENV-053 | 26: ODY-ENV-063 |
|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| Ext Volume [mL] | 800 | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | 6.22 | 6.10 | 6.19 | 6.21 | 5.78 | 6.02 | 5.94 | 6.09 |
| Conductivity [µS/cm] | 5310 | 5180 | 5230 | 5140 | 6360 | 5160 | 5110 | 5250 |
| Alkalinity [mg/L as CaCO3] | 2330 | 2250 | 2300 | 2330 | 3130 | 2240 | 2140 | 2250 |
| Sulphate [mg/L] | 69 | 6.1 | 4.7 | < 2 | < 2 | < 2 | 2.0 | 55 |
| Chloride [mg/L] | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 | < 20 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 0.07 | < 0.06 | 0.06 | 0.08 | 0.11 | 0.10 | 0.09 | < 0.06 |
| Phosphorus (total reactive) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | < 0.01 | 0.01 | < 0.01 | < 0.01 | 0.11 | 0.03 | 0.03 | < 0.01 |
| Arsenic [mg/L] | < 0.002 | < 0.002 | < 0.002 | 0.0021 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Silver [mg/L] | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Barium [mg/L] | 1.17 | 0.446 | 2.94 | 0.415 | 0.347 | 0.190 | 0.232 | 0.533 |
| Boron [mg/L] | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Beryllium [mg/L] | 0.00008 | 0.00010 | 0.00008 | 0.00011 | 0.00047 | 0.00014 | 0.00008 | < 0.00007 |
| Bismuth [mg/L] | < 0.00007 | < 0.00007 | < 0.00007 | < 0.00007 | < 0.00007 | < 0.00007 | < 0.00007 | < 0.00007 |
| Calcium [mg/L] | 547 | 486 | 487 | 510 | 2060 | 450 | 434 | 422 |
| Cadmium [mg/L] | 0.00145 | 0.00107 | 0.00170 | 0.00161 | 0.00145 | 0.00102 | 0.00121 | 0.00047 |
| Chromium [mg/L] | < 0.0003 | < 0.0003 | < 0.0003 | < 0.0003 | 0.0009 | 0.0003 | 0.0003 | 0.0003 |
| Cobalt [mg/L] | 0.00260 | 0.00072 | 0.00454 | 0.00081 | 0.00359 | 0.00167 | 0.00148 | 0.00320 |
| Copper [mg/L] | 0.0008 | 0.0012 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 | 0.0006 |
| Iron [mg/L] | 4.68 | 3.14 | 4.78 | 3.55 | 4.53 | 4.04 | 3.91 | 2.40 |
| Potassium [mg/L] | 28.0 | 8.16 | 19.4 | 28.3 | 28.8 | 36.1 | 32.5 | 59.8 |
| Lithium [mg/L] | 0.004 | 0.002 | 0.002 | 0.004 | 0.008 | 0.006 | 0.004 | 0.005 |
| Magnesium [mg/L] | 3.65 | 3.09 | 5.00 | 3.61 | 17.5 | 4.22 | 3.84 | 16.8 |
| Manganese [mg/L] | 5.29 | 4.49 | 5.65 | 5.52 | 17.6 | 6.15 | 6.64 | 5.89 |
| Molybdenum [mg/L] | 0.0008 | 0.0010 | 0.0009 | 0.0012 | 0.0011 | 0.0010 | 0.0013 | 0.0010 |
| Sodium [mg/L] | 1100 | 1080 | 1070 | 1060 | 1.6 | 1090 | 1090 | 1020 |
| Nickel [mg/L] | 0.001 | 0.001 | 0.002 | 0.003 | 0.015 | 0.007 | 0.004 | 0.018 |
| Phosphorus [mg/L] | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Lead [mg/L] | 0.0073 | 0.0076 | 0.0047 | 0.0055 | 0.0048 | 0.0035 | 0.0062 | 0.0014 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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**LR Report : CA11011-APR17**

| Analysis | 19: ODY-ENV-062 | 20: ODY-ENV-041 | 21: ODY-ENV-044 | 22: ODY-ENV-046 | 23: ODY-ENV-050 | 24: ODY-ENV-051 | 25: ODY-ENV-053 | 26: ODY-ENV-063 |
|---|---|---|---|---|---|---|---|---|
| Antimony [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |
| Selenium [mg/L] | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 | < 0.0004 |
| Silicon [mg/L] | 1.0 | 0.9 | 0.9 | 1.3 | 2.7 | 2.6 | 1.8 | 1.7 |
| Tin [mg/L] | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | 0.0001 |
| Strontium [mg/L] | 7.75 | 3.51 | 6.77 | 4.31 | 5.96 | 1.10 | 1.64 | 2.81 |
| Titanium [mg/L] | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 | < 0.0005 |
| Thallium [mg/L] | 0.00039 | 0.00010 | 0.00022 | 0.00013 | 0.00012 | 0.00013 | 0.00015 | 0.00050 |
| Uranium [mg/L] | 0.00183 | 0.00129 | 0.00251 | 0.00115 | 0.00002 | 0.00014 | 0.00054 | 0.00009 |
| Vanadium [mg/L] | 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0003 | 0.0004 | 0.0005 | < 0.0001 |
| Zinc [mg/L] | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |

| Analysis | 27: ODY-ENV-065 | 28: ODY-ENV-067 |
|---|---|---|
| Sample weight [g] | 40 | 40 |
| Ext Fluid [#1 or #2] | 1 | 1 |
| Ext Volume [mL] | 800 | 800 |
| Final pH | 6.22 | 6.27 |
| Conductivity [µS/cm] | 5310 | 5280 |
| Alkalinity [mg/L as CaCO3] | 2330 | 2380 |
| Sulphate [mg/L] | 7.8 | 9.8 |
| Chloride [mg/L] | < 20 | < 20 |
| Bromide [mg/L] | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 0.07 | 0.09 |
| Phosphorus (total reactive) [mg/L] | < 0.3 | < 0.3 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | < 0.01 | < 0.01 |
| Arsenic [mg/L] | < 0.002 | < 0.002 |
| Silver [mg/L] | < 0.0005 | < 0.0005 |
| Barium [mg/L] | 1.50 | 1.11 |
| Boron [mg/L] | < 0.02 | < 0.02 |
| Beryllium [mg/L] | < 0.00007 | < 0.00007 |
| Bismuth [mg/L] | < 0.00007 | < 0.00007 |
| Calcium [mg/L] | 522 | 525 |
| Cadmium [mg/L] | 0.00163 | 0.00155 |
| Chromium [mg/L] | < 0.0003 | < 0.0003 |
| Cobalt [mg/L] | 0.00102 | 0.00091 |
| Copper [mg/L] | 0.0006 | 0.0006 |
| Iron [mg/L] | 5.21 | 1.94 |
| Potassium [mg/L] | 25.5 | 23.3 |
| Lithium [mg/L] | 0.003 | 0.004 |
| Magnesium [mg/L] | 6.37 | 5.12 |
| Manganese [mg/L] | 5.62 | 5.54 |
| Molybdenum [mg/L] | 0.0008 | 0.0013 |
| Sodium [mg/L] | 1060 | 1030 |
| Nickel [mg/L] | 0.001 | 0.002 |
| Phosphorus [mg/L] | < 0.03 | < 0.03 |
| Lead [mg/L] | 0.0053 | 0.0036 |
| Antimony [mg/L] | < 0.002 | < 0.002 |
| Selenium [mg/L] | < 0.0004 | < 0.0004 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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**LR Report : CA11011-APR17**

| Analysis | 27: ODY-ENV-065 | 28: ODY-ENV-067 |
|---|---|---|
| Silicon [mg/L] | 1.1 | 1.2 |
| Tin [mg/L] | 0.0011 | 0.0002 |
| Strontium [mg/L] | 9.65 | 7.10 |
| Titanium [mg/L] | < 0.0005 | < 0.0005 |
| Thallium [mg/L] | 0.00018 | 0.00011 |
| Uranium [mg/L] | 0.00206 | 0.00162 |
| Vanadium [mg/L] | < 0.0001 | < 0.0001 |
| Zinc [mg/L] | 0.02 | < 0.02 |

Extraction Fluid #1 - pH 4.93 ± 0.05
= 5.7mLs of acetic acid plus 64.3 mLs of 1.0N NaOH bulked to 1L with deionized water.

Extraction Fluid #2 - pH 2.88 ± 0.05
=5.7 mLs of acetic acid bulked to 1L with deionized water.

## Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| Alkalinity | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2320 | N |
| Anions by IC | ME-CA-[ENV]IC-LAK-AN-001 | EPA300/MA300-Ions1.3 | Y |
| Conductivity | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2510 | Y |
| Flouride by Specific Ion Electrode | ME-CA-[ENV]EWL-LAK-AN-014 | SM 4500 | Y |
| Mercury by CVAAS | ME-CA-[ENV]SPE-LAK-AN-004 | EPA 7471A/SM 3112B | Y |
| Metals in aqueous samples - ICP-MS | ME-CA-[ENV]SPE-LAK-AN-006 | SM 3030/EPA 200.8 | Y |
| Reactive Phosphorus by SFA | ME-CA-[ENV]SFA-LAK-AN-004 | SM 4500-P F | N |

Chris Sullivan

*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | | |
| | | | | | | | % | | Low | High | | Low | High | |
| *Alkalinity - QCBatchID: EWL0130-MAY17* | | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 0 | 10 | 97 | 90 | 110 | NA | | | |
| *Anions by IC - QCBatchID: DIO0142-MAY17* | | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 101 | 80 | 120 | 101 | 75 | 125 | |
| Chloride | 0.2 | mg/L | <0.2 | | | ND | 20 | 101 | 80 | 120 | ND | 75 | 125 | |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | ND | 20 | 104 | 80 | 120 | 103 | 75 | 125 | |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 101 | 80 | 120 | 103 | 75 | 125 | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 0 | 20 | 100 | 80 | 120 | 99 | 75 | 125 | |
| *Anions by IC - QCBatchID: DIO0169-MAY17* | | | | | | | | | | | | | | |
| Chloride | 0.2 | mg/L | <0.2 | | | 3 | 20 | 98 | 80 | 120 | 97 | 75 | 125 | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 22 | 20 | 100 | 80 | 120 | 96 | 75 | 125 | |
| *Conductivity - QCBatchID: EWL0130-MAY17* | | | | | | | | | | | | | | |
| Conductivity | 2 | µS/cm | < 2 | | | 1 | 10 | 92 | 90 | 110 | NA | | | |
| *Conductivity - QCBatchID: EWL0140-MAY17* | | | | | | | | | | | | | | |
| Conductivity | 2 | µS/cm | < 2 | | | 0 | 10 | 100 | 90 | 110 | NA | | | |
| *Flouride by Specific Ion Electrode - QCBatchID: EWL0134-MAY17* | | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | 0 | 10 | 103 | 90 | 110 | 111 | 75 | 125 | |
| *Flouride by Specific Ion Electrode - QCBatchID: EWL0152-MAY17* | | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 105 | 90 | 110 | 101 | 75 | 125 | |
| *Mercury by CVAAS - QCBatchID: EHG0012-MAY17* | | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 103 | 90 | 110 | 105 | 70 | 130 | |
| *Metals - QCBatchID: EMS0040-MAY17* | | | | | | | | | | | | | | |
| Cobalt | 0.00004 | mg/L | <0.000004 | | | ND | 20 | 106 | 90 | 110 | 110 | 70 | 130 | |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0040-MAY17* | | | | | | | | | | | | | | |
| Aluminum | 0.01 | mg/L | <0.001 | | | 6 | 20 | 100 | 90 | 110 | 89 | 70 | 130 | |
| Antimony | 0.002 | mg/L | <0.0002 | | | ND | 20 | 96 | 90 | 110 | 98 | 70 | 130 | |
| Arsenic | 0.002 | mg/L | <0.0002 | | | 18 | 20 | 107 | 90 | 110 | 119 | 70 | 130 | |
| Barium | 0.0002 | mg/L | <0.00002 | | | 1 | 20 | 110 | 90 | 110 | 111 | 70 | 130 | |
| Beryllium | 0.00007 | mg/L | <0.000007 | | | ND | 20 | 108 | 90 | 110 | 121 | 70 | 130 | |
| Bismuth | 0.00007 | mg/L | <0.000007 | | | ND | 20 | 97 | 90 | 110 | 85 | 70 | 130 | |
| Boron | 0.02 | mg/L | <0.002 | | | 14 | 20 | 92 | 90 | 110 | NV | 70 | 130 | |
| Cadmium | 0.00003 | mg/L | <0.000003 | | | 16 | 20 | 105 | 90 | 110 | 130 | 70 | 130 | |
| Calcium | 0.1 | mg/L | <0.01 | | | 1 | 20 | 96 | 90 | 110 | 74 | 70 | 130 | |
| Chromium | 0.0003 | mg/L | <0.00003 | | | 7 | 20 | 106 | 90 | 110 | 113 | 70 | 130 | |
| Copper | 0.0002 | mg/L | <0.00002 | | | 2 | 20 | 104 | 90 | 110 | NV | 70 | 130 | |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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**TCLP1311--(Quebec Modified Version - MA. 100 -Lix.com.1.0)20:1 L/S ratio, 18hr**

**LR Report :** **CA11011-APR17**

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Iron | 0.07 | mg/L | <0.007 | | | ND | 20 | 104 | 90 | 110 | 85 | 70 | 130 |
| Lead | 0.0001 | mg/L | <0.00001 | | | 11 | 20 | 105 | 90 | 110 | 93 | 70 | 130 |
| Lithium | 0.001 | mg/L | <0.0001 | | | 0 | 20 | 109 | 90 | 110 | 100 | 70 | 130 |
| Magnesium | 0.01 | mg/L | <0.001 | | | 1 | 20 | 104 | 90 | 110 | NV | 70 | 130 |
| Manganese | 0.0001 | mg/L | <0.00001 | | | 0 | 20 | 107 | 90 | 110 | 102 | 70 | 130 |
| Molybdenum | 0.0001 | mg/L | <0.00001 | | | ND | 20 | 101 | 90 | 110 | 88 | 70 | 130 |
| Nickel | 0.001 | mg/L | <0.0001 | | | 12 | 20 | 106 | 90 | 110 | 109 | 70 | 130 |
| Phosphorus | 0.03 | mg/L | <0.003 | | | ND | 20 | 100 | 90 | 110 | 116 | 70 | 130 |
| Potassium | 0.03 | mg/L | <0.003 | | | 0 | 20 | 100 | 90 | 110 | NV | 70 | 130 |
| Selenium | 0.0004 | mg/L | <0.00004 | | | 4 | 20 | 102 | 90 | 110 | 119 | 70 | 130 |
| Silicon | 0.2 | mg/L | <0.02 | | | 2 | 20 | 103 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.0005 | mg/L | <0.00005 | | | ND | 20 | 104 | 90 | 110 | 108 | 70 | 130 |
| Sodium | 0.1 | mg/L | <0.01 | | | 5 | 20 | 99 | 90 | 110 | NV | 70 | 130 |
| Strontium | 0.0002 | mg/L | <0.00002 | | | 0 | 20 | 105 | 90 | 110 | NV | 70 | 130 |
| Thallium | 0.00005 | mg/L | <0.000005 | | | ND | 20 | 110 | 90 | 110 | 93 | 70 | 130 |
| Tin | 0.0001 | mg/L | <0.00001 | | | ND | 20 | 96 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.0005 | mg/L | <0.00005 | | | ND | 20 | 103 | 90 | 110 | 98 | 70 | 130 |
| Uranium | 0.00002 | mg/L | <0.000002 | | | 12 | 20 | 107 | 90 | 110 | NV | 70 | 130 |
| Vanadium | 0.0001 | mg/L | <0.00001 | | | 2 | 20 | 105 | 90 | 110 | 111 | 70 | 130 |
| Zinc | 0.02 | mg/L | <0.002 | | | ND | 20 | 105 | 90 | 110 | 113 | 70 | 130 |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0066-MAY17* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.3 | mg/L | <0.03 | | | ND | 10 | 99 | 90 | 110 | 89 | 75 | 125 |

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16-May-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0,

Phone: 819-757-2225
Fax:

**Date Rec. :** 26 April 2017
**LR Report:** **CA11012-APR17**
**Reference:** SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0) 20:1 L/S ratio, 18hr

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-52 | 7: ODY-ENV-001 | 8: ODY-ENV-008 | 9: ODY-ENV-033 |
|---|---|---|---|---|---|---|---|
| Sample weight [g] | 04-May-17 | 15:26 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid [#1 or #2] | 04-May-17 | 15:26 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 04-May-17 | 15:26 | 800 | 800 | 800 | 800 | 800 |
| Final pH | 04-May-17 | 15:26 | 9.35 | 9.27 | 9.85 | 9.72 | 9.56 |
| Conductivity [µS/cm] | 05-May-17 | 15:57 | 102 | 112 | 88 | 70 | 73 |
| Alkalinity [mg/L as CaCO3] | 05-May-17 | 15:57 | 18 | 16 | 24 | 21 | 21 |
| Sulphate [mg/L] | 05-May-17 | 11:18 | 23 | 29 | 14 | 10.0 | 11 |
| Chloride [mg/L] | 05-May-17 | 11:18 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | 05-May-17 | 11:18 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | 05-May-17 | 11:18 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | 05-May-17 | 11:18 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | 05-May-17 | 11:18 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 08-May-17 | 11:42 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 |
| Phosphorus (total reactive) [mg/L] | 08-May-17 | 13:55 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Mercury [mg/L] | 08-May-17 | 11:42 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 08-May-17 | 11:42 | 0.230 | 0.279 | 0.368 | 0.453 | 0.489 |
| Arsenic [mg/L] | 08-May-17 | 11:42 | 0.0008 | 0.0009 | 0.0011 | 0.0004 | 0.0003 |
| Silver [mg/L] | 08-May-17 | 11:42 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 08-May-17 | 11:42 | 0.532 | 0.0721 | 0.976 | 0.426 | 0.158 |
| Boron [mg/L] | 08-May-17 | 11:42 | < 0.002 | < 0.002 | 0.003 | < 0.002 | < 0.002 |
| Beryllium [mg/L] | 08-May-17 | 11:42 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Bismuth [mg/L] | 08-May-17 | 11:42 | 0.000010 | < 0.000007 | 0.000009 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 08-May-17 | 11:42 | 11.7 | 15.2 | 6.73 | 7.36 | 8.02 |
| Cadmium [mg/L] | 08-May-17 | 11:30 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 |
| Chromium [mg/L] | 08-May-17 | 11:42 | 0.00037 | 0.00024 | 0.00016 | 0.00004 | 0.00005 |
| Cobalt [mg/L] | 08-May-17 | 11:42 | 0.000311 | 0.000312 | 0.000010 | 0.000006 | < 0.000004 |
| Copper [mg/L] | 08-May-17 | 11:42 | 0.00085 | 0.00058 | 0.00015 | 0.00035 | 0.00015 |

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**LR Report :** **CA11012-APR17**

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-52 | 7: ODY-ENV-001 | 8: ODY-ENV-008 | 9: ODY-ENV-033 |
|---|---|---|---|---|---|---|---|
| Iron [mg/L] | 08-May-17 | 11:30 | 0.155 | 0.182 | < 0.007 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 08-May-17 | 11:30 | 5.26 | 2.57 | 7.99 | 5.15 | 2.90 |
| Lithium [mg/L] | 08-May-17 | 11:30 | 0.0011 | 0.0007 | 0.0015 | 0.0006 | 0.0009 |
| Magnesium [mg/L] | 08-May-17 | 11:30 | 0.504 | 0.389 | 0.442 | 0.446 | 0.458 |
| Manganese [mg/L] | 08-May-17 | 11:30 | 0.00084 | 0.00123 | 0.00090 | 0.00071 | 0.00072 |
| Molybdenum [mg/L] | 08-May-17 | 11:30 | 0.00072 | 0.00081 | 0.00011 | 0.00039 | 0.00022 |
| Sodium [mg/L] | 08-May-17 | 11:30 | 1.59 | 1.75 | 1.70 | 1.49 | 2.65 |
| Nickel [mg/L] | 08-May-17 | 11:30 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | 08-May-17 | 11:30 | 0.004 | < 0.003 | < 0.003 | 0.003 | < 0.003 |
| Lead [mg/L] | 08-May-17 | 11:29 | 0.00006 | 0.00002 | 0.00004 | 0.00002 | 0.00001 |
| Antimony [mg/L] | 08-May-17 | 11:29 | 0.0006 | 0.0005 | 0.0004 | 0.0003 | 0.0003 |
| Selenium [mg/L] | 08-May-17 | 11:29 | 0.00058 | 0.00025 | 0.00010 | 0.00008 | 0.00007 |
| Silicon [mg/L] | 08-May-17 | 11:29 | 1.86 | 1.63 | 3.17 | 2.96 | 2.94 |
| Tin [mg/L] | 08-May-17 | 11:29 | 0.00017 | 0.00003 | 0.00002 | 0.00003 | 0.00002 |
| Strontium [mg/L] | 11-May-17 | 09:51 | 4.75 | 1.45 | 6.53 | 3.04 | 1.85 |
| Titanium [mg/L] | 08-May-17 | 11:29 | < 0.00005 | 0.00009 | 0.00010 | 0.00018 | 0.00020 |
| Thallium [mg/L] | 08-May-17 | 11:29 | 0.000012 | 0.000009 | 0.000020 | 0.000005 | < 0.000005 |
| Uranium [mg/L] | 08-May-17 | 11:29 | 0.000058 | 0.000090 | 0.000101 | 0.000020 | 0.000056 |
| Vanadium [mg/L] | 08-May-17 | 11:29 | 0.00045 | 0.00034 | 0.00306 | 0.00394 | 0.00238 |
| Zinc [mg/L] | 08-May-17 | 11:29 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 10: ODY-ENV-039 | 11: ODY-ENV-019 | 12: ODY-ENV-022 | 13: ODY-ENV-023 | 14: ODY-ENV-028 | 15: ODY-ENV-030 | 16: ODY-ENV-032 |
|---|---|---|---|---|---|---|---|
| Sample weight [g] | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | 9.65 | 9.82 | 9.86 | 9.70 | 9.75 | 9.59 | 9.28 |
| Conductivity [µS/cm] | 71 | 71 | 72 | 51 | 85 | 57 | 233 |
| Alkalinity [mg/L as CaCO3] | 23 | 25 | 28 | 28 | 22 | 17 | 12 |
| Sulphate [mg/L] | 8.9 | 6.7 | 3.3 | 3.0 | 15 | 7.1 | 91 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | < 0.06 | < 0.06 | 0.10 | < 0.06 | < 0.06 | < 0.06 | 0.06 |
| Phosphorus (total reactive) [mg/L] | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.475 | 0.491 | 0.127 | 0.052 | 0.408 | 0.495 | 0.340 |
| Arsenic [mg/L] | 0.0010 | 0.0011 | 0.0005 | 0.0026 | 0.0006 | 0.0006 | 0.0002 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.108 | 0.201 | 0.0032 | 0.0043 | 0.878 | 0.144 | 0.0761 |
| Boron [mg/L] | < 0.002 | 0.004 | 0.002 | 0.004 | 0.003 | < 0.002 | < 0.002 |

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**LR Report : CA11012-APR17**

| Analysis | 10: ODY-ENV-039 | 11: ODY-ENV-019 | 12: ODY-ENV-022 | 13: ODY-ENV-023 | 14: ODY-ENV-028 | 15: ODY-ENV-030 | 16: ODY-ENV-032 |
|---|---|---|---|---|---|---|---|
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000010 |
| Calcium [mg/L] | 7.75 | 5.96 | 4.13 | 5.26 | 7.50 | 7.92 | 36.7 |
| Cadmium [mg/L] | < 0.000003 | 0.000005 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 |
| Chromium [mg/L] | 0.00004 | 0.00004 | 0.00038 | 0.00061 | 0.00004 | 0.00008 | 0.00004 |
| Cobalt [mg/L] | < 0.000004 | < 0.000004 | 0.000004 | 0.000009 | < 0.000004 | 0.000005 | 0.000006 |
| Copper [mg/L] | 0.00061 | 0.00032 | 0.00020 | 0.00062 | 0.00027 | 0.00020 | 0.00059 |
| Iron [mg/L] | < 0.007 | < 0.007 | < 0.007 | 0.009 | 0.008 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 4.60 | 7.96 | 13.3 | 2.89 | 5.19 | 2.43 | 7.14 |
| Lithium [mg/L] | 0.0006 | 0.0019 | 0.0017 | 0.0002 | 0.0008 | 0.0004 | 0.0014 |
| Magnesium [mg/L] | 0.613 | 0.351 | 0.709 | 0.899 | 0.485 | 0.170 | 0.528 |
| Manganese [mg/L] | 0.00105 | 0.00078 | 0.00029 | 0.00036 | 0.00159 | 0.00070 | 0.00310 |
| Molybdenum [mg/L] | 0.00028 | 0.00004 | 0.00079 | 0.00011 | 0.00005 | 0.00024 | 0.00010 |
| Sodium [mg/L] | 1.03 | 2.35 | 1.42 | 2.65 | 1.85 | 1.58 | 3.50 |
| Nickel [mg/L] | < 0.0001 | < 0.0001 | < 0.0001 | 0.0003 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | 0.007 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | 0.004 | < 0.003 |
| Lead [mg/L] | 0.00004 | 0.00001 | 0.00022 | 0.00005 | 0.00003 | 0.00003 | 0.00002 |
| Antimony [mg/L] | 0.0004 | 0.0004 | 0.0006 | 0.0005 | 0.0003 | 0.0003 | 0.0002 |
| Selenium [mg/L] | 0.00006 | < 0.00004 | 0.00018 | 0.00018 | 0.00005 | 0.00005 | 0.00006 |
| Silicon [mg/L] | 2.84 | 3.51 | 3.28 | 3.19 | 2.52 | 3.37 | 2.59 |
| Tin [mg/L] | 0.00002 | 0.00004 | 0.00005 | 0.00015 | < 0.00001 | 0.00003 | 0.00003 |
| Strontium [mg/L] | 3.02 | 1.85 | 0.0714 | 0.0537 | 6.97 | 0.720 | 1.45 |
| Titanium [mg/L] | 0.00023 | 0.00014 | 0.00011 | 0.00015 | 0.00012 | 0.00022 | < 0.00005 |
| Thallium [mg/L] | < 0.000005 | 0.000010 | 0.000009 | 0.000010 | 0.000013 | < 0.000005 | 0.000011 |
| Uranium [mg/L] | 0.000076 | 0.000081 | 0.000004 | 0.000003 | 0.000352 | 0.000059 | 0.000254 |
| Vanadium [mg/L] | 0.00248 | 0.00379 | 0.00969 | 0.0103 | 0.00209 | 0.00168 | 0.00229 |
| Zinc [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 17: ODY-ENV-056 | 18: ODY-ENV-057 | 19: ODY-ENV-062 | 20: ODY-ENV-041 | 21: ODY-ENV-044 | 22: ODY-ENV-046 | 23: ODY-ENV-050 |
|---|---|---|---|---|---|---|---|
| Sample weight [g] | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | 9.70 | 9.33 | 9.36 | 9.54 | 9.68 | 9.69 | 9.50 |
| Conductivity [µS/cm] | 106 | 153 | 175 | 65 | 62 | 57 | 58 |
| Alkalinity [mg/L as CaCO3] | 27 | 14 | 12 | 21 | 22 | 23 | 24 |
| Sulphate [mg/L] | 23 | 52 | 62 | 9.3 | 6.3 | 3.9 | 2.7 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | < 0.06 | 0.06 | < 0.06 | < 0.06 | < 0.06 | < 0.06 | 0.19 |

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**LR Report : CA11012-APR17**

| Analysis | 17: ODY-ENV-056 | 18: ODY-ENV-057 | 19: ODY-ENV-062 | 20: ODY-ENV-041 | 21: ODY-ENV-044 | 22: ODY-ENV-046 | 23: ODY-ENV-050 |
|---|---|---|---|---|---|---|---|
| Phosphorus (total reactive) [mg/L] | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.422 | 0.393 | 0.384 | 0.594 | 0.355 | 0.780 | 0.275 |
| Arsenic [mg/L] | 0.0008 | 0.0003 | 0.0006 | 0.0003 | 0.0006 | 0.0032 | 0.0004 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 1.29 | 0.380 | 0.235 | 0.0218 | 0.292 | 0.0049 | 0.0057 |
| Boron [mg/L] | 0.003 | < 0.002 | < 0.002 | 0.002 | < 0.002 | < 0.002 | 0.003 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | 0.000009 | < 0.000007 | 0.000007 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 7.35 | 20.0 | 25.5 | 8.47 | 7.30 | 7.01 | 6.01 |
| Cadmium [mg/L] | < 0.000003 | < 0.000003 | < 0.000003 | 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 |
| Chromium [mg/L] | 0.00004 | 0.00005 | 0.00005 | 0.00006 | 0.00003 | 0.00008 | 0.00030 |
| Cobalt [mg/L] | 0.000008 | 0.000007 | 0.000006 | 0.000004 | 0.000004 | < 0.000004 | < 0.000004 |
| Copper [mg/L] | 0.00033 | 0.00083 | 0.00050 | 0.00024 | 0.00039 | 0.00018 | 0.00013 |
| Iron [mg/L] | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 5.12 | 4.94 | 5.49 | 1.99 | 2.89 | 5.80 | 5.71 |
| Lithium [mg/L] | 0.0007 | 0.0015 | 0.0015 | 0.0004 | 0.0005 | 0.0012 | 0.0003 |
| Magnesium [mg/L] | 0.380 | 0.684 | 0.467 | 0.491 | 0.420 | 0.298 | 0.776 |
| Manganese [mg/L] | 0.00124 | 0.00300 | 0.00293 | 0.00060 | 0.00123 | 0.00089 | 0.00045 |
| Molybdenum [mg/L] | 0.00007 | 0.00011 | 0.00011 | 0.00010 | 0.00017 | 0.00039 | 0.00072 |
| Sodium [mg/L] | 2.78 | 3.06 | 2.47 | 2.04 | 1.99 | 1.25 | 1.20 |
| Nickel [mg/L] | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | < 0.003 | < 0.003 | < 0.003 | 0.003 | < 0.003 | < 0.003 | < 0.003 |
| Lead [mg/L] | 0.00007 | 0.00014 | 0.00004 | 0.00012 | 0.00003 | 0.00010 | 0.00003 |
| Antimony [mg/L] | 0.0002 | 0.0003 | 0.0003 | 0.0002 | 0.0004 | 0.0012 | 0.0006 |
| Selenium [mg/L] | < 0.00004 | 0.00005 | 0.00010 | < 0.00004 | 0.00008 | 0.00004 | < 0.00004 |
| Silicon [mg/L] | 2.87 | 2.26 | 2.37 | 2.56 | 3.08 | 2.98 | 1.61 |
| Tin [mg/L] | 0.00010 | 0.00014 | 0.00010 | 0.00004 | 0.00007 | 0.00002 | < 0.00001 |
| Strontium [mg/L] | 12.4 | 6.40 | 3.47 | 0.448 | 1.06 | 0.0922 | 0.174 |
| Titanium [mg/L] | 0.00005 | 0.00014 | 0.00012 | 0.00040 | 0.00016 | 0.00064 | 0.00009 |
| Thallium [mg/L] | 0.000005 | < 0.000005 | 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 | < 0.000005 |
| Uranium [mg/L] | 0.000062 | 0.000339 | 0.000208 | 0.000111 | 0.000158 | 0.000183 | 0.000005 |
| Vanadium [mg/L] | 0.00425 | 0.00214 | 0.00218 | 0.00232 | 0.00235 | 0.00224 | 0.00306 |
| Zinc [mg/L] | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 24: ODY-ENV-051 | 25: ODY-ENV-053 | 26: ODY-ENV-063 | 27: ODY-ENV-065 | 28: ODY-ENV-067 | 29: ODY-ENV-032 | 30: ODY-ENV-067 |
|---|---|---|---|---|---|---|---|
| Sample weight [g] | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Ext Fluid [#1 or #2] | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ext Volume [mL] | 800 | 800 | 800 | 800 | 800 | 800 | 800 |
| Final pH | 9.68 | 9.66 | 9.53 | 9.72 | 9.65 | 9.15 | 9.56 |
| Conductivity [µS/cm] | 62 | 61 | 134 | 75 | 77 | 244 | 78 |
| Alkalinity [mg/L as CaCO3] | 25 | 24 | 14 | 23 | 21 | 12 | 23 |

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**LR Report : CA11012-APR17**

| Analysis | 24: ODY-ENV-051 | 25: ODY-ENV-053 | 26: ODY-ENV-063 | 27: ODY-ENV-065 | 28: ODY-ENV-067 | 29: ODY-ENV-032 | 30: ODY-ENV-067 |
|---|---|---|---|---|---|---|---|
| Sulphate [mg/L] | 3.5 | 4.7 | 39 | 11 | 12 | 92 | 12 |
| Chloride [mg/L] | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 0.10 | 0.06 | < 0.06 | < 0.06 | 0.06 | 0.06 | 0.06 |
| Phosphorus (total reactive) [mg/L] | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.852 | 0.693 | 0.126 | 0.551 | 0.468 | 0.463 | 0.515 |
| Arsenic [mg/L] | 0.0009 | 0.0007 | 0.0009 | 0.0009 | 0.0034 | 0.0003 | 0.0035 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.0016 | 0.0017 | 0.0374 | 0.129 | 0.0313 | 0.0768 | 0.0340 |
| Boron [mg/L] | 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | 0.005 | < 0.002 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000007 | < 0.000007 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000011 | < 0.000007 |
| Calcium [mg/L] | 5.47 | 6.11 | 13.3 | 7.58 | 7.75 | 36.5 | 7.88 |
| Cadmium [mg/L] | < 0.000003 | < 0.000003 | < 0.000003 | < 0.000003 | 0.000005 | < 0.000003 | < 0.000003 |
| Chromium [mg/L] | 0.00022 | 0.00021 | 0.00027 | 0.00006 | 0.00005 | 0.00026 | 0.00003 |
| Cobalt [mg/L] | 0.000007 | < 0.000004 | 0.000004 | < 0.000004 | < 0.000004 | 0.000039 | < 0.000004 |
| Copper [mg/L] | 0.00022 | 0.00027 | 0.00021 | 0.00017 | 0.00015 | 0.00054 | 0.00027 |
| Iron [mg/L] | 0.010 | 0.008 | < 0.007 | < 0.007 | < 0.007 | 0.101 | < 0.007 |
| Potassium [mg/L] | 9.31 | 6.60 | 13.0 | 4.62 | 5.86 | 7.38 | 6.08 |
| Lithium [mg/L] | 0.0014 | 0.0010 | 0.0009 | 0.0010 | 0.0012 | 0.0016 | 0.0012 |
| Magnesium [mg/L] | 0.351 | 0.457 | 1.64 | 0.577 | 0.518 | 0.550 | 0.585 |
| Manganese [mg/L] | 0.00055 | 0.00070 | 0.00087 | 0.00126 | 0.00128 | 0.00491 | 0.00147 |
| Molybdenum [mg/L] | 0.00020 | 0.00025 | 0.00060 | 0.00019 | 0.00093 | 0.00015 | 0.00090 |
| Sodium [mg/L] | 1.27 | 2.07 | 0.37 | 2.11 | 2.46 | 3.43 | 2.47 |
| Nickel [mg/L] | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.0002 | < 0.0001 |
| Phosphorus [mg/L] | < 0.003 | < 0.003 | < 0.003 | 0.004 | < 0.003 | < 0.003 | < 0.003 |
| Lead [mg/L] | 0.00001 | 0.00001 | < 0.00001 | 0.00001 | < 0.00001 | 0.00005 | < 0.00001 |
| Antimony [mg/L] | 0.0012 | 0.0006 | 0.0009 | 0.0004 | 0.0005 | 0.0002 | 0.0005 |
| Selenium [mg/L] | 0.00019 | 0.00023 | 0.00028 | 0.00005 | 0.00005 | 0.00007 | 0.00005 |
| Silicon [mg/L] | 3.57 | 2.91 | 2.37 | 2.81 | 2.90 | 3.11 | 2.88 |
| Tin [mg/L] | 0.00003 | 0.00001 | 0.00113 | 0.00003 | 0.00002 | 0.00001 | < 0.00001 |
| Strontium [mg/L] | 0.0314 | 0.134 | 0.600 | 3.43 | 1.59 | 1.39 | 1.83 |
| Titanium [mg/L] | 0.00089 | 0.00048 | 0.00007 | 0.00019 | 0.00012 | 0.0129 | 0.00014 |
| Thallium [mg/L] | 0.000005 | < 0.000005 | 0.000007 | < 0.000005 | < 0.000005 | 0.000008 | < 0.000005 |
| Uranium [mg/L] | 0.000055 | 0.000041 | < 0.000002 | 0.000301 | 0.000146 | 0.000267 | 0.000171 |
| Vanadium [mg/L] | 0.00515 | 0.00373 | 0.00376 | 0.00213 | 0.00194 | 0.00301 | 0.00198 |
| Zinc [mg/L] | < 0.002 | < 0.002 | 0.006 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

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**LR Report :** **CA11012-APR17**

| Analysis | 31:BLK: $SPLP1312 Blank #1 |
|---|---|
| Sample weight [g] | 40 |
| Ext Fluid [#1 or #2] | 1 |
| Ext Volume [mL] | 800 |
| Final pH | --- |
| Conductivity [µS/cm] | 21 |
| Alkalinity [mg/L as CaCO3] | < 2 |
| Sulphate [mg/L] | 3.1 |
| Chloride [mg/L] | < 2 |
| Bromide [mg/L] | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 |
| Fluoride [mg/L] | < 0.06 |
| Phosphorus (total reactive) [mg/L] | < 0.03 |
| Mercury [mg/L] | < 0.00001 |
| Aluminum [mg/L] | 0.003 |
| Arsenic [mg/L] | < 0.0002 |
| Silver [mg/L] | < 0.00005 |
| Barium [mg/L] | 0.0008 |
| Boron [mg/L] | < 0.002 |
| Beryllium [mg/L] | < 0.000007 |
| Bismuth [mg/L] | < 0.000007 |
| Calcium [mg/L] | 0.07 |
| Cadmium [mg/L] | --- |
| Chromium [mg/L] | 0.00006 |
| Cobalt [mg/L] | 0.000010 |
| Copper [mg/L] | --- |
| Iron [mg/L] | < 0.007 |
| Potassium [mg/L] | 1.79 |
| Lithium [mg/L] | < 0.0001 |
| Magnesium [mg/L] | 0.005 |
| Manganese [mg/L] | 0.00058 |
| Molybdenum [mg/L] | 0.00004 |
| Sodium [mg/L] | 0.01 |
| Nickel [mg/L] | 0.0007 |
| Phosphorus [mg/L] | < 0.003 |
| Lead [mg/L] | --- |
| Antimony [mg/L] | 0.0010 |
| Selenium [mg/L] | < 0.00004 |
| Silicon [mg/L] | < 0.02 |
| Tin [mg/L] | 0.00007 |
| Strontium [mg/L] | 0.00326 |
| Titanium [mg/L] | < 0.00005 |
| Thallium [mg/L] | < 0.000005 |
| Uranium [mg/L] | 0.000004 |

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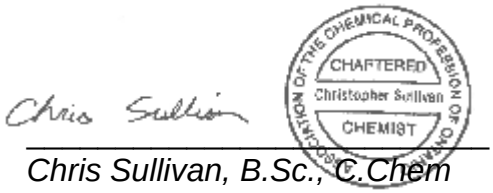
**LR Report :** **CA11012-APR17**

| Analysis | 31:BLK: $SPLP1312 Blank #1 |
|---|---|
| Vanadium [mg/L] | 0.00002 |
| Zinc [mg/L] | 0.006 |

## Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| Alkalinity | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2320 | N |
| Anions by IC | ME-CA-[ENV]IC-LAK-AN-001 | EPA300/MA300-Ions1.3 | Y |
| Conductivity | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2510 | Y |
| Flouride by Specific Ion Electrode | ME-CA-[ENV]EWL-LAK-AN-014 | SM 4500 | Y |
| Mercury by CVAAS | ME-CA-[ENV]SPE-LAK-AN-004 | EPA 7471A/SM 3112B | Y |
| Metals in aqueous samples - ICP-MS | ME-CA-[ENV]SPE-LAK-AN-006 | SM 3030/EPA 200.8 | Y |
| Reactive Phosphorus by SFA | ME-CA-[ENV]SFA-LAK-AN-004 | SM 4500-P F | N |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Alkalinity - QCBatchID: EWL0083-MAY17* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 0 | 10 | 100 | 90 | 110 | NA | | |
| *Anions by IC - QCBatchID: DIO0094-MAY17* | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 101 | 80 | 120 | 102 | 75 | 125 |
| Chloride | 0.2 | mg/L | <0.2 | | | 6 | 20 | 100 | 80 | 120 | 94 | 75 | 125 |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | 0 | 20 | 103 | 80 | 120 | 104 | 75 | 125 |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 102 | 80 | 120 | 102 | 75 | 125 |
| Sulphate | 0.2 | mg/L | <0.2 | | | 2 | 20 | 98 | 80 | 120 | 98 | 75 | 125 |
| *Conductivity - QCBatchID: EWL0083-MAY17* | | | | | | | | | | | | | |
| Conductivity | 2 | µS/cm | < 2 | | | 1 | 10 | 100 | 90 | 110 | NA | | |
| *Flouride by Specific Ion Electrode - QCBatchID: EWL0106-MAY17* | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 106 | 90 | 110 | 97 | 75 | 125 |
| *Mercury by CVAAS - QCBatchID: EHG0008-MAY17* | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 106 | 90 | 110 | 105 | 70 | 130 |
| *Metals - QCBatchID: EMS0026-MAY17* | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | ND | 20 | 108 | 90 | 110 | 100 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0026-MAY17* | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 3 | 20 | 107 | 90 | 110 | 96 | 70 | 130 |
| Antimony | 0.0002 | mg/L | <0.0002 | | | 1 | 20 | 97 | 90 | 110 | 91 | 70 | 130 |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | 18 | 20 | 102 | 90 | 110 | 101 | 70 | 130 |
| Barium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 100 | 90 | 110 | NV | 70 | 130 |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 101 | 90 | 110 | 101 | 70 | 130 |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | 5 | 20 | 101 | 90 | 110 | 89 | 70 | 130 |
| Boron | 0.002 | mg/L | <0.002 | | | ND | 20 | 102 | 90 | 110 | NV | 70 | 130 |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | ND | 20 | 106 | 90 | 110 | 86 | 70 | 130 |
| Calcium | 0.01 | mg/L | <0.01 | | | 0 | 20 | 102 | 90 | 110 | NV | 70 | 130 |
| Chromium | 0.00003 | mg/L | <0.00003 | | | 7 | 20 | 107 | 90 | 110 | 127 | 70 | 130 |
| Copper | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 108 | 90 | 110 | 82 | 70 | 130 |
| Iron | 0.007 | mg/L | <0.007 | | | ND | 20 | 106 | 90 | 110 | NV | 70 | 130 |
| Lead | 0.00001 | mg/L | <0.00001 | | | 10 | 20 | 101 | 90 | 110 | 84 | 70 | 130 |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 1 | 20 | 98 | 90 | 110 | 89 | 70 | 130 |
| Magnesium | 0.001 | mg/L | <0.001 | | | 3 | 20 | 107 | 90 | 110 | NV | 70 | 130 |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 6 | 20 | 105 | 90 | 110 | 71 | 70 | 130 |
| Molybdenum | 0.00001 | mg/L | <0.00001 | | | 19 | 20 | 104 | 90 | 110 | 95 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 106 | 90 | 110 | 96 | 70 | 130 |

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**SPLP1312--(Quebec Modified Version - MA. 100 -Lix.com.1.0)**
**20:1 L/S ratio, 18hr**

**LR Report :** **CA11012-APR17**

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Phosphorus | 0.003 | mg/L | <0.003 | | | ND | 20 | 97 | 90 | 110 | NV | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.003 | | | 1 | 20 | 107 | 90 | 110 | NV | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | 13 | 20 | 110 | 90 | 110 | 121 | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 1 | 20 | 109 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 105 | 90 | 110 | 84 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 2 | 20 | 103 | 90 | 110 | 83 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 5 | 20 | 107 | 90 | 110 | NV | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | ND | 20 | 100 | 90 | 110 | 90 | 70 | 130 |
| Tin | 0.00001 | mg/L | <0.00001 | | | 17 | 20 | 101 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 92 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 2 | 20 | 100 | 90 | 110 | 88 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | 0 | 20 | 105 | 90 | 110 | NV | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | ND | 20 | 109 | 90 | 110 | 79 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0033-MAY17* | | | | | | | | | | | | | |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 2 | 20 | 101 | 90 | 110 | NV | 70 | 130 |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0059-MAY17* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | ND | 10 | 101 | 90 | 110 | 76 | 75 | 125 |

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31-May-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0,

Phone: 819-757-2225
Fax:

**Date Rec. :** 26 April 2017
**LR Report:** **CA11013-APR17**

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-52 | 7: ODY-ENV-001 | 8: ODY-ENV-008 | 9: ODY-ENV-033 | 10: ODY-ENV-039 |
|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 23-May-17 | 14:55 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 23-May-17 | 14:55 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH | 23-May-17 | 14:55 | 8.23 | 8.22 | 8.90 | 8.90 | 8.63 | 8.73 |
| Conductivity [µS/cm] | 25-May-17 | 08:20 | 392 | 428 | 383 | 296 | 297 | 293 |
| Alkalinity [mg/L as CaCO3] | 25-May-17 | 08:20 | 53 | 37 | 61 | 46 | 46 | 54 |
| Sulphate [mg/L] | 25-May-17 | 14:38 | 110 | 150 | 81 | 58 | 68 | 62 |
| Chloride [mg/L] | 24-May-17 | 15:48 | 2.1 | < 2 | 2.2 | 4.7 | 7.3 | 3.2 |
| Bromide [mg/L] | 24-May-17 | 15:46 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | 24-May-17 | 15:46 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | 24-May-17 | 15:46 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | 24-May-17 | 15:46 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 24-May-17 | 14:32 | 0.08 | 0.19 | 0.19 | 0.56 | 0.36 | 0.28 |
| Phosphorus (total reactive) [mg/L] | 26-May-17 | 13:17 | 0.03 | < 0.03 | 0.04 | < 0.03 | < 0.03 | < 0.03 |
| Mercury [mg/L] | 25-May-17 | 11:12 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 26-May-17 | 13:38 | 0.055 | 0.070 | 0.094 | 0.181 | 0.187 | 0.203 |
| Arsenic [mg/L] | 26-May-17 | 13:38 | 0.0003 | 0.0003 | 0.0020 | 0.0015 | 0.0015 | 0.0016 |
| Silver [mg/L] | 26-May-17 | 13:38 | 0.00226 | 0.00074 | 0.00009 | < 0.00005 | 0.00028 | 0.00039 |
| Barium [mg/L] | 26-May-17 | 13:38 | 0.206 | 0.129 | 0.447 | 0.268 | 0.218 | 0.280 |
| Boron [mg/L] | 26-May-17 | 13:38 | 0.005 | 0.006 | 0.020 | 0.011 | 0.037 | 0.037 |
| Beryllium [mg/L] | 26-May-17 | 13:38 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Bismuth [mg/L] | 26-May-17 | 13:38 | < 0.000007 | < 0.000007 | 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 26-May-17 | 13:38 | 44.6 | 60.6 | 13.7 | 14.2 | 17.1 | 17.0 |
| Cadmium [mg/L] | 26-May-17 | 13:38 | 0.000008 | 0.000009 | 0.000006 | 0.000003 | < 0.000003 | 0.000003 |
| Chromium [mg/L] | 26-May-17 | 13:38 | 0.00006 | 0.00007 | 0.00011 | 0.00009 | 0.00012 | 0.00013 |
| Cobalt [mg/L] | 26-May-17 | 13:38 | 0.00146 | 0.00158 | 0.000023 | 0.000019 | 0.000025 | 0.000036 |
| Copper [mg/L] | 26-May-17 | 13:38 | 0.00096 | 0.00196 | 0.00019 | 0.00052 | 0.00095 | 0.00042 |
| Iron [mg/L] | 26-May-17 | 13:38 | 0.264 | 0.349 | < 0.007 | 0.007 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 26-May-17 | 13:38 | 22.3 | 14.8 | 49.6 | 36.6 | 15.7 | 28.3 |
| Lithium [mg/L] | 26-May-17 | 13:38 | 0.0076 | 0.0039 | 0.0123 | 0.0032 | 0.0062 | 0.0063 |
| Magnesium [mg/L] | 26-May-17 | 13:38 | 6.66 | 5.24 | 3.04 | 3.71 | 2.71 | 4.26 |
| Manganese [mg/L] | 26-May-17 | 13:38 | 0.0123 | 0.0143 | 0.00286 | 0.00216 | 0.00410 | 0.00572 |
| Molybdenum [mg/L] | 26-May-17 | 13:38 | 0.0213 | 0.0149 | 0.00198 | 0.00642 | 0.00832 | 0.0110 |
| Sodium [mg/L] | 26-May-17 | 13:38 | 9.82 | 11.4 | 24.1 | 13.8 | 24.9 | 12.1 |
| Nickel [mg/L] | 26-May-17 | 13:38 | 0.0003 | 0.0002 | 0.0001 | 0.0002 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | 26-May-17 | 13:38 | 0.004 | < 0.003 | 0.013 | 0.024 | 0.010 | 0.006 |
| Lead [mg/L] | 26-May-17 | 13:38 | 0.00012 | 0.00010 | 0.00008 | 0.00012 | 0.00009 | 0.00006 |

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**LR Report : CA11013-APR17**

| Analysis | 3: Analysis Approval Date | 4: Analysis Approval Time | 5: Detox Final Tail BL 154-50 | 6: Detox Final Tail BL 154-52 | 7: ODY-ENV-001 | 8: ODY-ENV-008 | 9: ODY-ENV-033 | 10: ODY-ENV-039 |
|---|---|---|---|---|---|---|---|---|
| Antimony [mg/L] | 26-May-17 | 13:38 | 0.0014 | 0.0009 | 0.0010 | 0.0013 | 0.0016 | 0.0019 |
| Selenium [mg/L] | 26-May-17 | 13:38 | 0.00136 | 0.00078 | 0.00080 | 0.00030 | 0.00059 | 0.00076 |
| Silicon [mg/L] | 26-May-17 | 13:38 | 3.01 | 2.68 | 7.98 | 5.33 | 4.55 | 3.64 |
| Tin [mg/L] | 26-May-17 | 13:38 | 0.00007 | 0.00014 | 0.00007 | 0.00008 | 0.00009 | 0.00009 |
| Strontium [mg/L] | 30-May-17 | 11:02 | 11.6 | 5.41 | 10.1 | 7.12 | 7.75 | 15.6 |
| Titanium [mg/L] | 26-May-17 | 13:38 | 0.00031 | 0.00014 | 0.00028 | 0.00044 | 0.00035 | 0.00024 |
| Thallium [mg/L] | 26-May-17 | 13:38 | 0.000016 | 0.000024 | 0.000029 | 0.000018 | 0.000014 | 0.000025 |
| Uranium [mg/L] | 26-May-17 | 13:38 | 0.000679 | 0.000724 | 0.00172 | 0.00119 | 0.00234 | 0.00192 |
| Vanadium [mg/L] | 26-May-17 | 13:38 | 0.00006 | 0.00006 | 0.0167 | 0.0127 | 0.00352 | 0.00165 |
| Zinc [mg/L] | 26-May-17 | 13:39 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 11: ODY-ENV-019 | 12: ODY-ENV-022 | 13: ODY-ENV-023 | 14: ODY-ENV-028 | 15: ODY-ENV-030 | 16: ODY-ENV-032 | 17: ODY-ENV-056 | 18: ODY-ENV-057 |
|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH | 9.18 | 9.05 | 9.44 | 9.06 | 9.01 | 8.40 | 9.00 | 8.86 |
| Conductivity [µS/cm] | 243 | 265 | 133 | 337 | 259 | 989 | 294 | 530 |
| Alkalinity [mg/L as CaCO3] | 49 | 73 | 53 | 45 | 46 | 11 | 35 | 17 |
| Sulphate [mg/L] | 43 | 20 | 3.9 | 91 | 46 | 500 | 81 | 210 |
| Chloride [mg/L] | 4.6 | 5.2 | 2.4 | 4.2 | 6.0 | 4.7 | 4.4 | 2.7 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 0.15 | 0.62 | 0.55 | 0.33 | 0.23 | 0.40 | 0.24 | 0.69 |
| Phosphorus (total reactive) [mg/L] | 0.04 | < 0.03 | 0.06 | < 0.03 | < 0.03 | 0.04 | < 0.03 | 0.04 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.224 | 0.060 | 0.073 | 0.151 | 0.270 | 0.134 | 0.190 | 0.120 |
| Arsenic [mg/L] | 0.0034 | 0.0050 | 0.0304 | 0.0016 | 0.0015 | 0.0005 | 0.0017 | 0.0006 |
| Silver [mg/L] | < 0.00005 | 0.00006 | < 0.00005 | 0.00007 | 0.00019 | < 0.00005 | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.266 | 0.00887 | 0.00570 | 0.378 | 0.103 | 0.0387 | 0.410 | 0.138 |
| Boron [mg/L] | 0.045 | 0.017 | 0.023 | 0.031 | 0.028 | 0.018 | 0.030 | 0.010 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000008 | < 0.000007 | 0.000013 | 0.000007 |
| Calcium [mg/L] | 6.63 | 6.04 | 3.31 | 11.5 | 8.53 | 178 | 12.3 | 41.9 |
| Cadmium [mg/L] | 0.000004 | 0.000006 | 0.000004 | 0.000005 | 0.000004 | < 0.000003 | 0.000004 | 0.000003 |
| Chromium [mg/L] | 0.00026 | 0.00349 | 0.00346 | 0.00021 | 0.00018 | 0.00018 | 0.00021 | 0.00021 |
| Cobalt [mg/L] | 0.000014 | 0.000059 | 0.000172 | 0.000017 | 0.000018 | 0.000036 | 0.000018 | 0.000026 |
| Copper [mg/L] | 0.00029 | 0.00047 | 0.00045 | 0.00038 | 0.00364 | 0.00025 | 0.00018 | 0.00528 |
| Iron [mg/L] | < 0.007 | 0.040 | 0.114 | < 0.007 | 0.020 | 0.010 | < 0.007 | < 0.007 |
| Potassium [mg/L] | 29.2 | 56.9 | 18.2 | 27.9 | 27.7 | 30.2 | 17.1 | 29.7 |
| Lithium [mg/L] | 0.0118 | 0.0090 | 0.0002 | 0.0097 | 0.0027 | 0.0119 | 0.0046 | 0.0102 |
| Magnesium [mg/L] | 0.936 | 3.71 | 1.54 | 1.84 | 0.826 | 3.75 | 1.34 | 4.61 |
| Manganese [mg/L] | 0.00128 | 0.00145 | 0.00253 | 0.00189 | 0.00168 | 0.0178 | 0.00208 | 0.00665 |
| Molybdenum [mg/L] | 0.00754 | 0.0131 | 0.00150 | 0.00991 | 0.0263 | 0.0117 | 0.00760 | 0.00155 |
| Sodium [mg/L] | 21.5 | 9.53 | 13.4 | 29.9 | 25.0 | 28.2 | 24.8 | 35.5 |
| Nickel [mg/L] | < 0.0001 | 0.0007 | 0.0023 | < 0.0001 | < 0.0001 | 0.0001 | < 0.0001 | < 0.0001 |
| Phosphorus [mg/L] | 0.011 | 0.015 | 0.025 | 0.004 | 0.008 | < 0.003 | 0.004 | < 0.003 |
| Lead [mg/L] | 0.00007 | 0.00023 | 0.00016 | 0.00009 | 0.00039 | 0.00004 | 0.00009 | 0.00009 |
| Antimony [mg/L] | 0.0013 | 0.0048 | 0.0026 | 0.0006 | 0.0008 | 0.0006 | 0.0007 | 0.0007 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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**LR Report : CA11013-APR17**

| Analysis | 11: ODY-ENV-019 | 12: ODY-ENV-022 | 13: ODY-ENV-023 | 14: ODY-ENV-028 | 15: ODY-ENV-030 | 16: ODY-ENV-032 | 17: ODY-ENV-056 | 18: ODY-ENV-057 |
|---|---|---|---|---|---|---|---|---|
| Selenium [mg/L] | 0.00022 | 0.00207 | 0.00057 | 0.00061 | 0.00054 | 0.00038 | 0.00046 | 0.00040 |
| Silicon [mg/L] | 5.54 | 11.2 | 11.9 | 5.89 | 5.62 | 4.80 | 4.44 | 6.65 |
| Tin [mg/L] | 0.00009 | 0.00015 | 0.00019 | 0.00017 | 0.00019 | 0.00005 | 0.00011 | 0.00061 |
| Strontium [mg/L] | 5.73 | 0.198 | 0.0743 | 16.6 | 1.84 | 7.20 | 20.5 | 10.1 |
| Titanium [mg/L] | 0.00018 | 0.00188 | 0.00142 | 0.00016 | 0.00074 | 0.00024 | 0.00010 | 0.00016 |
| Thallium [mg/L] | 0.000026 | 0.000035 | 0.000016 | 0.000031 | 0.000023 | 0.000031 | 0.000016 | 0.000010 |
| Uranium [mg/L] | 0.00134 | 0.000085 | 0.000032 | 0.00174 | 0.00143 | 0.00136 | 0.00113 | 0.000995 |
| Vanadium [mg/L] | 0.0105 | 0.0425 | 0.0260 | 0.00796 | 0.00232 | 0.00243 | 0.00631 | 0.0109 |
| Zinc [mg/L] | < 0.002 | < 0.002 | 0.017 | < 0.002 | 0.003 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 19: ODY-ENV-062 | 20: ODY-ENV-041 | 21: ODY-ENV-044 | 22: ODY-ENV-046 | 23: ODY-ENV-050 | 24: ODY-ENV-051 | 25: ODY-ENV-053 | 26: ODY-ENV-063 |
|---|---|---|---|---|---|---|---|---|
| Sample weight [g] | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Final pH | 8.46 | 9.01 | 8.90 | 8.80 | 9.32 | 9.07 | 9.06 | 8.81 |
| Conductivity [µS/cm] | 762 | 196 | 217 | 196 | 146 | 209 | 217 | 607 |
| Alkalinity [mg/L as CaCO3] | 16 | 36 | 55 | 54 | 58 | 60 | 57 | 31 |
| Sulphate [mg/L] | 340 | 43 | 34 | 22 | < 2 | 16 | 23 | 230 |
| Chloride [mg/L] | 4.0 | 3.4 | 4.0 | < 2 | 2.4 | < 2 | < 2 | < 2 |
| Bromide [mg/L] | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 0.38 | 0.30 | 0.34 | 0.48 | 1.65 | 0.91 | 0.71 | 0.31 |
| Phosphorus (total reactive) [mg/L] | < 0.03 | 0.03 | < 0.03 | < 0.03 | < 0.03 | 0.04 | 0.04 | < 0.03 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.140 | 0.378 | 0.197 | 0.443 | 0.226 | 0.784 | 0.656 | 0.017 |
| Arsenic [mg/L] | 0.0006 | 0.0010 | 0.0013 | 0.0080 | 0.0009 | 0.0042 | 0.0042 | 0.0012 |
| Silver [mg/L] | < 0.00005 | < 0.00005 | < 0.00005 | 0.00016 | < 0.00005 | 0.00012 | 0.00018 | < 0.00005 |
| Barium [mg/L] | 0.0873 | 0.0600 | 0.196 | 0.0108 | 0.00916 | 0.00605 | 0.00646 | 0.110 |
| Boron [mg/L] | 0.028 | 0.021 | 0.025 | 0.019 | 0.024 | 0.018 | 0.015 | 0.011 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | < 0.000007 | 0.000012 | 0.000010 | < 0.000007 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 | < 0.000007 | 0.000019 | < 0.000007 | 0.000029 | 0.000026 | < 0.000007 |
| Calcium [mg/L] | 116 | 10.4 | 9.77 | 10.3 | 3.08 | 4.50 | 5.41 | 31.2 |
| Cadmium [mg/L] | 0.000009 | 0.000005 | 0.000003 | 0.000009 | 0.000005 | 0.000008 | 0.000005 | < 0.000003 |
| Chromium [mg/L] | 0.00010 | 0.00018 | 0.00021 | 0.00022 | 0.00030 | 0.00145 | 0.00153 | 0.00027 |
| Cobalt [mg/L] | 0.000043 | 0.000028 | 0.000024 | 0.000023 | 0.000023 | 0.000103 | 0.000076 | 0.000028 |
| Copper [mg/L] | 0.00017 | 0.00068 | 0.00150 | 0.00021 | 0.00040 | 0.00045 | 0.00086 | 0.00026 |
| Iron [mg/L] | < 0.007 | 0.030 | < 0.007 | 0.024 | 0.019 | 0.186 | 0.163 | < 0.007 |
| Potassium [mg/L] | 23.8 | 11.6 | 15.2 | 26.9 | 31.4 | 41.6 | 34.2 | 95.7 |
| Lithium [mg/L] | 0.0129 | 0.0013 | 0.0034 | 0.0070 | 0.0003 | 0.0052 | 0.0039 | 0.0046 |
| Magnesium [mg/L] | 3.45 | 1.37 | 2.61 | 1.05 | 0.780 | 0.817 | 0.989 | 17.3 |
| Manganese [mg/L] | 0.0185 | 0.00201 | 0.00317 | 0.00244 | 0.00059 | 0.00316 | 0.00328 | 0.00392 |
| Molybdenum [mg/L] | 0.00840 | 0.00572 | 0.00810 | 0.00600 | 0.00971 | 0.00697 | 0.00839 | 0.00597 |
| Sodium [mg/L] | 23.7 | 19.1 | 21.1 | 12.7 | 8.53 | 10.7 | 16.7 | 4.05 |
| Nickel [mg/L] | 0.0001 | 0.0002 | 0.0001 | 0.0002 | 0.0001 | 0.0006 | 0.0005 | 0.0002 |
| Phosphorus [mg/L] | < 0.003 | 0.010 | 0.005 | 0.014 | 0.009 | 0.018 | 0.020 | 0.005 |
| Lead [mg/L] | 0.00003 | 0.00024 | 0.00010 | 0.00023 | 0.00004 | 0.00036 | 0.00029 | 0.00005 |
| Antimony [mg/L] | 0.0008 | 0.0006 | 0.0017 | 0.0099 | 0.0016 | 0.0091 | 0.0045 | 0.0043 |
| Selenium [mg/L] | 0.00049 | 0.00034 | 0.00123 | 0.00036 | 0.00005 | 0.00140 | 0.00151 | 0.00063 |

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**LR Report :** **CA11013-APR17**

| Analysis | 19: ODY-ENV-062 | 20: ODY-ENV-041 | 21: ODY-ENV-044 | 22: ODY-ENV-046 | 23: ODY-ENV-050 | 24: ODY-ENV-051 | 25: ODY-ENV-053 | 26: ODY-ENV-063 |
|---|---|---|---|---|---|---|---|---|
| Silicon [mg/L] | 4.40 | 4.07 | 4.93 | 3.26 | 2.42 | 3.32 | 3.51 | 7.68 |
| Tin [mg/L] | 0.00009 | 0.00028 | 0.00021 | 0.00009 | 0.00012 | 0.00013 | 0.00015 | 0.00008 |
| Strontium [mg/L] | 11.5 | 1.98 | 3.54 | 0.304 | 0.159 | 0.0538 | 0.178 | 2.98 |
| Titanium [mg/L] | < 0.00005 | 0.00170 | 0.00028 | 0.00246 | 0.00063 | 0.0141 | 0.0122 | 0.00019 |
| Thallium [mg/L] | 0.000022 | 0.000011 | 0.000013 | 0.000014 | 0.000008 | 0.000028 | 0.000025 | 0.000025 |
| Uranium [mg/L] | 0.00212 | 0.00266 | 0.00631 | 0.00459 | 0.000111 | 0.00145 | 0.00211 | 0.000119 |
| Vanadium [mg/L] | 0.00176 | 0.00598 | 0.00413 | 0.00417 | 0.00635 | 0.0144 | 0.0152 | 0.00584 |
| Zinc [mg/L] | < 0.002 | 0.002 | < 0.002 | 0.004 | < 0.002 | < 0.002 | < 0.002 | < 0.002 |

| Analysis | 27: ODY-ENV-065 | 28: ODY-ENV-067 |
|---|---|---|
| Sample weight [g] | 100 | 100 |
| Volume D.I. Water [mL] | 400 | 400 |
| Final pH | 8.86 | 8.71 |
| Conductivity [µS/cm] | 277 | 321 |
| Alkalinity [mg/L as CaCO3] | 58 | 58 |
| Sulphate [mg/L] | 61 | 76 |
| Chloride [mg/L] | 2.2 | 2.4 |
| Bromide [mg/L] | < 3 | < 3 |
| Nitrite (as N) [mg/L] | < 0.3 | < 0.3 |
| Nitrate (as N) [mg/L] | < 0.6 | < 0.6 |
| Nitrate + Nitrite (as N) [mg/L] | < 0.6 | < 0.6 |
| Fluoride [mg/L] | 0.38 | 0.53 |
| Phosphorus (total reactive) [mg/L] | < 0.03 | < 0.03 |
| Mercury [mg/L] | < 0.00001 | < 0.00001 |
| Aluminum [mg/L] | 0.265 | 0.262 |
| Arsenic [mg/L] | 0.0017 | 0.0042 |
| Silver [mg/L] | < 0.00005 | < 0.00005 |
| Barium [mg/L] | 0.247 | 0.165 |
| Boron [mg/L] | 0.017 | 0.019 |
| Beryllium [mg/L] | < 0.000007 | < 0.000007 |
| Bismuth [mg/L] | < 0.000007 | < 0.000007 |
| Calcium [mg/L] | 13.2 | 16.0 |
| Cadmium [mg/L] | 0.000008 | 0.000004 |
| Chromium [mg/L] | 0.00021 | 0.00017 |
| Cobalt [mg/L] | 0.000028 | 0.000029 |
| Copper [mg/L] | 0.00050 | 0.00039 |
| Iron [mg/L] | 0.010 | < 0.007 |
| Potassium [mg/L] | 23.0 | 29.6 |
| Lithium [mg/L] | 0.0077 | 0.0092 |
| Magnesium [mg/L] | 3.47 | 4.16 |
| Manganese [mg/L] | 0.00384 | 0.00519 |
| Molybdenum [mg/L] | 0.00781 | 0.00997 |
| Sodium [mg/L] | 18.4 | 20.7 |
| Nickel [mg/L] | 0.0001 | 0.0001 |
| Phosphorus [mg/L] | 0.006 | < 0.003 |
| Lead [mg/L] | 0.00011 | 0.00012 |
| Antimony [mg/L] | 0.0019 | 0.0031 |
| Selenium [mg/L] | 0.00029 | 0.00032 |
| Silicon [mg/L] | 3.81 | 3.47 |

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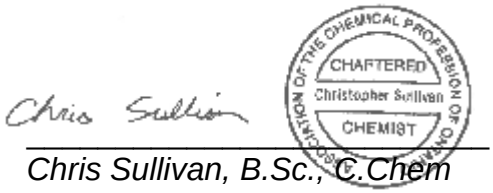
**LR Report :** **CA11013-APR17**

| Analysis | 27: ODY-ENV-065 | 28: ODY-ENV-067 |
|---|---|---|
| Tin [mg/L] | 0.00016 | 0.00019 |
| Strontium [mg/L] | 12.5 | 8.24 |
| Titanium [mg/L] | 0.00039 | 0.00034 |
| Thallium [mg/L] | 0.000015 | 0.000017 |
| Uranium [mg/L] | 0.00366 | 0.00287 |
| Vanadium [mg/L] | 0.00252 | 0.00276 |
| Zinc [mg/L] | < 0.002 | < 0.002 |

## Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| Alkalinity | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2320 | N |
| Anions by IC | ME-CA-[ENV]IC-LAK-AN-001 | EPA300/MA300-Ions1.3 | Y |
| Conductivity | ME-CA-[ENV]EWL-LAK-AN-006 | SM 2510 | Y |
| Flouride by Specific Ion Electrode | ME-CA-[ENV]EWL-LAK-AN-014 | SM 4500 | Y |
| Mercury by CVAAS | ME-CA-[ENV]SPE-LAK-AN-004 | EPA 7471A/SM 3112B | Y |
| Metals in aqueous samples - ICP-MS | ME-CA-[ENV]SPE-LAK-AN-006 | SM 3030/EPA 200.8 | Y |
| Reactive Phosphorus by SFA | ME-CA-[ENV]SFA-LAK-AN-004 | SM 4500-P F | N |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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**LR Report :** **CA11013-APR17**

# Quality Control Report

| Inorganic Analysis | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| *Alkalinity - QCBatchID: EWL0390-MAY17* | | | | | | | | | | | | | |
| Alkalinity | 2 | mg/L as Ca | < 2 | | | 0 | 10 | 104 | 90 | 110 | NA | | |
| *Anions by IC - QCBatchID: DIO0390-MAY17* | | | | | | | | | | | | | |
| Bromide | 0.3 | mg/L | <0.3 | | | ND | 20 | 100 | 80 | 120 | 104 | 75 | 125 |
| Chloride | 0.2 | mg/L | <0.2 | | | 1 | 20 | 101 | 80 | 120 | 103 | 75 | 125 |
| Nitrate (as N) | 0.06 | mg/L | <0.06 | | | ND | 20 | 103 | 80 | 120 | 104 | 75 | 125 |
| Nitrate + Nitrite (as N) | 0.06 | mg/L | <0.06 | | | NA | | NA | | | NA | | |
| Nitrite (as N) | 0.03 | mg/L | <0.03 | | | ND | 20 | 102 | 80 | 120 | 103 | 75 | 125 |
| Sulphate | 0.2 | mg/L | <0.2 | | | 0 | 20 | 100 | 80 | 120 | 104 | 75 | 125 |
| *Anions by IC - QCBatchID: DIO0413-MAY17* | | | | | | | | | | | | | |
| Sulphate | 0.2 | mg/L | <0.2 | | | 0 | 20 | 96 | 80 | 120 | 90 | 75 | 125 |
| *Conductivity - QCBatchID: EWL0390-MAY17* | | | | | | | | | | | | | |
| Conductivity | 2 | µS/cm | < 2 | | | 0 | 10 | 100 | 90 | 110 | NA | | |
| *Flouride by Specific Ion Electrode - QCBatchID: EWL0393-MAY17* | | | | | | | | | | | | | |
| Fluoride | 0.06 | mg/L | <0.06 | | | ND | 10 | 101 | 90 | 110 | 103 | 75 | 125 |
| *Mercury by CVAAS - QCBatchID: EHG0029-MAY17* | | | | | | | | | | | | | |
| Mercury | 0.00001 | mg/L | < 0.00001 | | | ND | 20 | 108 | 90 | 110 | 115 | 70 | 130 |
| *Metals - QCBatchID: EMS0087-MAY17* | | | | | | | | | | | | | |
| Cobalt | 0.000004 | mg/L | <0.000004 | | | 1 | 20 | 102 | 90 | 110 | 104 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0087-MAY17* | | | | | | | | | | | | | |
| Aluminum | 0.001 | mg/L | <0.001 | | | 3 | 20 | 107 | 90 | 110 | 104 | 70 | 130 |
| Antimony | 0.0002 | mg/L | <0.0002 | | | 0 | 20 | 100 | 90 | 110 | NV | 70 | 130 |
| Arsenic | 0.0002 | mg/L | <0.0002 | | | 3 | 20 | 105 | 90 | 110 | NV | 70 | 130 |
| Barium | 0.00002 | mg/L | <0.00002 | | | 2 | 20 | 102 | 90 | 110 | NV | 70 | 130 |
| Beryllium | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 102 | 90 | 110 | 93 | 70 | 130 |
| Bismuth | 0.000007 | mg/L | <0.000007 | | | ND | 20 | 109 | 90 | 110 | 79 | 70 | 130 |
| Boron | 0.002 | mg/L | <0.002 | | | 2 | 20 | 103 | 90 | 110 | NV | 70 | 130 |
| Cadmium | 0.000003 | mg/L | <0.000003 | | | ND | 20 | 102 | 90 | 110 | 114 | 70 | 130 |
| Calcium | 0.01 | mg/L | <0.01 | | | 11 | 20 | 108 | 90 | 110 | NV | 70 | 130 |
| Chromium | 0.00003 | mg/L | <0.00003 | | | 7 | 20 | 104 | 90 | 110 | 100 | 70 | 130 |
| Copper | 0.00002 | mg/L | 0.000024 | | | 7 | 20 | 102 | 90 | 110 | 98 | 70 | 130 |
| Iron | 0.007 | mg/L | <0.007 | | | ND | 20 | 105 | 90 | 110 | 91 | 70 | 130 |
| Lead | 0.00001 | mg/L | <0.00001 | | | 3 | 20 | 109 | 90 | 110 | 97 | 70 | 130 |
| Lithium | 0.0001 | mg/L | <0.0001 | | | 2 | 20 | 103 | 90 | 110 | NV | 70 | 130 |
| Magnesium | 0.001 | mg/L | <0.001 | | | 3 | 20 | 104 | 90 | 110 | 95 | 70 | 130 |
| Manganese | 0.00001 | mg/L | <0.00001 | | | 0 | 20 | 105 | 90 | 110 | 107 | 70 | 130 |

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**LR Report :** **CA11013-APR17**

| Inorganic Analysis | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Reporting Limit | Unit | Method Blank | Duplicate | | | | LCS / Spike Blank | | | Matrix Spike / Reference Material | | | |
| | | | | Result 1 | Result 2 | RPD | Acceptance Criteria | Spike Recovery (%) | Recovery Limits (%) | | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | | | | % | | Low | High | | Low | High |
| Molybdenum | 0.00001 | mg/L | <0.00001 | | | 19 | 20 | 102 | 90 | 110 | 89 | 70 | 130 |
| Nickel | 0.0001 | mg/L | <0.0001 | | | ND | 20 | 101 | 90 | 110 | 104 | 70 | 130 |
| Phosphorus | 0.003 | mg/L | <0.003 | | | ND | 20 | 99 | 90 | 110 | NV | 70 | 130 |
| Potassium | 0.003 | mg/L | <0.003 | | | 4 | 20 | 106 | 90 | 110 | NV | 70 | 130 |
| Selenium | 0.00004 | mg/L | <0.00004 | | | 11 | 20 | 102 | 90 | 110 | NV | 70 | 130 |
| Silicon | 0.02 | mg/L | <0.02 | | | 12 | 20 | 105 | 90 | 110 | NV | 70 | 130 |
| Silver | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 101 | 90 | 110 | 109 | 70 | 130 |
| Sodium | 0.01 | mg/L | <0.01 | | | 3 | 20 | 97 | 90 | 110 | 98 | 70 | 130 |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 3 | 20 | 104 | 90 | 110 | 80 | 70 | 130 |
| Thallium | 0.000005 | mg/L | <0.000005 | | | ND | 20 | 106 | 90 | 110 | 92 | 70 | 130 |
| Tin | 0.00001 | mg/L | <0.00001 | | | 19 | 20 | 99 | 90 | 110 | NV | 70 | 130 |
| Titanium | 0.00005 | mg/L | <0.00005 | | | ND | 20 | 98 | 90 | 110 | NV | 70 | 130 |
| Uranium | 0.000002 | mg/L | <0.000002 | | | 0 | 20 | 109 | 90 | 110 | 76 | 70 | 130 |
| Vanadium | 0.00001 | mg/L | <0.00001 | | | 1 | 20 | 103 | 90 | 110 | 99 | 70 | 130 |
| Zinc | 0.002 | mg/L | <0.002 | | | ND | 20 | 102 | 90 | 110 | 111 | 70 | 130 |
| *Metals in aqueous samples - ICP-MS - QCBatchID: EMS0117-MAY17* | | | | | | | | | | | | | |
| Strontium | 0.00002 | mg/L | <0.00002 | | | 1 | 20 | 108 | 90 | 110 | NV | 70 | 130 |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0197-MAY17* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | 12 | 10 | 90 | 90 | 110 | NV | 75 | 125 |
| *Reactive Phosphorus by SFA - QCBatchID: SKA0208-MAY17* | | | | | | | | | | | | | |
| Phosphorus (total reactive) | 0.03 | mg/L | <0.03 | | | 9 | 10 | 90 | 90 | 110 | 79 | 75 | 125 |

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23-March-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0,

Phone: 819-757-2225
Fax:

**Date Rec. :** 10 March 2017
**LR Report:** **CA11007-MAR17**
**Reference:** Odyssey

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| **Analysis** | **5: Detox Final Tail BL 154-50** | **6: Detox Final Tail BL 154-51** | **7: Detox Final Tail BL 154-52** |
|---|---|---|---|
| Sample Date & Time | Date:N/A | Date:N/A | Date:N/A |
| SiO2 [%] | 67.6 | 65.1 | 65.4 |
| Al2O3 [%] | 13.0 | 14.3 | 13.9 |
| Fe2O3 [%] | 3.18 | 3.44 | 3.73 |
| MgO [%] | 1.40 | 1.36 | 1.78 |
| CaO [%] | 2.50 | 2.97 | 3.07 |
| Na2O [%] | 3.74 | 5.14 | 3.82 |
| K2O [%] | 5.51 | 4.13 | 4.19 |
| TiO2 [%] | 0.39 | 0.45 | 0.48 |
| P2O5 [%] | 0.19 | 0.22 | 0.20 |
| MnO [%] | 0.04 | 0.05 | 0.06 |
| Cr2O3 [%] | < 0.01 | < 0.01 | < 0.01 |
| V2O5 [%] | < 0.01 | 0.01 | 0.02 |
| LOI [%] | 2.00 | 2.15 | 2.77 |
| Sum [%] | 99.6 | 99.3 | 99.5 |

*Brian Graham B.Sc.*
*Project Specialist*
*Environmental Services, Analytical*

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**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier, Malartic
, J0Y 1Z0
Phone: 819-757-2225, Fax:

07-April-2017

**Date Rec. :** 27 March 2017
**LR Report:** **CA11024-MAR17**
**Reference:** Odyssey

**Copy:** #1

# CERTIFICATE OF ANALYSIS
## Final Report

| Sample ID | SiO2 % | Al2O3 % | Fe2O3 % | MgO % | CaO % | Na2O % | K2O % | TiO2 % | P2O5 % | MnO % | Cr2O3 % | V2O5 % | LOI % | Sum % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5: ODY-ENV-001 | 67.2 | 13.4 | 2.88 | 1.07 | 2.68 | 4.19 | 5.54 | 0.45 | 0.23 | 0.02 | < 0.01 | 0.01 | 2.64 | 100.3 |
| 6: ODY-ENV-002 | 65.1 | 14.3 | 3.17 | 1.57 | 3.16 | 5.98 | 3.25 | 0.47 | 0.20 | 0.04 | < 0.01 | < 0.01 | 2.63 | 99.9 |
| 7: ODY-ENV-003 | 65.4 | 13.9 | 3.10 | 1.20 | 2.87 | 4.68 | 4.92 | 0.48 | 0.24 | 0.03 | < 0.01 | 0.02 | 3.17 | 100.0 |
| 8: ODY-ENV-004 | 64.8 | 13.3 | 2.70 | 1.05 | 2.89 | 5.07 | 4.15 | 0.41 | 0.21 | 0.03 | < 0.01 | 0.02 | 2.76 | 97.4 |
| 9: ODY-ENV-005 | 64.4 | 14.8 | 3.22 | 1.33 | 2.98 | 5.29 | 4.36 | 0.49 | 0.24 | 0.04 | < 0.01 | 0.01 | 2.52 | 99.7 |
| 10: ODY-ENV-006 | 44.7 | 10.5 | 12.3 | 14.2 | 9.12 | 1.80 | 1.78 | 0.79 | 0.07 | 0.20 | 0.15 | 0.04 | 4.07 | 99.7 |
| 11: ODY-ENV-007 | 66.0 | 13.2 | 3.35 | 1.46 | 2.89 | 6.36 | 1.79 | 0.51 | 0.23 | 0.03 | < 0.01 | 0.02 | 2.25 | 98.1 |
| 12: ODY-ENV-008 | 64.4 | 13.8 | 2.87 | 1.55 | 2.93 | 3.46 | 6.32 | 0.46 | 0.15 | 0.04 | < 0.01 | 0.01 | 2.72 | 98.6 |
| 13: ODY-ENV-009 | 44.3 | 11.3 | 16.2 | 4.61 | 7.94 | 3.17 | 3.29 | 2.27 | 0.19 | 0.23 | < 0.01 | 0.08 | 5.52 | 99.2 |
| 14: ODY-ENV-010 | 64.7 | 14.3 | 3.28 | 2.18 | 3.11 | 4.96 | 3.70 | 0.49 | 0.22 | 0.02 | < 0.01 | 0.01 | 3.37 | 100.3 |
| 15: ODY-ENV-011 | 63.3 | 16.4 | 3.31 | 1.88 | 2.78 | 3.33 | 4.99 | 0.54 | 0.13 | 0.04 | < 0.01 | 0.02 | 2.16 | 98.9 |
| 16: ODY-ENV-012 | 49.9 | 6.45 | 7.83 | 14.8 | 8.31 | 0.24 | 3.45 | 0.31 | 0.01 | 0.12 | 0.21 | 0.03 | 8.43 | 100.2 |
| 17: ODY-ENV-013 | 64.6 | 14.6 | 3.22 | 1.33 | 3.07 | 5.50 | 3.79 | 0.49 | 0.25 | 0.04 | 0.01 | < 0.01 | 2.16 | 99.1 |
| 18: ODY-ENV-014 | 65.0 | 13.4 | 3.24 | 1.48 | 2.56 | 2.19 | 7.70 | 0.51 | 0.23 | 0.03 | < 0.01 | < 0.01 | 2.25 | 98.7 |
| 19: ODY-ENV-015 | 62.7 | 13.4 | 2.89 | 1.26 | 2.58 | 5.36 | 3.98 | 0.44 | 0.22 | 0.04 | < 0.01 | 0.02 | 2.98 | 95.9 |
| 20: ODY-ENV-016 | 46.0 | 11.7 | 16.7 | 4.80 | 8.02 | 4.63 | 1.65 | 2.33 | 0.19 | 0.24 | 0.01 | 0.09 | 4.38 | 100.7 |
| 21: ODY-ENV-017 | 47.1 | 12.1 | 14.7 | 5.68 | 7.64 | 3.21 | 2.89 | 1.42 | 0.13 | 0.22 | 0.01 | 0.06 | 4.67 | 99.9 |
| 22: ODY-ENV-018 | 64.1 | 14.6 | 3.14 | 1.29 | 2.96 | 4.31 | 5.25 | 0.50 | 0.24 | 0.04 | < 0.01 | < 0.01 | 2.36 | 98.8 |
| 23: ODY-ENV-019 | 64.3 | 14.3 | 3.09 | 1.16 | 2.90 | 5.10 | 4.99 | 0.49 | 0.23 | 0.03 | 0.01 | 0.02 | 2.29 | 98.9 |

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Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA11024-MAR17**

| Sample ID | SiO2 % | Al2O3 % | Fe2O3 % | MgO % | CaO % | Na2O % | K2O % | TiO2 % | P2O5 % | MnO % | Cr2O3 % | V2O5 % | LOI % | Sum % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24: ODY-ENV-020 | 40.9 | 5.20 | 10.6 | 24.1 | 7.42 | 0.08 | 1.13 | 0.33 | 0.02 | 0.17 | 0.32 | 0.03 | 9.85 | 100.2 |
| 25: ODY-ENV-021 | 42.6 | 6.36 | 11.0 | 21.5 | 7.65 | 0.26 | 2.53 | 0.44 | 0.02 | 0.17 | 0.29 | 0.03 | 7.38 | 100.2 |
| 26: ODY-ENV-022 | 47.6 | 8.07 | 8.12 | 14.1 | 8.32 | 0.57 | 3.84 | 0.31 | 0.05 | 0.14 | 0.18 | 0.04 | 8.40 | 99.7 |
| 27: ODY-ENV-023 | 43.2 | 6.07 | 10.4 | 22.0 | 7.66 | 0.46 | 0.46 | 0.35 | 0.03 | 0.15 | 0.31 | 0.03 | 9.26 | 100.4 |
| 28: ODY-ENV-024 | 39.1 | 4.85 | 9.83 | 24.6 | 6.92 | 0.07 | 1.40 | 0.30 | 0.01 | 0.16 | 0.29 | 0.02 | 13.0 | 100.5 |
| 29: ODY-ENV-025 | 37.6 | 4.73 | 10.3 | 25.5 | 6.61 | 0.04 | 0.73 | 0.31 | 0.02 | 0.16 | 0.30 | 0.03 | 14.2 | 100.6 |
| 30: ODY-ENV-026 | 64.9 | 15.6 | 3.06 | 1.23 | 3.04 | 6.37 | 2.63 | 0.50 | 0.22 | 0.03 | < 0.01 | < 0.01 | 2.05 | 99.6 |
| 31: ODY-ENV-027 | 64.4 | 15.2 | 3.28 | 1.40 | 3.08 | 6.05 | 3.09 | 0.50 | 0.23 | 0.04 | < 0.01 | 0.02 | 2.56 | 99.8 |
| 32: ODY-ENV-028 | 65.6 | 14.0 | 2.81 | 1.18 | 2.79 | 5.47 | 3.96 | 0.44 | 0.20 | 0.04 | < 0.01 | < 0.01 | 2.61 | 99.0 |
| 33: ODY-ENV-029 | 64.8 | 15.0 | 3.21 | 1.27 | 3.13 | 6.11 | 2.80 | 0.49 | 0.22 | 0.05 | < 0.01 | 0.02 | 2.38 | 99.5 |
| 34: ODY-ENV-030 | 70.2 | 14.9 | 1.20 | 0.27 | 1.36 | 4.44 | 6.10 | 0.20 | 0.11 | < 0.01 | < 0.01 | < 0.01 | 1.42 | 100.2 |
| 35: ODY-ENV-031 | 72.0 | 10.5 | 2.25 | 1.28 | 1.89 | 0.39 | 8.55 | 0.35 | < 0.01 | 0.01 | < 0.01 | < 0.01 | 1.87 | 99.0 |
| 36: ODY-ENV-032 | 66.3 | 14.7 | 3.17 | 1.26 | 3.03 | 5.89 | 2.64 | 0.48 | 0.22 | 0.04 | < 0.01 | 0.01 | 2.48 | 100.2 |
| 37: ODY-ENV-033 | 66.9 | 13.9 | 3.07 | 1.28 | 2.92 | 5.00 | 2.96 | 0.47 | 0.23 | 0.04 | < 0.01 | < 0.01 | 2.79 | 99.5 |
| 38: ODY-ENV-034 | 68.4 | 13.2 | 3.01 | 1.38 | 2.61 | 1.79 | 4.41 | 0.45 | 0.21 | 0.04 | < 0.01 | < 0.01 | 3.39 | 99.0 |
| 39: ODY-ENV-035 | 62.4 | 13.6 | 4.29 | 2.66 | 4.75 | 3.39 | 3.12 | 0.45 | 0.16 | 0.06 | 0.02 | < 0.01 | 4.80 | 99.7 |
| 40: ODY-ENV-036 | 59.8 | 15.8 | 5.64 | 3.02 | 3.16 | 1.37 | 4.62 | 0.58 | 0.10 | 0.07 | 0.04 | 0.03 | 4.76 | 99.0 |
| 41: ODY-ENV-037 | 63.5 | 13.6 | 3.02 | 1.34 | 2.91 | 3.99 | 5.13 | 0.46 | 0.21 | 0.02 | < 0.01 | 0.01 | 2.47 | 96.7 |
| 42: ODY-ENV-038 | 71.4 | 12.7 | 2.82 | 1.45 | 2.26 | 2.09 | 3.16 | 0.42 | 0.18 | 0.04 | < 0.01 | < 0.01 | 2.85 | 99.4 |
| 43: ODY-ENV-039 | 69.2 | 12.6 | 2.69 | 1.10 | 2.56 | 2.68 | 5.81 | 0.41 | 0.21 | 0.04 | < 0.01 | < 0.01 | 2.56 | 99.8 |
| 44: ODY-ENV-040 | 69.3 | 13.2 | 2.89 | 1.00 | 2.74 | 1.36 | 4.50 | 0.44 | 0.21 | 0.03 | < 0.01 | 0.02 | 3.32 | 99.0 |
| 45: ODY-ENV-041 | 63.4 | 15.7 | 3.31 | 1.30 | 3.02 | 5.74 | 3.60 | 0.54 | 0.26 | 0.04 | < 0.01 | 0.02 | 2.59 | 99.6 |
| 46: ODY-ENV-042 | 80.0 | 11.3 | 1.27 | 0.89 | 0.40 | 2.01 | 2.52 | 0.21 | 0.05 | 0.02 | < 0.01 | 0.01 | 1.50 | 100.1 |
| 47: ODY-ENV-043 | 64.6 | 15.3 | 3.24 | 1.24 | 3.09 | 5.58 | 3.32 | 0.50 | 0.23 | 0.04 | < 0.01 | < 0.01 | 2.45 | 99.6 |
| 48: ODY-ENV-044 | 74.1 | 10.7 | 2.47 | 0.89 | 2.44 | 4.07 | 2.07 | 0.35 | 0.17 | 0.04 | < 0.01 | < 0.01 | 2.11 | 99.5 |
| 49: ODY-ENV-045 | 64.3 | 15.2 | 3.18 | 1.23 | 3.05 | 5.70 | 3.32 | 0.51 | 0.24 | 0.05 | < 0.01 | 0.01 | 2.51 | 99.2 |
| 50: ODY-ENV-046 | 65.0 | 15.7 | 3.34 | 1.43 | 2.77 | 3.20 | 3.90 | 0.53 | 0.26 | 0.05 | < 0.01 | 0.02 | 3.06 | 99.2 |
| 51: ODY-ENV-047 | 64.1 | 15.6 | 3.37 | 1.35 | 3.15 | 5.11 | 3.05 | 0.53 | 0.24 | 0.03 | < 0.01 | 0.01 | 2.75 | 99.3 |
| 52: ODY-ENV-048 | 66.8 | 14.4 | 3.38 | 1.36 | 2.88 | 3.03 | 3.45 | 0.50 | 0.25 | 0.03 | < 0.01 | 0.01 | 3.13 | 99.2 |
| 53: ODY-ENV-049 | 41.8 | 15.5 | 9.59 | 8.19 | 8.47 | 1.72 | 5.48 | 0.43 | 0.02 | 0.17 | 0.01 | 0.05 | 8.20 | 99.6 |
| 54: ODY-ENV-050 | 39.9 | 12.5 | 9.41 | 12.1 | 10.3 | 1.01 | 2.18 | 0.31 | < 0.01 | 0.16 | 0.05 | 0.05 | 12.4 | 100.5 |
| 55: ODY-ENV-051 | 63.4 | 15.4 | 5.39 | 2.80 | 2.53 | 2.59 | 4.12 | 0.57 | 0.14 | 0.07 | 0.03 | 0.02 | 2.66 | 99.7 |
| 56: ODY-ENV-052 | 57.8 | 18.2 | 6.69 | 3.32 | 2.18 | 1.87 | 5.54 | 0.67 | 0.14 | 0.06 | 0.03 | 0.04 | 3.34 | 99.9 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

SGS Canada Inc.
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Lakefield - Ontario - K0L 2H0
Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA11024-MAR17**

| Sample ID | SiO2 % | Al2O3 % | Fe2O3 % | MgO % | CaO % | Na2O % | K2O % | TiO2 % | P2O5 % | MnO % | Cr2O3 % | V2O5 % | LOI % | Sum % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 57: ODY-ENV-053 | 64.5 | 14.5 | 5.11 | 2.59 | 2.67 | 4.04 | 2.88 | 0.52 | 0.13 | 0.07 | 0.03 | 0.02 | 2.06 | 99.2 |
| 58: ODY-ENV-054 | 45.4 | 12.9 | 10.3 | 6.89 | 7.36 | 4.09 | 2.31 | 0.66 | 0.05 | 0.19 | 0.02 | 0.05 | 9.04 | 99.3 |
| 59: ODY-ENV-055 | 64.6 | 14.6 | 4.84 | 2.51 | 2.66 | 2.85 | 3.63 | 0.53 | 0.13 | 0.06 | 0.04 | < 0.01 | 2.56 | 99.1 |
| 60: ODY-ENV-056 | 63.0 | 15.0 | 3.42 | 1.36 | 3.25 | 6.38 | 3.05 | 0.53 | 0.25 | 0.04 | < 0.01 | 0.02 | 2.43 | 98.7 |
| 61: ODY-ENV-057 | 63.1 | 15.3 | 3.33 | 1.31 | 3.14 | 6.00 | 3.08 | 0.50 | 0.24 | 0.04 | < 0.01 | 0.01 | 2.45 | 98.6 |
| 62: ODY-ENV-058 | 64.8 | 14.9 | 3.00 | 1.22 | 2.94 | 5.91 | 3.27 | 0.47 | 0.22 | 0.04 | < 0.01 | 0.02 | 2.13 | 98.9 |
| 63: ODY-ENV-059 | 45.0 | 10.7 | 15.0 | 7.16 | 7.10 | 3.47 | 3.06 | 1.81 | 0.15 | 0.23 | 0.03 | 0.08 | 5.76 | 99.5 |
| 64: ODY-ENV-060 | 63.9 | 15.6 | 3.07 | 1.21 | 3.25 | 7.09 | 1.98 | 0.49 | 0.23 | 0.03 | 0.01 | 0.02 | 2.65 | 99.5 |
| 65: ODY-ENV-061 | 63.0 | 15.7 | 3.58 | 1.39 | 3.39 | 6.20 | 2.91 | 0.55 | 0.27 | 0.03 | < 0.01 | 0.01 | 2.70 | 99.7 |
| 66: ODY-ENV-062 | 65.4 | 14.8 | 2.91 | 1.10 | 2.90 | 6.01 | 2.99 | 0.45 | 0.21 | 0.03 | < 0.01 | < 0.01 | 1.96 | 98.8 |
| 67: ODY-ENV-063 | 41.8 | 8.18 | 10.6 | 19.2 | 6.59 | 0.41 | 3.22 | 0.40 | 0.04 | 0.14 | 0.24 | 0.03 | 9.23 | 100.0 |
| 68: ODY-ENV-064 | 64.4 | 15.4 | 3.30 | 1.26 | 3.17 | 5.45 | 3.25 | 0.53 | 0.24 | 0.04 | < 0.01 | < 0.01 | 3.03 | 100.1 |
| 69: ODY-ENV-065 | 66.0 | 14.2 | 3.10 | 1.20 | 2.91 | 4.64 | 3.39 | 0.47 | 0.22 | 0.04 | < 0.01 | 0.02 | 2.77 | 99.0 |
| 70: ODY-ENV-066 | 64.7 | 15.2 | 3.33 | 1.34 | 2.98 | 4.36 | 4.61 | 0.52 | 0.26 | 0.03 | 0.01 | 0.01 | 2.58 | 99.9 |
| 71: ODY-ENV-067 | 65.9 | 14.9 | 3.10 | 1.24 | 2.96 | 4.39 | 3.06 | 0.49 | 0.23 | 0.03 | < 0.01 | 0.01 | 2.87 | 99.2 |
| 72: ODY-ENV-068 | 64.1 | 15.3 | 3.32 | 1.26 | 3.08 | 5.12 | 3.77 | 0.51 | 0.25 | 0.04 | < 0.01 | 0.02 | 2.79 | 99.5 |
| 73: ODY-ENV-069 | 46.2 | 7.12 | 7.50 | 14.6 | 9.00 | 0.26 | 3.95 | 0.31 | < 0.01 | 0.11 | 0.20 | 0.04 | 10.5 | 99.8 |
| 74: ODY-ENV-070 | 47.9 | 10.7 | 13.1 | 6.09 | 6.48 | 0.21 | 6.79 | 1.43 | 0.13 | 0.19 | 0.02 | 0.06 | 5.92 | 99.0 |
| 75: ODY-ENV-071 | 62.9 | 16.0 | 5.74 | 3.04 | 2.58 | 4.42 | 3.08 | 0.59 | 0.15 | 0.07 | 0.03 | 0.01 | 1.23 | 99.9 |
| 76: ODY-ENV-072 | 50.4 | 5.95 | 9.81 | 20.1 | 5.77 | 0.56 | 3.73 | 0.44 | 0.03 | 0.15 | 0.22 | 0.02 | 2.91 | 100.0 |
| 77: ODY-ENV-073 | 41.8 | 6.38 | 9.89 | 20.8 | 7.79 | 0.21 | 2.21 | 0.32 | 0.01 | 0.16 | 0.27 | 0.02 | 9.82 | 99.8 |
| 78: ODY-ENV-074 | 44.2 | 14.0 | 7.57 | 5.69 | 10.8 | 1.68 | 4.28 | 0.67 | 0.26 | 0.11 | 0.05 | 0.03 | 10.9 | 100.2 |
| 79: ODY-ENV-075 | 39.9 | 5.05 | 9.38 | 22.3 | 7.12 | 0.04 | 2.12 | 0.29 | 0.02 | 0.15 | 0.30 | 0.02 | 13.5 | 100.2 |
| 80: ODY-ENV-076 | 46.6 | 11.9 | 17.0 | 4.93 | 7.65 | 4.33 | 1.15 | 2.13 | 0.19 | 0.25 | < 0.01 | 0.08 | 3.15 | 99.4 |
| 81: ODY-ENV-077 | 79.1 | 8.73 | 1.84 | 0.33 | 1.44 | 0.10 | 7.01 | 0.27 | 0.16 | < 0.01 | 0.02 | < 0.01 | 1.42 | 100.4 |
| 82-DUP: ODY-ENV-016 | 45.6 | 11.5 | 16.6 | 4.77 | 7.95 | 4.61 | 1.62 | 2.28 | 0.19 | 0.25 | < 0.01 | 0.08 | 4.37 | 99.9 |
| 83-DUP: ODY-ENV-036 | 59.7 | 16.0 | 5.64 | 2.98 | 3.17 | 1.36 | 4.66 | 0.58 | 0.10 | 0.07 | 0.03 | 0.03 | 4.57 | 98.9 |
| 84-DUP: ODY-ENV-056 | 62.8 | 15.0 | 3.34 | 1.34 | 3.25 | 6.42 | 3.01 | 0.51 | 0.25 | 0.05 | < 0.01 | 0.02 | 2.40 | 98.3 |
| 85-DUP: ODY-ENV-077 | 78.9 | 8.78 | 1.82 | 0.37 | 1.44 | 0.10 | 7.04 | 0.27 | 0.16 | < 0.01 | 0.03 | < 0.01 | 1.45 | 100.3 |

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

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Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA11024-MAR17**

## Method Descriptions

| Parameter | SGS Method Code | Reference Method Code | PALA |
|---|---|---|---|
| | | | N |
| Inorganics-General | | | N |
| Inorganics-General | GO/GC/GT_XRF76V/R | | N |

Chris Sullivan

*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

# Quantitative X-Ray Diffraction by Rietveld Refinement

| | |
|---|---|
| ***Report Prepared for:*** | *Environmental -Analytical* |
| ***Project Number/ LIMS No.*** | *Custom XRD/MI4508-MAY17* |
| ***Sample Receipt:*** | *May 11, 2017* |
| ***Sample Analysis:*** | *May 12, 2017* |
| ***Reporting Date:*** | *May 18, 2017* |

---

| | |
|---|---|
| ***Instrument:*** | BRUKER AXS D8 Advance Diffractometer |
| ***Test Conditions:*** | Co radiation, 40 kV, 35 mA<br>Regular Scanning: Step: 0.02°, Step time: 1s, 2θ range: 3-80° |
| ***Interpretations*** : | PDF2/PDF4 powder diffraction databases issued by the International Center for Diffraction Data (ICDD). DiffracPIus Eva and Topas software. |
| ***Detection Limit*** : | 0.5-2%. Strongly dependent on crystallinity. |

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***Contents:***

1) Method Summary
2) Summary of Mineral Assemblages
3) Quantitative XRD Results
4) XRD Pattern(s)

Kim Gibbs, H.B.Sc., P.Geo.
Senior Mineralogist

Huyun Zhou, Ph.D., P.Geo.
Senior Mineralogist

**ACCREDITATION:** SGS Minerals Services Lakefield is accredited to the requirements of ISO/IEC 17025 for specific tests as listed on our scope of accreditation, including geochemical, mineralogical and trade mineral tests. To view a list of the accredited methods, please visit the following website and search SGS Canada - Minerals Services - Lakefield: http://palcan.scc.ca/SpecsSearch/GLSearchForm.do.

# Method Summary

The Rietveld Method of Mineral Identification by XRD (ME-LR-MIN-MET-MN-D05) method used by SGS Minerals Services is accredited to the requirements of ISO/IEC 17025.

***Mineral Identification and Interpretation:***

Mineral identification and interpretation involves matching the diffraction pattern of an unknown material to patterns of single-phase reference materials. The reference patterns are compiled by the Joint Committee on Powder Diffraction Standards - International Center for Diffraction Data (JCPDS-ICDD) database and released on software as Powder Diffraction Files (PDF).

Interpretations do not reflect the presence of non-crystalline and/or amorphous compounds, except when internal standards have been added by request. Mineral proportions may be strongly influenced by crystallinity, crystal structure and preferred orientations. Mineral or compound identification and quantitative analysis results should be accompanied by supporting chemical assay data or other additional tests.

***Quantitative Rietveld Analysis:***

Quantitative Rietveld Analysis is performed by using Topas 4.2 (Bruker AXS), a graphics based profile analysis program built around a non-linear least squares fitting system, to determine the amount of different phases present in a multicomponent sample. Whole pattern analyses are predicated by the fact that the X-ray diffraction pattern is a total sum of both instrumental and specimen factors. Unlike other peak intensity-based methods, the Rietveld method uses a least squares approach to refine a theoretical line profile until it matches the obtained experimental patterns.

Rietveld refinement is completed with a set of minerals specifically identified for the sample. Zero values indicate that the mineral was included in the refinement calculations, but the calculated concentration was less than 0.05wt%. Minerals not identified by the analyst are not included in refinement calculations for specific samples and are indicated with a dash.

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## Summary of Rietveld Quantitative Analysis X-ray Diffraction Results

### Quantitative X-ray Diffraction Results

| Mineral/Compound | Detox Final Tail BL 154-50 MAY4508-01 (wt %) | ODY-ENV-008 MAY4508-02 (wt %) | ODY-ENV-033 MAY4508-03 (wt %) | ODY-ENV-019 MAY4508-04 (wt %) | ODY-ENV-022 MAY4508-05 (wt %) | ODY-ENV-023 MAY4508-06 (wt %) | ODY-ENV-028 MAY4508-07 (wt %) | ODY-ENV-032 MAY4508-08 (wt %) | ODY-ENV-057 MAY4508-09 (wt %) |
|---|---|---|---|---|---|---|---|---|---|
| Quartz | 24.6 | 20.2 | 25.9 | 12.9 | 15.0 | 1.9 | 19.0 | 20.6 | 15.1 |
| Ankerite | 1.2 | 0.3 | 0.3 | 0.4 | 0.8 | 0.5 | 0.6 | 0.0 | 0.0 |
| Albite | 34.3 | 27.6 | 42.4 | 44.7 | 1.7 | 2.8 | 42.9 | 49.3 | 52.5 |
| Anorthite | 3.8 | 2.8 | 5.6 | 3.8 | 10.4 | 3.6 | 6.8 | 6.4 | 4.7 |
| Chlorite | 1.7 | 2.6 | 3.4 | 1.0 | 5.6 | 28.3 | 1.3 | 2.0 | 2.0 |
| Biotite | 3.0 | 3.3 | 1.1 | 5.8 | 21.3 | 10.8 | 4.5 | 4.3 | 4.5 |
| Calcite | 3.9 | 5.9 | 4.4 | 5.3 | 6.4 | 9.0 | 5.2 | 4.5 | 5.1 |
| Microcline | 24.9 | 33.9 | 10.7 | 24.0 | 3.5 | 3.0 | 17.1 | 7.2 | 11.2 |
| Muscovite | 2.0 | 2.6 | 5.4 | 1.6 | 7.0 | 0.2 | 2.2 | 5.3 | 4.2 |
| Pyrite | 0.7 | 0.7 | 0.7 | 0.4 | 0.7 | - | 0.4 | 0.4 | 0.6 |
| Talc | - | - | - | - | 4.9 | 17.0 | - | - | - |
| Actinolite | - | - | - | - | 14.5 | 20.4 | - | - | - |
| Dolomite | - | - | - | - | 8.2 | 2.5 | - | - | - |
| TOTAL | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

*Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.*

*Dashes indicate that the mineral was not identifed by the analyst and not included in the refinement calculation for the sample.*

| Mineral/Compound | Formula |
|---|---|
| Quartz | $SiO_2$ |
| Ankerite | $CaFe(CO_3)_2$ |
| Albite | $NaAlSi_3O_8$ |
| Anorthite | $CaAl_2Si_2O_8$ |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ |
| Biotite | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ |
| Calcite | $CaCO_3$ |
| Microcline | $KAlSi_3O_8$ |
| Muscovite | $KAl_2(AlSi_3O_{10})(OH)_2$ |
| Pyrite | $FeS_2$ |
| Talc | $Mg_3Si_4O_{10}(OH)_2$ |
| Actinolite | $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ |
| Dolomite | $CaMg(CO_3)_2$ |

## Summary of Rietveld Quantitative Analysis X-ray Diffraction Results

### Quantitative X-ray Diffraction Results

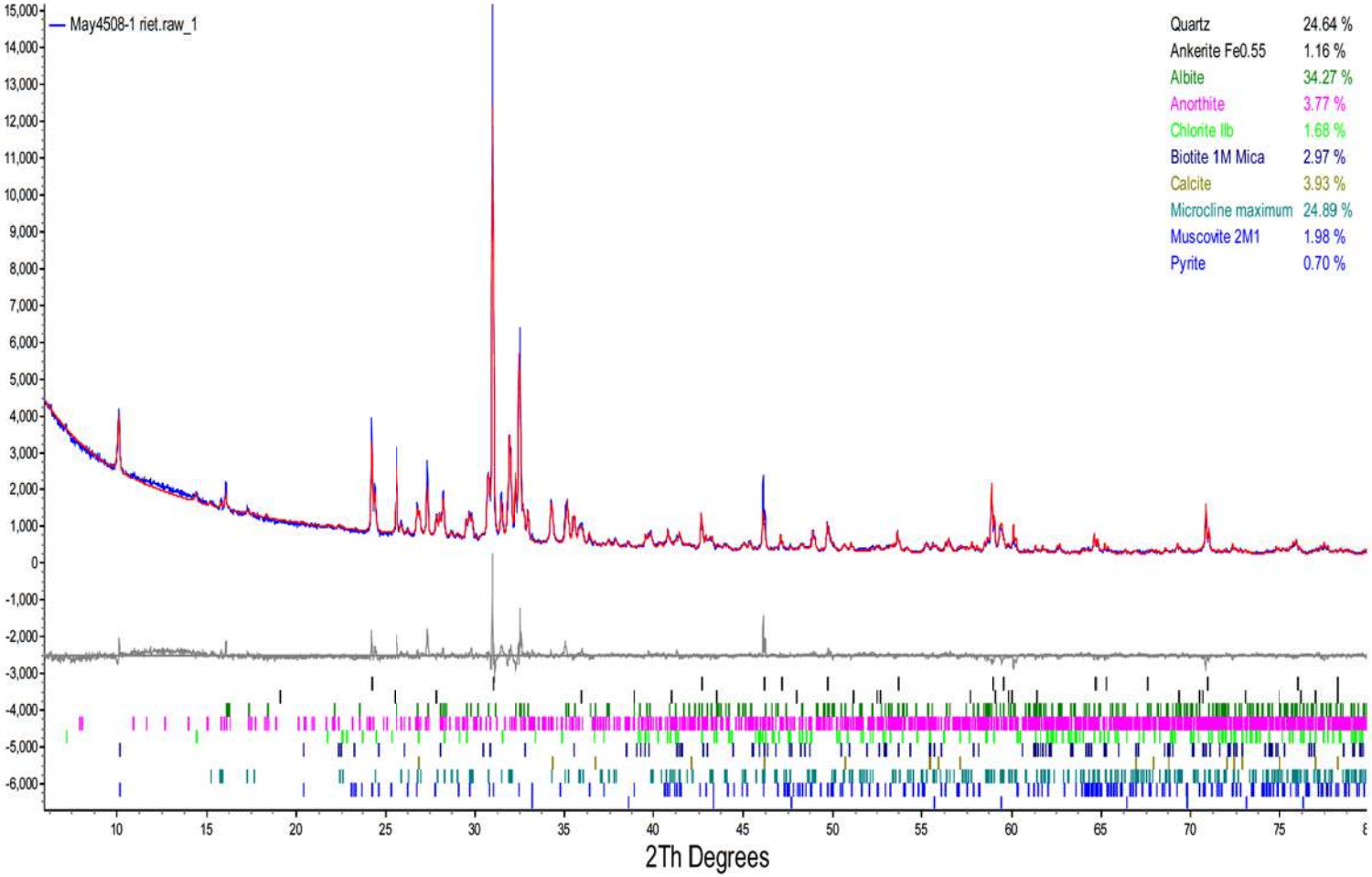
| Mineral/Compound | ODY-ENV-062 MAY4508-10 (wt %) | ODY-ENV-041 MAY4508-11 (wt %) | ODY-ENV-046 MAY4508-12 (wt %) | ODY-ENV-050 MAY4508-13 (wt %) | ODY-ENV-053 MAY4508-14 (wt %) | ODY-ENV-063 MAY4508-15 (wt %) | ODY-ENV-065 MAY4508-16 (wt %) | ODY-ENV-067 MAY4508-17 (wt %) |
|---|---|---|---|---|---|---|---|---|
| Quartz | 18.3 | 12.5 | 30.3 | 13.2 | 27.9 | 4.4 | 29.0 | 27.5 |
| Ankerite | 0.5 | 0.2 | - | - | 0.2 | 0.1 | 0.7 | 0.3 |
| Albite | 52.0 | 46.6 | 26.6 | 8.8 | 36.4 | 2.1 | 39.0 | 39.3 |
| Anorthite | 4.1 | 5.4 | 3.1 | 3.9 | 3.9 | 5.7 | 3.8 | 2.8 |
| Chlorite | 0.7 | 5.4 | 1.1 | 32.0 | 2.2 | 10.6 | - | - |
| Biotite | 3.3 | 1.1 | 5.3 | 12.8 | 11.2 | 24.9 | 2.8 | 4.8 |
| Calcite | 4.7 | 5.0 | 4.1 | 20.9 | 3.4 | 4.3 | 4.0 | 4.7 |
| Microcline | 12.2 | 14.7 | 1.0 | 2.8 | 2.3 | 1.8 | 8.1 | 2.3 |
| Muscovite | 3.7 | 8.5 | 28.0 | 5.5 | 11.8 | 5.8 | 12.6 | 17.9 |
| Pyrite | 0.5 | 0.6 | 0.4 | - | 0.7 | 0.2 | - | 0.5 |
| Talc | - | - | - | - | - | 23.6 | - | - |
| Actinolite | - | - | - | - | - | 9.1 | - | - |
| Dolomite | - | - | - | - | - | 7.4 | - | - |
| TOTAL | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

*Zero values indicate that the mineral was included in the refinement, but the calculated concentration is below a measurable value.*

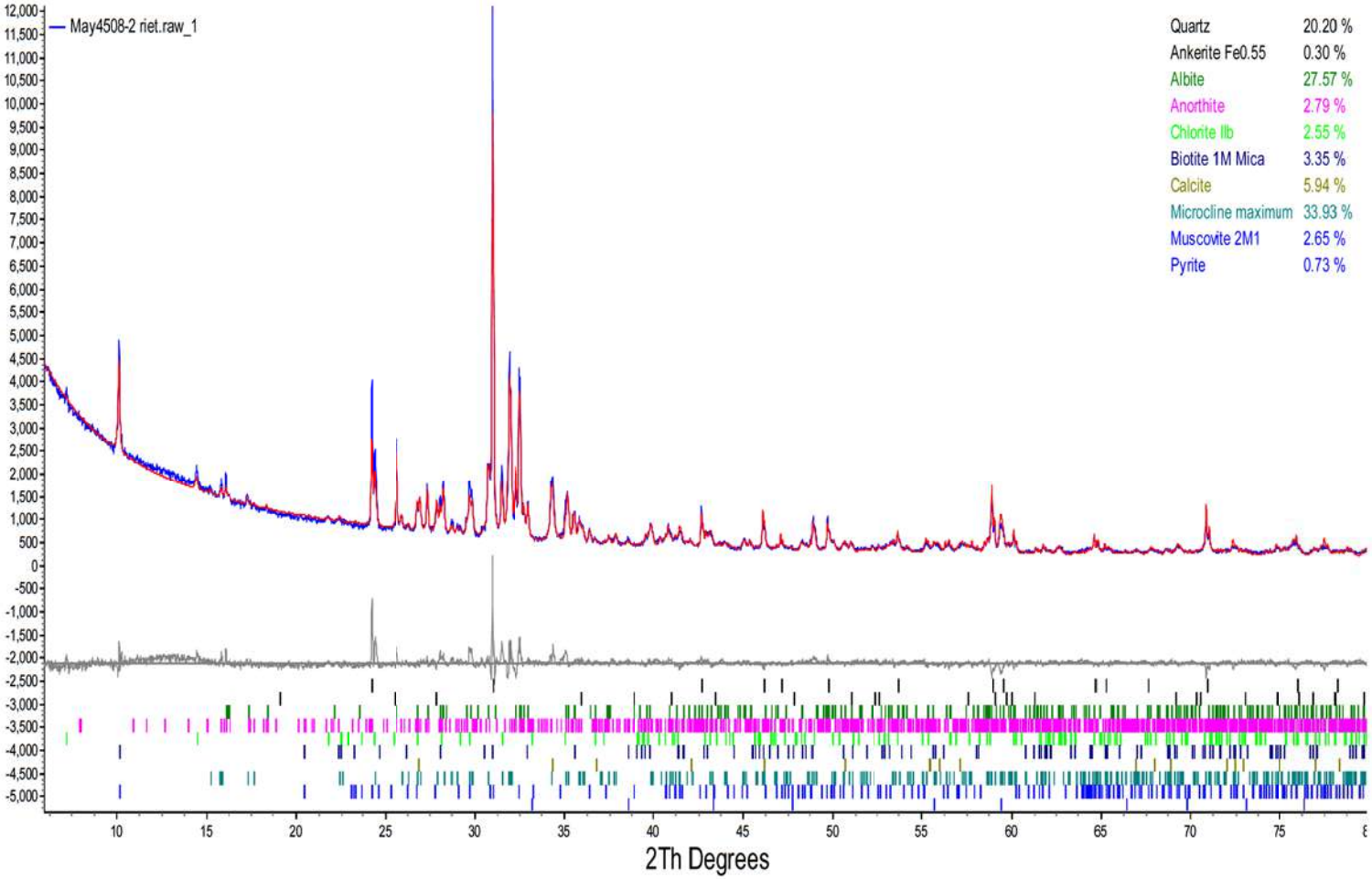
*Dashes indicate that the mineral was not identfed by the analyst and not included in the refinement calculation for the sample.*

| Mineral/Compound | Formula |
|---|---|
| Quartz | $SiO_2$ |
| Ankerite | $CaFe(CO_3)_2$ |
| Albite | $NaAlSi_3O_8$ |
| Anorthite | $CaAl_2Si_2O_8$ |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ |
| Biotite | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ |
| Calcite | $CaCO_3$ |
| Microcline | $KAlSi_3O_8$ |
| Muscovite | $KAl_2(AlSi_3C_{10})(OH)_2$ |
| Pyrite | $FeS_2$ |
| Talc | $Mg_3Si_4O_{10}(OH)_2$ |
| Actinolite | $Ca_2(Mg,Fe)_5Si_8O_{22}(OH)_2$ |
| Dolomite | $CaMg(CO_3)_2$ |

## Detox Final Tail BL 154-50



ODY-ENV-008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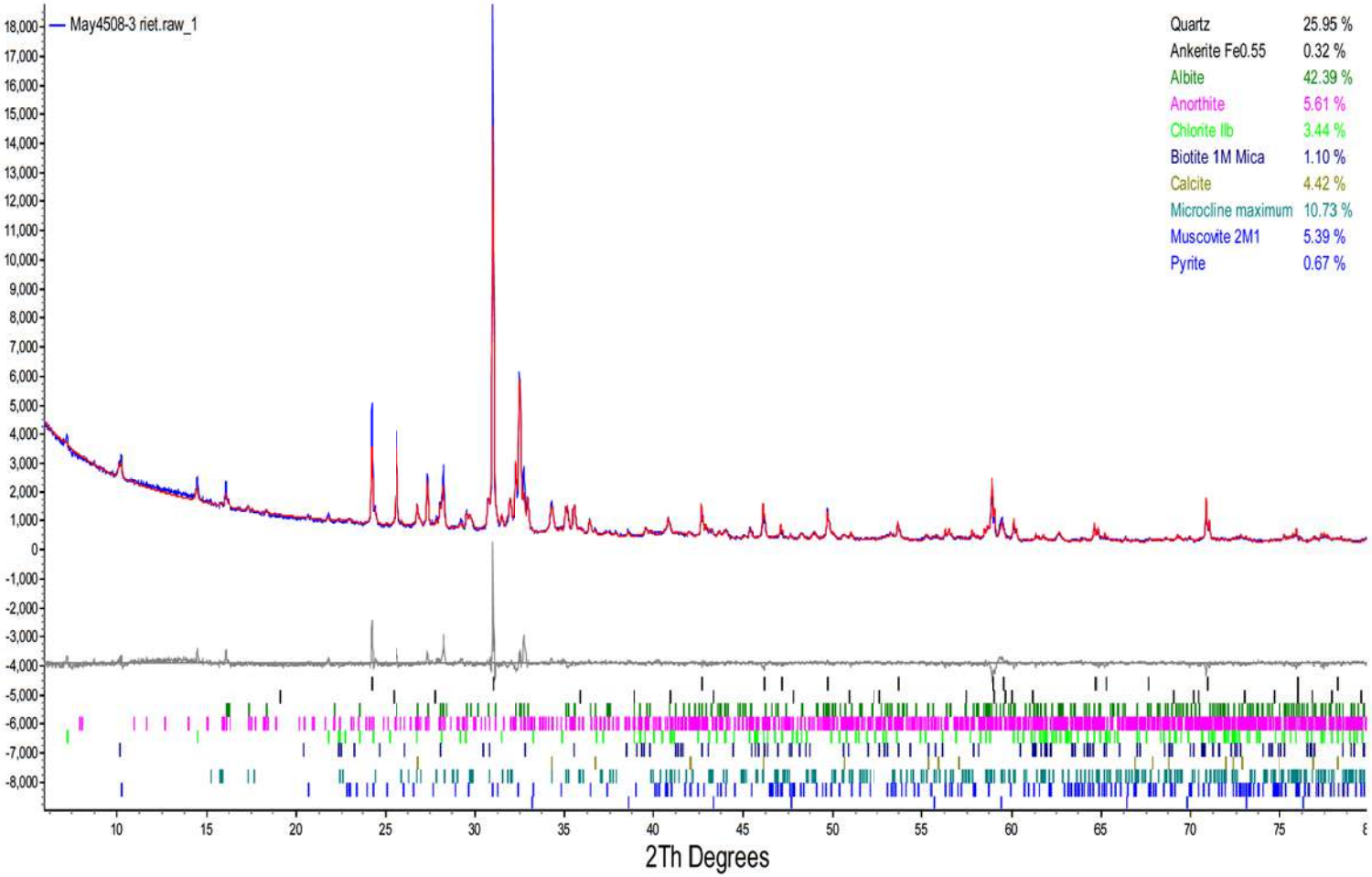
Quartz 20.20 %
Ankerite Fe0.55 0.30 %
Albite 27.57 %
Anorthite 2.79 %
Chlorite IIb 2.55 %
Biotite 1M Mica 3.35 %
Calcite 5.94 %
Microcline maximum 33.93 %
Muscovite 2M1 2.65 %
Pyrite 0.73 %
2Th Degrees

ODY-ENV-033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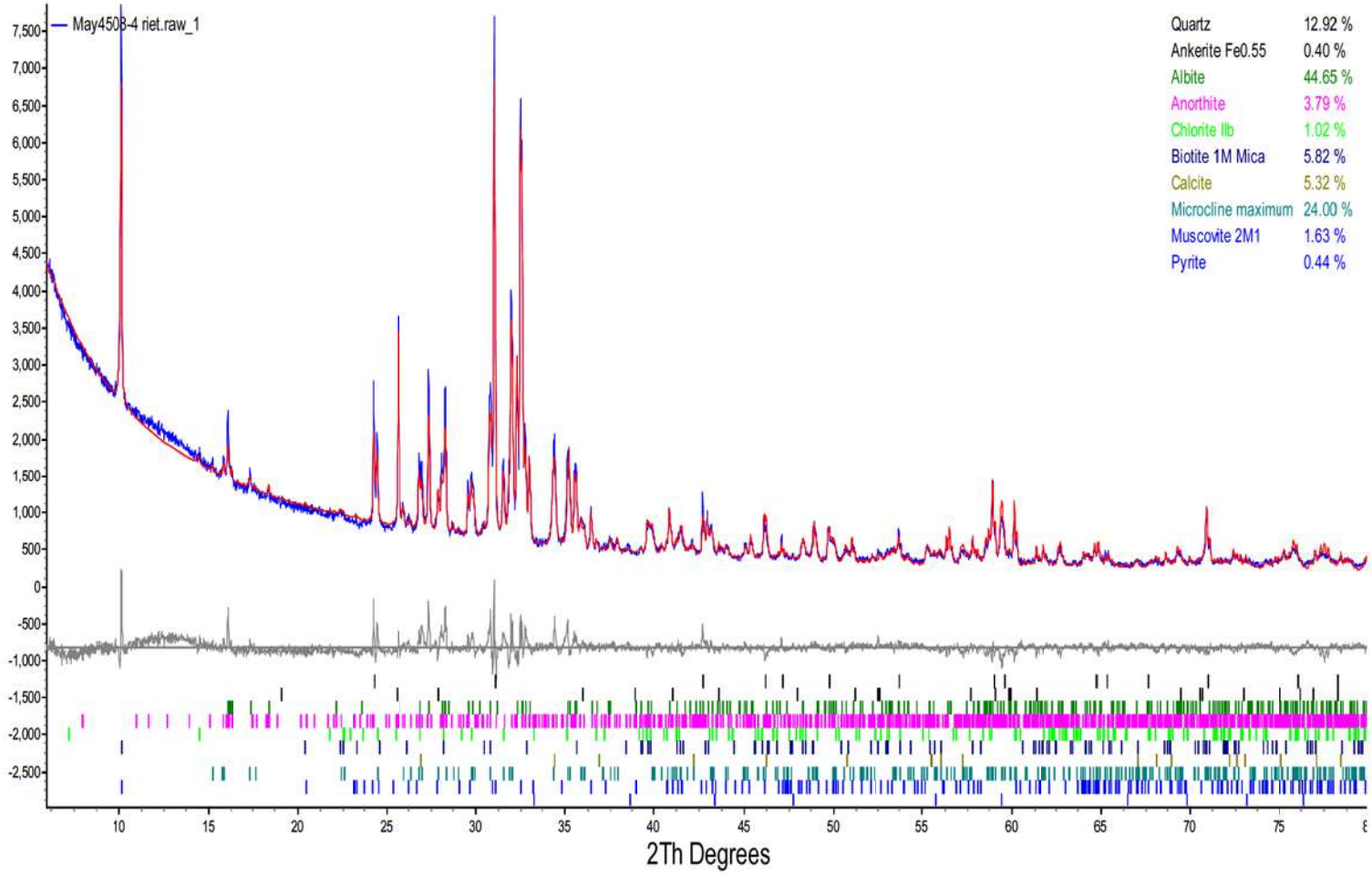
Quartz 25.95 %
Ankerite Fe0.55 0.32 %
Albite 42.39 %
Anorthite 5.61 %
Chlorite IIb 3.44 %
Biotite 1M Mica 1.10 %
Calcite 4.42 %
Microcline maximum 10.73 %
Muscovite 2M1 5.39 %
Pyrite 0.67 %
2Th Degrees

ODY-ENV-019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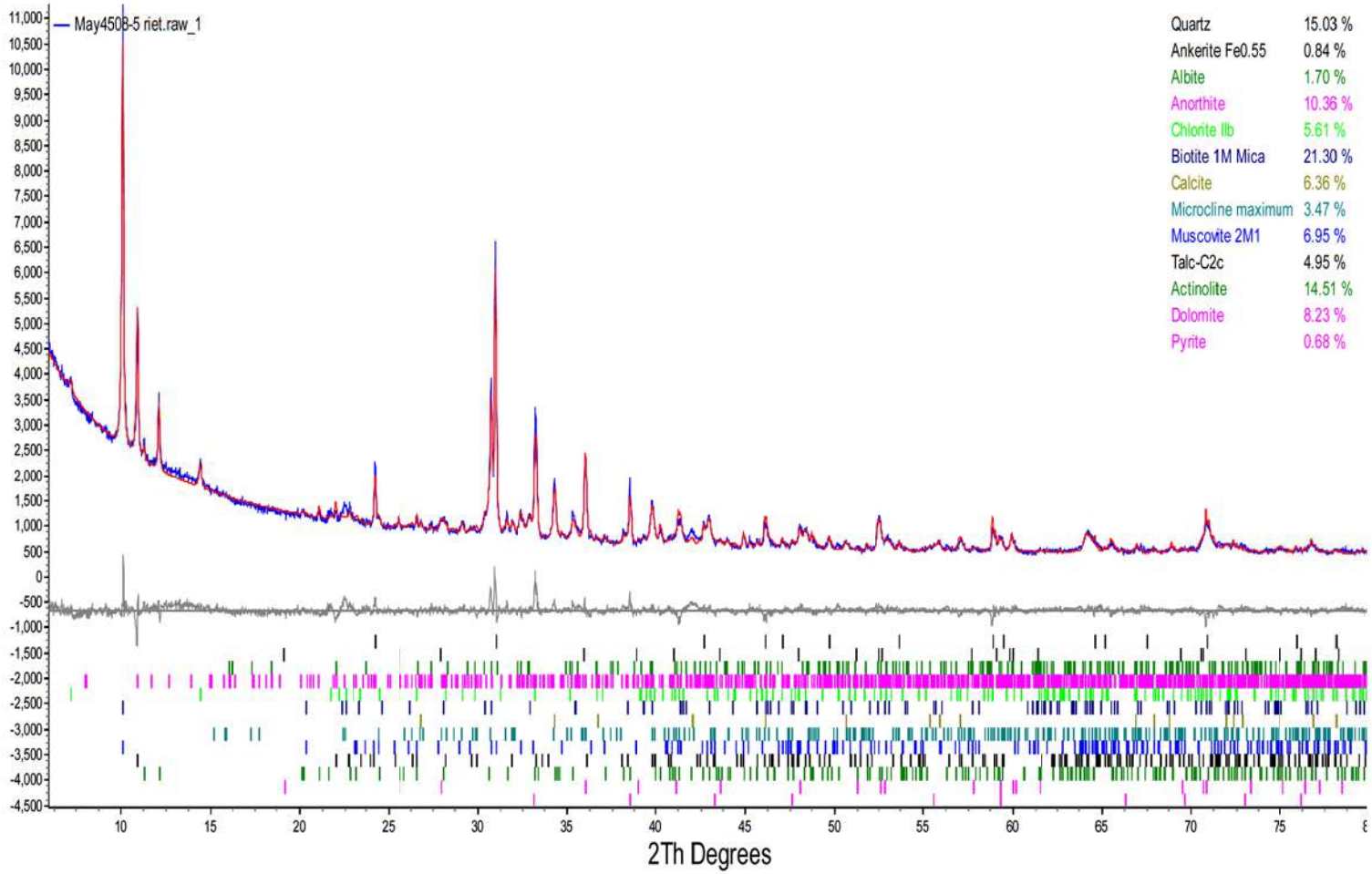
Quartz 12.92 %
Ankerite Fe0.55 0.40 %
Albite 44.65 %
Anorthite 3.79 %
Chlorite IIb 1.02 %
Biotite 1M Mica 5.82 %
Calcite 5.32 %
Microcline maximum 24.00 %
Muscovite 2M1 1.63 %
Pyrite 0.44 %
2Th Degrees

# ODY-ENV-022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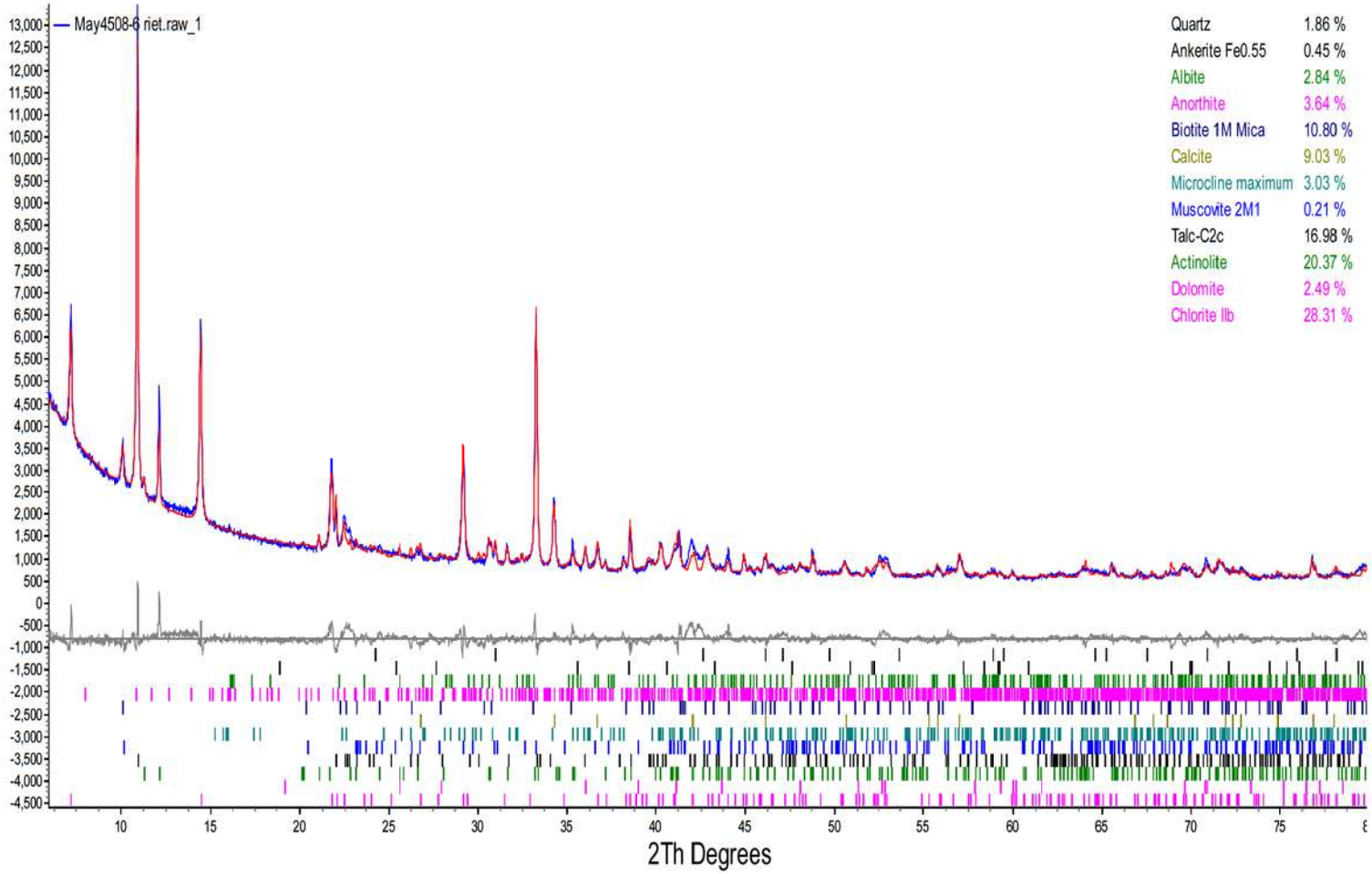
Quartz 15.03 %
Ankerite Fe0.55 0.84 %
Albite 1.70 %
Anorthite 10.36 %
Chlorite IIb 5.61 %
Biotite 1M Mica 21.30 %
Calcite 6.36 %
Microcline maximum 3.47 %
Muscovite 2M1 6.95 %
Talc-C2c 4.95 %
Actinolite 14.51 %
Dolomite 8.23 %
Pyrite 0.68 %
2Th Degrees

# ODY-ENV-023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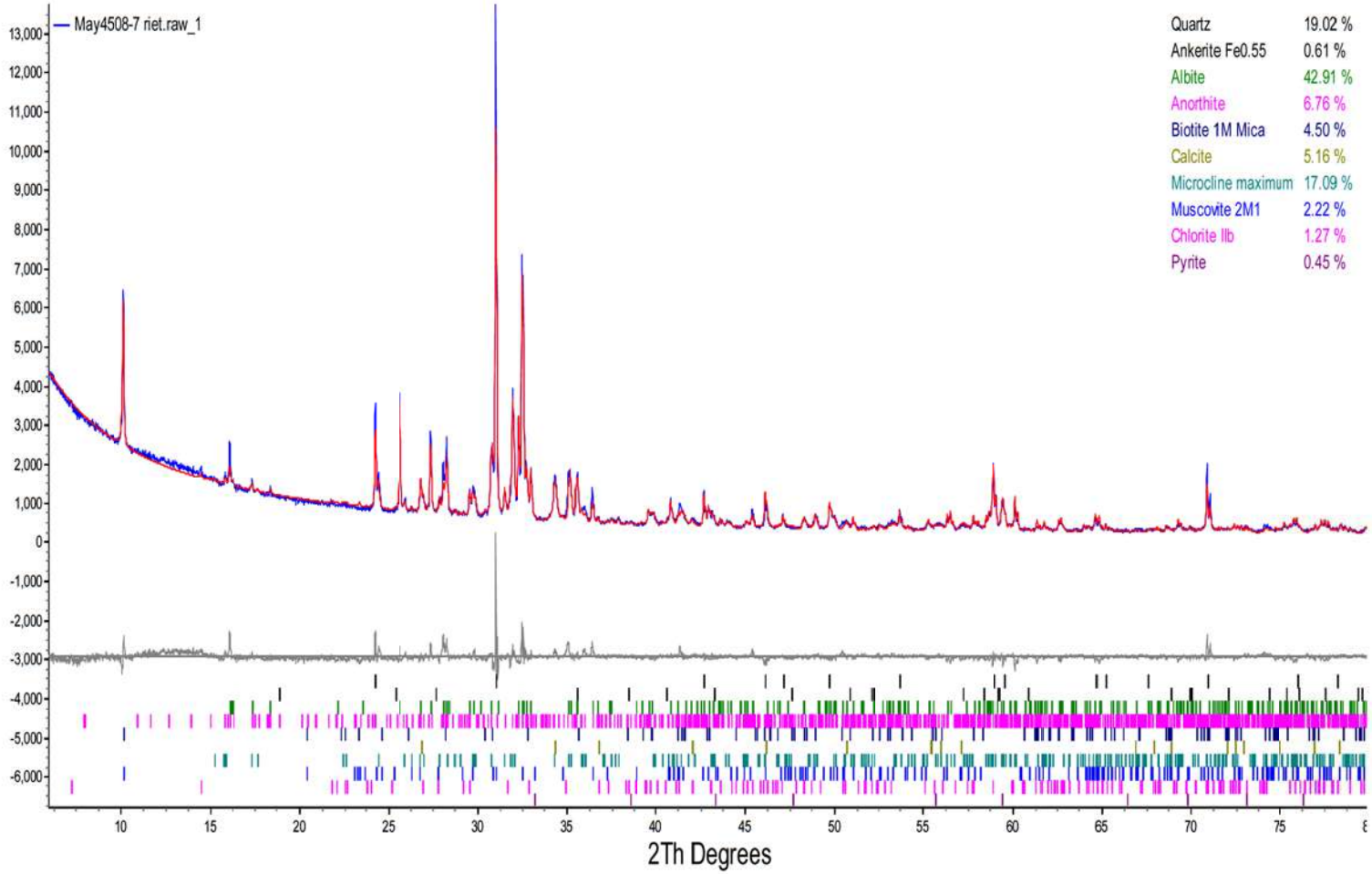
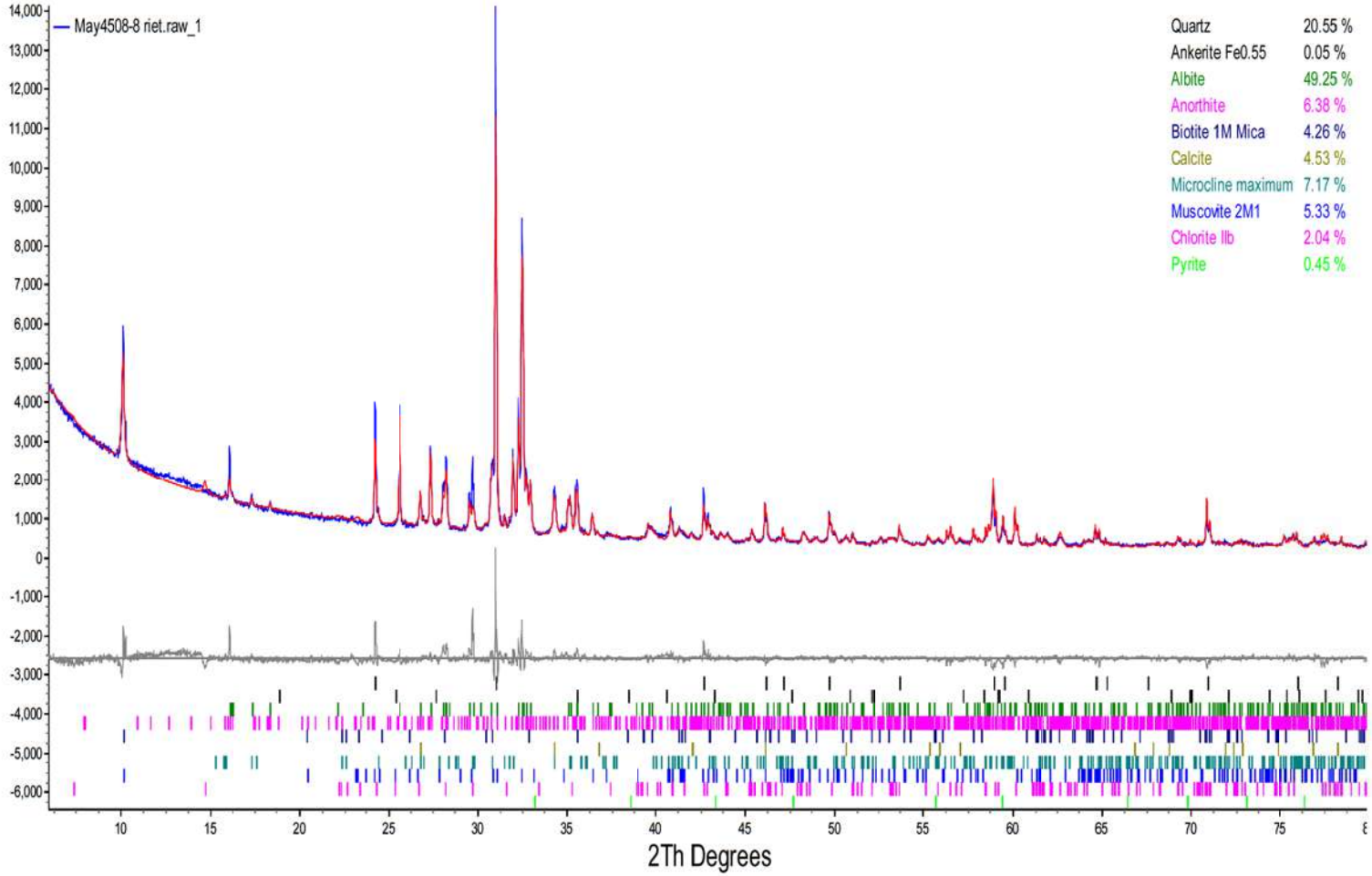
Ankerite Fe0.55 0.45 %
Albite 2.84 %
Anorthite 3.64 %
Biotite 1M Mica 10.80 %
Calcite 9.03 %
Microcline maximum 3.03 %
Muscovite 2M1 0.21 %
Talc-C2c 16.98 %
Actinolite 20.37 %
Dolomite 2.49 %
Chlorite IIb 28.31 %
2Th Degrees

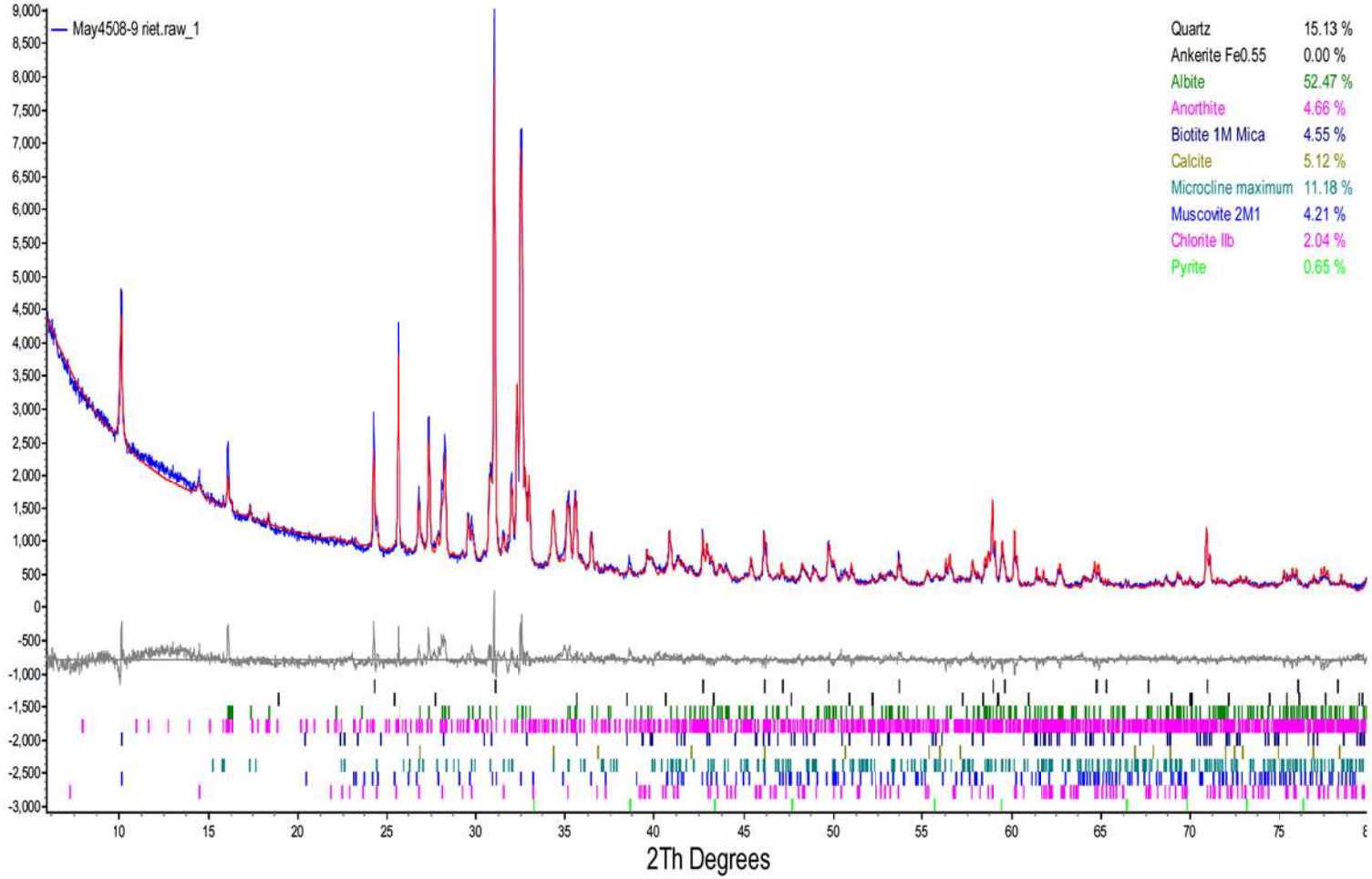
ODY-ENV-028


May4508-7 riet.raw_1
Quartz 19.02 %
Ankerite Fe0.55 0.61 %
Albite 42.91 %
Anorthite 6.76 %
Biotite 1M Mica 4.50 %
Calcite 5.16 %
Microcline maximum 17.09 %
Muscovite 2M1 2.22 %
Chlorite IIb 1.27 %
Pyrite 0.45 %
2Th Degrees

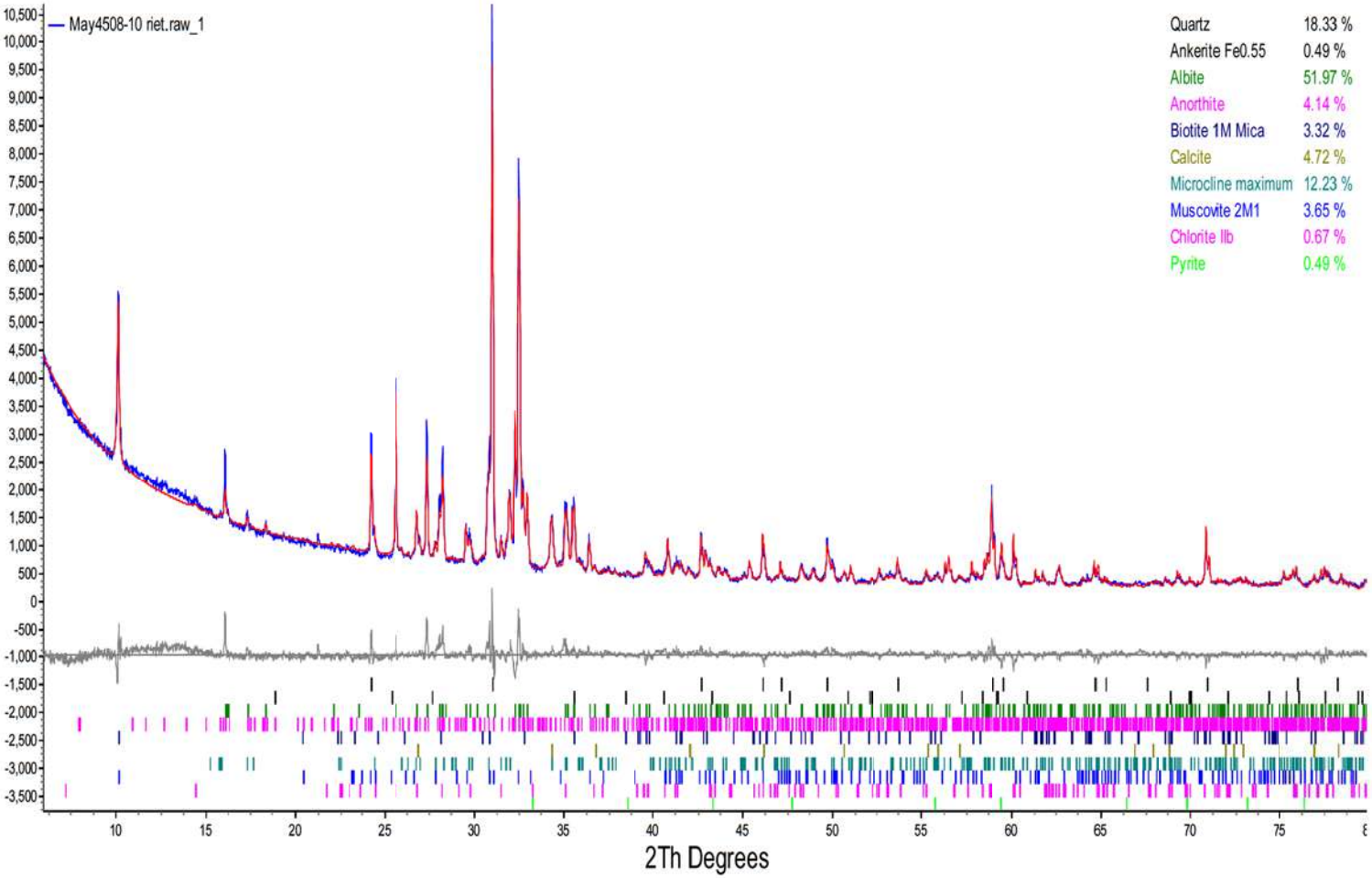
ODY-ENV-032


May4508-8 riet.raw_1
Quartz 20.55 %
Ankerite Fe0.55 0.05 %
Albite 49.25 %
Anorthite 6.38 %
Biotite 1M Mica 4.26 %
Calcite 4.53 %
Microcline maximum 7.17 %
Muscovite 2M1 5.33 %
Chlorite IIb 2.04 %
Pyrite 0.45 %
2Th Degrees

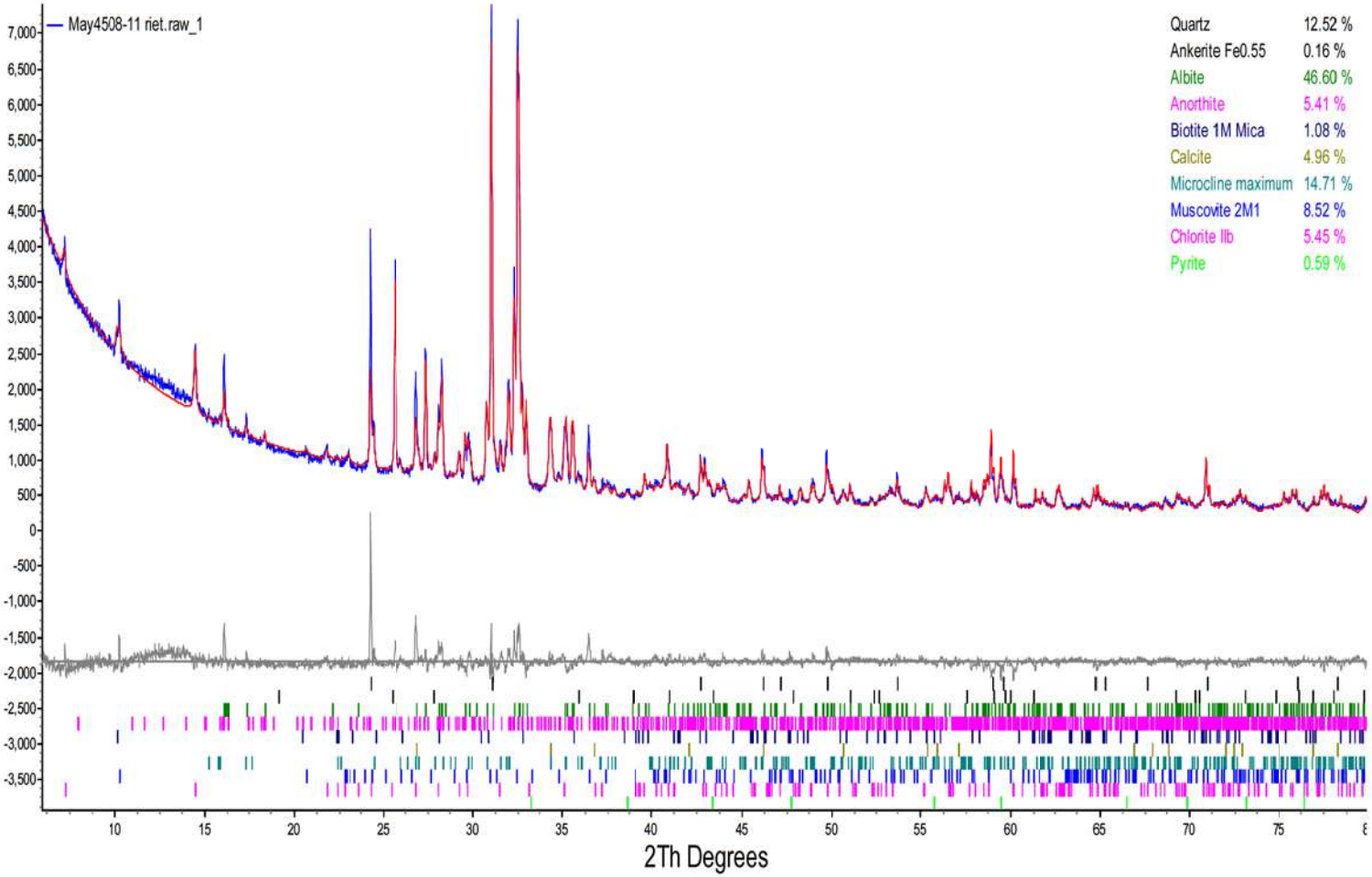
ODY-ENV-057


May4508-9 riet.raw_1
Quartz 15.13 %
Ankerite Fe0.55 0.00 %
Albite 52.47 %
Anorthite 4.66 %
Biotite 1M Mica 4.55 %
Calcite 5.12 %
Microcline maximum 11.18 %
Muscovite 2M1 4.21 %
Chlorite IIb 2.04 %
Pyrite 0.65 %
2Th Degrees

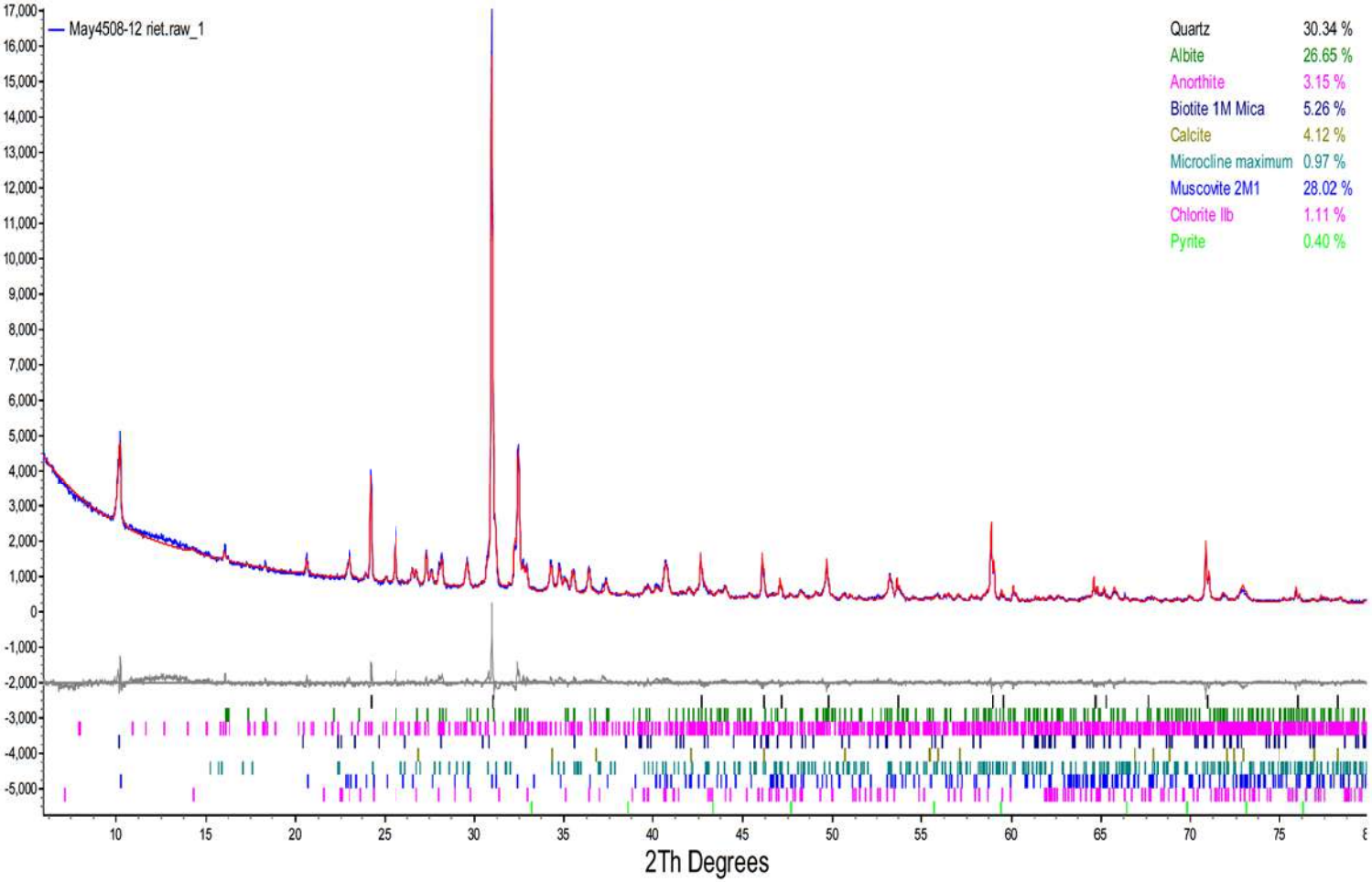
ODY-ENV-062


May4508-10 riet.raw_1
Quartz 18.33 %
Ankerite Fe0.55 0.49 %
Albite 51.97 %
Anorthite 4.14 %
Biotite 1M Mica 3.32 %
Calcite 4.72 %
Microcline maximum 12.23 %
Muscovite 2M1 3.65 %
Chlorite IIb 0.67 %
Pyrite 0.49 %
2Th Degrees

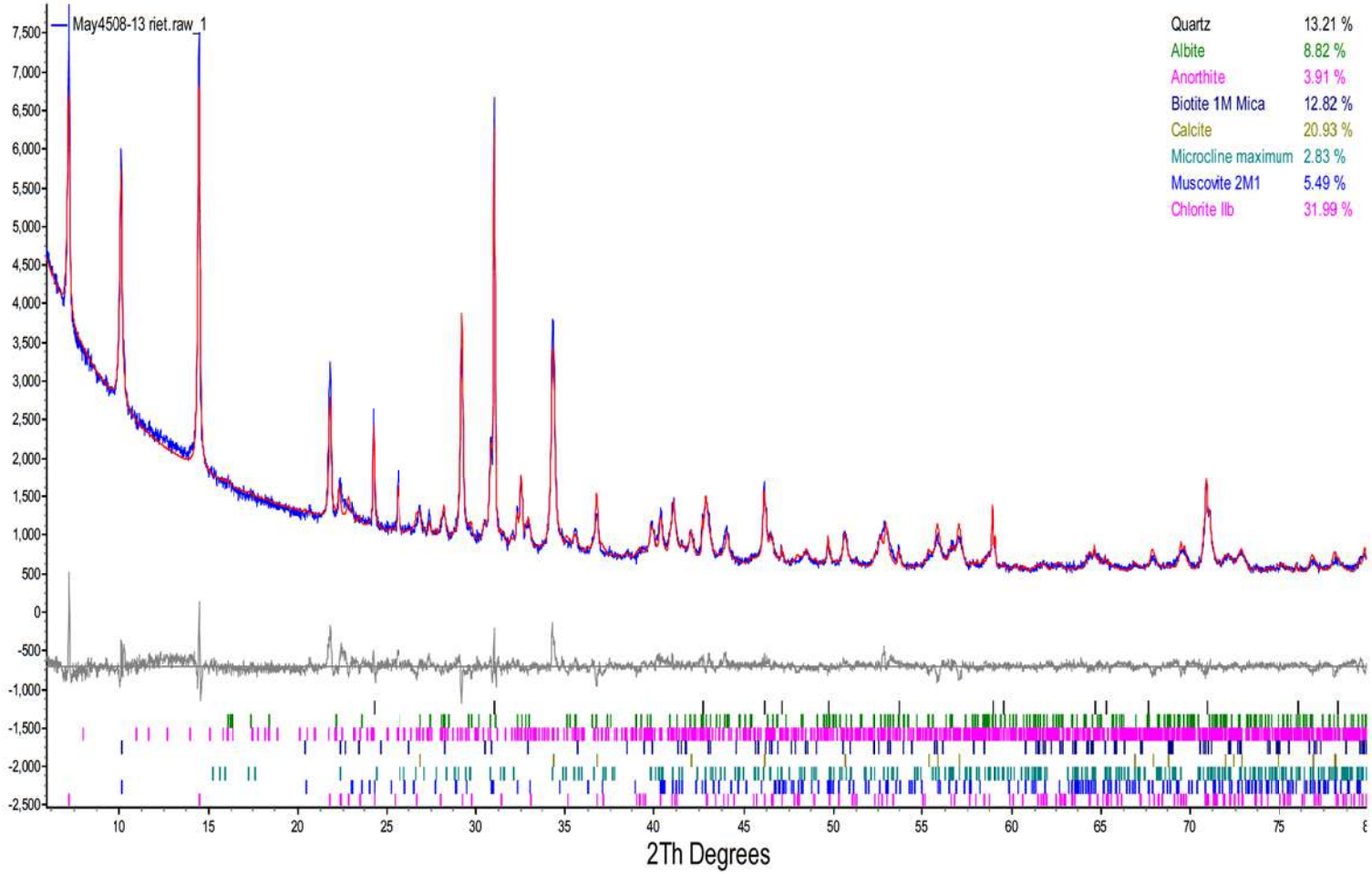
ODY-ENV-041


May4508-11 riet.raw_1
Quartz 12.52 %
Ankerite Fe0.55 0.16 %
Albite 46.60 %
Anorthite 5.41 %
Biotite 1M Mica 1.08 %
Calcite 4.96 %
Microcline maximum 14.71 %
Muscovite 2M1 8.52 %
Chlorite IIb 5.45 %
Pyrite 0.59 %
2Th Degrees

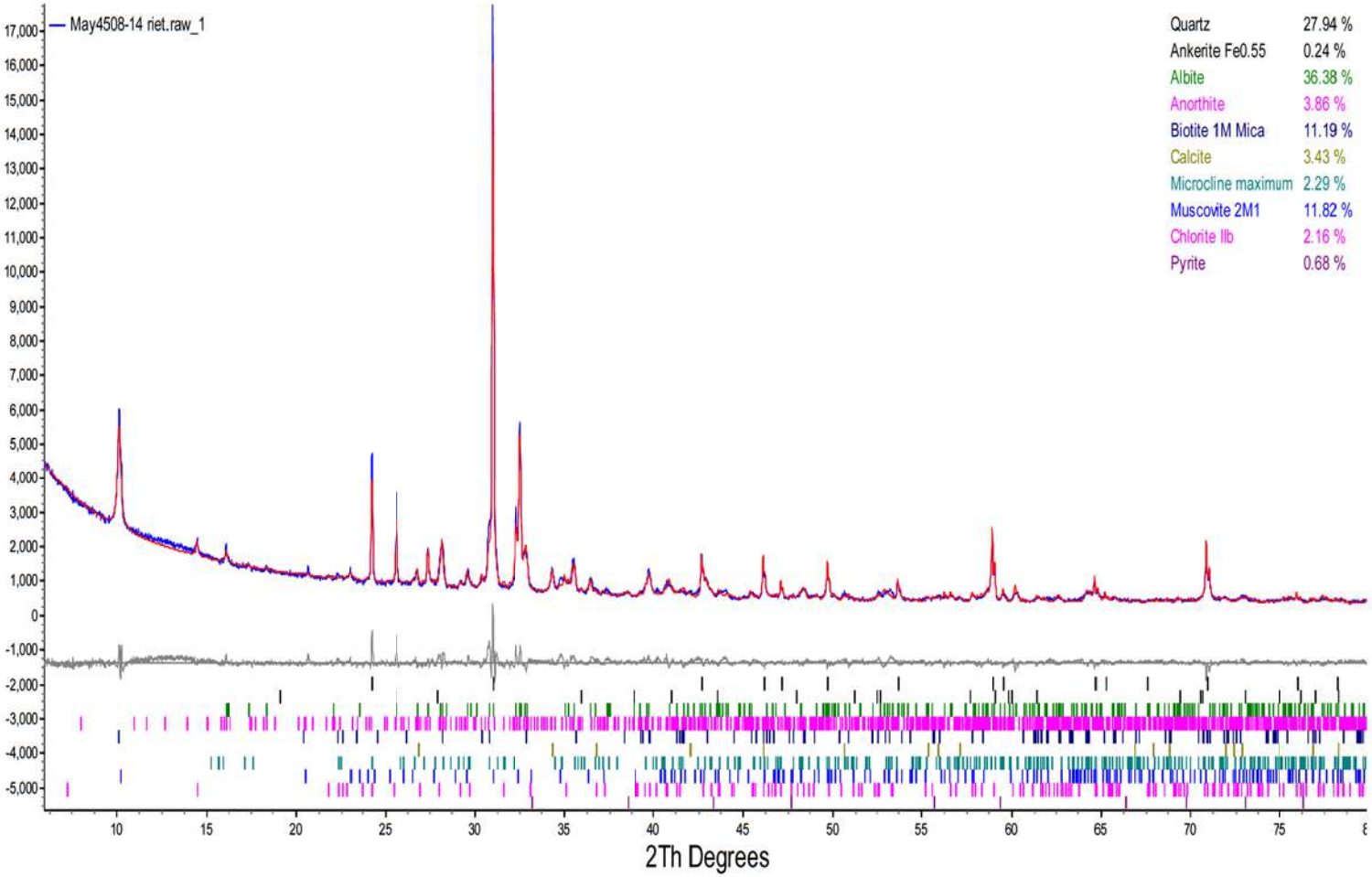
ODY-ENV-046


May4508-12 riet.raw_1
Quartz 30.34 %
Albite 26.65 %
Anorthite 3.15 %
Biotite 1M Mica 5.26 %
Calcite 4.12 %
Microcline maximum 0.97 %
Muscovite 2M1 28.02 %
Chlorite IIb 1.11 %
Pyrite 0.40 %
2Th Degrees

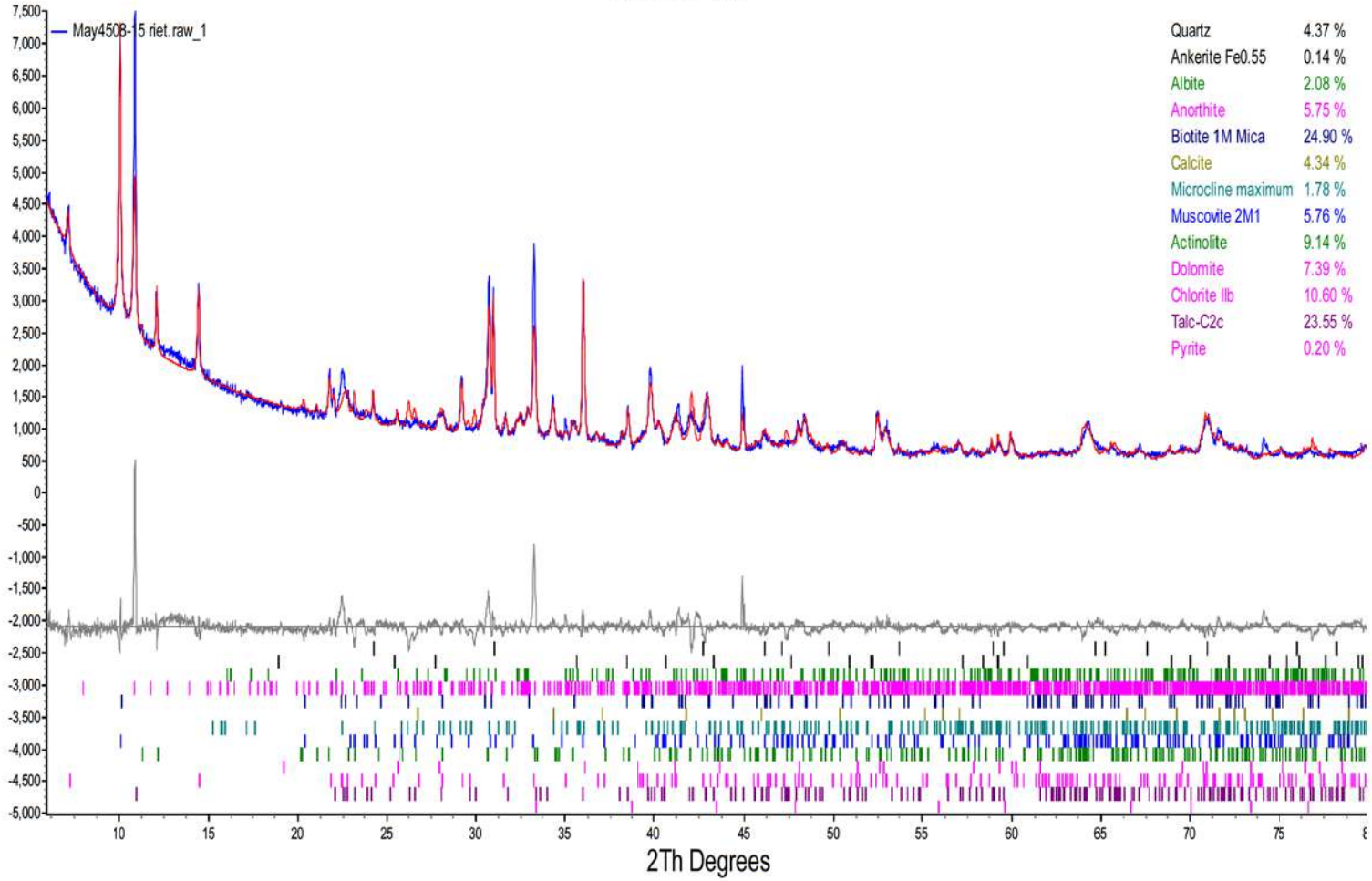
ODY-ENV-050


May4508-13 riet.raw_1
Quartz 13.21 %
Albite 8.82 %
Anorthite 3.91 %
Biotite 1M Mica 12.82 %
Calcite 20.93 %
Microcline maximum 2.83 %
Muscovite 2M1 5.49 %
Chlorite IIb 31.99 %
2Th Degrees

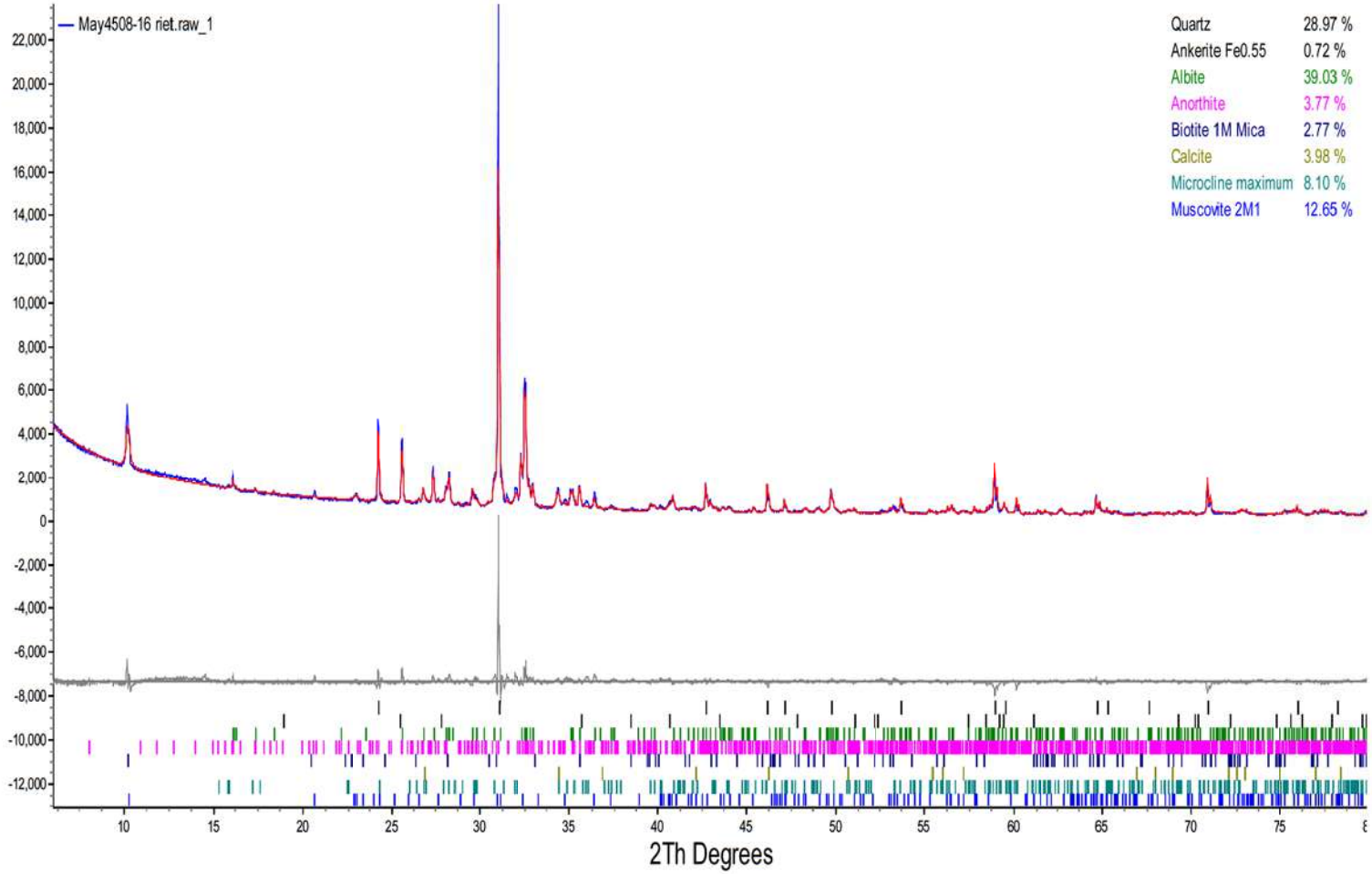
ODY-ENV-053


May4508-14 riet.raw_1
Quartz 27.94 %
Ankerite Fe0.55 0.24 %
Albite 36.38 %
Anorthite 3.86 %
Biotite 1M Mica 11.19 %
Calcite 3.43 %
Microcline maximum 2.29 %
Muscovite 2M1 11.82 %
Chlorite IIb 2.16 %
Pyrite 0.68 %
2Th Degrees

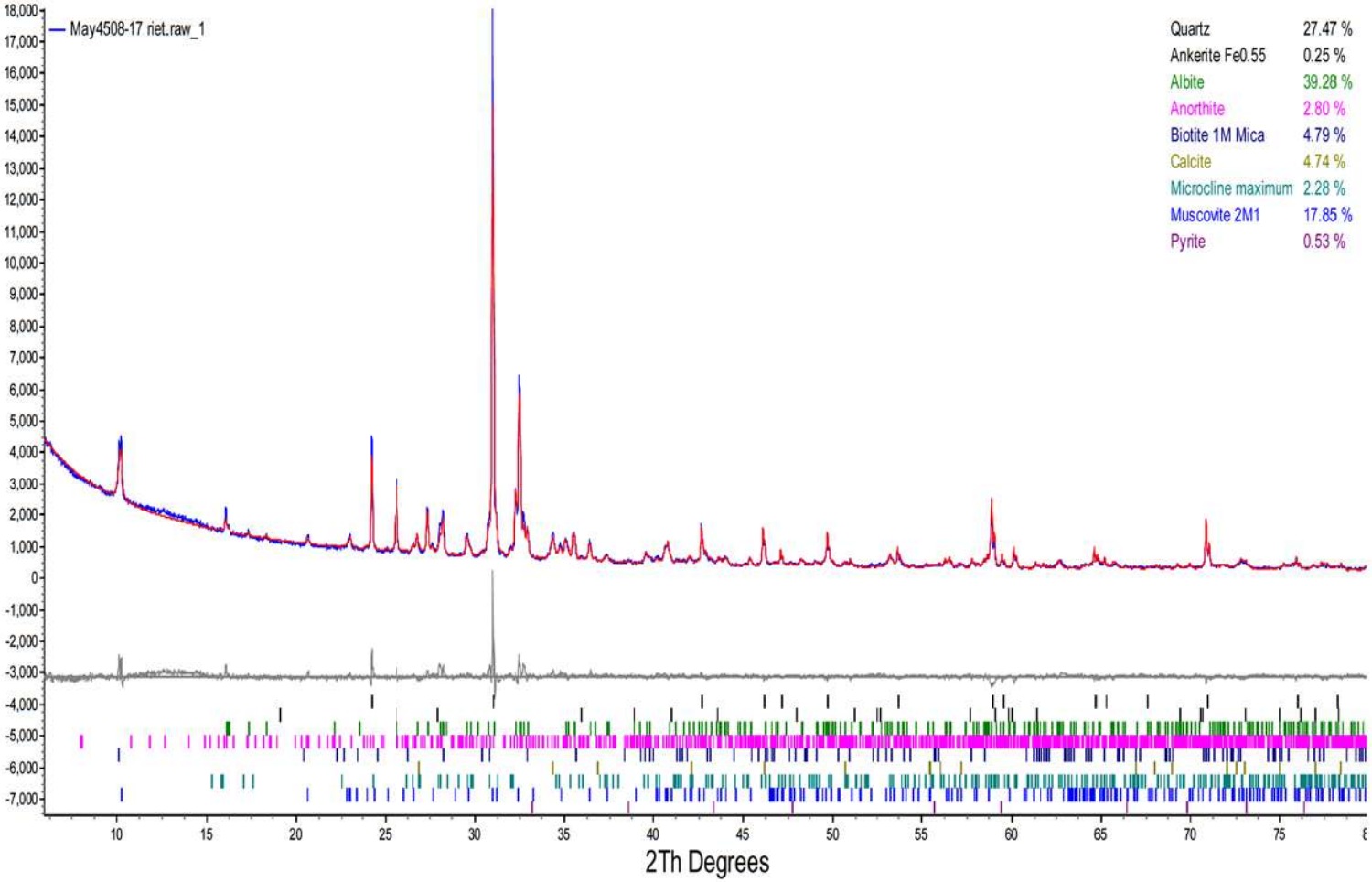
ODY-ENV-063


May4508-15 riet.raw_1
Quartz 4.37 %
Ankerite Fe0.55 0.14 %
Albite 2.08 %
Anorthite 5.75 %
Biotite 1M Mica 24.90 %
Calcite 4.34 %
Microcline maximum 1.78 %
Muscovite 2M1 5.76 %
Actinolite 9.14 %
Dolomite 7.39 %
Chlorite IIb 10.60 %
Talc-C2c 23.55 %
Pyrite 0.20 %
2Th Degrees

ODY-ENV-065


May4508-16 riet.raw_1
Quartz 28.97 %
Ankerite Fe0.55 0.72 %
Albite 39.03 %
Anorthite 3.77 %
Biotite 1M Mica 2.77 %
Calcite 3.98 %
Microcline maximum 8.10 %
Muscovite 2M1 12.65 %
22,000
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
-2,000
-4,000
-6,000
-8,000
-10,000
-12,000
10
15
20
25
30
35
40
45
50
55
60
65
70
75
2Th Degrees

ODY-ENV-067


May4508-17 riet.raw_1
Quartz 27.47 %
Ankerite Fe0.55 0.25 %
Albite 39.28 %
Anorthite 2.80 %
Biotite 1M Mica 4.79 %
Calcite 4.74 %
Microcline maximum 2.28 %
Muscovite 2M1 17.85 %
Pyrite 0.53 %
2Th Degrees

**SGS Canada Inc.**
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08-June-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier, Malartic
, J0Y 1Z0
Phone: 819-757-2225, Fax:

**Date Rec. :** 26 April 2017
**LR Report:** **CA11009-APR17**

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Sample ID | Neutralization Capacity eq/Kg |
|---|---|
| 1: Analysis Start Date | 07-Jun-17 |
| 2: Analysis Start Time | 13:10 |
| 3: Analysis Approval Date | 08-Jun-17 |
| 4: Analysis Approval Time | 16:53 |
| 5: Detox Final Tail BL 154-5 | 0.0 |
| 6: Detox Final Tail BL 154-5 | 0.0 |
| 7: ODY-ENV-001 | 0.4 |
| 8: ODY-ENV-008 | 0.4 |
| 9: ODY-ENV-033 | 0.4 |
| 10: ODY-ENV-039 | 0.4 |
| 11: ODY-ENV-019 | 0.4 |
| 12: ODY-ENV-022 | 0.4 |
| 13: ODY-ENV-023 | 0.4 |
| 14: ODY-ENV-028 | 0.4 |
| 15: ODY-ENV-030 | 0.4 |
| 16: ODY-ENV-032 | 0.0 |
| 17: ODY-ENV-056 | 0.4 |
| 18: ODY-ENV-057 | 0.4 |
| 19: ODY-ENV-062 | 0.0 |
| 20: ODY-ENV-041 | 0.4 |
| 21: ODY-ENV-044 | 0.4 |
| 22: ODY-ENV-046 | 0.4 |
| 23: ODY-ENV-050 | 0.4 |
| 24: ODY-ENV-051 | 0.4 |
| 25: ODY-ENV-053 | 0.4 |
| 26: ODY-ENV-063 | 0.4 |
| 27: ODY-ENV-065 | 0.4 |
| 28: ODY-ENV-067 | 0.4 |

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0001025221



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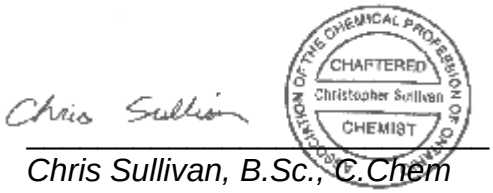
Phone: 705-652-2000 FAX: 705-652-6365

**LR Report :** **CA11009-APR17**




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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0001025221



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31-May-2017

**Canadian Malartic GP**
Attn : Sandra Pouliot

100, chemin du lac Mourier
Malartic, QC
J0Y 1Z0,

Phone: 819-757-2225
Fax:

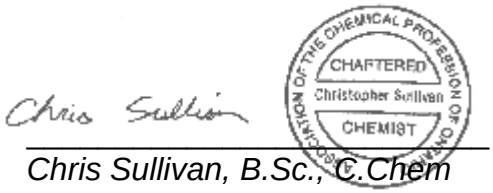
**Date Rec. :** 26 April 2017
**LR Report:** **CA11008-APR17**

**Copy:** #1

# CERTIFICATE OF ANALYSIS

## Final Report

| Sample ID | Sample weight g | Initial pH | Vol H2SO4 mL | H2SO4 Normality | NP t CaCO3/1000 t | AP t CaCO3/1000 t | NNP kg CaCO3/ tonne |
|---|---|---|---|---|---|---|---|
| 3: Analysis Approval Date | 10-May-17 | 10-May-17 | 10-May-17 | 10-May-17 | 10-May-17 | --- | --- |
| 4: Analysis Approval Time | 12:51 | 12:51 | 12:51 | 12:51 | 12:51 | --- | --- |
| 5: Detox Final Tail BL 154-50 | 2.04 | 9.65 | 2.20 | 1.00 | 54 | 22.1 | 32 |
| 6: Detox Final Tail BL 154-52 | 2.18 | 9.50 | 2.40 | 1.00 | 55 | 16.2 | 39 |
| 7: ODY-ENV-001 | 2.01 | 9.61 | 2.30 | 1.00 | 57 | 21.5 | 36 |
| 8: ODY-ENV-008 | 2.04 | 9.62 | 2.40 | 1.00 | 59 | 13.9 | 45 |
| 9: ODY-ENV-033 | 2.14 | 9.57 | 2.30 | 1.00 | 54 | 15.4 | 38 |
| 10: ODY-ENV-039 | 2.04 | 9.29 | 2.10 | 1.00 | 52 | 15.6 | 36 |
| 11: ODY-ENV-019 | 2.08 | 9.74 | 2.50 | 1.00 | 60 | 4.66 | 55 |
| 12: ODY-ENV-022 | 2.05 | 9.82 | 7.35 | 1.00 | 179 | 5.22 | 174 |
| 13: ODY-ENV-023 | 2.15 | 9.68 | 5.45 | 1.00 | 127 | 2.16 | 125 |
| 14: ODY-ENV-028 | 2.01 | 9.63 | 2.30 | 1.00 | 57 | 5.09 | 52 |
| 15: ODY-ENV-030 | 2.00 | 9.97 | 1.30 | 1.00 | 32 | 7.69 | 25 |
| 16: ODY-ENV-032 | 2.04 | 9.13 | 2.10 | 1.00 | 52 | 4.12 | 47 |
| 17: ODY-ENV-056 | 2.07 | 9.49 | 2.35 | 1.00 | 57 | 5.19 | 52 |
| 18: ODY-ENV-057 | 2.07 | 9.21 | 2.20 | 1.00 | 53 | 4.38 | 49 |
| 19: ODY-ENV-062 | 2.19 | 8.68 | 2.15 | 1.00 | 49 | 7.34 | 42 |
| 20: ODY-ENV-041 | 2.05 | 9.26 | 2.15 | 1.00 | 52 | 3.56 | 49 |
| 21: ODY-ENV-044 | 2.16 | 9.33 | 2.10 | 1.00 | 49 | 4.69 | 44 |
| 22: ODY-ENV-046 | 2.05 | 9.42 | 2.00 | 1.00 | 49 | 13.6 | 35 |
| 23: ODY-ENV-050 | 2.06 | 9.38 | 7.95 | 1.00 | 193 | 0.19 | 193 |
| 24: ODY-ENV-051 | 2.09 | 9.42 | 1.75 | 1.00 | 42 | 7.19 | 35 |
| 25: ODY-ENV-053 | 2.08 | 8.98 | 1.50 | 1.00 | 36 | 8.94 | 27 |
| 26: ODY-ENV-063 | 2.07 | 9.46 | 6.25 | 1.00 | 151 | 4.03 | 147 |
| 27: ODY-ENV-065 | 2.12 | 9.35 | 2.55 | 1.00 | 60 | 7.16 | 53 |
| 28: ODY-ENV-067 | 2.20 | 9.35 | 2.40 | 1.00 | 54 | 12.2 | 42 |




*Chris Sullivan, B.Sc., C.Chem*
*Project Specialist*
*Environmental Services, Analytical*

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**LR Report :** **CA11008-APR17**

MA110 ACISOL 1.0
Gross NP (kg CaCO3/tonne) Section 7.3
AP (kg CaCO3/tonne) = Total S x 31.25
ASTM E1918 - S and C speciation

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0001015401



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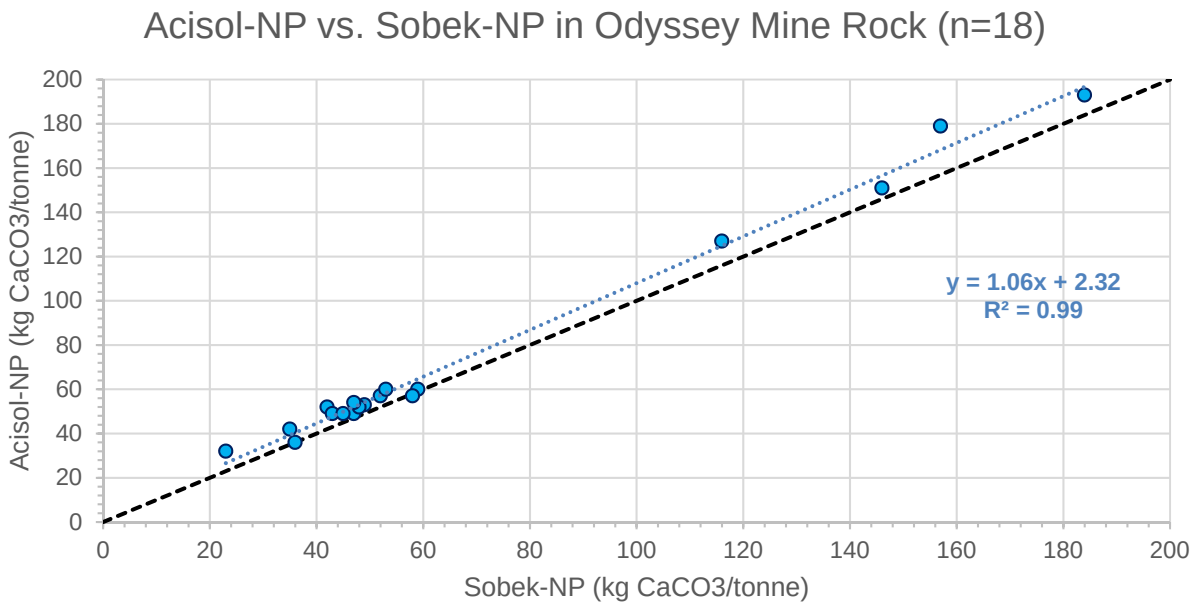
Test method information available upon request. "Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

# APPENDIX D

# Acisol ABA vs. Sobek ABA

| Sample Type | Sample ID | Acisol 1.0-NP | Sobek-NP | Acisol-NP Percent Increase over Sobek-NP |
|---|---|---|---|---|
| | | kgCaCO3/t | | |
| Tailings | Detox Final Tail BL 154-50 | 54 | 53 | 2% |
| Tailings | Detox Final Tail BL 154-52 | 55 | 54 | 2% |
| Ore | ODY-ENV-001 | 57 | 54 | 6% |
| Ore | ODY-ENV-008 | 59 | 51 | 16% |
| Ore | ODY-ENV-033 | 54 | 48 | 13% |
| Ore | ODY-ENV-039 | 52 | 48 | 8% |
| Mine Rock | ODY-ENV-019 | 60 | 59 | 2% |
| Mine Rock | ODY-ENV-022 | 179 | 157 | 14% |
| Mine Rock | ODY-ENV-023 | 127 | 116 | 9% |
| Mine Rock | ODY-ENV-028 | 57 | 52 | 10% |
| Mine Rock | ODY-ENV-030 | 32 | 23 | 39% |
| Mine Rock | ODY-ENV-032 | 52 | 42 | 24% |
| Mine Rock | ODY-ENV-056 | 57 | 58 | -2% |
| Mine Rock | ODY-ENV-057 | 53 | 49 | 8% |
| Mine Rock | ODY-ENV-062 | 49 | 47 | 4% |
| Mine Rock | ODY-ENV-041 | 52 | 48 | 8% |
| Mine Rock | ODY-ENV-044 | 49 | 43 | 14% |
| Mine Rock | ODY-ENV-046 | 49 | 45 | 9% |
| Mine Rock | ODY-ENV-050 | 193 | 184 | 5% |
| Mine Rock | ODY-ENV-051 | 42 | 35 | 20% |
| Mine Rock | ODY-ENV-053 | 36 | 36 | 0% |
| Mine Rock | ODY-ENV-063 | 151 | 146 | 3% |
| Mine Rock | ODY-ENV-065 | 60 | 53 | 13% |
| Mine Rock | ODY-ENV-067 | 54 | 47 | 15% |



# APPENDIX E

# Directive 019 Evaluation Criteria

# 1.0 Directive 019

*Directive 019* is a guidance document from the Ministère du Développement durable, l'Environnement et de la Lutte contre les changements climatiques (MDDELLC, 2012) presenting requirements for various mining activities with the purposes of environmental protection.

The low-risk *Directive 019* materials evaluation criteria are summarized as follows.

## 1.1 Directive 019 Classification – Acid Base Accounting

*Directive 019* presents criteria for evaluating the acid generation potential of a material. These criteria are discussed in **Section 3.1** of this report. The recommended ABA characterization criterion for the Odyssey mine rock, see **Section 3.1.2.1**, also satisfies the *Directive 019* criteria.

## 1.2 Directive 019 Classification - Metals Contents and Leachability Criteria

In addition to the acid generation potential characteristics used to classify mine materials as low-risk, *Directive 019* presents characterization criteria based on metals contents and leachability criteria. The metals contents (mg/kg) criteria are the first screening criteria that can be applied to categorize materials as low-risk. However, if materials are not classified as low-risk based on their metals contents, they can be classified as low-risk based on leachability criteria. The metals contents results determine which parameters should be evaluated by leachability criteria.

### 1.2.1 Directive 019 Low-Risk Classification - Metals Contents Criteria

*Directive 019* recommends the screening of the solids contents in mine materials versus the '*politique de protection des sols et de réhabilitation des terraines contaminés'* (PPSRTC) criteria. However, these criteria are currently under review and revised criteria from Annexe 1 and 2 of the *Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés (Guide d'intervention*) (MDDELCC, 2016) are recommended. These revised criteria are shown in **Table 1-1**.

If more than 90% of the samples are less than the level 'A' generic soil criteria, for all parameters, then that sample can be classified as low-risk. If more than 10% of the samples analyzed are found to exceed the level 'A' generic soil criteria for a particular parameter, then that parameter can be carried forward for leachability criteria comparison as an alternative to the soil criteria comparison.

**Table 1-1: Solids Contents Criteria for Mine Materials Classification**

| Parameter | Critères Génériques pour les sols 'A'[1] (mg/kg) |
|---|---|
| Silver (Ag) | 0.5 |
| Arsenic (As) | 5 |
| Barium (Ba) | 240 |
| Cadmium (Cd) | 0.9 |
| Cobalt (Co) | 30 |
| Chromium (Cr) | 100 |
| Copper (Cu) | 65 |
| Tin (Sn) | 5 |
| Manganese (Mn) | 1000 |
| Mercury (Hg) | 0.3 |
| Molybdenum (Mo) | 8 |
| Nickel (Ni) | 50 |
| Lead (Pb) | 40 |
| Selenium (Se) | 3 |
| Zinc (Zn) | 150 |

**Note:**

1) Solids contents are for the geological province of 'Supérieur' in which the MCM operation resides.

### 1.2.2 Directive 019 Low-Risk Classification - Leachability Criteria

As per *Directive 019*, materials can be considered low-risk if leachate quality is below 'leachable materials' criteria. These 'leachable materials' are classified by TCLP leach test (MA.100-Lix.com.1.1) results. The TCLP concentrations are required to be less than the criteria for groundwater protection (protection des eaux souterraines) to be classified as low risk. Samples with TCLP concentrations greater than the groundwater criteria but less than the « *Directive 019 Annexe II Tableau 1* » criteria are classified as 'elevated risk materials'. The applicable groundwater protection criteria are the « *Annexe 7 Grille des Critères de qualitè des eaux souterraines* » for « *résurgence dans l'eau de surface* » from the *Guide d'intervention* (MDDELCC, 2016), as shown in **Table 1-2**.

**Table 1-2: Résurgence dans l'eau de surface Criteria**

| Parameter | Résurgence dans l'eau de surface |
|---|---|
| | (mg/L) |
| Antimony | 1.1 |
| Silver | 0.00062 |
| Arsenic | 0.34 |
| Barium | 0.6 |
| Boron | 28 |
| Cadmium | 0.0011 |
| Chromium (III) | 1 |
| Chromium (VI) | 0.016 |
| Cobalt | 0.37 |
| Copper | 0.0073 |
| Manganese | 2.3 |
| Molybdenum | 29 |
| Nickel | 0.26 |
| Lead | 0.034 |
| Selenium | 0.062 |
| Uranium | 0.32 |
| Zinc | 0.067 |

To account for the variability in individual samples the parameter concentrations are not considered to exceed the groundwater protection criteria unless at least 10% of the samples exceed the applicable criteria per parameter. For example, if 15% of TCLP test samples reported cadmium concentrations greater than 10 times the « *résurgence dans l'eau de surface criteria* » (0.0011 mg/L) then these samples would be considered to exceed the criteria and would not be categorized as low-risk. As an additional example, if five percent of TCLP test samples reported copper concentrations greater than the « *résurgence dans l'eau* » criteria (0.0073 mg/L) then copper would not be a parameter considered for TCLP criteria comparison and these samples would be categorized as low-risk.

TCLP testing (MA. 100 – Lix.com. 1.1) uses prepared acetic acid solutions having pH values as low as 2.9. Low pH conditions like this are not expected for the non-potentially acid generating mine materials (e.g. mine rock with $carbon_{total}$/$sulphur_{total}$ ratios greater than 0.81), and therefore, the TCLP testing is considered to be an extreme test to assess leachability of constituents for non-potentially acid generating Odyssey materials.

The TCLP testing is also considered to classify materials with elevated risk if the leach results exceed the criteria of « *Directive 019 Annexe II Tableau 1* ».

ANNEXE

# C-2 *DEUXIÈME ÉTUDE*

# EAST MALARTIC AND SHEEHAN DEPOSITS - GEOCHEMICAL CHARACTERIZATION

Report prepared for:

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# EAST MALARTIC AND SHEEHAN DEPOSITS – GEOCHEMICAL CHARACTERIZATION

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# EXECUTIVE SUMMARY

The Mine Canadian Malartic (MCM) is located approximately 25 km west of Val-d'Or and 80 km east of Rouyn-Noranda, Quebec. The property lies within the Municipality of Malartic and straddles the townships of Fournière, Malartic, and Surimau.

To the east of the existing MCM open pit lie the East Malartic and Sheehan zones. These zones are being explored to assess the opportunity for new potential sources of ore for the MCM mill.

The East Malartic zone, a previous gold producing property, is related to the Sladen fault and extends from beneath the Canadian Malartic open pit eastward to beneath the Odyssey North Zone. The Sheehan Zone lies immediately north of East Malartic in a shear zone including porphyritic intrusives and ultramafic volcanic rocks (Agnico-Eagle, 2019a).

EcoMetrix Incorporated (EcoMetrix) was retained by MCM to complete a geochemical characterization of the deposit and the mine rock and ore samples presented in this report were selected by EcoMetrix and the geology staff at Canadian Malartic to be representative of the mine rock and ore from the East Malartic and Sheehan zones.

*Directive 019* is a guidance document from the Ministère de l'Environnement et de la Lutte contre les Changements Climatiques (MELCC, 2012) presenting requirements for various mining activities with the purposes of environmental protection. *Directive 019* provides risk-classification information on mine materials and was applied in this assessment. *Directive 019* provides criteria related to the potential for acid generation, metals contents, and leachability to classify mine materials as low-risk.

Samples from East Malartic included 15 mine rock samples from the dilution hanging wall, dilution footwall, and development areas, in addition to 10 ore samples from the mineralized zone. Samples from Sheehan included 14 mine rock samples from the dilution and development areas in addition to 10 ore samples from the mineralized zone. A variety of lithologies and alterations were sampled from each area. Samples were processed and submitted for analyses including: acid base accounting (ABA), metals contents analysis, whole rock analysis, Rietveld XRD analysis, neutralization capacity, CTEU-9 leach testing, SPLP leach testing, and TCLP leach testing.

### Acid Generation Characterization

Consistent with historical findings for mine materials from the MCM deposit, the waste rock and ore samples from East Malartic and Sheehan show an excellent linear correlation between the neutralization potential (NP) based on carbonate content (Carb-NP) and the neutralization potential measured by the Sobek and Acisol methods (Sobek-NP and Acisol-NP).

The Carb-NP is considered to be effective for maintaining neutral pH drainage. The carbonate NP to acid potential ratio (Carb-NP/AP or Carb-NPR) of 2 is a more conservative criterion than an Acisol neutralization potential to acid potential ratio (Acisol-NPR) criterion of 3 as presented in

*Directive 019*. It was confirmed that, with a single exception, samples with Carb-NPR values greater than 2 also have Acisol-NPR values greater than 3.

A practical and effective means of classifying the acid generation characteristics of mine rock at East Malartic was applied from observed relationships between Carb-NPR and the C/S ratio. Total carbon (C) is a surrogate for Carb-NP and total sulphur (S) is a surrogate for sulphide content or AP of the mine rock. Using this approach, it was found that both mine rock and ore with C/S values greater than 0.68 are non-potentially acid generating (non-PAG), samples with C/S values lower than 0.39 are classified as PAG, and samples with values between 0.39 and 0.68 have an uncertain potential for acid generation.

**East Malartic Mine Rock – Geochemical Summary**

Geochemical testing of mine rock from the East Malartic zone identified that:

- Approximately 40% of the mine rock is non-PAG. The majority of the PAG rock is from metasedimentary rock. None of the material meets the *Directive 019* low-risk material criteria principally due to elevated barium and manganese concentrations in the TCLP leachate.
- Approximately 40% of the mine rock is low-risk according to a reasonable alternative leachability criterion (**Section 5.1.1**) applying SPLP and CTUE-9 criteria to non-PAG rock as an alternative to the TCLP criteria;
- Mine rock from the East Malartic zones tends to have higher metals contents than at the Sheehan deposit;
    - The highest metals contents for many parameters were identified in the footwall whereas barium and zinc were most elevated in development materials.
    - Silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc concentrations were elevated in at least one lithology from either the East Malartic zone or Sheehan zone and were carried forward as parameters of concern used in interpreting leachability test results.
- Rietveld XRD analyses show that the mine rock is dominated by quartz and aluminosilicates and that:
    - Two carbonate minerals were identified as dominant: dolomite ($Ca,Mg(CO_3)_2$) and calcite ($CaCO_3$). These two minerals provide effective neutralization potential.
    - Pyrite ($FeS_2$) was the only source of sulphide present in the samples.
- Leachability testing via the aggressive TCLP test shows that barium, manganese, and copper can leach at elevated concentrations under acidic conditions compared to the « *résurgence dans l'eau de surface criteria* »;
- CTEU-9 and SPLP test results do not exhibit concentrations greater than their respective comparative criteria.

**Sheehan Mine Rock – Geochemical Summary**

Geochemical testing of mine rock from the Sheehan zone identified that:

- All Sheehan mine rock samples were non-PAG. None of the material meets the *Directive 019* low-risk material criteria principally due to elevated barium and manganese concentrations in the TCLP leachate.
- Approximately 43% of the mine rock is low-risk according to a reasonable alternative leachability criterion (**Section 5.1.1**) applying SPLP and CTUE-9 criteria to non-PAG rock as an alternative to the TCLP criteria.
- Mine rock from the Sheehan zones tends to have lower metals contents than at the East Malartic deposit;

The metals contents of rock from the development and dilution zones were generally similar to one another though the development zone materials tended to have higher barium, cobalt, chromium, and nickel contents (**Table 4-4**).

  - Silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc concentrations were elevated in at least one lithology from either the East Malartic zone or Sheehan zone and were carried forward as constituents of potential concern used in interpreting leachability test results.

- Rietveld XRD analyses show that the mine rock is dominated by quartz and aluminosilicates and that:
  - Three carbonate minerals were identified: dolomite ($Ca,Mg(CO_3)_2$), calcite ($CaCO_3$), and ankerite ($Ca,Fe(CO_3)_2$). The relative quantities of ankerite, which provides effective neutralization only for the calcium portion of the mineral, is low and the vast majority of the carbonate content is represented by calcium and magnesium carbonates that represent effective neutralization potential.
  - Pyrite ($FeS_2$) was the only source of sulphide in the samples.
- Leachability testing via the aggressive TCLP test shows that barium, manganese, and nickel can leach at elevated concentrations under acidic conditions compared to the « *résurgence dans l'eau de surface criteria* »;
- In the CTEU-9 leachate some samples had barium and chromium concentrations greater than the « *règlement sur la qualité de l'eau potable* » and the « *résurgence dans l'eau de surface* » criteria; and

Some samples had SPLP leachate concentrations for barium greater than the « *résurgence dans l'eau de surface* » criterion though all concentrations were lower than the comparative « *règlement sur la qualité de l'eau potable* » criterion.

**East Malartic Ore – Geochemical Summary**

The same principles pertaining to mine rock characterization were also applied to the ore characterization. Geochemical testing of ore from the East Malartic deposit identified that:

- East Malartic ore samples were 50% non-PAG;
- None of the ore is considered low-risk according to *Directive 019* in consideration of the TCLP results for barium, manganese, and lead;
- Metals contents in ore samples were greater than the comparative « *Critères Génériques pour les Sols* » - *'A'* standards for silver, barium, cobalt, chromium, molybdenum, manganese, nickel, and lead;
- The East Malartic ore typically has higher silver, manganese, and lead contents than the Sheehan ore. Cobalt, chromium, and molybdenum contents are similar in the two ore sources. East Malartic ore also typically has lower barium and nickel contents than the Sheehan ore;
- Rietveld XRD analyses show that the ore is dominated by quartz, aluminosilicates, and phyllosilicates and that:
    - Two carbonate minerals were identified: dolomite ($Ca,Mg(CO_3)_2$) and calcite ($CaCO_3$). These minerals provide effective neutralization potential.
- All ore samples exceeded at least one of the « *résurgence dans l'eau de surface* » TCLP criteria for barium, manganese, or lead;
- In the CTEU-9 leachate one sample had chromium concentrations greater than the « *règlement sur la qualité de l'eau potable* » criterion and an additional sample had barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion; and
- All SPLP leachate samples had concentrations below the comparative « *règlement sur la qualité de l'eau potable* » criterion and one sample had barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion.

**Sheehan Ore – Geochemical Summary**

- Sheehan ore samples were 80% non-PAG;
- None of the ore is considered low-risk according to *Directive 019* criteria applied to the TCLP results for barium, manganese, and lead;
- Ore solids contents are greater than the comparative « *Critères Génériques pour les Sols* » - *'A'* standards for silver, barium, cobalt, chromium, molybdenum, manganese, nickel, and lead;
- The Sheehan ore typically has higher barium and nickel contents than the East Malartic ore. Cobalt, chromium, and molybdenum contents are similar in the two ore sources. Sheehan ore also has lower silver, manganese, and lead contents than the East Malartic ore;
- Rietveld XRD analyses show that the ore is dominated by quartz and aluminosilicates and that:
    - Three carbonate minerals were identified: dolomite ($Ca,Mg(CO_3)_2$), calcite ($CaCO_3$), and magnesite ($MgCO_3$). These minerals represent effective neutralization potential.

- All ore samples exceeded at least one of the « *résurgence dans l'eau de surface* » TCLP criteria for barium, manganese, or lead; and
- In the CTEU-9 leachate all samples had concentrations lower than the « *règlement sur la qualité de l'eau potable* » criteria though one sample had molybdenum concentrations greater than the « *résurgence dans l'eau de surface* » criterion; and

All SPLP leachate samples had concentrations below the comparative « *règlement sur la qualité de l'eau potable* » criterion and one sample had barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion.

**Conclusion**

In consideration of the East Malartic and Sheehan mine rock quality, no additional management measures are required for incorporating these rocks into the Canadian Malartic operation. The East Malartic and Sheehan mine rock can be safely managed within the existing Canadian Malartic mine rock storage areas under existing mine management procedures.

If East Malartic and Sheehan ore samples are reasonable surrogates of tailings quality and knowing that existing Canadian Malartic storage management procedures handle all tailings as potentially acid generating then no additional management measures are required for incorporating East Malartic and Sheehan tailings into the Canadian Malartic operation. The East Malartic and Sheehan tailings can be safely managed within existing Canadian Malartic tailings storage areas under existing mine management procedures. However, tailings-specific geochemical testing is recommended to confirm potential relationships between ore and tailings quality.

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# ACRONYM LIST

**ABA** — **Acid Base Accounting**
*A series of chemical analyses and calculated values to estimate the magnitude of the acid generation potential and acid neutralization potential of a sample.*

**Acisol-NP** — **Acisol Neutralization Potential**
*Estimated amount of acid a material is capable of neutralizing. Measured according to the 'MA. 110 – Acisol 1.0' method (CEAE, 2014). Reported in units of $kg_{CaCO3}$/$tonne_{rock}$.*

**AP** — **Acid Potential**
*The total acid a material is capable of generating. Analyses of sulphur species are used to estimate acid potential. Calculated as sulphide sulphur (%S) multiplied by 31.25 assuming that all sulphide reacts like pyrite ($FeS_2$). Reported in units of $kg_{CaCO3}$/$tonne_{rock}$*

**ARD** — **Acid Rock Drainage**
*Acidic pH drainage derived from materials with an insufficient capacity to neutralize acidic products of sulphide, elemental sulphur oxidation, the dissolution of acidic minerals, and the dissolution of amorphous materials.*

**C** — **Carbon**
*The carbon content of the material. Can potentially be correlated to, and used as a surrogate for, the carbonate neutralization potential.*

**Carb-NP** — **Carbonate Neutralization Potential**
*The maximum neutralization capacity that would be available if all the carbonate minerals in a sample reacted like calcite ($CaCO_3$). Reported in units of $kg_{CaCO3}$/$tonne_{rock}$*

**Carb-NPR** — **Carbonate Neutralization Potential Ratio**
*The ratio of the Carb-NP divided by the AP. Unitless. Calculated as part of Acid Base Accounting.*

**CTEU-9**
*A water leach extraction test. Described in MA. 100 – Lix.com 1.1.*

**CTEU-10**
*An acetic acid leach extraction test. Described in MA. 100 – Lix.com 1.1*

**ML** — **Metal Leaching**
*The extraction of soluble metals by percolating solvents.*

**NP** — **Neutralization Potential**
*The total acid a material is capable of neutralizing. Estimated from laboratory analyses. Reported in units of $kg_{CaCO3}$/$tonne_{rock}$.*

**NNP** — **Net Neutralization Potential**
*Neutralization potential minus acid potential. Calculated as part of Acid Base Accounting. Reported in units of $kg_{CaCO3}$/$tonne_{rock.}$*

**NPR** — **Neutralization Potential Ratio**
*Neutralization potential divided by acid potential. Calculated as part of Acid Base Accounting. Unitless.*

**PAG** — **Potentially Acid Generating**
*Materials predicted to potentially generate acidity in the future if exposed to air and water at the earth's surface. Materials that are net neutral or alkaline will become acidic in the future if the rate of acid neutralization is unable to keep up with the addition of acidity.*

**S** — **Sulphur**
*The sulphur content of the material. Can potentially be correlated to, and used as a surrogate for, the acid potential.*

**Sobek-NP** **Sobek Neutralization Potential**
*A standard NP test in which a strong acid is added to a sample to attain a pH below 2, it is allowed to react, and then the remaining acid is measured to determine the amount of acid consumed*

**Sobek-NPR** **Sobek Neutralization Potential Ratio**
*The ratio of the Sobek-NP divided by the AP. Unitless.*

**SPLP** **Synthetic Precipitation Leaching Procedure**
*A leach test to simulate the effects of acid rainfall. Described in MA. 100 – Lix.com 1.1.*

**TCLP** **Toxicity Characteristic Leaching Procedure**
*A leach test to assess the mobility of inorganic species.*

# 1.0 INTRODUCTION

The Mine Canadian Malartic (MCM) is located approximately 25 km west of Val-d'Or and 80 km east of Rouyn-Noranda, Quebec (**Figure 1-1**). The property lies within the Municipality of Malartic and straddles the townships of Fournière, Malartic, and Surimau.

**Figure 1-1: Location of the Malartic Mine**

## 1.1 Historical Mining at Malartic

Mining in the Malartic area began in the 1930s, including both underground and open pit operations. The underground mines included the Canadian Malartic, East Malartic, and the Malartic Goldfields. The Canadian Malartic and Malartic Goldfields closed in 1965 followed by the closure of the Barnat and East Malartic mines in 1980. The underground mines, in operation until the 1980s, stored tailings in several facilities at the sites, including Cellules 1, 2 and 3, and the East Malartic tailings, with little to no mine rock stored on site (Golder, 2009).

Osisko Mining discovered new deposits in the area and completed evaluations of the project in 2009. Osisko Mining received approval from the Quebec government to develop an open pit mine at Canadian Malartic in 2009, with operations commencing in 2011. The feasibility study completed in 2008 indicated a proven and probable reserve of 6.28 Moz and an estimated mine life of 10 years. The 2008 mine plan included the production of 326 Mt of mine rock and 183 Mt of tailings.

Definition drilling of the eastern extension of the Canadian Malartic deposit was completed in 2009. In January 2010, this new extension was added to the Canadian Malartic mine and a new proven and probable reserve of 8.97 Moz of gold was determined.

In June 2014, Agnico Eagle Mines Limited (AEM) and Yamana Gold Incorporated (Yamana), completed the acquisition of the Osisko Mining Corporation including the Canadian Malartic mine, to form the Canadian Malartic Partnership.

Mine life at Canadian Malartic is expected to last through 2026 and the Government of Quebec has authorized the proposed extension of the Canadian Malartic mine and the diversion of Highway 117 in Malartic. Additional deposits to the east of the existing open pit are continuing to be explored. To the east of the existing MCM open pit lie the Odyssey North and Odyssey South zones. On December 19th 2018 Decree 1370-2018 authorizes completion of the Odyssey project for the underground mining of the East Malartic and Jeffrey mineralized zones.

## 1.2 East Malartic and Sheehan Deposits

To the east of the existing MCM open pit lie the East Malartic and Sheehan zones. These zones are being explored to assess the opportunity for new potential sources of ore for the MCM mill. These zones are shown in **Figure 1-2**.

The East Malartic zone, a previous gold producing property, is related to the Sladen fault and extends from beneath the Canadian Malartic open pit eastward to beneath the Odyssey North Zone. The Sheehan Zone lies immediately north of East Malartic in a shear zone including porphyritic intrusives and ultramafic volcanic rocks (Agnico-Eagle, 2019a).

This report details the geochemical characteristics of the samples recovered from both the East Malartic and the Sheehan deposits representing potential mine rock and ore from the deposits. The *Directive 019* (MELCC, 2012) classification process was used as guidance for sample analysis and interpretation to complement the principles presented in Price (2009) for the prediction of acid rock drainage and metal leaching (ARD/ML) for mine materials.

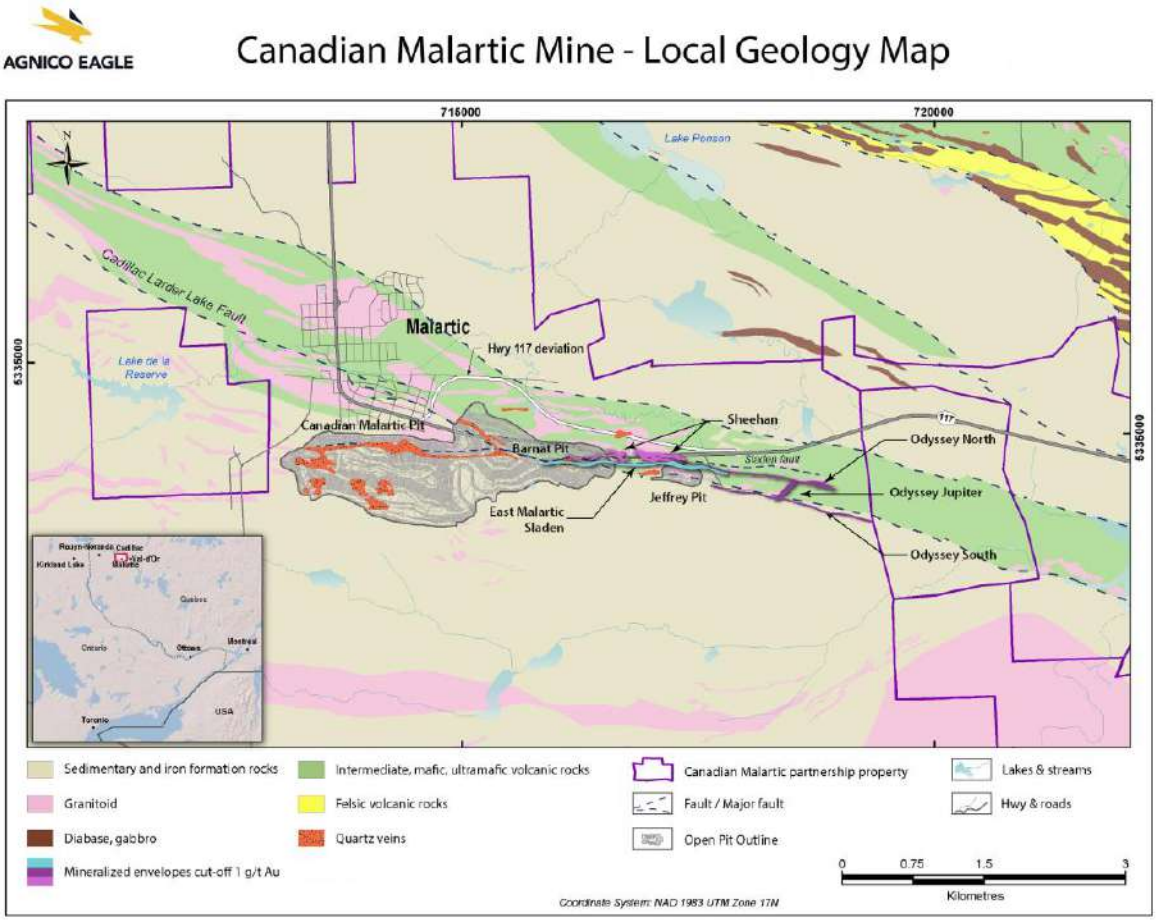


**Figure 1-2: Location of East Malartic and Sheehan Deposits (Agnico Eagle, 2019b)**

## 1.3 Objectives and Scope

The scope of this investigation was to characterize the mine rock and ore materials expected to be produced from the East Malartic and Sheehan deposits and to serve as a supporting document for permitting purposes at the MCM operation.

The testing procedures used to characterize these materials are presented in **Table 1-1**.

The geochemical characteristics of the materials from the East Malartic and Sheehan zones were interpreted in the context of an ARD/ML risk assessment as well as protocols and guidance presented in *Directive 019* and Price (2009) to identify the preferred management strategies for these materials.

**Table 1-1: East Malartic and Sheehan Zones - Characterization Procedures**

| Test Completed | Criteria for Evaluation |
|---|---|
| Acid Base Accounting (Includes Acisol-Neutralisation Potential, Acid Potential, Carb-Neutralisation Potential, Carbon and Sulphur species) | *Directive 019* & Price (2009) |
| Neutralisation Capacity | 3 eq/kg benchmark |
| Solids Content Analysis | Critères génériqes pour les sols |
| Whole Rock Analysis | Qualitative Analysis |
| Rietveld Analysis | Qualitative Analysis |
| CTEU-9 Testing | Règlement sur la qualite de l'eau potable<br>&<br>resurgence dans l'eau de surface |
| SPLP Testing | 10x Règlement sur la qualite de l'eau potable<br>&<br>resurgence dans l'eau de surface |
| TCLP Testing | Low-Risk Criteria:<br>résurgence dans l'eau de surface |
| | Elevated risk criteria:<br>D019 Annexe II Tableau 1 |

# 2.0 MINE WASTE MATERIALS SAMPLING

Samples from the East Malartic and Sheehan deposits were collected in 2018 for geochemical testing by Mine Canadian Malartic (MCM). These included 29 mine rock and 20 ore samples. Many of the samples evaluated, but not all, consisted of composites made from up to four individual drill core fragments – a listing of the sample IDs and composite sample components is included in **Appendix A**. The ore samples may be reasonable tailings surrogates because sulphide and carbonate minerals are not expected to be removed from the ore during the milling process; however tailings-specific testing is recommended to confirm these relationships.

The set of mine rock and ore samples presented in this report were selected by EcoMetrix and the geology staff at Canadian Malartic to be representative of the mine rock and ore from the East Malartic and Sheehan zones.

Samples from East Malartic included 15 mine rock samples from the dilution hanging wall, dilution footwall, and development areas, in addition to 10 ore samples from the mineralized zone. Samples from Sheehan included 14 mine rock samples from the dilution and development areas in addition to 10 ore samples from the mineralized zone. A variety of lithologies and alterations were sampled from each area. A summary of the sample IDs, lithologies, and alterations are provided in **Appendix A**.

All samples were submitted to SGS Laboratories for solids content and acid base accounting (ABA). A representative subset of 24 samples, including five ore and seven mine rock samples from East Malartic, along with five ore and seven rock samples from Sheehan were analyzed further. Additional analyses performed at SGS Laboratories (Lakefield, ON) included confirmatory ABA, neutralization capacity, whole rock analysis, SPLP, CTEU-9, and TCLP leachability tests. The testing by SGS was performed in accordance with Centre d'expertise en Analyse Environmentale du Québec (CEAE) methods. Rietveld X-ray diffraction (XRD) analysis was performed on 18 of these samples. The laboratory results are presented in full in **Appendix B**.

## 2.1 East Malartic - Sample Selection

Samples from East Malartic represent the mineralized zone (e.g. ore), the dilution rock hanging wall, the dilution rock footwall, and the development zone.

### 2.1.1 Mineralized Zone

Volume estimates and proportional estimates of the distribution of lithologies at the East Malartic mineralized zone are presented in **Table 2-1**. This zone is dominated by metasedimentary rock, including schist, with minor amounts of ultramafic and porphyry rock. Samples for analysis were selected to remain representative of the lithological distribution of this zone. Sample counts per lithology are also indicated in **Table 2-1**.

**Table 2-1: Lithology Distribution of the East Malartic Mineralized Zone**

| Lithology | Mass | | Sample Selection | |
|---|---|---|---|---|
| | tonnes | Percent | No. Samples | Percentage of Samples |
| Sediment | 4,022,975 | 70% | 5 | 50% |
| Ultramafic | 129,631 | 2% | 2 | 20% |
| Schist | 1,556,954 | 27% | 3 | 30% |
| Porphyry | 53,295 | 1% | 0 | 0% |
| **Total** | 5,762,855 | 100% | 10 | 100% |

**Note:**
Sample numbers are shown for first phase of the analytical program including solids contents and acid base accounting. The sample subset for subsequent phases were representative of these distributions.

### 2.1.2 Dilution Rock – Hanging Wall and Footwall

Volume estimates and proportional estimates of the distribution of lithologies at the East Malartic dilution zone are presented in **Table 2-2**. The East Malartic dilution hanging wall consists mainly of metasedimentary rock whereas the dilution footwall is mainly schist with some ultramafic and porphyry rock. Samples for analysis were selected to remain representative of the lithological distribution of this zone. Sample counts per lithology are also indicated in **Table 2-2**.

**Table 2-2: Lithology Distribution of the East Malartic Dilution Zone**

| Lithology | Mass | | Sample Selection | |
|---|---|---|---|---|
| | tonnes | Percent | No. Samples | Percentage of Samples |
| Sediment | 606,870 | 49% | 4 | 40% |
| Ultramafic | 54,902 | 4% | 1 | 10% |
| Schist | 567,952 | 46% | 4 | 40% |
| Porphyry | 14,623 | 1% | 1 | 10% |
| **Total** | 1,244,347 | 100% | 10 | 100% |

**Note:**
Sample numbers are shown for first phase of the analytical program including solids contents and acid base accounting. The subset of samples for subsequent phases were representative of these distributions.

### 2.1.3 Development Zone

Volume estimates and proportional estimates of the lithology distributions at the East Malartic and Sheehan development zone are presented in **Table 2-3**. The East Malartic development zone is mostly represented by metasedimentary rock with some porphyry. The Sheehan development zone consists mainly of ultramafic, porphyry, and schist rock. Samples for analysis were selected to remain representative of the lithological distribution of this zone. Sample counts per lithology are also indicated in **Table 2-3**.

**Table 2-3: Lithology Distribution of the East Malartic and Sheehan Development Zone**

| Lithology | Mass | | Sample Selection | |
|---|---|---|---|---|
| | tonnes | Percent | No. Samples | Percentage of Samples |
| Sediment | 1,154,093 | 63% | 5 | 42% |
| Ultramafic & Schist | 444,367 | 24% | 4 | 33% |
| Porphyry | 236,234 | 13% | 3 | 25% |
| **Total** | 1,834,693 | 100% | 12 | 100% |

**Note:**
Sample numbers are shown for first phase of the analytical program including solids contents and acid base accounting. The subset of samples for subsequent phases were representative of these distributions.

## 2.2 Sheehan - Sample Selection

Samples from Sheehan represent the mineralized zone (e.g. ore), dilution rock, and the development zone. The Sheehan development zone lithological distributions are described above in **Section 2.1.3**.

### 2.2.1 Mineralized Zone

Volume estimates and proportional estimates of the distribution of lithologies at the Sheehan mineralized zone are presented in **Table 2-4**. This zone is dominated by porphyry rock, followed by ultramafic, with minor quantities of schist. Samples for analysis were selected to remain representative of the lithological distribution of this zone. Sample counts per lithology are also indicated in **Table 2-4**.

**Table 2-4: Lithology Distribution of the Sheehan Mineralized Zone**

| Lithology | Mass | | Sample Selection | |
|---|---|---|---|---|
| | tonnes | Percent | No. Samples | Percentage of Samples |
| Sediment | --- | -- | 0 | 0% |
| Ultramafic | 1,075,089 | 25% | 4 | 40% |
| Schist | 392,728 | 9% | 1 | 10% |
| Porphyry | 2,795,850 | 66% | 5 | 50% |
| **Total** | 4,263,667 | 100% | 10 | 100% |

**Note:**
Sample numbers are shown for first phase of the analytical program including solids contents and acid base accounting. The subset of samples for subsequent phases were representative of these distributions.

### 2.2.2 Dilution Rock

Volume estimates and proportional estimates of the distribution of lithologies of the Sheehan dilution rock are presented in **Table 2-5**. This zone is not differentiated into a hanging wall

and footwall. The lithologies present, include mainly porphyry, followed by ultramafic and schist. Samples for analysis were selected to remain representative of the lithological distribution of this zone. Sample counts per lithology are also indicated in **Table 2-5**.

**Table 2-5: Lithology Distribution of the Sheehan Dilution Rock**

| Lithology | Mass | | Sample Selection | |
|---|---|---|---|---|
| | tonnes | Percent | No. Samples | Percentage of Samples |
| Sediment | - | -- | 0 | 0% |
| Ultramafic | 324,063 | 35% | 2 | 29% |
| Schist | 112,064 | 12% | 1 | 14% |
| Porphyry | 481,302 | 52% | 4 | 57% |
| **Total** | 917,430 | 100% | 7 | 100% |

**Note:**
Sample numbers are shown for first phase of the analytical program including solids contents and acid base accounting. The subset of samples for subsequent phases were representative of these distributions.

# 3.0 MINE MATERIALS PRINCIPLES & CLASSIFICATION

## 3.1 Geochemistry Background and Criteria for ABA Characterization

The ABA characteristics that are used to determine the potential risk of acid generation in mine materials include the acid potential (AP) that is calculated from the sulphide-sulphur content and the neutralization potential (NP) that can be estimated in several ways. Both AP and NP are presented in units of kg-$CaCO_3$/tonne that represent the kilograms of calcium carbonate equivalent per tonne of rock. The NP is commonly measured using some modification of the Sobek method that includes addition of a strong acid to a sample, allowing time to react and then measuring the remaining acid to determine the amount of acid consumed. The Acisol-NP (MA. 110 – ACISOL 1.0 in CEAE, 2014) is one such similar method of estimating NP. Another method to estimate NP is to measure carbonate ($CO_3$) in the sample and calculate the equivalent $CaCO_3$ content. The ratio of NP/AP is then used to determine if the material has adequate NP to consume the acid produced if all the sulphide-sulphur is oxidized. If the AP exceeds the NP, resulting in an NP/AP ratio less than 1, the material is classified as potentially acid generating (PAG).

Theoretically, one unit of AP (as S) will produce 2 units of acid ($H^+$). Also, theoretically, one unit of NP (as $CaCO_3$) will consume either 1 or 2 units of acid, depending on the physio-chemical conditions when the neutralization reactions occur (Price, 2009). Therefore, as a conservative measure, it is assumed that 2 units of NP will be required to neutralize the acid from 1 unit of AP in order to maintain neutral conditions in the mine material indefinitely and to classify the material as non-potentially acid generating (non-PAG). This means the ratio of NP/AP should be greater than 2 to maintain neutral conditions, theoretically.

However, in the acid rock drainage guidelines originally presented by Price (1997), it was acknowledged that there was some uncertainty in the estimation of the NP by the Sobek method and in order to address this uncertainty, an NP/AP ratio greater than 3 was recommended. The *Directive 019* criterion for low-risk material that is based on the original Price (1997) guidelines is an NP/AP ratio greater than 3.

However, the Sobek-NP or Acisol-NP can be a poor estimate for of the actually available “effective” NP in some materials. The more recent approach of interpreting NP (Price, 2009) utilizes an NPR of greater than 2 to represent non-PAG materials if the NP is known to be “effective” (e.g. carbonate). If the effectiveness of the NP is known then an NP/AP value of 2 is the appropriate lower value for non-PAG determination. Whereas when using effective-NP values materials having NPR values between 1 and 2 can be classified as having an “uncertain” potential for acid generation. A common precautionary approach is to assume that materials classified as uncertain are conservatively treated as PAG.

### 3.1.1 Comparison of Neutralization Potential Estimation Methods on Historical MCM Rock, Odyssey Mine Rock, and East Malartic and Sheehan

Prior investigations at MCM demonstrated that the carbonate neutralization potential (Carb-NP) was well correlated with the modified Sobek neutralization potential (Sobek-NP) in the mine rock. Additionally, Acisol-NP test methods on mine rock from the area were found to yield NP values that were higher, and less conservative than the Sobek-NP approach (EcoMetrix 2017a).

For reference, the relationship between Carb-NP and Sobek-NP in mine rock samples from MCM (EcoMetrix, 2015) is shown in **Figure 3-1**. The linear correlation is excellent ($r^2$=0.97) and the Carb-NP values are typically somewhat less than, and therefore more conservative than, the Sobek-NP values below about 150 kg-$CaCO_3$/tonne. The Carb-NP values were calculated from the measured carbonate contents (as $CO_3$). Accordingly, the relationship between Carb-NP and Sobek-NP at the Odyssey deposits also show an excellent linear correlation ($r^2$=0.98), **Figure 3-2**. The Carb-NP values remain less than, and are more conservative than, the Sobek-NP for values below approximately 150 kg-$CaCO_3$/tonne.

The relationship between Carb-NP and Acisol-NP in ore and mine rock samples from the East Malartic and Sheehan deposits is shown in **Figure 3-3**. These results continue to be in agreement with historical work at the Malartic mine. The linear correlation is excellent across the dataset ($r^2$=0.97) and the Carb-NP values are typically somewhat less than, and more conservative than, the Acisol-NP values below about 150 kg-$CaCO_3$/tonne. In consideration of these results the Carb-NP was identified to be the preferred and more conservative measure of NP for acid generation potential assessment. Though Acisol-NP may be more conservative at the higher range of values this is not likely to be relevant for practical acid generation potential classification as materials with higher NP values are increasingly unlikely to be potentially acid generating.

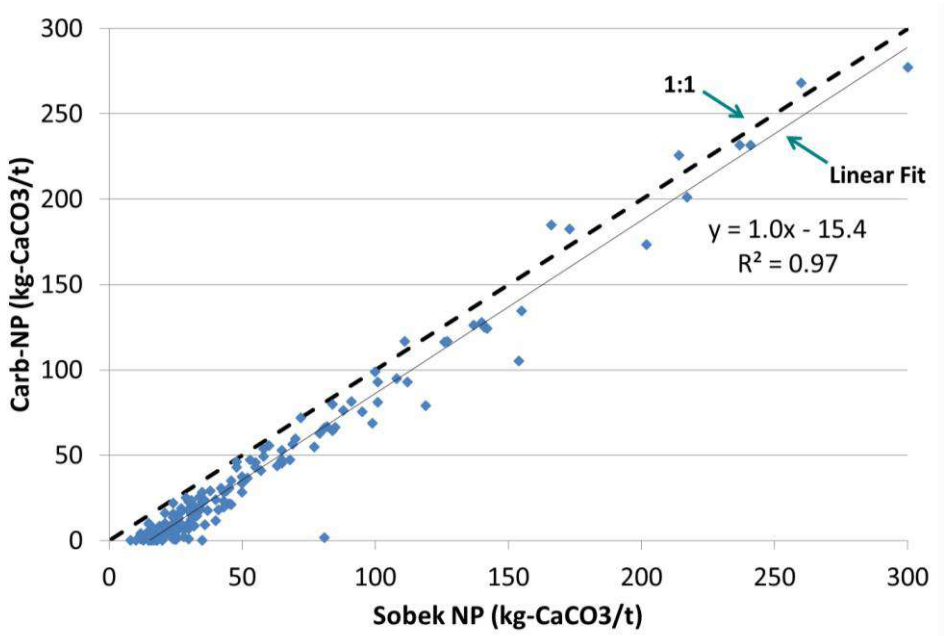


**Figure 3-1: Relationship between Carb-NP and Sobek-NP for historical MCM Mine Rock Samples (EcoMetrix, 2015)**

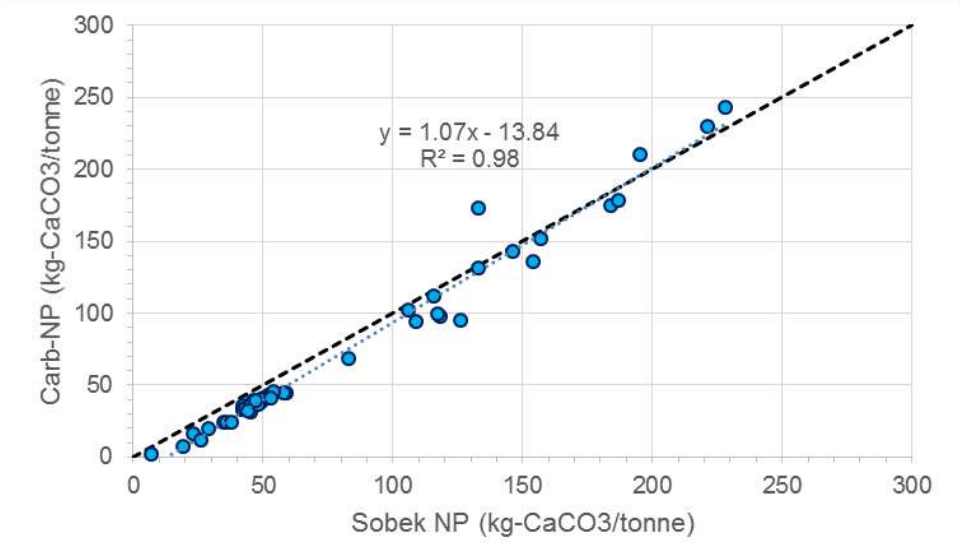


**Figure 3-2: Relationship between Carb-NP and Sobek-NP for Odyssey Mine Rock Samples (n=51) (EcoMetrix, 2017a)**

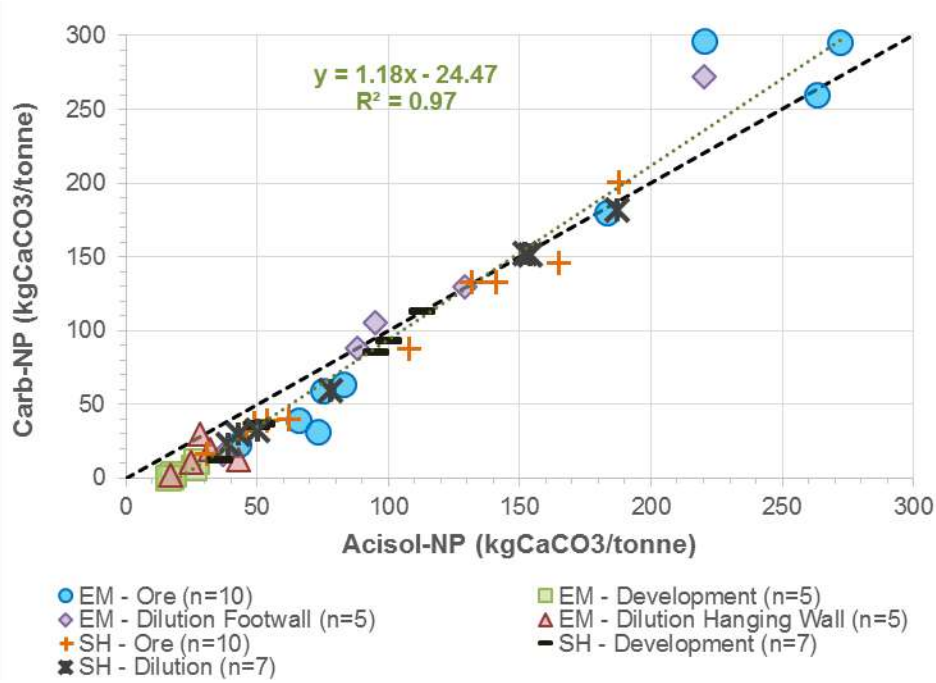


**Figure 3-3: Relationship between Carb-NP and Acisol-NP for East Malartic and Sheehan Ore and Mine Rock Samples (n=49)**

**Note:**
Trendline shown is representative of all samples.

The sulphide species were measured, and the sulphide contents were used to evaluate the acid potential (AP) of the mine rock.

The ratio represented by the Acisol-NP divided by the AP calculated from the sulphide-sulphur in %S is referred to as the Acisol-neutralization potential ratio (Acisol-NPR). The ratio represented by the Carb-NP divided by the AP calculated from the sulphide-sulphur (%S) is referred to as the carbonate neutralization potential ratio (Carb-NPR). Carb-NPR is a more conservative estimate of NPR than Acisol-NPR in East Malartic and Sheehan materials.

The most current guideline for prediction of acid generation presented by Price (2009) also recommend the use of “effective” NP for ABA characterization. Carbonate minerals, excluding iron and manganese carbonates, are considered to represent effective-NP because they consume acid and maintain a neutral pH drainage or contact water. **Figure 3-4** shows that, with the single exception of an East Malartic dilution hanging wall sample, when the Carb-NPR ratio was greater than 2 in East Malartic and Sheehan mine rock and ore then the Acisol-NPR ratio will be greater than 3 and will therefore meet the *Directive 019* criterion. This relationship is consistent with the results from more than 200 samples from the Canadian Malartic and Barnat deposits that were assessed in the EcoMetrix (2015) report and the Odyssey deposits in the EcoMetrix (2017a) report. Therefore, in consideration of the

Carb-NP effectiveness, the Carb-NP/AP ratio of 2 was used as a more conservative criterion than the Acisol-NPR criterion of 3 as presented in *Directive 019*.

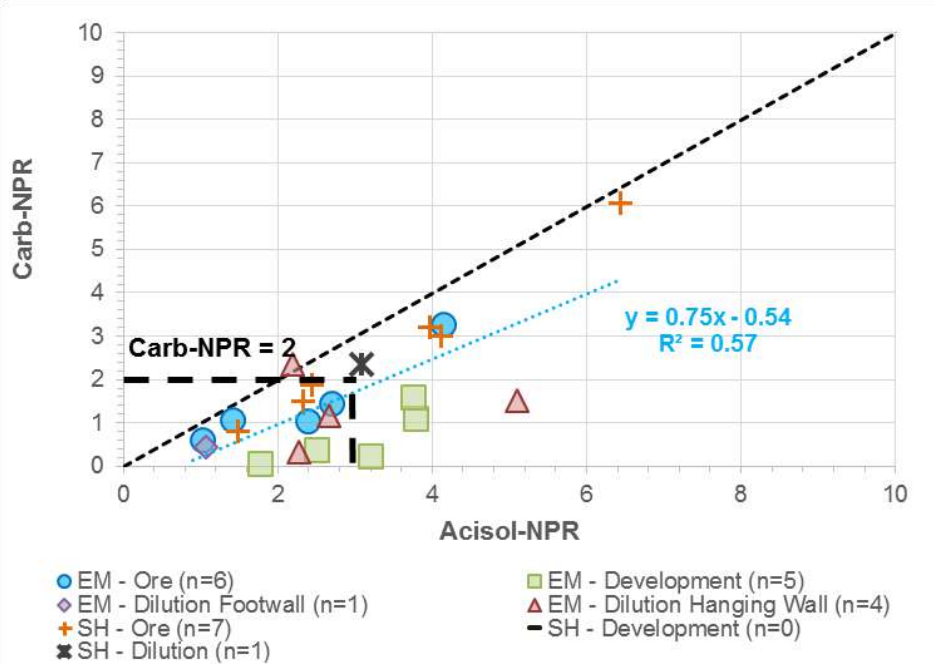


**Figure 3-4: Relationship between Carb-NPR and Acisol-NPR for East Malartic and Sheehan Samples with Carb-NPR less than 7**

### 3.1.2 Net Neutralization Potential

An additional ABA consideration for identifying non-PAG materials presented in *Directive 019* is that the net neutralization potential (NNP), the difference between the neutralization potential and the acid generation potential (NNP=NP-AP), should exceed 20 kg $CaCO_3$/tonne. As shown in **Figure 3-5**, except for a single mine rock sample from the East Malartic dilution hanging wall, all rock with a Carb-NPR greater than 2 also had NNP values greater than 20 kg $CaCO_3$/tonne. This sample with an NNP value of less than 20 kg $CaCO_3$/tonne (net Carb-NP of 17.2 $kg_{CaCO3}$/tonne) had a total sulphur content of 0.549% sulphur and would be considered as potentially acid generating as per *Directive 019*. As only a single sample from this dataset would be marginally miscategorised according to the Carb-NPR approach the application of a Carb-NPR value of 2 criterion for the East Malartic and Sheehan deposit rock and ore is considered to be an effective criterion that satisfies the *Directive 019* ABA criteria and is consistent with the Price (2009) guidelines.

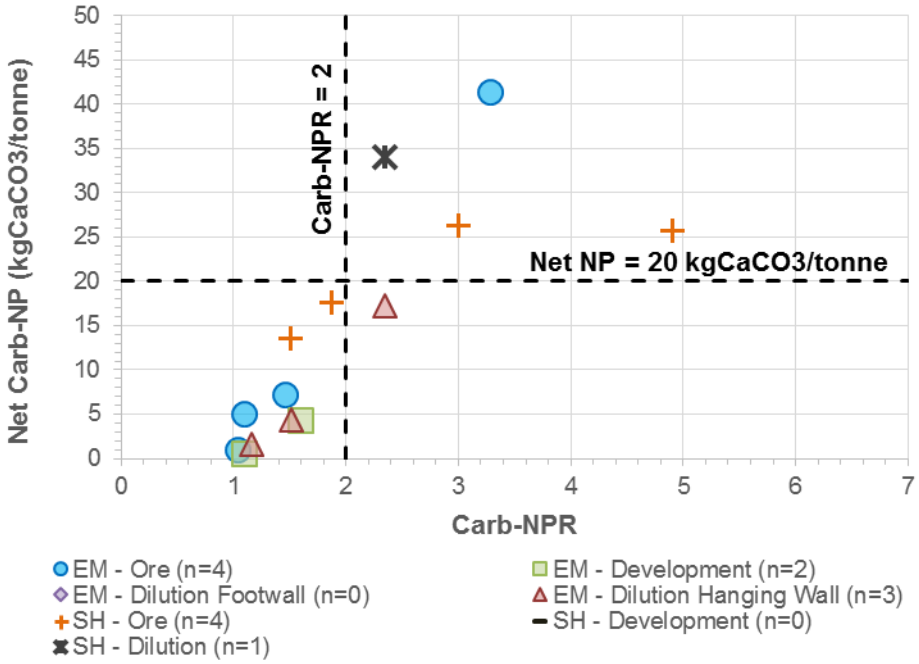


**Figure 3-5: Relationship between Net NP and Carb-NPR for Mine Rock Samples with Carb-NPR less than 7**

### 3.1.2.1 Use of carbon$_{total}$/sulphur$_{total}$ (C/S) ratios for Mine Rock and Ore ABA Classification at East Malartic and Sheehan Deposits

The Carb-NPR can be estimated from the carbon$_{total}$/sulphur$_{total}$ (C/S) ratio in which total carbon (C) is a surrogate for carbonate and total sulphur (S) is a surrogate for sulphide. The C/S ratio is plotted versus the Carb-NPR in **Figure 3-6** and identifies a very strong correlation ($r^2$ = 0.95) in this dataset. In **Figure 3-6** there appear to be outliers from the Sheehan development zone with Carb-NPR values between 50 and 60 whereas the majority of samples are very well represented by the linear trend.

To identify a meaningful relationship between C/S and Carb-NPR only samples with Carb-NPR values of less than 7 were selected for analysis. This was performed to prevent potential biases that could arise from including samples with Carb-NPR values that are much greater than 2 that are clearly non-PAG and are not relevant when it comes to PAG or non-PAG classification.

**Figure 3-7** presents the relationship between C/S and Carb-NPR for samples with Carb-NPR less than 7 and identifies a very strong correlation ($r^2$ = 0.96) in this range of values. Within this subset a C/S ratio of approximately 0.68 equates a Carb-NPR value of 2 that can be used for non-PAG material identification. A C/S ratio of 0.68 is slightly lower than a ratio of 0.81 as identified in the Odyssey mine rock (EcoMetrix 2017b) and is also lower than the value of 0.9 used at MCM to identify non-PAG mine rock (EcoMetrix 2015). Similarly, a C/S ratio of approximately 0.39 equates a Carb-NPR value of 1 that can be used to identify PAG

materials. Mine rock or ore with C/S values between 0.39 and 0.68 would be classified as having an uncertain potential for acid generation and would be of lower risk than PAG materials.

A C/S value of 0.68 was developed from the characteristics of the East Malartic and Sheehan mine rock and ore and allows for the practical measuring of total carbon and total sulphur on samples to classify non-acid generating mine materials. This ABA classification approach is more conservative than the *Directive 019* approach in that materials of all sulphur contents, not only those greater than 0.3% total sulphur (per *Directive 019* guidance) are evaluated.

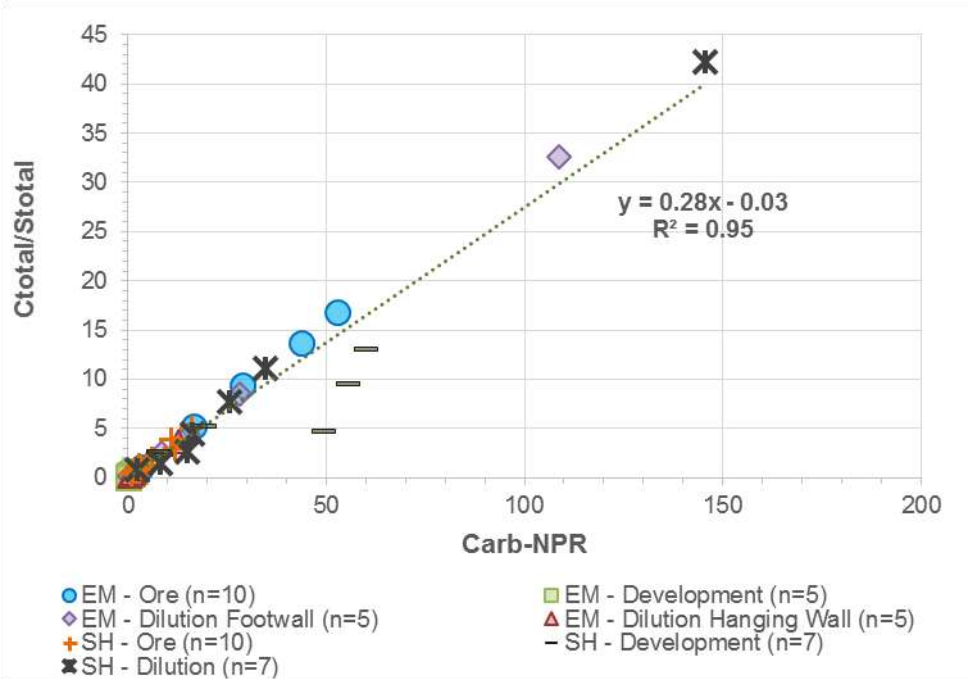


**Figure 3-6: Total Carbon/Total Sulphur ratios in relation to Carb-NPR values for East Malartic and Sheehan deposit materials (n=49)**

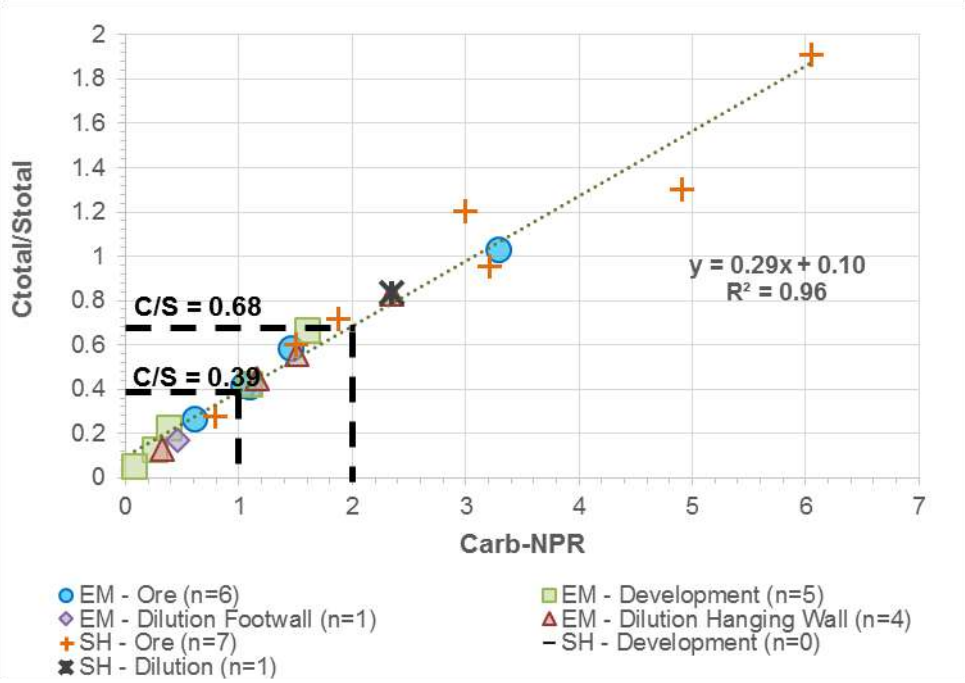


**Figure 3-7: Total Carbon/Total Sulphur ratios in relation to Carb-NPR values less than 7 for East Malartic and Sheehan deposit materials (n=24)**

## 3.2 Directive 019

*Directive 019* is a guidance document from the Ministère de l'Environnement et de la Lutte contre les Changements Climatiques (MELCC, 2012) presenting requirements for various mining activities with the purposes of environmental protection.

The *Directive 019* guidance document provides risk-classification information on mine materials and is applied in this assessment. To classify mine materials as low-risk according to the *Directive 019* criteria there are restrictions based on the quality of the mine materials that include limitations on the material's potential for acid generation, metals contents, and leachability criteria.

*Directive 019* also contains guidance regarding cyanide contents, organic compounds, ionizing radiation, and flammability. These specific criteria are not relevant to the mine rock and ore at the East Malartic and Sheehan deposits and were not evaluated further for material classification purposes.

The *Directive 019* evaluation criteria are summarized in **Appendix C**.

# 4.0 GEOCHEMICAL TEST RESULTS

The results from the East Malartic and Sheehan sampling program are presented in the following sections. Discussions are typically limited to those parameters identified in mine rock and ore that have solids contents greater than « *critères génériques pour les sols* » level 'A' generic soils criteria. The complete listing of all analytical data for mine rock and ore are provided in **Appendix B**.

## 4.1 Mine Rock

### 4.1.1 ABA Analyses

As identified in **Section 3.1.2.1** a C/S ratio of 0.68 or greater can be used to identify East Malartic and Sheehan mine rock and ore as non-PAG and a C/S ratio of 0.39 or lower can be used to identify East Malartic and Sheehan mine rock as PAG. Mine rock with an uncertain potential for acid generation would be of lower risk than PAG materials. The potential for acid generation classification for the East Malartic and Sheehan mine rock are summarized in **Table 4-1**. The East Malartic C/S values are plotted in **Figure 4-1** and Sheehan C/S values in **Figure 4-2**. Additionally, the C/S values are plotted per lithology in **Figure 4-3** and summarized in **Table 4-2**.

**Table 4-1: East Malartic and Sheehan Mine Rock – Potential for Acid Generation Summary**

| Location | | Count | PAG C/S < 0.39 | Uncertain 0.39 ≥ C/S > 0.68 | Non-PAG C/S ≥ 0.68 |
|---|---|---|---|---|---|
| East Malartic | All Waste Rock | 15 | 33% | 27% | 40% |
| | Development | 5 | 60% | 40% | 0% |
| | Dilution - Hanging Wall | 5 | 20% | 40% | 40% |
| | Dilution - Footwall | 5 | 20% | 0% | 80% |
| Sheehan | All Waste Rock | 14 | 0% | 0% | 100% |
| | Development | 7 | 0% | 0% | 100% |
| | Dilution | 7 | 0% | 0% | 100% |
| **All Rock** | | **29** | 17% | 14% | 69% |

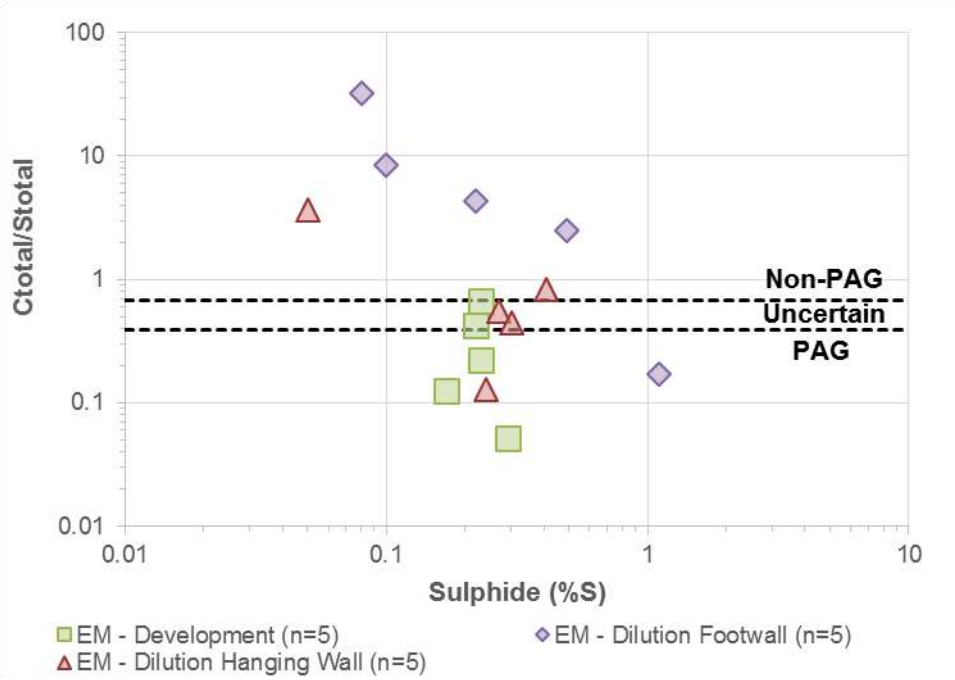


**Figure 4-1: C/S vs. Sulphide (%S) for East Malartic Rock (n=15)**

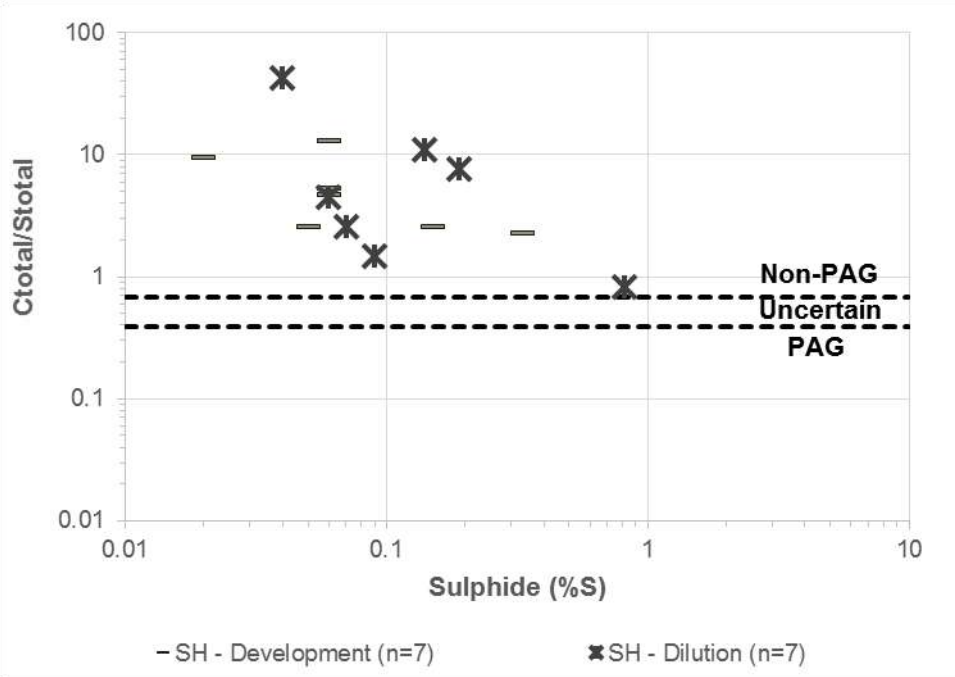


**Figure 4-2: C/S vs. Sulphide (%S) for Sheehan Mine Rock (n=14)**

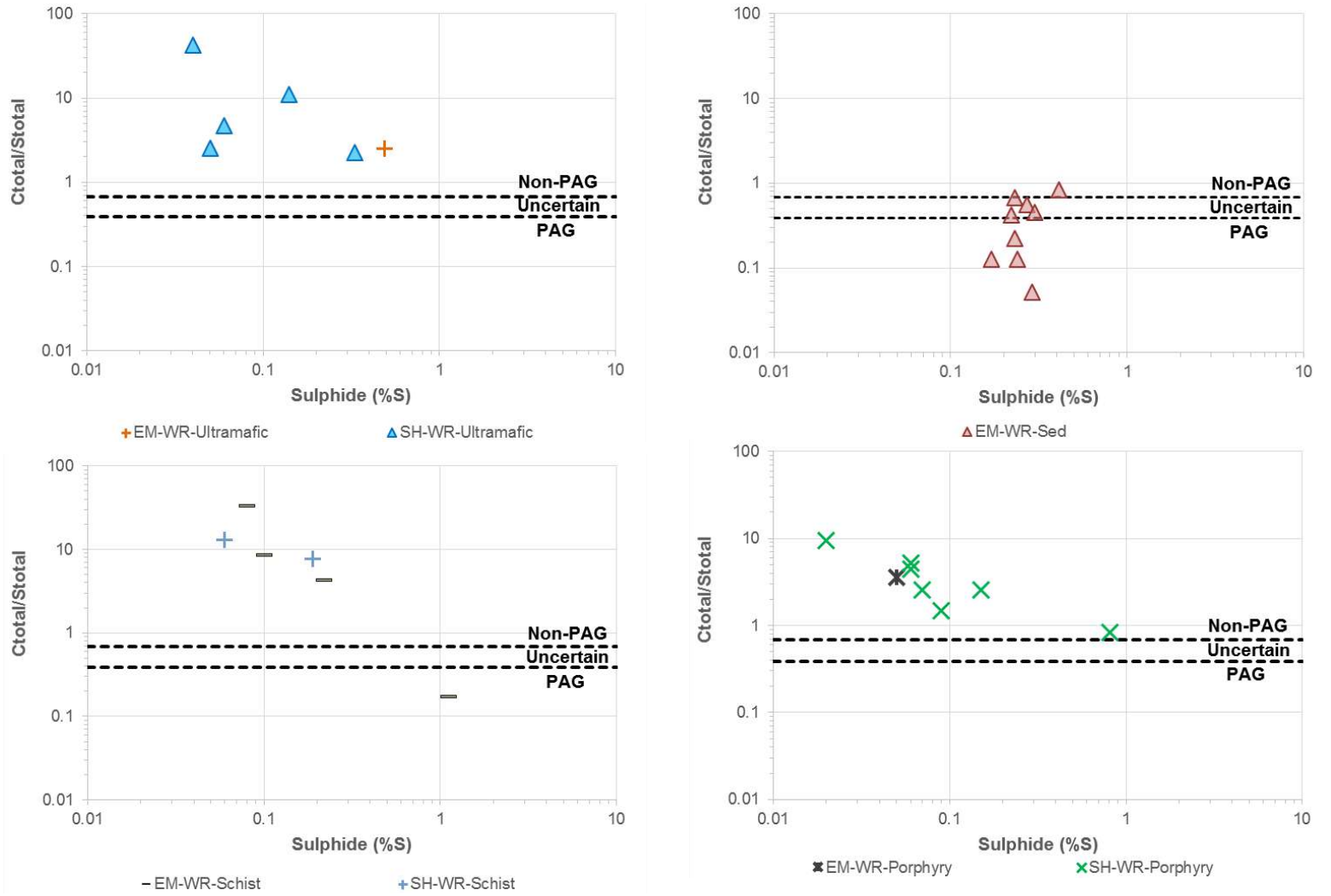


**Figure 4-3: C/S vs. Sulphide (%S) per Lithology (n=29)**

The proportion of non-PAG materials varies widely across the mine rock zones, sampling locations, and per lithology. As identified in **Table 4-1** all mine rock from the Sheehan deposit zones was found to be non-PAG whereas only 40% of the samples from the East Malartic zone was non-PAG. At least one sample from each East Malartic deposit zone was PAG or had an uncertain potential for acid generation.

As shown in **Figure 4-3** the ultramafic, schist, and porphyry rock samples typically demonstrated linear relationships regardless of their deposit source whereas the metasedimentary rock samples, a lithology only present to an appreciable extent at East Malartic, had a non-linear relationship and most metasedimentary samples were either PAG or had an uncertain potential for acid generation. As identified in **Table 4-2** the metasedimentary samples are responsible for the majority of the PAG and uncertain potential for acid generation classification at the East Malartic dilution and development zones. All porphyry and ultramafic samples from both East Malartic and Sheehan were non-PAG. A single schist sample from the East Malartic dilution footwall zone was PAG.

**Table 4-2: East Malartic and Sheehan Mine Rock – Potential for Acid Generation by Lithology**

| Lithology | | Count | PAG C/S < 0.39 | Uncertain 0.39 ≥ C/S > 0.68 | Non-PAG C/S ≥ 0.68 |
|---|---|---|---|---|---|
| Waste Rock | Sediment | 9 | 44% | 44% | 11% |
| | Schist | 6 | 17% | 0% | 83% |
| | Ultramafic | 6 | 0% | 0% | 100% |
| | Porphyry | 8 | 0% | 0% | 100% |

### 4.1.2 Solids Contents

As per *Directive 019* guidance, solids contents were compared to the « *critères génériques pour les sols* » 'A' level standards. If more than 10% of samples exceed these standards for a particular parameter in any one of the targeted lithologies (i.e. metasedimentary, schist, ultramafic, or porphyry) then that parameter is identified as a parameter of concern that will be examined in the leachate criteria analyses. More than 10% of samples in any one lithology exceeded the 'A' level standards for silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc as shown in **Table 4-3**. The Level 'A' standard exceedances for barium, cobalt, chromium, copper, and nickel were reported in multiple lithologies whereas silver, manganese, and zinc Level 'A' criteria exceedances were limited to a single lithology and were conservatively carried forward as parameters of concern for other lithologies.

**Table 4-3: East Malartic and Sheehan Mine Rock - Parameters with more than 10% of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Standards in Any One Lithology**

| Parameter | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria |
|---|---|
| Silver[1] | 3% |
| Barium | 48% |
| Cobalt | 41% |
| Chromium | 76% |
| Copper | 17% |
| Manganese[1] | 3% |
| Nickel | 76% |
| Zinc[1] | 3% |

**Note:**
1) Silver was greater than the Level 'A' criterion in more than 10% of the metasedimentary samples, manganese in more than 10% of the schist samples, and zinc in more than 10% of the ultramafic samples.

The solids contents for these parameters are summarized for each zone and location in **Table 4-4**. In general, the East Malartic mine rock had higher solids contents than samples from the Sheehan deposit. These elevated solids contents were most frequent in the footwall whereas barium and zinc were most elevated in the East Malartic development materials.

**Table 4-4: East Malartic and Sheehan Mine Rock – Solids Contents by Zone and Location**

| Parameter | | "Critères Génériques pour les Sols" – 'A' Criteria | East Malartic | | | Sheehan | |
|---|---|---|---|---|---|---|---|
| | | | Development | Dilution Hanging Wall | Dilution Footwall | Development | Dilution |
| | | | n=5 | n=5 | n=5 | n=7 | n=7 |
| Silver | Median Content (mg/kg) | 0.5 | 0.13 | ***0.19*** | 0.12 | 0.12 | 0.10 |
| | Average Content (mg/kg) | | 0.14 | ***0.24*** | 0.13 | 0.12 | 0.14 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 0% | 20% | 0% | 0% | 0% |
| Barium | Median Content (mg/kg) | 240 | ***300*** | 230 | 81 | 290 | 220 |
| | Average Content (mg/kg) | | ***324*** | 278 | 98 | 313 | 213 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 80% | 40% | 0% | 71% | 43% |
| Cobalt | Median Content (mg/kg) | 30 | 23 | 23 | ***52*** | 46 | 15 |
| | Average Content (mg/kg) | | 22 | 20 | ***56*** | 34 | 26 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 0% | 0% | 100% | 57% | 43% |
| Chromium | Median Content (mg/kg) | 100 | 170 | 180 | ***810*** | 530 | 120 |
| | Average Content (mg/kg) | | 166 | 181 | ***844*** | 462 | 377 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 100% | 80% | 100% | 57% | 57% |
| Copper | Median Content (mg/kg) | 65 | 49 | 53 | ***59*** | 33 | 34 |
| | Average Content (mg/kg) | | 49 | 45 | ***66*** | 42 | 44 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 0% | 0% | 40% | 14% | 29% |
| Manganese | Median Content (mg/kg) | 1000 | 410 | 500 | ***810*** | 260 | 320 |
| | Average Content (mg/kg) | | 418 | 444 | ***770*** | 516 | 536 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 0% | 0% | 20% | 0% | 0% |
| Nickel | Median Content (mg/kg) | 50 | 87 | 85 | ***460*** | 270 | 66 |
| | Average Content (mg/kg) | | 82 | 79 | ***446*** | 314 | 199 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 100% | 80% | 100% | 57% | 57% |
| Zinc | Median Content (mg/kg) | 150 | ***78*** | ***78*** | 24 | 67 | 57 |
| | Average Content (mg/kg) | | ***76*** | 66 | 27 | 55 | 68 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 0% | 0% | 0% | 0% | 14% |

**Note:**
Bolded and italicized values indicate the location with the highest average and median contents.
Shaded values indicate values greater than "Critères Génériques pour les Sols" – 'A' values.

### Solids Content by Lithology

The average solids contents for silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc for different lithologies are summarized in **Table 4-5**. In summary, compared to other rock types:

- The metasedimentary rock has the highest silver and zinc contents with marginally elevated barium;
- The ultramafic rock has the highest cobalt, chromium, copper and manganese contents with a median nickel content similar to, but slightly lower than that of the schist rock;
- The schist rock contains cobalt, chromium, copper, manganese in similar, but slightly lower quantities than those of the ultramafic rock. Nickel is present in the highest levels in the schist rock; and
- The porphyry rock had low silver, cobalt, chromium, copper, manganese, and nickel contents; however, the barium and zinc contents were comparatively high.

## Table 4-5: East Malartic and Sheehan Mine Rock – Median Solids Content by Lithology

| Parameter | Critères Génériques pour les Sols – 'A' | All Rock | Sediment | Schist | Ultramafic | Porphyry |
|---|---|---|---|---|---|---|
| **Count** | -- | 29 | 9 | 6 | 6 | 8 |
| Silver (mg/kg) | 0.5 | 0.12 | ***0.17*** | 0.10 | 0.14 | 0.11 |
| Barium (mg/kg) | 240 | 230 | ***290*** | 77 | 235 | 280 |
| Cobalt (mg/kg) | 30 | 24 | 23 | 50.5 | ***51*** | 7 |
| Chromium (mg/kg) | 100 | 190 | 180 | 810 | ***850*** | 34 |
| Copper (mg/kg) | 65 | 50 | 51 | 53 | ***64*** | 13 |
| Manganese (mg/kg) | 1000 | 490 | 490 | 805 | ***925*** | 235 |
| Nickel (mg/kg) | 50 | 88 | 87 | ***470*** | 420 | 9 |
| Zinc (mg/kg) | 150 | 67 | ***78*** | 24 | 54 | 67 |

**Note:**
Bolded and italicized values indicate the location with the highest average and median contents.
Shaded values indicate values greater than "Critères Génériques pour les Sols" – 'A' values.

### Whole Rock Analysis

Whole rock analysis provides the major element oxides in a rock sample. The average whole rock analysis contents for the East Malartic and Sheehan zones are summarized in **Table 4-6**, full analytical results are in **Appendix B**. In general, $SiO_2$, $Al_2O_3$, and $Fe_2O_3$ dominate the mine rock at both East Malartic and Sheehan.

When the mine rock from each zone is viewed in aggregate they both had generally similar mineral distributions where the East Malartic development and dilution hanging wall rock had similar distributions as the Sheehan development and dilution rock though MgO was particularly small component of the mine rock from the East Malartic development and dilution hanging wall zones. The location with the most distinct mineralogical distribution is the East Malartic dilution footwall that had substantially lower proportions of $SiO_2$, $AL_2O_3$, $Na_2O$ and markedly higher quantities of $Fe_2O_3$, MgO, and CaO.

The average whole rock contents as measured per lithology are summarized in **Table 4-7**. In general, the metasedimentary and porphyry rock had similar distributions with higher proportions of $SiO_2$, $Al_2O_3$, and $Na_2O$ than the schist and ultramafic rock. The schist and ultramafic rock had higher proportions of $Fe_2O_3$, MgO, and CaO than the metasedimentary and porphyry rock.

**Table 4-6: East Malartic and Sheehan Mine Rock – Average Whole Rock Analysis Results by Zone and Location**

| Parameter | East Malartic | | | | Sheehan | | |
|---|---|---|---|---|---|---|---|
| | All Waste Rock | Development | Dilution Hanging Wall | Dilution Footwall | All Waste Rock | Development | Dilution |
| **Count** | 7 | 2 | 2 | 3 | 7 | 4 | 3 |
| $SiO_2$ (%) | 53.7 | 63.4 | 61.9 | 41.7 | 53.8 | 53.3 | 54.4 |
| $Al_2O_3$ (%) | 11.2 | 15.8 | 15.3 | 5.4 | 11.1 | 10.5 | 12.0 |
| $Fe_2O_3$ (%) | 7.6 | 5.6 | 5.6 | 10.2 | 6.3 | 6.8 | 5.8 |
| MgO (%) | 11.0 | 3.0 | 3.2 | 21.6 | 11.3 | 13.0 | 8.9 |
| CaO (%) | 4.7 | 2.2 | 2.8 | 7.7 | 4.5 | 4.9 | 4.1 |
| $Na_2O$ (%) | 2.4 | 4.2 | 3.9 | 0.3 | 4.0 | 3.4 | 4.7 |
| $K_2O$ (%) | 2.7 | 2.9 | 3.3 | 2.3 | 1.9 | 1.7 | 2.2 |
| $TiO_2$ (%) | 0.5 | 0.6 | 0.6 | 0.3 | 0.4 | 0.4 | 0.5 |
| $P_2O_5$ (%) | 0.10 | 0.16 | 0.2 | 0.02 | 0.14 | 0.13 | 0.2 |
| MnO (%) | 0.1 | 0.07 | 0.08 | 0.2 | 0.09 | 0.1 | 0.07 |
| $Cr_2O_3$ (%) | 0.1 | 0.04 | 0.04 | 0.3 | 0.1 | 0.2 | 0.1 |
| $V_2O_5$ (%) | 0.02 | 0.02 | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 |
| Loss on ignition (%) | 4.8 | 1.5 | 2.2 | 8.8 | 5.4 | 5.2 | 5.7 |

**Table 4-7: East Malartic and Sheehan Mine Rock – Average Whole Rock Analysis Results by Lithology**

| Parameter | Waste Rock | | | |
|---|---|---|---|---|
| | Sediment | Schist | Ultramafic | Porphyry |
| Count | 4 | 3 | 3 | 4 |
| $SiO_2$ (%) | 62.7 | 42.1 | 41.0 | 63.1 |
| $Al_2O_3$ (%) | 15.5 | 5.4 | 5.4 | 15.4 |
| $Fe_2O_3$ (%) | 5.6 | 10.0 | 10.5 | 3.3 |
| MgO (%) | 3.1 | 21.8 | 24.2 | 1.4 |
| CaO (%) | 2.5 | 7.2 | 7.0 | 3.1 |
| $Na_2O$ (%) | 4.0 | 0.3 | 0.2 | 6.8 |
| $K_2O$ (%) | 3.1 | 2.7 | 1.1 | 2.2 |
| $TiO_2$ (%) | 0.6 | 0.3 | 0.3 | 0.5 |
| $P_2O_5$ (%) | 0.2 | 0.02 | 0.02 | 0.2 |
| MnO (%) | 0.07 | 0.2 | 0.2 | 0.04 |
| $Cr_2O_3$ (%) | 0.04 | 0.3 | 0.3 | 0.02 |
| $V_2O_5$ (%) | 0.02 | 0.03 | 0.02 | 0.02 |
| Loss on ignition (%) | 1.9 | 8.6 | 9.2 | 2.8 |

### Rietveld Analysis

The average Rietveld analysis results for the East Malartic and Sheehan zones are summarized in **Table 4-8**, with full analytical results provided in **Appendix B**. In general, the mine rock is dominated by quartz, silicates, aluminosilicates, inosilicates, and phyllosilicates with albite, quartz, and biotite being the most significant single minerals. The East Malartic dilution footwall mine rock is the most substantially different from the other zones with no albite and large proportions of magnesiohornblende, chlorite, talc, and biotite.

The sole source of sulphur is pyrite with pyrite contents reaching up to 0.8% in the mine rock. Additionally, three sources of carbonates were identified: dolomite ($CaMg(CO_3)_2$), calcite ($Ca(CO_3)_2$), and ankerite ($CaFe(CO_3)_2$). Dolomite and calcite represent the vast majority of the carbonates and these carbonates are considered to be 100% effective at providing neutralization potential. The iron carbonate portion in the ankerite is not considered to represent effective neutralization, whereas the calcium carbonate portion of the ankerite represents effective NP. There was no ankerite in the East Malartic rock and the ankerite proportion in the Sheehan zones represented approximately 1% of the total carbonate content. As such, the overwhelming majority of the carbonates in the mine rock will provide effective neutralization further validating the use of Carb-NP as a measure of effective neutralization potential.

The average Rietveld analysis results per lithology are summarized in **Table 4-9**. In metasedimentary samples, the dominant minerals include albite, quartz, and phlogopite with the smallest proportion of carbonates (i.e. 2.7%) amongst the lithologies. In schist the dominant minerals are magnesiohornblende, biotite, and talc with a large proportion of dolomite. In the ultramafic rock the dominant minerals are talc, chlorite, and biotite with large proportions of dolomite. In porphyry the dominant minerals are albite, quartz, and microcline with approximately 5% carbonates.

## Table 4-8: East Malartic and Sheehan Mine Rock – Average Rietveld Analysis Results by Zone and Location

| Parameter | | | East Malartic | | | | Sheehan | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | All Waste Rock | Development | Dilution Hanging Wall | Dilution Footwall | All Waste Rock | Development | Dilution |
| Count | | | 6 | 2 | 1 | 3 | 6 | 3 | 3 |
| Quartz | Quartz (wt%) | $SiO_2$ | 11.5 | 21.8 | 20.9 | 1.6 | 8.8 | 10.1 | 7.6 |
| Silicate | Talc (wt%) | $Mg_3Si_4O_{10}(OH)_2$ | 8.5 | 0 | 0 | 17.1 | 8.4 | 6.7 | 10.2 |
| Aluminosilicates | Chlorite (wt%) | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | 9.6 | 0.4 | 3.6 | 17.8 | 7.9 | 8.8 | 6.9 |
| | Muscovite (wt%) | $KAl_2(AlSi_3O_{10})(OH)_2$ | 5.4 | 7.7 | 10.6 | 2.2 | 1.7 | 1.8 | 1.6 |
| | Albite (wt%) | $NaAlSi_3O_8$ | 22.7 | 47.8 | 40.4 | 0 | 43.0 | 42.5 | 43.6 |
| | Microcline (wt%) | $KAlSi_3O_8$ | 0.4 | 0 | 2.2 | 0 | 4.4 | 4.0 | 4.9 |
| | Biotite (wt%) | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | 11.1 | 0 | 15.5 | 17.0 | 8.7 | 6.3 | 11.2 |
| Inosilicate | Magnesiohornblende (wt%) | $Na.46Ca_{1.7}Mg_{3.44}Fe_{1.72}Al_{1.08}Si_{6.92}O_{23}(OH$ | 13.5 | 0 | 0 | 27.0 | 4.3 | 7.9 | 0.6 |
| | Diopside (wt%) | $CaMgSi_2O_6$ | 0.2 | 0.7 | 0 | 0 | 0.6 | 1.2 | 0 |
| Phyllosilicates | Phlogopite (wt%) | $KMg_3(AlSi_3O_{10})(OH)_2$ | 6.4 | 19.3 | 0 | 0 | 0 | 0 | 0 |
| Oxide Mineral | Magnetite (wt%) | $Fe_3O_4$ | 0.5 | 0 | 0.4 | 0.8 | 1.7 | 1.2 | 2.2 |
| | Brucite (wt%) | $Mg(OH)_2$ | 0.03 | 0 | 0 | 0.1 | 0 | 0 | 0 |
| | Hematite (wt%) | $Fe_2O_3$ | 0.1 | 0 | 0.3 | 0.2 | 0.1 | 0.2 | 0 |
| | Ilmenite (wt%) | $FeTiO_3$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Periclase (wt%) | MgO | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | Rutile (wt%) | $TiO_2$ | 0.2 | 0.5 | 0.4 | 0.0 | 0.3 | 0.4 | 0.2 |
| | Iron (wt%) | Fe | 0.1 | 0.0 | 0.0 | 0.3 | 0 | 0 | 0 |
| Carbonate | Dolomite (wt%) | $CaMg(CO_3)_2$ | 6.4 | 0.2 | 0.0 | 12.6 | 6.0 | 5.0 | 7.1 |
| | Calcite (wt%) | $CaCO_3$ | 2.7 | 1.3 | 5.1 | 2.8 | 3.4 | 3.6 | 3.1 |
| | Magnesite (wt%) | $MgCO_3$ | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Ankerite (wt%) | $CaFe(CO_3)_2$ | 0 | 0 | 0 | 0 | 0.1 | 0 | 0.1 |
| Sulphides | Pyrite (wt%) | $FeS_2$ | 0.6 | 0.3 | 0.6 | 0.8 | 0.4 | 0.3 | 0.6 |
| Sulphate | Gypsum (wt%) | $CaSO_4 \cdot 2H_2O$ | 0 | 0 | 0 | 0 | 0.1 | 0 | 0.2 |

## Table 4-9: East Malartic and Sheehan Mine Rock – Average Rietveld Analysis Results by Lithology

| Parameter | | | Sediment | Schist | Ultramafic | Porphyry |
|---|---|---|---|---|---|---|
| Count | | | 3 | 3 | 2 | 4 |
| Quartz | Quartz (wt%) | $SiO_2$ | 21.5 | 2.0 | 1.1 | 12.4 |
| Silicate | Talc (wt%) | $Mg_3Si_4O_{10}(OH)_2$ | 0 | 17.0 | 25.1 | 0.1 |
| Aluminosilicates | Chlorite (wt%) | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | 1.4 | 15.5 | 23.3 | 1.9 |
| | Muscovite (wt%) | $KAl_2(AlSi_3O_{10})(OH)_2$ | 8.7 | 0 | 3.3 | 2.5 |
| | Albite (wt%) | $NaAlSi_3O_8$ | 45.3 | 0 | 0 | 64.5 |
| | Microcline (wt%) | $KAlSi_3O_8$ | 0.7 | 0 | 0 | 6.6 |
| | Biotite (wt%) | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | 5.2 | 18.1 | 15.8 | 4.4 |
| Inosilicate | Magnesiohornblende (wt%) | $Na.46Ca_{1.7}Mg_{3.44}Fe_{1.72}Al_{1.08}Si_{6.92}O_{23}(OH)$ | 0 | 27.2 | 12.5 | 0 |
| | Diopside (wt%) | $CaMgSi_2O_6$ | 0.5 | 1.2 | 0 | 0 |
| Phyllosilicates | Phlogopite (wt%) | $KMg_3(AlSi_3O_{10})(OH)_2$ | 12.9 | 0 | 0 | 0 |
| Oxide Mineral | Magnetite (wt%) | $Fe_3O_4$ | 0.1 | 1.4 | 2.5 | 0.9 |
| | Brucite (wt%) | $Mg(OH)_2$ | 0 | 0.1 | 0 | 0 |
| | Hematite (wt%) | $Fe_2O_3$ | 0.1 | 0 | 0.2 | 0.2 |
| | Ilmenite (wt%) | $FeTiO_3$ | 0 | 0 | 0 | 0 |
| | Periclase (wt%) | MgO | 0 | 0 | 0 | 0 |
| Other | Rutile (wt%) | $TiO_2$ | 0.5 | 0 | 0 | 0.5 |
| | Iron (wt%) | Fe | 0 | 0.3 | 0 | 0 |
| Carbonate | Dolomite (wt%) | $CaMg(CO_3)_2$ | 0.1 | 14.7 | 13.2 | 0.9 |
| | Calcite (wt%) | $CaCO_3$ | 2.6 | 1.8 | 2.7 | 4.4 |
| | Magnesite (wt%) | $MgCO_3$ | 0 | 0 | 0 | 0 |
| | Ankerite (wt%) | $CaFe(CO_3)_2$ | 0 | 0 | 0 | 0.1 |
| Sulphides | Pyrite (wt%) | $FeS_2$ | 0.4 | 0.8 | 0.2 | 0.5 |
| Sulphate | Gypsum (wt%) | $CaSO_4 \cdot 2H_2O$ | 0 | 0 | 0 | 0.2 |

### 4.1.3 Leachability

A suite of leachability tests was performed on the mine rock and ore samples to further characterize the materials. *Directive 019* classification applies TCLP testing and comparative criteria to classify materials. In addition to TCLP testing this investigation also includes CTEU-9 testing and SPLP testing to characterize mine materials. The full leachability results from this testing program are shown in **Appendix B**.

Fourteen mine rock and ten ore samples were evaluated. The mine rock samples included seven samples from East Malartic and seven from the Sheehan deposit. The East Malartic samples include two from the development zone, two from the dilution hanging wall, and three from the dilution footwall. The Sheehan samples include four from the development zone and three from the dilution zone.

The parameters evaluated in the leachability testing are those where more than 10% of solids samples exceeded the « *critères génériques pour les sols* » *'A'* standards. For mine rock these parameters include silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc.

#### Neutralization Capacity Testing

The neutralization capacity test (MA. 110 – C. neu 1.0) is performed to determine the buffering capacity of the mine rock and serves as an indicator of the potential mobility of relevant constituents. The results of the neutralization capacity test do not directly determine mine rock classification but can instead be used to identify the preferred leachability test for subsequent classification.

Samples evaluated to have neutralization capacities of less than 3 eq/kg are recommended for TCLP testing whereas samples with neutralization capacities of 3 eq/kg or greater are recommended for CTEU-10 (*Lixiviation pour la valorisation de résidus*) testing. This recommendation is adapted from *Guide de Valorisation des Matières Résiduelles Inorganiques Non Dangereuses de Source Industrielle Comme Matériau de Construction* (MELCC, 2002*)* guidance*.*

All samples evaluated had neutralization capacities of less than 3 eq/kg and TCLP testing was performed, see **Appendix B**.

#### TCLP

The TCLP testing (MA. 100 – Lix.com. 1.1) uses prepared acetic acid solutions having pH values as low as 2.9. Low pH conditions like this are not expected for the non-potentially acid generating mine rock, with C/S ratios greater than 0.68 and therefore, the TCLP testing is considered to be an extreme test for assessing constituent leachability for the East Malartic and Sheehan materials meeting this C/S criterion.

The *Directive 019* categorization process applies the TCLP test with two sets of comparative criteria. These criteria are applied to identify materials that can be classified as low-risk, with results compared to « *résurgence dans l'eau de surface* » values, or classified as elevated risk with results compared to the « *Directive 019 Annexe II Tableau 1* » criteria.

The TCLP leachate concentrations for silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc were compared with the *Directive 019* low-risk criteria, « *résurgence dans l'eau de surface* » criteria of Annexe 7 of the *Guide d'intervention* (MELCC, 2019) in **Table 4-10** for the East Malartic and Sheehan zones.

The results of this conservative TCLP assessment show that for the East Malartic mine rock 86% of samples are greater than the manganese criterion, 43% are greater than the barium criterion, and 14% exceed the copper criterion. For the Sheehan mine rock samples 86% had TCLP concentrations greater than both the barium and manganese criteria, and 14% of samples were higher than the nickel criterion. For both deposits, at least one parameter's criterion was exceeded in each sample.

The TCLP leachate concentrations per lithology were compared with the *Directive 019* low-risk criteria, « *résurgence dans l'eau de surface* » criteria of Annexe 7 of the *Guide d'intervention* (MELCC, 2019) in **Table 4-11**. The results of this comparison show that manganese concentrations are elevated in most samples from any lithology, barium was elevated in most ultramafic, schist, and porphyry samples, and copper was only elevated in in one metasedimentary sample.

No samples produced TCLP leachate concentrations higher than the *Directive 019* elevated risk criteria (*Directive 019 Annexe II Tableau 1*).

**Table 4-10: East Malartic and Sheehan Mine Rock – TCLP Leachability, Directive 019 Criteria**

| Mine Rock | Parameter | Percentage of All Samples Exceeding Résurgence dans l'eau de surface Criteria | Percentage of Samples Exceeding Directive 019 - Annexe II Tableau 1[1] Criteria |
|---|---|---|---|
| East Malartic (n=7) | Silver | 0% | -- |
| | Barium | 43% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Copper | 14% | -- |
| | Manganese | 86% | -- |
| | Nickel | 0% | -- |
| | Zinc | 0% | -- |
| Sheehan (n=7) | Silver | 0% | -- |
| | Barium | 86% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Copper | 0% | -- |
| | Manganese | 86% | -- |
| | Nickel | 14% | -- |
| | Zinc | 0% | -- |

**Note:**

1) Silver, cobalt, copper, manganese, nickel, and zinc do not have prescribed criteria according to Directive 019 – Annexe II Tableau 1.

## Table 4-11: East Malartic and Sheehan Mine Rock – TCLP Leachability by Lithology, Directive 019 Criteria

| Mine Rock | Parameter | Percentage of All Samples Exceeding Résurgence dans l'eau de surface Criteria | Percentage of Samples Exceeding Directive 019 - Annexe II Tableau 1[1] Criteria |
|---|---|---|---|
| Sediment (n=4) | Silver | 0% | -- |
| | Barium | 25% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Copper | 25% | -- |
| | Manganese | 75% | -- |
| | Nickel | 0% | -- |
| | Zinc | 0% | -- |
| Schist (n=3) | Silver | 0% | -- |
| | Barium | 67% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Copper | 0% | -- |
| | Manganese | 100% | -- |
| | Nickel | 0% | -- |
| | Zinc | 0% | -- |
| Ultramafic (n=3) | Silver | 0% | -- |
| | Barium | 67% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Copper | 0% | -- |
| | Manganese | 67% | -- |
| | Nickel | 33% | -- |
| | Zinc | 0% | -- |
| Porphyry (n=4) | Silver | 0% | -- |
| | Barium | 100% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Copper | 0% | -- |
| | Manganese | 100% | -- |
| | Nickel | 0% | -- |
| | Zinc | 0% | -- |

**Note:**

1) Silver, cobalt, copper, manganese, nickel, and zinc do not have prescribed criteria according to Directive 019 – Annexe II Tableau 1.

### CTEU-9

The CTEU-9 test (MA. 100 – Lix.com. 1.1) is a 7-day neutral water leach (pH 7.0) test applied in mine rock categorization. The CTEU-9 test results were compared with potable water (*Règlement sur la qualité de l'eau potable, Q-2 r. 40*) and « *résurgence dans l'eau de surface* » criteria to support mine rock characterization. The results of the CTEU-9 leachate characterization are summarized per deposit in **Table 4-12**. No constituents from East Malartic exceeded the « *règlement sur la qualité de l'eau potable* » criteria or the « *résurgence dans l'eau de surface* » criteria. Whereas in the Sheehan samples some samples had barium and chromium had concentrations greater than the « *règlement sur la qualité de l'eau potable* » and one sample had a barium concentration greater than the « *résurgence dans l'eau de surface* » criterion.

The CTEU-9 test results were compared with potable water criteria per lithology in **Table 4-13**. No constituents from the metasedimentary and porphyry samples exceeded either the « *règlement sur la qualité de l'eau potable* » and « *résurgence dans l'eau de surface* » criteria. Some ultramafic samples had concentrations greater than the potable water criteria for chromium and barium one ultramafic sample had a barium concentration greater than the « *résurgence dans l'eau de surface* » criterion. Additionally, one schist sample had chromium concentrations greater than the potable water criterion with no schist samples having concentrations greater than « *résurgence dans l'eau de surface* » criteria.

**Table 4-12: East Malartic and Sheehan Mine Rock – CTEU-9 Leachability**

| Mine Rock | Parameter | Percentage of Samples Exceeding CTEU-9 Criteria | |
|---|---|---|---|
| | | Règlement sur la qualité de l'eau potable Criteria[1] | Résurgence dans l'eau de surface |
| East Malartic (n=7) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Sheehan (n=7) | Silver | -- | 0% |
| | Barium | 14% | 14% |
| | Cobalt | -- | 0% |
| | Chromium | 43% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |

**Note:**
1) Silver, cobalt, manganese, nickel, and zinc do not have comparative potable water criteria according to « *Règlement sur la qualité de l'eau potable* ».

## Table 4-13: East Malartic and Sheehan Mine Rock – CTEU-9 Leachability by Lithology

| Mine Rock | Parameter | Percentage of Samples Exceeding CTEU-9 Criteria | |
|---|---|---|---|
| | | Règlement sur la qualité de l'eau potable Criteria[1] | Résurgence dans l'eau de surface |
| Sediment (n=4) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Schist (n=3) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 33% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Ultramafic (n=3) | Silver | -- | 0% |
| | Barium | 33% | 33% |
| | Cobalt | -- | 0% |
| | Chromium | 67% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Porphyry (n=4) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |

**Note:**

1) Silver, cobalt, manganese, nickel, and zinc do not have comparative potable water criteria according to « *Règlement sur la qualité de l'eau potable* ».

### SPLP

The SPLP test (MA. 100 – Lix.com. 1.1) is an 18-hour acidic water leach (pH = 4.2) applied in mine rock categorization. The SPLP test results were compared with concentrations ten times the potable water criteria (*Règlement sur la qualité de l'eau potable, Q-2 r. 40*) and « *résurgence dans l'eau de surface* » criteria to support sample characterization. The results of the SPLP leachate characterization are summarized per deposit zone in **Table 4-14** and the results are summarized per lithology in **Table 4-15**.

No constituents exceeded ten times the « *règlement sur la qualité de l'eau potable* » criteria in the mine rock samples.

Barium was the sole constituent measured at concentrations greater than the « *résurgence dans l'eau de surface* » criterion. No samples from East Malartic had concentrations greater than the « *résurgence dans l'eau de surface* » criteria. Some samples from Sheehan had barium concentrations greater than their « *résurgence dans l'eau de surface* » criterion.

No constituents from the metasedimentary and schist samples exceeded « *résurgence dans l'eau de surface* » criteria whereas one ultramafic and one porphyry sample each had barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion.

**Table 4-14: East Malartic and Sheehan Mine Rock – SPLP Leachability**

| Mine Rock | Parameter | Percentage of Samples Exceeding SPLP Criteria | |
|---|---|---|---|
| | | Ten Times "Règlement sur la qualité de l'eau potable" Criteria[1] | Résurgence dans l'eau de surface |
| East Malartic (n=7) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Sheehan (n=7) | Silver | -- | 0% |
| | Barium | 0% | 29% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |

**Note:**
1) Silver, cobalt, manganese, nickel, and zinc do not have comparative potable water criteria according to « *Règlement sur la qualité de l'eau potable* ».

## Table 4-15: East Malartic and Sheehan Mine Rock – SPLP Leachability by Lithology

| Mine Rock | Parameter | Percentage of Samples Exceeding SPLP Criteria | |
|---|---|---|---|
| | | Ten Times "Règlement sur la qualité de l'eau potable" Criteria[1] | Résurgence dans l'eau de surface |
| Sediment (n=4) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Schist (n=3) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Ultramafic (n=3) | Silver | -- | 0% |
| | Barium | 0% | 33% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |
| Porphyry (n=4) | Silver | -- | 0% |
| | Barium | 0% | 25% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Copper | 0% | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Zinc | -- | 0% |

**Note:**

1) Silver, cobalt, manganese, nickel, and zinc do not have comparative potable water criteria according to « *Règlement sur la qualité de l'eau potable* ».

## 4.2 Ore

The *Directive 019* classification processes are principally applied to categorize mine materials for management purposes. This section summarizes the ABA, solids contents, and leachability information for the ore.

### 4.2.1 Ore - ABA

The same principles pertaining to mine rock ABA are also applied to ore characterization. As with the mine rock, described in **Section 3.1.1**, the Carb-NP values were compared to the Acisol-NP values, as illustrated in **Figure 3-4**.

Additionally, as indicated in **Figure 3-7** the relationships between C/S and Carb-NPR for samples with Carb-NPR less than 7 identifies that within this subset of materials (i.e. both mine rock and ore) a C/S ratio of approximately 0.68 equates a Carb-NPR value of 2 that can be used for non-PAG material identification. Similarly, a C/S ratio of approximately 0.39 equates a Carb-NPR value of 1 that can be used to identify PAG materials. Mine rock with C/S values between 0.39 and 0.68 would be classified as having an uncertain potential for acid generation and would be of lower risk than PAG materials.

The relationship between C/S values and sulphide contents for the ore is presented in **Figure 4-4** and the proportions of PAG and non-PAG materials are summarized in **Table 4-16**. Approximately 65% of all ore samples have non-PAG C/S values, 20% have an uncertain potential for acid generation, and 15% are PAG. The Sheehan deposit ore samples were 80% non-PAG whereas 50% of ore samples from East Malartic were non-PAG.

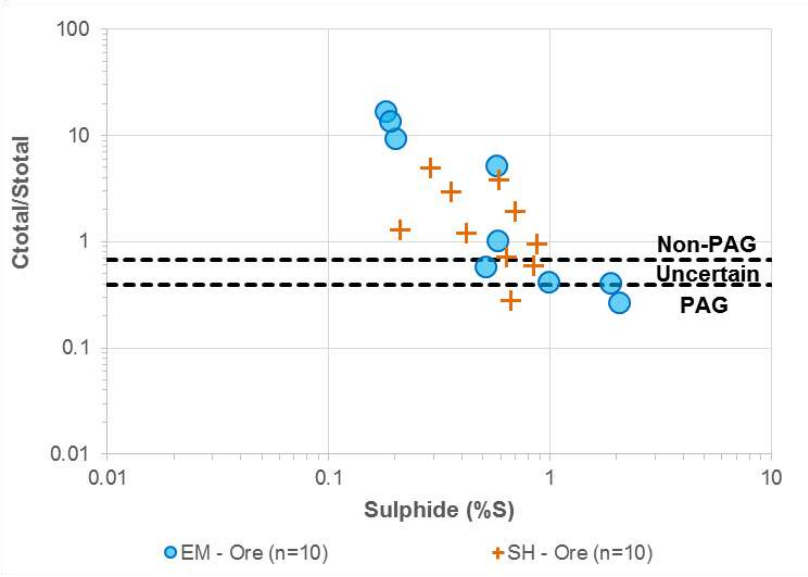


**Figure 4-4: C/S vs. Sulphide (%S) for East Malartic and Sheehan Ore (n=20)**

**Table 4-16: East Malartic and Sheehan Ore – Acid Generation Potential Summary**

| Location | Count | PAG C/S < 0.39 | Uncertain 0.39 ≥ C/S > 0.68 | Non-PAG C/S ≥ 0.68 |
|---|---|---|---|---|
| East Malartic | 10 | 2 | 3 | 5 |
| | | 20% | 30% | 50% |
| Sheehan | 10 | 1 | 1 | 8 |
| | | 10% | 10% | 80% |
| All Ore | 20 | 3 | 4 | 13 |
| | | 15% | 20% | 65% |

### 4.2.2 Solids Contents

The solids contents were compared to the « *critères génériques pour les sols* » 'A' standards to provide a consistent comparative metric between the mine rock and the ore. As with the mine rock if more than 10% of samples exceed these standards for a particular parameter then that parameter is identified as a parameter of concern that will be discussed more detail in the leachate criteria analyses. For the ore silver, barium, cobalt, chromium, manganese, molybdenum, and nickel each had more than 10% of samples exceed the 'A' level standards, **Table 4-17**.

This parameter list is generally very similar to the mine rock list shown in **Table 4-3**. The cobalt, chromium, and nickel exceedance percentages were similar in mine rock and ore. The barium, copper, and zinc exceedances were lower in the ore than in mine rock, and the silver, manganese, lead, and molybdenum exceedance percentages were greater in the ore than in the mine rock.

**Table 4-17: East Malartic and Sheehan Ore - Parameters with more than 10% of Samples Exceeding Critères Génériques pour les Sols – 'A' Standards**

| Parameter | Percentage of Samples Exceeding Critères Génériques pour les Sols – 'A' Criteria |
|---|---|
| Silver | 70% |
| Barium | 30% |
| Cobalt | 50% |
| Chromium | 80% |
| Manganese | 20% |
| Molybdenum | 30% |
| Nickel | 80% |
| Lead | 20% |

The solids contents for these parameters are summarized for the East Malartic and Sheehan ore in **Table 4-18**. The East Malartic ore has higher silver, manganese, and lead contents whereas the Sheehan ore has higher barium and nickel contents with similar cobalt, chromium, and molybdenum contents in the two ore sources.

**Table 4-18: East Malartic and Sheehan Ore – Solids Contents Summary**

| Parameter | | Critères Génériques pour les Sols – 'A' | East Malartic Ore | Sheehan Ore |
|---|---|---|---|---|
| | | | n=10 | n=10 |
| Silver | Median Content (mg/kg) | 0.5 | ***0.92*** | 0.57 |
| | Average Content (mg/kg) | | ***1.20*** | 0.80 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 90% | 50% |
| Barium | Median Content (mg/kg) | 240 | 145 | ***235*** |
| | Average Content (mg/kg) | | 150 | ***242*** |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 20% | 40% |
| Cobalt | Median Content (mg/kg) | 30 | ***32*** | 29 |
| | Average Content (mg/kg) | | ***33*** | 32 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 50% | 50% |
| Chromium | Median Content (mg/kg) | 100 | 365 | ***495*** |
| | Average Content (mg/kg) | | ***573*** | 511 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 100% | 60% |
| Molybdenum | Median Content (mg/kg) | 8 | 5 | ***5*** |
| | Average Content (mg/kg) | | ***11*** | 6 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 40% | 20% |
| Manganese | Median Content (mg/kg) | 1000 | ***650*** | 450 |
| | Average Content (mg/kg) | | ***725*** | 528 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 30% | 10% |
| Nickel | Median Content (mg/kg) | 50 | 185 | ***233*** |
| | Average Content (mg/kg) | | 242 | ***253*** |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 100% | 60% |
| Lead | Median Content (mg/kg) | 40 | ***15*** | 9 |
| | Average Content (mg/kg) | | ***22*** | 17 |
| | Percentage of Samples Exceeding "Critères Génériques pour les Sols" – 'A' Criteria | | 20% | 20% |

**Notes:**
Bolded and italicized values indicate the location with the highest average and median contents.
Shaded values indicate values greater than "Critères Génériques pour les Sols" – 'A' values.

### Whole Rock Analysis

The whole rock analysis contents for the East Malartic and Sheehan ore samples are summarized in **Table 4-19**. $SiO_2$, MgO, and $Al_2O_3$ are the dominant oxides in ore. In general, both the East Malartic and Sheehan ore consist of similar materials. Full analysis results are presented in **Appendix B**.

**Table 4-19: East Malartic and Sheehan Ore – Average Whole Rock Analysis Results**

| Parameter | All Ore | East Malartic Ore | Sheehan Ore |
|---|---|---|---|
| **Count** | 10 | 5 | 5 |
| $SiO_2$ (%) | 53.6 | 53.9 | 53.2 |
| $Al_2O_3$ (%) | 9.9 | 10.3 | 9.5 |
| $Fe_2O_3$ (%) | 6.6 | 6.6 | 6.6 |
| MgO (%) | 10.1 | 9.5 | 10.7 |
| CaO (%) | 5.4 | 5.1 | 5.8 |
| $Na_2O$ (%) | 2.4 | 2.7 | 2.1 |
| $K_2O$ (%) | 3.6 | 3.1 | 4.1 |
| $TiO_2$ (%) | 0.4 | 0.4 | 0.4 |
| $P_2O_5$ (%) | 0.1 | 0.09 | 0.1 |
| MnO (%) | 0.1 | 0.1 | 0.1 |
| $Cr_2O_3$ (%) | 0.1 | 0.1 | 0.2 |
| $V_2O_5$ (%) | 0.02 | 0.02 | 0.02 |
| Loss on ignition (%) | 6.2 | 6.7 | 5.8 |

### Rietveld Analysis

The average Rietveld analysis results for the East Malartic and Sheehan ore are summarized in **Table 4-20** and full analytical results are provided in **Appendix B**. In general the majority of the ore is constituted of albite, quartz, and biotite. Though many minerals were present in similar proportions in the East Malartic and Sheehan ore there were large differences in the quartz, muscovite, microcline, biotite, and phlogopite contents. Quartz and phlogopite are present in greater proportions in the East Malartic ore whereas muscovite, microcline, and biotite are present in greater proportions in the Sheehan ore.

The sole source of sulphur is pyrite with average pyrite contents reaching up to 0.9% in the ore. Additionally, three sources of carbonates were identified: dolomite, calcite, and magnesite. These carbonates are considered to be 100% effective at providing neutralization potential and further validate the use of Carb-NP as a measure of effective neutralization potential in ore.

**Table 4-20: East Malartic and Sheehan Ore – Average Rietveld Analysis Results by Zone and Location**

| Parameter | | | All Ore | East Malartic Ore | Sheehan Ore |
|---|---|---|---|---|---|
| Count | | | 6 | 3 | 3 |
| Quartz | Quartz (wt%) | $SiO_2$ | 15.1 | 19.9 | 10.3 |
| Silicate | Talc (wt%) | $Mg_3Si_4O_{10}(OH)_2$ | 7.6 | 6.8 | 8.4 |
| Aluminosilicates | Chlorite (wt%) | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | 6.2 | 5.8 | 6.5 |
| | Muscovite (wt%) | $KAl_2(AlSi_3O_{10})(OH)_2$ | 1.8 | 0.3 | 3.3 |
| | Albite (wt%) | $NaAlSi_3O_8$ | 32.8 | 34.2 | 31.4 |
| | Microcline (wt%) | $KAlSi_3O_8$ | 5.8 | 1.7 | 9.9 |
| | Biotite (wt%) | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | 9.3 | 5.5 | 13.1 |
| Inosilicate | Magnesiohornblende (wt%) | $Na.46Ca_{1.7}Mg_{3.44}Fe_{1.72}Al_{1.08}Si_{6.92}O_{23}(OH)$ | 2.2 | 1.3 | 3.1 |
| | Diopside (wt%) | $CaMgSi_2O_6$ | 0.4 | 0 | 0.8 |
| Phyllosilicates | Phlogopite (wt%) | $KMg_3(AlSi_3O_{10})(OH)_2$ | 5.6 | 11.2 | 0 |
| Oxide Mineral | Magnetite (wt%) | $Fe_3O_4$ | 0.1 | 0.1 | 0.2 |
| | Brucite (wt%) | $Mg(OH)_2$ | 0 | 0 | 0 |
| | Hematite (wt%) | $Fe_2O_3$ | 0.2 | 0 | 0.4 |
| | Ilmenite (wt%) | $FeTiO_3$ | 0.1 | 0 | 0.2 |
| | Periclase (wt%) | MgO | 0.2 | 0 | 0.4 |
| Other | Rutile (wt%) | $TiO_2$ | 0.1 | 0.1 | 0.1 |
| | Iron (wt%) | Fe | 0 | 0 | 0 |
| Carbonate | Dolomite (wt%) | $CaMg(CO_3)_2$ | 6.1 | 6.7 | 5.5 |
| | Calcite (wt%) | $CaCO_3$ | 5.3 | 5.6 | 4.9 |
| | Magnesite (wt%) | $MgCO_3$ | 0.6 | 0 | 1.1 |
| | Ankerite (wt%) | $CaFe(CO_3)_2$ | 0 | 0 | 0 |
| Sulphides | Pyrite (wt%) | $FeS_2$ | 0.6 | 0.9 | 0.4 |
| Sulphate | Gypsum (wt%) | $CaSO_4 \cdot 2H_2O$ | 0 | 0 | 0 |

### 4.2.3 Leachability

Leachability and neutralisation capacity tests were also performed on the ore samples. Five ore samples were from the East Malartic deposit and five samples were from the Sheehan deposit. Consistent with the mine rock, the neutralization capacity testing identified that all ore samples had low neutralisation capacities of less than 3 eq/kg.

Samples evaluated to have neutralization capacities of less than 3 eq/kg are recommended for TCLP testing whereas samples with neutralization capacities of 3 eq/kg or greater are recommended for CTEU-10 (*Lixiviation pour la valorisation de résidus*) testing. This recommendation is adapted from *Guide de Valorisation des Matières Résiduelles Inorganiques Non Dangereuses de Source Industrielle Comme Matériau de Construction* (MELCC, 2002*)* guidance*.*

For consistency with the mine rock comparison leachability comparison (**Section 4.1.3**) the TCLP results are compared with the *Directive 019* low-risk criteria, « *résurgence dans l'eau de surface* » criteria of Annexe 7 of the *Guide d'intervention* (MELCC, 2019) and the *Directive 019* elevated risk criteria (*Directive 019 Annexe II Tableau 1*), the CTEU-9 results are compared with potable water criteria (*Règlement sur la qualité de l'eau potable, Q-2 r. 40*) in addition to « *résurgence dans l'eau de surface* » criteria, lastly the SPLP results are

compared with ten times the potable water criteria in addition to « *résurgence dans l'eau de surface* » criteria.

The parameters evaluated in the leachability testing are those where more than 10% of the ore samples exceeded the « *critères génériques pour les sols* » *'A'* standards. These parameters include silver, barium, cobalt, chromium, manganese, molybdenum, nickel, and lead.

The test results are summarized for in **Table 4-21** for TCLP results, **Table 4-22** for CTEU-9 results, and **Table 4-23** for the SPLP results. Full leachability results are presented in **Appendix B**.

The TCLP leachate barium, manganese, and lead concentrations were greater than the comparative *Directive 019* « *résurgence dans l'eau de surface* » values for many ore samples. All ore samples had manganese concentrations greater than the comparative criterion, all Sheehan samples had barium concentrations greater than the comparative criterion, some East Malartic ore samples had barium concentrations greater than the criterion, and some samples from each of East Malartic and Sheehan had lead concentrations greater than their criterion. The barium and manganese TCLP leachate concentrations were also elevated in a large proportion of the East Malartic and Sheehan mine rock.

No ore samples exceeded the *Directive 019* elevated risk criteria (*Directive 019 Annexe II Tableau 1*).

A single East Malartic ore sample had a CTEU-9 leachate chromium concentration greater than the « *règlement sur la qualité de l'eau potable* » comparative value. All other samples had CTEU-9 leachate concentrations lower than the comparative values. Additionally, one East Malartic ore sample had a CTEU-9 leachate barium concentration greater than its « *résurgence dans l'eau de surface* » criterion and one Sheehan ore sample had a CTEU-9 leachate molybdenum concentration greater than its « *résurgence dans l'eau de surface* » criterion value.

No SPLP test concentrations exceeded the ten times « *règlement sur la qualité de l'eau potable* » criteria and one sample from each of the East Malartic and Sheehan ore samples had SPLP leachate barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion.

**Table 4-21: East Malartic and Sheehan Ore – TCLP Leachability, Directive 019 Criteria**

| Ore | Parameter | Percentage of All Samples Exceeding Résurgence dans l'eau de surface Criteria | Percentage of Samples Exceeding Directive 019 - Annexe II Tableau 1[1] Criteria |
|---|---|---|---|
| East Malartic (n=5) | Silver | 0% | -- |
| | Barium | 60% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Molybdenum | 0% | -- |
| | Manganese | 100% | -- |
| | Nickel | 0% | -- |
| | Lead | 80% | 0% |
| Sheehan (n=5) | Silver | 0% | -- |
| | Barium | 100% | 0% |
| | Cobalt | 0% | -- |
| | Chromium | 0% | 0% |
| | Molybdenum | 0% | -- |
| | Manganese | 100% | -- |
| | Nickel | 0% | -- |
| | Lead | 40% | 0% |

**Note:**
1) Silver, cobalt, molybdenum, manganese, and nickel do not have prescribed criteria according to Directive 019 – Annexe II Tableau 1.

**Table 4-22: East Malartic and Sheehan Ore – CTEU-9 Leachability**

| Ore | Parameter | Percentage of Samples Exceeding CTEU-9 Criteria | |
|---|---|---|---|
| | | Règlement sur la qualité de l'eau potable Criteria[1] | Résurgence dans l'eau de surface |
| East Malartic (n=5) | Silver | -- | 0% |
| | Barium | 0% | 20% |
| | Cobalt | -- | 0% |
| | Chromium | 20% | 0% |
| | Molybdenum | -- | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Lead | 0% | 0% |
| Sheehan (n=5) | Silver | -- | 0% |
| | Barium | 0% | 0% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Molybdenum | -- | 20% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Lead | 0% | 0% |

**Note:**
1) Silver, cobalt, molybdenum, manganese, and nickel do not have prescribed criteria according to the « *Règlement sur la qualité de l'eau potable* ».

**Table 4-23: East Malartic and Sheehan Ore – SPLP Leachability**

| Ore | Parameter | Percentage of Samples Exceeding SPLP Criteria | |
|---|---|---|---|
| | | Ten Times "Règlement sur la qualité de l'eau potable" Criteria[1] | Résurgence dans l'eau de surface |
| East Malartic (n=5) | Silver | -- | 0% |
| | Barium | 0% | 20% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Molybdenum | -- | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Lead | 0% | 0% |
| Sheehan (n=5) | Silver | -- | 0% |
| | Barium | 0% | 20% |
| | Cobalt | -- | 0% |
| | Chromium | 0% | 0% |
| | Molybdenum | -- | 0% |
| | Manganese | -- | 0% |
| | Nickel | -- | 0% |
| | Lead | 0% | 0% |

**Note:**
1) Silver, cobalt, molybdenum, manganese, and nickel do not have prescribed criteria according to the « *Règlement sur la qualité de l'eau potable* ».

# 5.0 MINE MATERIALS CHARACTERIZATION

The mine rock and ore from this investigation were evaluated according to the *Directive 019* characterization approach, as detailed in **Appendix C**, and the results of these characterizations are presented herein.

## 5.1 Mine Rock – Directive 019 Classification

As per the *Directive 019* materials classification approach, **Appendix C**, materials can meet low-risk criteria if they satisfy ABA requirements and also meet either the soil criteria for the solids or the groundwater protection criteria for the TCLP leach. Materials satisfying these low-risk criteria can have different usability constraints than higher-risk or leachable materials. For example, low-risk materials, as defined by *Directive 019*, can be considered usable for on-site and select off-site construction purposes.

The results of the *Directive 019* low-risk material classification process using the C/S values and the TCLP results for the East Malartic and Sheehan mine rock indicate that none of the mine rock meets the low-risk classification standards. Even though approximately 40% of the East Malartic mine rock and 100% of the Sheehan mine rock was non-PAG, with PAG determination principally controlled by the C/S values of the metasedimentary samples, the TCLP leachate concentrations resulted in exclusion from the low-risk category. The manganese and barium concentrations in the TCLP leachate were the most common constituents exceeding their respective TCLP criteria.

A TCLP test uses prepared acetic acid solutions having pH values as low as 2.9 are not expected to represent conditions that non-potentially acid generating mine rock would encounter. As was presented in **Table 4-2** the metasedimentary samples are responsible for the majority of the PAG and uncertain potential for acid generation classification at East Malartic whereas all porphyry and ultramafic mine rock samples from East Malartic and Sheehan were non-PAG and 83% of the schist samples were non-PAG.

### 5.1.1 Mine Rock - Alternative Reasonable Leachability Criteria for non-PAG Material

The TCLP tests using prepared acetic acid solutions with pH values as low as 2.9 are not expected to represent conditions that the non-potentially acid generating mine materials would encounter. Alternative leach tests are recommended for the classification of non-PAG mine rock and ore. These tests would include the SPLP (synthetic precipitation leaching procedure) and CTEU-9 (7-day neutral water leach extraction) tests that are applied in the *Guide de Valorisation des Matières Résiduelles Inorganiques Non Dangereuses de Source Industrielle Comme Matériau de Construction (Guide de Valorisation in* MELCC, 2002).

The SPLP testing involves leaching with prepared solutions of pH 4.2 and the CTEU-9 testing involves leaching with neutral water (pH 7.0) over a period of 7 days and are expected to better represent conditions that mine rock would encounter in the environment. As per the *Guide de Valorisation* approach the CTEU-9 leachate is compared with potable water criteria (Règlement sur la qualité de l'eau potable, Q-2 r. 40) in addition to the « résurgence dans l'eau de surface » values and the SPLP leachate is compared with concentrations ten times that of potable water criteria in addition to the « résurgence dans l'eau de surface » values. Materials satisfying CTEU-9 and SPLP leachate criteria are recommended to also be categorized as low-risk, materials that do not meet both criteria are recommended to be classified as either moderate or high risk.

To account for the variability in individual samples the constituent concentrations are not considered to exceed the SPLP and CTEU-9 criteria unless at least 10% of the samples exceed the applicable criteria per constituent.

The constituents evaluated in this mine rock leachate comparison include silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc and are those with more than 10% of the samples exceeding the level 'A' generic soil criteria.

The deposit specific leachability results mine, as summarized in **Section 4.1.3** are used to separately characterize the East Malartic and Sheehan mine rock. The logic for this reasonable approach to low-risk material identification using the CTEU-9 and SPLP leachate criteria is shown for East Malartic mine rock in **Figure 5-1** and for Sheehan mine rock in **Figure 5-2**.

Approximately 40% of the East Malartic mine rock will meet the site-specific C/S criteria and these leachability criteria for low-risk classification. All East Malartic mine rock samples had CTEU-9 and SPLP concentrations lower than their comparative criteria. The principal reason why East Malartic rock did not satisfy the criteria is due to the prevalence of PAG and uncertain acid generation potential metasedimentary materials from the development and dilution hanging wall areas.

Approximately 42.8% of the Sheehan mine rock will meet the site-specific C/S criteria and these leachability criteria. All Sheehan mine rock met the C/S criteria and the principal reason why Sheehan mine rock did not satisfy the criteria is due to the barium and chromium concentrations in the CTEU-9 leachate.

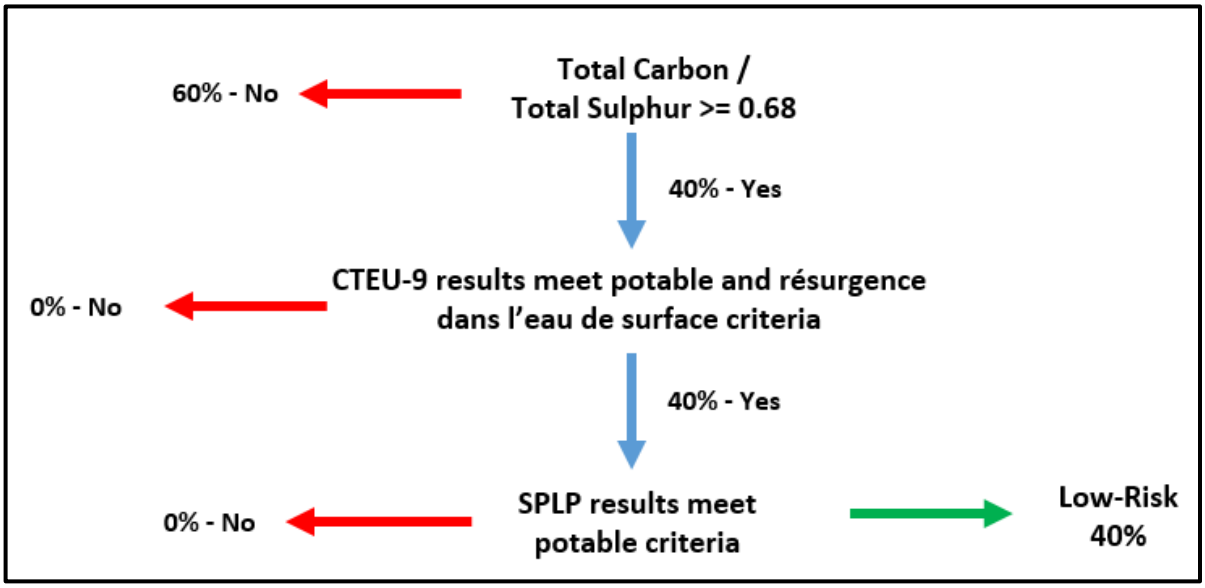


**Figure 5-1: East Malartic Mine Rock Classification – CTEU-9 and SPLP Leachability Criteria**

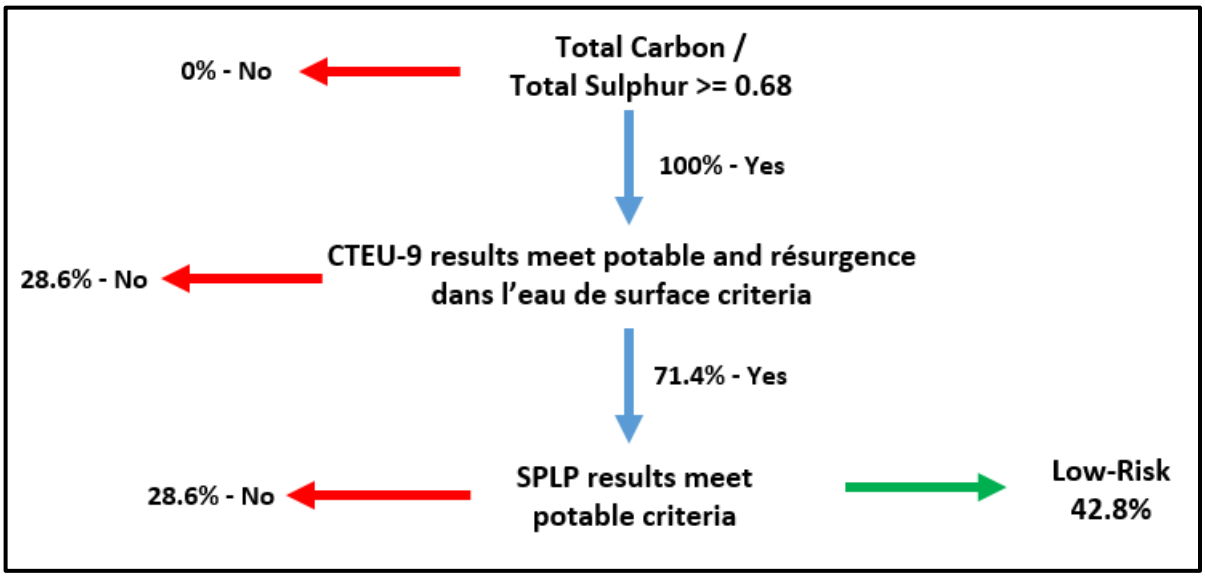


**Figure 5-2: Sheehan Mine Rock Classification – CTEU-9 and SPLP Leachability Criteria**

## 5.2 Ore – Directive 019 Classification

To serve as a comparison to the mine rock quality the ore was also compared against the *Directive 019* low-risk materials classification process. The results of the *Directive 019* low-risk material classification process using the C/S values and the TCLP results for the East Malartic and Sheehan ore indicate that none of the ore meets the low-risk classification standards. Even though significant proportions of the ore were non-PAG the TCLP leachate concentrations resulted in exclusion from the low-risk category. The manganese, barium, and lead concentrations in the TCLP leachate were the most common constituents exceeding their respective TCLP criteria.

TCLP testing using prepared acetic acid solutions having pH values as low as 2.9 are not expected to represent conditions that non-potentially acid generating ore would encounter.

### 5.2.1 Ore - Alternative Reasonable Leachability Criteria for non-PAG Material

Consistent with mine rock, TCLP tests using prepared acetic acid solutions with pH values as low as 2.9 are not expected to represent conditions that the non-potentially acid generating ore would encounter. Alternative leach tests are recommended for the classification of non-PAG ore. These tests would include the SPLP (synthetic precipitation leaching procedure) and CTEU-9 (7-day neutral water leach extraction) tests that are applied in the *Guide de Valorisation des Matières Résiduelles Inorganiques Non Dangereuses de Source Industrielle Comme Matériau de Construction (Guide de Valorisation in* MELCC, 2002).

As with mine rock, the constituent concentrations are not considered to exceed the SPLP and CTEU-9 criteria unless at least 10% of the samples exceed the applicable criteria per constituent.

The constituents evaluated in this ore leachate comparison include silver, barium, cobalt, chromium, manganese, molybdenum, nickel, and lead and are those with more than 10% of the samples exceeding the level ‘A’ generic soil criteria values.

As the deposit-specific leachability results for ore from East Malartic and Sheehan were similar to one another (**Section 4.2.3**), and in consideration of the smaller dataset of leachability results for ore than for waste rock the leachability results for ore samples from both East Malartic and Sheehan were grouped for the purposes of this approach to characterization.

The logic for this reasonable approach to low-risk material identification using the CTEU-9 and SPLP leachate criteria is shown for East Malartic ore in **Figure 5-3** and for Sheehan ore in **Figure 5-4**.

Approximately 42.5% of the East Malartic ore will meet the site-specific C/S criteria and the CTEU-9 and SPLP leachability criteria for low-risk classification. The principal reason why East Malartic ore did not satisfy the criteria is due to the proportions of PAG and uncertain ore samples.

Approximately 68% of the Sheehan ore will meet the site-specific C/S criteria and these leachability criteria.

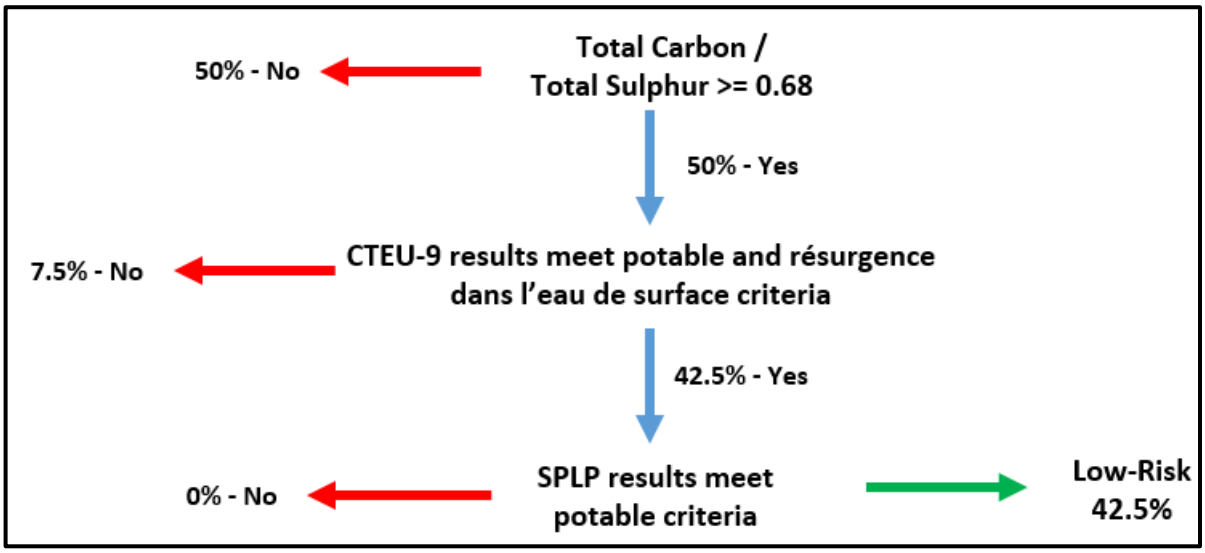


**Figure 5-3: East Malartic Ore – CTEU-9 and SPLP Leachability Criteria**

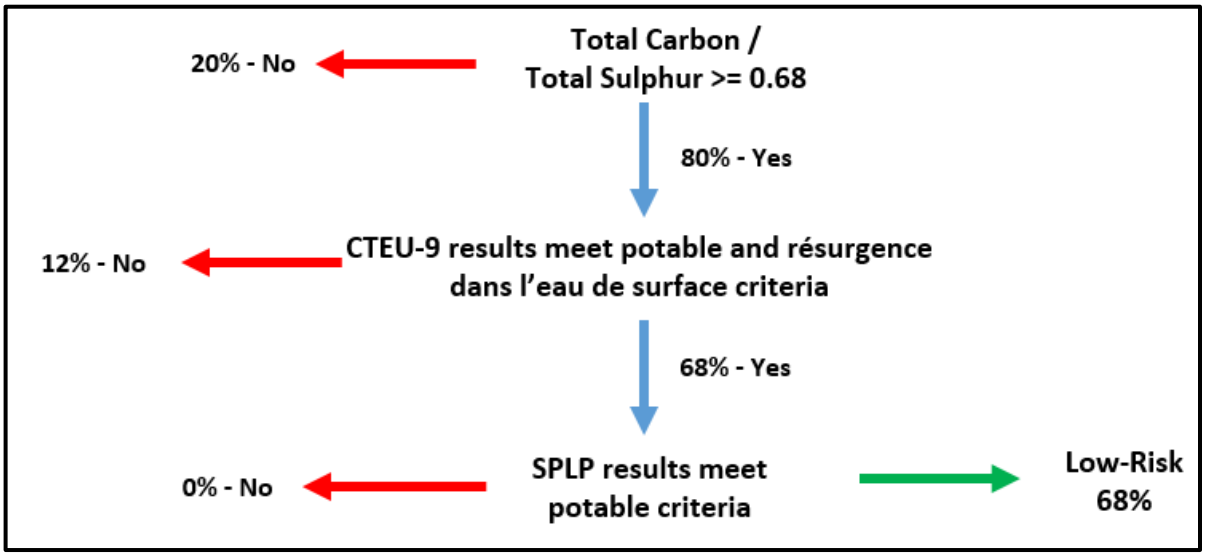


**Figure 5-4: Sheehan Ore – CTEU-9 and SPLP Leachability Criteria**

# 6.0 COMPARISON TO OTHER CANADIAN MALARTIC MATERIALS

## 6.1.1 Mine Rock

This characterization study identified that the Sheehan deposit has higher proportions of non-PAG rock and ore than the East Malartic deposit. In general, East Malartic mine rock ABA characteristics are more closely comparable to those of the Canadian Malartic rock whereas the Sheehan rock is generally more reflective of the Odyssey mine rock characteristics.

The East Malartic mine rock has higher proportions of non-PAG materials (40% non-PAG) than the ongoing Canadian Malartic operation (25% non-PAG) as reported in EcoMetrix (2017b) but has lower proportions of non-PAG rock than the Odyssey mine rock (92% non-PAG) as reported in EcoMetrix (2017a). All of the Sheehan mine rock was non-PAG which is similar to the results for Odyssey mine rock where approximately 92% of the mine rock was non-PAG.

For both the East Malartic and Sheehan mine rock the TCLP leachate concentrations resulted in all samples being excluded from *Directive 019* low-risk classification. The barium and manganese concentrations in TCLP leachate were the primary factors for not meeting the low-risk classification (**Table 4-1**). Barium TCLP concentrations have consistently been a principal factor for exclusion from *Directive 019* low-risk classification of mine rock in both the Canadian Malartic and Odyssey deposits (EcoMetrix, 2017a and 2017b).

The application of an alternative reasonable criterion (**Section 5.1.1**) for low-risk materials classification where only non-PAG materials are evaluated according to SPLP and CTEU-9 leachability results in approximately 40%% of East Malartic mine rock being low-risk and 42.8% of the Sheehan mine rock being low-risk. For reference, this alternative reasonable criterion was also evaluated for the Canadian Malartic deposit where approximately 20.5% of the mine rock met these low risk criteria.

## 6.1.2 Ore

East Malartic and Sheehan ore characteristics are presented in comparison to historical Odyssey (EcoMetrix, 2017a) and Barnat ore and tailings characterization (EcoMetrix, 2018). In general, the East Malartic and Sheehan ore characteristics were more consistent with that observed at Odyssey and generally has higher proportions of non-PAG materials than ore from the Barnat deposit.

The East Malartic ore is approximately 50% non-PAG. This proportion is higher than at Barnat where approximately 22% of the ore was non-PAG and is lower than at Odyssey

where 75% was non-PAG. The Sheehan ore is approximately 80% non-PAG and this proportion is most directly comparable to the Odyssey ore.

For both the East Malartic and Sheehan ore the TCLP leachate concentrations resulted in all samples being excluded from *Directive 019* low-risk classification. Barium, lead, and manganese concentrations in TCLP leachate were the primary factors for not meeting the low-risk classification (**Table 4-21**). If, for comparative purposes, the ore was also evaluated against the alternative reasonable leachability criterion for non-PAG materials 42.5% of the East Malartic ore would be low-risk and 68% of the Sheehan ore would be low-risk. For reference, if Odyssey ore were evaluated against the alternative low-risk leachability criterion then approximately 75% of the ore would be low-risk (EcoMetrix, 2017a).

# 7.0 RECOMMENDATIONS AND SUMMARY

## 7.1 Recommendations

In consideration of the East Malartic and Sheehan mine rock quality no additional management measures are required for incorporating these rocks into the Canadian Malartic operation. The East Malartic and Sheehan mine rock can be safely managed within the existing Canadian Malartic mine rock storage areas under existing mine management procedures.

If East Malartic and Sheehan ore samples are reasonable surrogates of tailings quality and knowing that existing Canadian Malartic storage management procedures handle all tailings as potentially acid generating then no additional management measures are required for incorporating East Malartic and Sheehan tailings into the Canadian Malartic operation. The East Malartic and Sheehan tailings can be safely managed within existing Canadian Malartic tailings storage areas under existing mine management procedures. However, tailings-specific geochemical testing is recommended to confirm potential relationships between ore and tailings quality.

## 7.2 Characterization Summary

### 7.2.1 East Malartic Mine Rock

A practical and effective means of classifying the acid generation characteristics of mine rock at East Malartic was applied from observed relationships between Carb-NPR and the C/S ratio. Total carbon (C) is a surrogate for carbonate and total sulphur (S) is a surrogate for sulphide content of the mine rock. Using this approach it was found that mine rock with C/S values greater than 0.68 are non-PAG, samples with C/S values lower than 0.39 are PAG, and samples with values between 0.39 and 0.68 have an uncertain potential for acid generation.

Geochemical testing of mine rock from the East Malartic zone identified that:

- Approximately 40% of the mine rock is non-PAG. The majority of the PAG rock is from metasedimentary rock. None of the material meets the *Directive 019* low-risk material criteria principally due to elevated barium and manganese concentrations in the TCLP leachate.
- Approximately 40% of the mine rock is low-risk according to a reasonable alternative leachability criterion (**Section 5.1.1**) applying SPLP and CTUE-9 criteria to non-PAG rock as an alternative to the TCLP criteria;
- Mine rock from the East Malartic zones tends to have higher metals contents than at the Sheehan deposit;

  - The highest metals contents for many parameters were identified in the footwall whereas barium and zinc were most elevated in development materials.
  - Silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc concentrations were elevated in at least one lithology from either the East Malartic zone or Sheehan zone and were carried forward as constituents of concern used in interpreting leachability test results.
- Rietveld XRD analyses show that the mine rock is dominated by quartz and aluminosilicates and that:
  - Two carbonate minerals were identified as dominant: dolomite ($Ca,Mg(CO_3)_2$) and calcite ($CaCO_3$). These two minerals provide effective neutralization potential.
  - Pyrite ($FeS_2$) is the only source of sulphide.
- Leachability testing via the aggressive TCLP test shows that barium, manganese, and copper can leach at elevated concentrations under acidic conditions compared to the « *résurgence dans l'eau de surface criteria* »;
- CTEU-9 and SPLP test results do not exhibit concentrations greater than their respective comparative criteria.

### 7.2.2 Sheehan Mine Rock

Consistent with the East Malartic rock a C/S ratio can be used to determine the proportions of potentially acid generating rock at Sheehan. Mine rock with C/S values greater than 0.68 are non-PAG, samples with C/S values lower than 0.39 are PAG, and samples with values between 0.39 and 0.68 have an uncertain potential for acid generation.

Geochemical testing of mine rock from the Sheehan zone identified that:

- All Sheehan mine rock is non-PAG. None of the material meets the *Directive 019* low-risk material criteria principally due to elevated barium and manganese concentrations in the TCLP leachate.
- Approximately 42.8% of the mine rock is low-risk according to a reasonable alternative leachability criterion (**Section 5.1.1**) applying SPLP and CTUE-9 criteria to non-PAG rock as an alternative to the TCLP criteria.
- Mine rock from the Sheehan zones tends to have lower metals contents than at the East Malartic deposit;

The metals contents of rock from the development and dilution zones were generally similar to one another though the development zone materials tended to have higher barium, cobalt, chromium, and nickel contents (**Table 4-4**).

  - Silver, barium, cobalt, chromium, copper, manganese, nickel, and zinc concentrations were elevated in at least one lithology from either the East Malartic zone or Sheehan zone and were carried forward as parameters of concern used in interpreting leachability test results.

- Rietveld XRD analyses show that the mine rock is dominated by quartz and aluminosilicates and that:
  - Three carbonate minerals were identified: dolomite ($Ca,Mg(CO_3)_2$), calcite ($CaCO_3$), and ankerite ($Ca,Fe(CO_3)_2$). The relative quantities of ankerite, which provides effective neutralization only for the calcium portion of the mineral, is low and the vast majority of the carbonate content is represented by calcium and magnesium carbonates and will provide effective neutralization.
  - Pyrite ($FeS_2$) is the only source of sulphide.
- Leachability testing via the aggressive TCLP test shows that barium, manganese, and nickel can leach at elevated concentrations under acidic conditions compared to the « *résurgence dans l'eau de surface criteria* »;
- In the CTEU-9 leachate some samples had barium and chromium concentrations greater than the « *règlement sur la qualité de l'eau potable* » and the « *résurgence dans l'eau de surface* » criteria; and
- Some samples had SPLP leachate barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion though all concentrations were lower than the comparative « *règlement sur la qualité de l'eau potable* » criterion.

### 7.2.3 East Malartic Ore

Consistent with the mine rock samples evaluated C/S ratios were also found to be effective in determining the proportions of potentially acid generating ore at the East Malartic deposit. Mine rock with C/S values greater than 0.68 are non-PAG, samples with C/S values lower than 0.39 are PAG, and samples with values between 0.39 and 0.68 have an uncertain potential for acid generation.

Geochemical testing of ore from the East Malartic deposit identified that:

- East Malartic ore samples were 50% non-PAG;
- None of the ore is considered low-risk according to *Directive 019* in consideration of the TCLP results for barium, manganese, and lead;
- Ore metals contents are greater than the comparative « *Critères Génériques pour les Sols* » - *'A'* standards for silver, barium, cobalt, chromium, molybdenum, manganese, nickel, and lead;

- The East Malartic ore typically has higher silver, manganese, and lead contents than the Sheehan ore. Cobalt, chromium, and molybdenum contents are similar in the two ore sources. East Malartic ore also typically has lower barium and nickel contents than the Sheehan ore;
- Rietveld XRD analyses show that the ore is dominated by quartz, aluminosilicates, and phyllosilicates and that:
    - Two carbonate minerals were identified: dolomite ($Ca,Mg(CO_3)_2$) and calcite ($CaCO_3$). These minerals provide effective neutralization potential.
- All ore samples exceeded at least one of the « *résurgence dans l'eau de surface* » TCLP criteria for barium, manganese, or lead;
- In the CTEU-9 leachate one sample had chromium concentrations greater than the « *règlement sur la qualité de l'eau potable* » criterion and an additional sample had barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion; and
- All SPLP leachate samples had concentrations below the comparative « *règlement sur la qualité de l'eau potable* » criterion and one sample had barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion.

### 7.2.4 Sheehan Ore

Consistent with the mine rock samples evaluated C/S ratios were also found to be effective in determining the proportions of potentially acid generating ore at the East Malartic deposit. Mine rock with C/S values greater than 0.68 are non-PAG, samples with C/S values lower than 0.39 are PAG, and samples with values between 0.39 and 0.68 have an uncertain potential for acid generation.

Geochemical testing of ore from the Sheehan deposit identified that:

- Sheehan ore samples were 80% non-PAG;
- None of the ore is considered low-risk according to *Directive 019* in consideration of the TCLP results for barium, manganese, and lead;
- Metals contents in ore are greater than the comparative « *Critères Génériques pour les Sols* » - *'A'* standards for silver, barium, cobalt, chromium, molybdenum, manganese, nickel, and lead;
- The Sheehan ore typically has higher barium and nickel contents than the East Malartic ore. Cobalt, chromium, and molybdenum contents are similar in the two ore sources. Sheehan ore also has lower silver, manganese, and lead contents than the East Malartic ore;

- Rietveld XRD analyses show that the ore is dominated by quartz and aluminosilicates and that:
    - Three carbonate minerals were identified: dolomite ($Ca,Mg(CO_3)_2$), calcite ($CaCO_3$), and magnesite ($MgCO_3$). These minerals will provide effective neutralization potential.
- All ore samples exceeded at least one of the « *résurgence dans l'eau de surface* » TCLP criteria for barium, manganese, or lead; and
- In the CTEU-9 leachate all samples had concentrations lower than the « *règlement sur la qualité de l'eau potable* » criteria though one sample had molybdenum concentrations greater than the « *résurgence dans l'eau de surface* » criterion; and
- All SPLP leachate samples had concentrations below the comparative « *règlement sur la qualité de l'eau potable* » criterion and one sample had barium concentrations greater than the « *résurgence dans l'eau de surface* » criterion.

# 8.0 REFERENCES

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# APPENDIX A

## Sample Details

| Composite Sample ID | Component Sample Info Part 1 | | | | | Component Sample Info Part 2 (If applicable) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hole ID | From | To | Alteration | Lithology | Hole ID | From | To | Alteration | Lithology |
| **EM - ORE - 01** | MEV17-SH-1001 | 475 | 476 | CGR | SEDIMENT | MEV17-SH-1001 | 476 | 477.4 | CGR | SEDIMENT |
| **EM - ORE - 02** | MEV17-022 | 410.9 | 412 | SGR | SEDIMENT | MEV17-022 | 412 | 413.25 | SGR | SEDIMENT |
| **EM - ORE - 03** | MEV18-063 | 500 | 501 | AGR | SEDIMENT | MEV18-063 | 501 | 502 | AGR | SEDIMENT |
| **EM - ORE - 04** | MEV17-008 | 569 | 569.5 | CGR | SEDIMENT | MEV17-008 | 569.5 | 570.3 | CGR | SEDIMENT |
| **EM - ORE - 05** | MEV17-014 | 571.54 | 572.15 | AUM | VOLC_UM | MEV17-014 | 572.15 | 572.6 | AUM | VOLC_UM |
| **EM - ORE - 06** | MEV17-EA-2003A | 807.4 | 808 | TCH | SCHIST | MEV17-EA-2003A | 808 | 809 | TCH | SCHIST |
| **EM - ORE - 07** | MEV17-028 | 657 | 658 | SGR | SEDIMENT | MEV17-028 | 658 | 659 | SGR | SEDIMENT |
| **EM - ORE - 08** | MEV17-049 | 500 | 500.6 | TCH | SCHIST | MEV17-049 | 500.6 | 501.35 | TCH | SCHIST |
| **EM - ORE - 09** | MEV18-072 | 705 | 706.15 | AUM | VOLC_UM | MEV18-072 | 708 | 709.15 | AUM | VOLC_UM |
| **EM - ORE - 10** | MEV17-020 | 358.4 | 359.5 | TCH | SCHIST | MEV17-020 | 360 | 361 | TCH | SCHIST |
| **EM - Development - 01** | MEV17-022 | 295 | 296 | AGR | SEDIMENT | MEV17-022 | 296 | 297 | AGR | SEDIMENT |
| **EM - Development - 02** | MEV17-SH-1002 | 399 | 399.8 | AGR | SEDIMENT | MEV17-SH-1002 | 399.8 | 401 | AGR | SEDIMENT |
| **EM - Development - 03** | MEV18-052 | 573 | 574 | AGR | SEDIMENT | MEV18-052 | 574 | 575 | AGR | SEDIMENT |
| **EM - Development - 04** | MEV17-028 | 706 | 707 | AGR | SEDIMENT | MEV17-028 | 707 | 708 | AGR | SEDIMENT |
| **EM - Development - 05** | MEV18-063 | 571 | 572 | AGR | SEDIMENT | MEV18-063 | 572 | 573 | AGR | SEDIMENT |
| **EM - Dilution Footwall - 01** | MEV17-028 | 637 | 638 | TCH | SCHIST | MEV17-028 | 638 | 639 | TCH | SCHIST |
| **EM - Dilution Footwall - 02** | MEV17-048 | 547 | 548 | TCH | SCHIST | MEV17-048 | 548 | 549 | TCH | SCHIST |
| **EM - Dilution Footwall - 03** | MEV17-EA-2001A | 770 | 771 | TCH | SCHIST | MEV17-EA-2001A | 771 | 772 | TCH | SCHIST |
| **EM - Dilution Footwall - 04** | MEV17-SH-1001 | 466 | 467.5 | TCH | SCHIST | MEV17-SH-1001 | 467.5 | 468.5 | TCH | SCHIST |
| **EM - Dilution Footwall - 05** | MEV17-008 | 561 | 562 | AUM | VOLC_UM | MEV17-008 | 562 | 563 | AUM | VOLC_UM |
| **EM - Dilution Hanging Wall - 01** | MEV17-028 | 668.6 | 669 | AGR | SEDIMENT | MEV17-028 | 669 | 670 | AGR | SEDIMENT |
| **EM - Dilution Hanging Wall - 02** | MEV17-022 | 351 | 352 | AGR | SEDIMENT | MEV17-022 | 352 | 353 | AGR | SEDIMENT |
| **EM - Dilution Hanging Wall - 03** | MEV17-048WA | 542 | 543 | AGR | SEDIMENT | MEV17-048WA | 543 | 544 | AGR | SEDIMENT |
| **EM - Dilution Hanging Wall - 04** | MEV17-SH-1003 | 568.9 | 570 | AGR | SEDIMENT | MEV17-SH-1003 | 570 | 570.84 | AGR | SEDIMENT |
| **EM - Dilution Hanging Wall - 05** | MEV18-055 | 576.7 | 577 | SPO | PORPHYRY | MEV18-055 | 577 | 578 | SPO | PORPHYRY |
| **SH - ORE - 01** | MEV17-024 | 526 | 527 | CPO | PORPHYRY | MEV17-024 | 527 | 528 | CPO | PORPHYRY |
| **SH - ORE - 02** | MEV17-027 | 455.42 | 456.15 | AUM | VOLC_UM | MEV17-027 | 456.15 | 457 | AUM | VOLC_UM |
| **SH - ORE - 03** | MEV17-012A | 534 | 535 | TCH | SCHIST | MEV17-012A | 535 | 535.5 | TCH | SCHIST |
| **SH - ORE - 04** | ODY15-5018 | 417.5 | 418.75 | I2H | PORPHYRY | ODY15-5018 | 418.75 | 419.35 | I2H | PORPHYRY |
| **SH - ORE - 05** | MEV18-054W | 432.5 | 434 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **SH - ORE - 06** | MEV18-057 | 473 | 474 | APO | PORPHYRY | MEV18-057 | 474 | 475 | APO | PORPHYRY |
| **SH - ORE - 07** | MEV18-062 | 305 | 306 | SPO | PORPHYRY | MEV18-062 | 306 | 307 | SPO | PORPHYRY |
| **SH - ORE - 08** | MEV17-SH-1005 | 478.75 | 479.5 | APO | PORPHYRY | MEV17-SH-1005 | 479.5 | 480 | APO | PORPHYRY |
| **SH - ORE - 09** | MEV18-077W | 527 | 527.6 | AUM | VOLC_UM | MEV18-077W | 542.25 | 542.7 | AUM | VOLC_UM |
| **SH - ORE - 10** | MEV18-088 | 622.8 | 623.55 | CUM | VOLC_UM | MEV18-088 | 623.55 | 624.3 | CUM | VOLC_UM |

| Composite Sample ID | Component Sample Info Part 3 (If applicable) | | | | | Component Sample Info Part 4 (If applicable) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hole ID | From | To | Alteration | Lithology | Hole ID | From | To | Alteration | Lithology |
| **EM - ORE - 01** | MEV17-SH-1001 | 477.4 | 479 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - ORE - 02** | MEV17-022 | 413.25 | 413.95 | CGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - ORE - 03** | MEV18-063 | 502 | 503 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - ORE - 04** | MEV17-008 | 570.3 | 571 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - ORE - 05** | MEV17-014 | 572.6 | 573.5 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **EM - ORE - 06** | MEV17-EA-2003A | 809 | 809.6 | TCH | SCHIST | -- | -- | -- | -- | -- |
| **EM - ORE - 07** | MEV17-028 | 659 | 660 | SGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - ORE - 08** | MEV17-049 | 501.35 | 502.55 | TCH | SCHIST | -- | -- | -- | -- | -- |
| **EM - ORE - 09** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **EM - ORE - 10** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **EM - Development - 01** | MEV17-022 | 297 | 298 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Development - 02** | MEV17-SH-1002 | 401 | 402.05 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Development - 03** | MEV18-052 | 575 | 576 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Development - 04** | MEV17-028 | 708 | 709 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Development - 05** | MEV18-063 | 573 | 574 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Dilution Footwall - 01** | MEV17-028 | 639 | 640.1 | TCH | SCHIST | -- | -- | -- | -- | -- |
| **EM - Dilution Footwall - 02** | MEV17-048 | 549 | 550 | TCH | SCHIST | -- | -- | -- | -- | -- |
| **EM - Dilution Footwall - 03** | MEV17-EA-2001A | 772 | 773 | TCH | SCHIST | -- | -- | -- | -- | -- |
| **EM - Dilution Footwall - 04** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **EM - Dilution Footwall - 05** | MEV17-008 | 563 | 564 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **EM - Dilution Hanging Wall - 01** | MEV17-028 | 670 | 671 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Dilution Hanging Wall - 02** | MEV17-022 | 353 | 354 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Dilution Hanging Wall - 03** | MEV17-048WA | 544 | 545 | AGR | SEDIMENT | -- | -- | -- | -- | -- |
| **EM - Dilution Hanging Wall - 04** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **EM - Dilution Hanging Wall - 05** | MEV18-055 | 578 | 579 | SPO | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - ORE - 01** | MEV17-024 | 528 | 529 | CPO | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - ORE - 02** | MEV17-027 | 457 | 458 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **SH - ORE - 03** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - ORE - 04** | ODY15-5018 | 419.35 | 420.1 | I2H | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - ORE - 05** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - ORE - 06** | MEV18-057 | 475 | 475.9 | APO | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - ORE - 07** | MEV18-062 | 307 | 308 | SPO | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - ORE - 08** | MEV17-SH-1005 | 480.5 | 481 | APO | PORPHYRY | MEV17-SH-1005 | 481 | 482 | APO | PORPHYRY |
| **SH - ORE - 09** | MEV18-077W | 542.7 | 543 | AUM | VOLC_UM | MEV18-077W | 543 | 544 | AUM | VOLC_UM |
| **SH - ORE - 10** | MEV18-088 | 624.3 | 625.15 | CUM | VOLC_UM | -- | -- | -- | -- | -- |

| Composite Sample ID | Component Sample Info Part 1 | | | | | Component Sample Info Part 2 (If applicable) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hole ID | From | To | Alteration | Lithology | Hole ID | From | To | Alteration | Lithology |
| **SH - Development - 01** | MEV17-003W | 427.8 | 429 | TCH | SCHIST | MEV17-003W | 429 | 430 | TCH | SCHIST |
| **SH - Development - 02** | MEV17-004 | 469 | 470.15 | AUM | VOLC_UM | MEV17-004 | 470.15 | 471.15 | AUM | VOLC_UM |
| **SH - Development - 03** | MEV17-027 | 398 | 399 | AUM | VOLC_UM | MEV17-027 | 399 | 400.55 | AUM | VOLC_UM |
| **SH - Development - 04** | MEV17-SH-1005 | 451 | 452 | APO | PORPHYRY | MEV17-SH-1005 | 452 | 453 | APO | PORPHYRY |
| **SH - Development - 05** | MEV18-059 | 329 | 330 | APO | PORPHYRY | MEV18-059 | 330 | 331 | APO | PORPHYRY |
| **SH - Development - 06** | CHL09-2227 | 122 | 123.5 | AUM | VOLC_UM | CHL09-2227 | 123.5 | 125 | AUM | VOLC_UM |
| **SH - Development - 07** | CHL11-2413 | 228.5 | 230 | APO | PORPHYRY | CHL11-2413 | 230 | 231.5 | APO | PORPHYRY |
| **SH - Dilution - 01** | MEV17-002 | 473 | 474 | APO | PORPHYRY | MEV17-002 | 474 | 475 | APO | PORPHYRY |
| **SH - Dilution - 02** | MEV17-012A | 468 | 469 | SPO | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - Dilution - 03** | MEV17-023 | 454.7 | 455.55 | AUM | VOLC_UM | MEV17-023 | 455.8 | 457 | AUM | VOLC_UM |
| **SH - Dilution - 04** | MEV17-EA-2005 | 390 | 391 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **SH - Dilution - 05** | MEV17-SH-1007 | 525 | 526 | TCH | SCHIST | MEV17-SH-1007 | 526 | 527 | TCH | SCHIST |
| **SH - Dilution - 06** | MEV17-SH-1005 | 469 | 470 | APO | PORPHYRY | MEV17-SH-1005 | 470 | 471 | APO | PORPHYRY |
| **SH - Dilution - 07** | MEV18-064 | 403 | 404 | APO | PORPHYRY | MEV18-064 | 404 | 405 | APO | PORPHYRY |

| Composite Sample ID | Component Sample Info Part 3 (If applicable) | | | | | Component Sample Info Part 4 (If applicable) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Hole ID | From | To | Alteration | Lithology | Hole ID | From | To | Alteration | Lithology |
| **SH - Development - 01** | MEV17-003W | 430 | 431 | TCH | SCHIST | -- | -- | -- | -- | -- |
| **SH - Development - 02** | MEV17-004 | 471.15 | 472.2 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **SH - Development - 03** | MEV17-027 | 400.55 | 401.25 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **SH - Development - 04** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - Development - 05** | MEV18-059 | 331 | 332 | APO | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - Development - 06** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - Development - 07** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - Dilution - 01** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - Dilution - 02** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - Dilution - 03** | MEV17-023 | 457 | 458 | AUM | VOLC_UM | -- | -- | -- | -- | -- |
| **SH - Dilution - 04** | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **SH - Dilution - 05** | MEV17-SH-1007 | 527 | 528 | TCH | SCHIST | -- | -- | -- | -- | -- |
| **SH - Dilution - 06** | MEV17-SH-1005 | 471 | 472 | APO | PORPHYRY | -- | -- | -- | -- | -- |
| **SH - Dilution - 07** | MEV18-064 | 405 | 406 | APO | PORPHYRY | -- | -- | -- | -- | -- |

# APPENDIX B

## Summarized Laboratory Data

| Test Phase | Analysis | Parameter | EM - ORE - 01 | EM - ORE - 02 | EM - ORE - 03 | EM - ORE - 04 | EM - ORE - 05 | EM - ORE - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 3.10 | 3.38 | 5.43 | 3.50 | 5.18 | 3.70 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 2.3 | 2.2 | 0.63 | 0.52 | 1.0 | 0.83 |
| | | Aluminum (mg/kg) | 11000 | 6400 | 16000 | 23000 | 23000 | 20000 |
| | | Arsenic (mg/kg) | 0.9 | 0.9 | 0.8 | 1.1 | 0.7 | 0.6 |
| | | Boron (mg/kg) | <1.0 | 1 | <1.0 | 1 | 1 | 2 |
| | | Barium (mg/kg) | 68 | 130 | 160 | 65 | 180 | 290 |
| | | Beryllium (mg/kg) | 1.2 | 0.69 | 0.39 | 1.5 | 2.6 | 1.5 |
| | | Bismuth (mg/kg) | 2.8 | 1.6 | 0.69 | 0.56 | 0.47 | 0.55 |
| | | Calcium (mg/kg) | 16000 | 33000 | 15000 | 29000 | 58000 | 51000 |
| | | Cadmium (mg/kg) | 0.10 | 0.15 | 0.08 | 0.30 | 0.13 | 0.11 |
| | | Cobalt (mg/kg) | 20 | 20 | 19 | 27 | 57 | 38 |
| | | Chromium (mg/kg) | 140 | 210 | 180 | 220 | 1400 | 890 |
| | | Copper (mg/kg) | 44 | 38 | 52 | 50 | 41 | 34 |
| | | Iron (mg/kg) | 37000 | 32000 | 34000 | 43000 | 46000 | 39000 |
| | | Potassium (mg/kg) | 14000 | 3500 | 17000 | 25000 | 24000 | 17000 |
| | | Lithium (mg/kg) | 16 | 9 | 22 | 22 | 28 | 27 |
| | | Magnesium (mg/kg) | 14000 | 11000 | 15000 | 26000 | 69000 | 53000 |
| | | Manganese (mg/kg) | 390 | 640 | 450 | 660 | 1200 | 1100 |
| | | Molybdenum (mg/kg) | 8.4 | 16 | 3.1 | 5.5 | 1.9 | 3.9 |
| | | Sodium (mg/kg) | 330 | 470 | 610 | 220 | 120 | 110 |
| | | Nickel (mg/kg) | 78 | 69 | 74 | 110 | 540 | 350 |
| | | Phosphorus (mg/kg) | 440 | 330 | 590 | 880 | 4.3 | 31 |
| | | Lead (mg/kg) | 46 | 15 | 13 | 27 | 37 | 4.8 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | 0.6 | <0.5 | 1.0 | 1.1 | <0.5 | <0.5 |
| | | Strontium (mg/kg) | 72 | 260 | 58 | 220 | 1000 | 420 |
| | | Titanium (mg/kg) | 1200 | 570 | 2100 | 2800 | 1500 | 920 |
| | | Thallium (mg/kg) | 0.25 | 0.06 | 0.32 | 0.47 | 0.41 | 0.39 |
| | | Uranium (mg/kg) | 0.86 | 0.66 | 1.1 | 1.1 | 0.13 | 0.092 |
| | | Vanadium (mg/kg) | 91 | 48 | 93 | 110 | 180 | 110 |
| | | Zinc (mg/kg) | 72 | 51 | 75 | 96 | 84 | 54 |
| | | Weight (mg/kg) | 6788 | 5888 | 2465 | 3884 | 3290 | 3073 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 2.03 | 2.05 | 2.03 | 2.07 | 2.03 | 1.99 |
| | | Initial pH | 9.75 | 9.74 | 9.73 | 9.91 | 9.95 | 9.85 |
| | | Vol H2SO4 (mL) | 1.45 | 3.40 | 1.75 | 3.10 | 11.05 | 8.75 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 36 | 83 | 43 | 75 | 272 | 220 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 63.4 | 72.8 | 21.0 | 25.2 | 22.2 | 6.91 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | -27.7 | 10 | 22 | 50 | 250 | 213 |
| | | Sulphur (total) (%) | 2.03 | 2.33 | 0.673 | 0.805 | 0.710 | 0.221 |
| | | Acid Leachable SO4-S (%) | 0.74 | 0.45 | 0.16 | 0.22 | 0.14 | 0.04 |
| | | Sulphide (%) | 1.29 | 1.88 | 0.51 | 0.58 | 0.57 | 0.18 |
| | | Carbon (total) (%) | 0.401 | 0.959 | 0.393 | 0.832 | 3.74 | 3.72 |
| | | Carbonate (%CO3) | 1.46 | 3.83 | 1.39 | 3.57 | 17.7 | 17.8 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | #N/A | 100 | 100 | 100 | #N/A | #N/A |
| | | Volume D.I. Water [mL] | #N/A | 400 | 400 | 400 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 01 | EM - ORE - 02 | EM - ORE - 03 | EM - ORE - 04 | EM - ORE - 05 | EM - ORE - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | #N/A | 8.55 | 8.88 | 9.02 | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 68 | 119 | 103 | #N/A | #N/A |
| | | pH [no unit] | #N/A | 8.12 | 8.43 | 8.48 | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 485 | 566 | 538 | #N/A | #N/A |
| | | F [mg/L] | #N/A | 1.38 | 2.48 | 1.77 | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | 3.5 | 2.5 | 3.2 | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 88 | 62 | 57 | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | <3.0 | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | <0.3 | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | <0.03 | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.083 | 0.383 | 0.410 | #N/A | #N/A |
| | | As [mg/L] | #N/A | 0.0004 | 0.0011 | 0.0012 | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | 0.00193 | 0.00078 | 0.00051 | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 0.0716 | 0.0206 | 0.00939 | #N/A | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | <0.000007 | <0.000007 | #N/A | #N/A |
| | | B [mg/L] | #N/A | 0.013 | 0.014 | 0.015 | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | 0.000036 | 0.000027 | 0.000038 | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 16.8 | 6.35 | 5.08 | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | 0.000017 | 0.000008 | 0.000006 | #N/A | #N/A |
| | | Co [mg/L] | #N/A | 0.000041 | 0.000042 | 0.000022 | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.00034 | 0.0119 | 0.00820 | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.00115 | 0.00046 | 0.00062 | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | 0.012 | 0.032 | 0.016 | #N/A | #N/A |
| | | K [mg/L] | #N/A | 21.5 | 88.1 | 121 | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.0136 | 0.0605 | 0.0387 | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 11.4 | 3.59 | 2.52 | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 0.00758 | 0.00236 | 0.00147 | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.0247 | 0.00752 | 0.0147 | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 40.7 | 41.5 | 15.0 | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | 0.0003 | 0.0002 | <0.0001 | #N/A | #N/A |
| | | P [mg/L] | #N/A | 0.005 | 0.006 | 0.019 | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | 0.00011 | 0.00007 | 0.00010 | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | 0.0011 | 0.0028 | 0.0042 | #N/A | #N/A |
| | | Se [mg/L] | #N/A | 0.00111 | 0.00059 | 0.00040 | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 4.83 | 2.43 | 1.98 | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.00010 | 0.00006 | 0.00010 | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 0.452 | 0.0954 | 0.131 | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | 0.00018 | 0.00292 | 0.00132 | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | <0.000005 | 0.000056 | 0.000058 | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.000358 | 0.00109 | 0.000382 | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.00439 | 0.0230 | 0.0205 | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | <0.002 | <0.002 | <0.002 | #N/A | #N/A |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | #N/A | 0 | 0.4 | 0.4 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 01 | EM - ORE - 02 | EM - ORE - 03 | EM - ORE - 04 | EM - ORE - 05 | EM - ORE - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | #N/A | 1 | 1 | 1 | #N/A | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | 400 | 400 | #N/A | #N/A |
| | | Final pH | #N/A | 9.23 | 9.48 | 9.57 | #N/A | #N/A |
| | | F [mg/L] | #N/A | <0.06 | 0.09 | 0.06 | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 6.4 | 4.2 | 3.3 | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | <2.0 | <2.0 | <2.0 | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | <3.0 | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | <0.3 | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 70 | 66 | 69 | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 24 | 25 | 29 | #N/A | #N/A |
| | | pH [no unit] | #N/A | 7.45 | 7.59 | 7.78 | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | <0.03 | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.220 | 0.529 | 0.563 | #N/A | #N/A |
| | | As [mg/L] | #N/A | 0.0004 | 0.0006 | 0.0007 | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | <0.00005 | <0.00005 | <0.00005 | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 0.296 | 0.00660 | 0.00145 | #N/A | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | <0.000007 | <0.000007 | #N/A | #N/A |
| | | B [mg/L] | #N/A | <0.002 | <0.002 | <0.002 | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | <0.000007 | <0.000007 | <0.000007 | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 9.57 | 6.30 | 5.40 | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | <0.000003 | <0.000003 | <0.000003 | #N/A | #N/A |
| | | Co [mg/L] | #N/A | <0.000004 | <0.000004 | <0.000004 | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.00011 | 0.00016 | 0.00011 | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.00008 | 0.00005 | 0.00017 | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | <0.007 | <0.007 | <0.007 | #N/A | #N/A |
| | | K [mg/L] | #N/A | 2.43 | 7.62 | 9.54 | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.0009 | 0.0034 | 0.0025 | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 0.852 | 0.463 | 0.424 | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 0.00203 | 0.00082 | 0.00052 | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.00222 | 0.00092 | 0.00086 | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 1.78 | 2.39 | 0.92 | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | <0.0001 | <0.0001 | <0.0001 | #N/A | #N/A |
| | | P [mg/L] | #N/A | <0.003 | 0.004 | <0.003 | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | 0.00007 | <0.00001 | 0.00003 | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | <0.0002 | 0.0003 | 0.0006 | #N/A | #N/A |
| | | Se [mg/L] | #N/A | 0.00013 | 0.00013 | 0.00007 | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 2.01 | 2.22 | 1.85 | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 0.243 | 0.0708 | 0.0538 | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.00005 | <0.00001 | 0.00003 | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | 0.00006 | 0.00027 | 0.00026 | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | <0.000005 | <0.000005 | <0.000005 | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.000010 | 0.000019 | 0.000005 | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.00268 | 0.00493 | 0.00342 | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | 0.015 | <0.002 | <0.002 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 01 | EM - ORE - 02 | EM - ORE - 03 | EM - ORE - 04 | EM - ORE - 05 | EM - ORE - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | #N/A | 20 | 20 | 20 | #N/A | #N/A |
| | | Ext Fluid [#1 or #2] | #N/A | 2 | 1 | 1 | #N/A | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | 400 | 400 | #N/A | #N/A |
| | | Final pH | #N/A | 4.91 | 5.60 | 6.13 | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 4510 | 6260 | 6690 | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 1320 | 2440 | 2810 | #N/A | #N/A |
| | | pH [no unit] | #N/A | 4.96 | 5.66 | 6.54 | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 6.3 | 2.2 | <2.0 | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | <20.0 | <20.0 | <20.0 | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | <3.0 | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | <0.3 | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | F [mg/L] | #N/A | 0.06 | 0.08 | 0.07 | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | <0.03 | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.92 | 0.15 | 0.01 | #N/A | #N/A |
| | | As [mg/L] | #N/A | <0.002 | <0.002 | <0.002 | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | <0.0005 | <0.0005 | <0.0005 | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 2.81 | 0.523 | 0.194 | #N/A | #N/A |
| | | B [mg/L] | #N/A | <0.02 | <0.02 | <0.02 | #N/A | #N/A |
| | | Be [mg/L] | #N/A | 0.00138 | 0.00023 | 0.00019 | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | 0.00031 | <0.00007 | <0.00007 | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 1510 | 542 | 755 | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | 0.00370 | 0.00186 | 0.00315 | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.0283 | 0.0031 | 0.0009 | #N/A | #N/A |
| | | Co [mg/L] | #N/A | 0.00675 | 0.00718 | 0.00473 | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.0111 | 0.0011 | 0.0010 | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | 8.49 | 5.93 | 4.17 | #N/A | #N/A |
| | | K [mg/L] | #N/A | 16.4 | 33.4 | 64.1 | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.005 | 0.009 | 0.007 | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 13.8 | 5.43 | 5.73 | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 22.1 | 6.63 | 7.58 | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.0018 | 0.0005 | 0.0008 | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 3.1 | 1510 | 1520 | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | 0.012 | 0.008 | 0.008 | #N/A | #N/A |
| | | P [mg/L] | #N/A | <0.03 | <0.03 | <0.03 | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | 0.108 | 0.0358 | 0.0370 | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.00206 | 0.00247 | 0.00032 | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | <0.002 | <0.002 | <0.002 | #N/A | #N/A |
| | | Se [mg/L] | #N/A | <0.0004 | <0.0004 | <0.0004 | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 1.40 | 2.07 | 1.38 | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.0040 | 0.0027 | <0.0001 | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 9.84 | 1.66 | 3.27 | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | <0.0005 | <0.0005 | <0.0005 | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | 0.00009 | <0.00005 | 0.00012 | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.0003 | 0.0011 | 0.0003 | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | <0.02 | <0.02 | <0.02 | #N/A | #N/A |
| | | Weight [g] | #N/A | 5729 | 2312 | 3715 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 01 | EM - ORE - 02 | EM - ORE - 03 | EM - ORE - 04 | EM - ORE - 05 | EM - ORE - 06 |
|---|---|---|---|---|---|---|---|---|
| **Phase 2 Analysis** | **TCLP Toxicity Characteristic Leaching Procedure** | Split | #N/A | 1 | 1 | 1 | #N/A | #N/A |
| | | Pulv200M [250g] | #N/A | 1 | 1 | 1 | #N/A | #N/A |
| **Phase 2 Analysis** | **Acid Base Accounting** | Sample weight (g) | #N/A | 1.94 | 2.00 | 2.02 | #N/A | #N/A |
| | | Initial pH | #N/A | 9.71 | 9.80 | 9.77 | #N/A | #N/A |
| | | Vol H2SO4 (mL) | #N/A | 2.55 | 2.05 | 2.60 | #N/A | #N/A |
| | | H2SO4 Normality | #N/A | 1 | 1.00 | 1.00 | #N/A | #N/A |
| | | Acisol-NP (kgCaCO3/tonne) | #N/A | 65.7 | 51.2 | 64.4 | #N/A | #N/A |
| | | AP (kgCaCO3/tonne) | #N/A | 75.3 | 22.5 | 25.0 | #N/A | #N/A |
| | | NNPkg CaCO3/tonne | #N/A | -9.6 | 29 | 39 | #N/A | #N/A |
| | | S Acid% | #N/A | 2.41 | 0.720 | 0.801 | #N/A | #N/A |
| | | LeachableSO4-S% | #N/A | 0.30 | 0.14 | 0.24 | #N/A | #N/A |
| | | Sulphide% | #N/A | 2.11 | 0.58 | 0.56 | #N/A | #N/A |
| | | C% | #N/A | 0.821 | 0.394 | 0.740 | #N/A | #N/A |
| | | CO3% (as %CO3) | #N/A | 3.36 | 1.50 | 3.22 | #N/A | #N/A |
| **Phase 2 Analysis** | **Rietveld XRD** | Quartz (wt%) | #N/A | 27.9 | 21.2 | #N/A | #N/A | #N/A |
| | | Talc (wt%) | #N/A | 2.3 | 0.0 | #N/A | #N/A | #N/A |
| | | Chlorite (wt%) | #N/A | 4.0 | 3.3 | #N/A | #N/A | #N/A |
| | | Muscovite (wt%) | #N/A | 0.8 | 0.0 | #N/A | #N/A | #N/A |
| | | Albite (wt%) | #N/A | 46.2 | 52.9 | #N/A | #N/A | #N/A |
| | | Microcline (wt%) | #N/A | 1.1 | 4.0 | #N/A | #N/A | #N/A |
| | | Biotite (wt%) | #N/A | 2.6 | 13.9 | #N/A | #N/A | #N/A |
| | | Magnesiohornblende (wt%) | #N/A | 3.8 | 0.0 | #N/A | #N/A | #N/A |
| | | Diopside (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Phlogopite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Magnetite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Brucite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Hematite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Ilmenite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Periclase (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Rutile (wt%) | #N/A | 0.4 | 0.0 | #N/A | #N/A | #N/A |
| | | Iron (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Dolomite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Calcite (wt%) | #N/A | 8.9 | 4.0 | #N/A | #N/A | #N/A |
| | | Magnesite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Ankerite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Pyrite (wt%) | #N/A | 2.1 | 0.7 | #N/A | #N/A | #N/A |
| | | Gypsum (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | TOTAL (wt%) | #N/A | 100 | 100 | #N/A | #N/A | #N/A |
| **Phase 2 Analysis** | **Whole Rock Analysis** | SiO2% | #N/A | 67.2 | 64.4 | 54.9 | #N/A | #N/A |
| | | Al2O3% | #N/A | 9.67 | 14.0 | 15.2 | #N/A | #N/A |
| | | Fe2O3% | #N/A | 4.49 | 4.82 | 6.46 | #N/A | #N/A |
| | | MgO% | #N/A | 2.78 | 2.69 | 4.42 | #N/A | #N/A |
| | | CaO% | #N/A | 4.35 | 2.39 | 3.65 | #N/A | #N/A |
| | | Na2O% | #N/A | 4.58 | 5.29 | 2.44 | #N/A | #N/A |
| | | K2O% | #N/A | 0.64 | 2.50 | 6.95 | #N/A | #N/A |
| | | TiO2% | #N/A | 0.43 | 0.51 | 0.65 | #N/A | #N/A |
| | | P2O5% | #N/A | 0.08 | 0.14 | 0.21 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 01 | EM - ORE - 02 | EM - ORE - 03 | EM - ORE - 04 | EM - ORE - 05 | EM - ORE - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | #N/A | 0.08 | 0.06 | 0.08 | #N/A | #N/A |
| | | Cr2O3% | #N/A | 0.04 | 0.03 | 0.04 | #N/A | #N/A |
| | | V2O5% | #N/A | <0.01 | 0.02 | 0.03 | #N/A | #N/A |
| | | LOI% | #N/A | 3.48 | 2.65 | 3.25 | #N/A | #N/A |
| | | Sum% | #N/A | 97.8 | 99.5 | 98.3 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 07 | EM - ORE - 08 | EM - ORE - 09 | EM - ORE - 10 | EM - Development - 01 | EM Development - 02 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 2.40 | 2.70 | <1.0 | 2.20 | 2.30 | 2.90 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 2.3 | 1.4 | 0.28 | 0.54 | 0.20 | 0.15 |
| | | Aluminum (mg/kg) | 12000 | 9000 | 14000 | 28000 | 22000 | 17000 |
| | | Arsenic (mg/kg) | 0.7 | 0.9 | 0.7 | <0.5 | 1.7 | 1.5 |
| | | Boron (mg/kg) | 1 | 1 | 1 | 1 | 1 | 1 |
| | | Barium (mg/kg) | 31 | 200 | 94 | 280 | 370 | 190 |
| | | Beryllium (mg/kg) | 1.3 | 0.93 | 1.1 | 3.4 | 0.18 | 0.25 |
| | | Bismuth (mg/kg) | 0.79 | 1.6 | 0.56 | 0.40 | 0.34 | 0.49 |
| | | Calcium (mg/kg) | 25000 | 17000 | 41000 | 65000 | 7100 | 8400 |
| | | Cadmium (mg/kg) | 0.12 | 0.05 | 0.07 | 0.19 | 0.04 | 0.05 |
| | | Cobalt (mg/kg) | 21 | 36 | 43 | 50 | 23 | 19 |
| | | Chromium (mg/kg) | 150 | 510 | 730 | 1300 | 180 | 140 |
| | | Copper (mg/kg) | 29 | 29 | 45 | 16 | 49 | 52 |
| | | Iron (mg/kg) | 39000 | 26000 | 32000 | 55000 | 41000 | 32000 |
| | | Potassium (mg/kg) | 12000 | 9900 | 10000 | 32000 | 20000 | 16000 |
| | | Lithium (mg/kg) | 15 | 11 | 10 | 31 | 19 | 16 |
| | | Magnesium (mg/kg) | 15000 | 20000 | 53000 | 70000 | 17000 | 14000 |
| | | Manganese (mg/kg) | 510 | 300 | 900 | 1100 | 510 | 390 |
| | | Molybdenum (mg/kg) | 18 | 52 | 1.6 | 2.6 | 3.2 | 2.9 |
| | | Sodium (mg/kg) | 530 | 280 | 120 | 120 | 690 | 460 |
| | | Nickel (mg/kg) | 74 | 260 | 340 | 520 | 88 | 74 |
| | | Phosphorus (mg/kg) | 310 | 190 | 69 | 17 | 680 | 550 |
| | | Lead (mg/kg) | 10 | 50 | 3.9 | 14 | 3.1 | 9.8 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | 0.8 | <0.5 | <0.5 | 0.6 | 1.1 | 0.7 |
| | | Strontium (mg/kg) | 110 | 43 | 300 | 700 | 29 | 32 |
| | | Titanium (mg/kg) | 1000 | 690 | 690 | 1600 | 2500 | 2000 |
| | | Thallium (mg/kg) | 0.20 | 0.24 | 0.30 | 0.46 | 0.27 | 0.28 |
| | | Uranium (mg/kg) | 0.75 | 0.26 | 0.096 | 0.20 | 1.1 | 0.82 |
| | | Vanadium (mg/kg) | 57 | 69 | 90 | 180 | 91 | 66 |
| | | Zinc (mg/kg) | 55 | 34 | 30 | 130 | 80 | 68 |
| | | Weight (mg/kg) | 5342 | 3045 | 4432 | 2019 | 4024 | 5724 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 2.06 | 2.06 | 2.06 | 2.05 | 2.04 | 2.02 |
| | | Initial pH | 9.76 | 9.84 | 9.87 | 9.80 | 9.72 | 9.64 |
| | | Vol H2SO4 (mL) | 2.70 | 3.00 | 7.55 | 10.80 | 1.05 | 1.10 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 66 | 73 | 183 | 263 | 26 | 27 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 81.7 | 37.1 | 8.38 | 7.41 | 9.28 | 8.75 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | -16.2 | 36 | 175 | 256 | 16 | 18 |
| | | Sulphur (total) (%) | 2.61 | 1.19 | 0.268 | 0.237 | 0.297 | 0.280 |
| | | Acid Leachable SO4-S (%) | 0.56 | 0.21 | 0.07 | 0.05 | 0.08 | 0.05 |
| | | Sulphide (%) | 2.05 | 0.98 | 0.20 | 0.19 | 0.22 | 0.23 |
| | | Carbon (total) (%) | 0.698 | 0.500 | 2.52 | 3.25 | 0.126 | 0.187 |
| | | Carbonate (%CO3) | 2.34 | 1.90 | 10.8 | 15.6 | 0.450 | 0.689 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | #N/A | #N/A | 100 | 100 | 100 | #N/A |
| | | Volume D.I. Water [mL] | #N/A | #N/A | 400 | 400 | 400 | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 07 | EM - ORE - 08 | EM - ORE - 09 | EM - ORE - 10 | EM - Development - 01 | EM Development - 02 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | #N/A | #N/A | 8.97 | 9.08 | 8.88 | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | 95 | 148 | 144 | #N/A |
| | | pH [no unit] | #N/A | #N/A | 8.53 | 8.68 | 8.34 | #N/A |
| | | Conductivity [uS/cm] | #N/A | #N/A | 440 | 572 | 567 | #N/A |
| | | F [mg/L] | #N/A | #N/A | 0.42 | 0.90 | 1.74 | #N/A |
| | | Cl [mg/L] | #N/A | #N/A | <2.0 | 3.9 | 3.0 | #N/A |
| | | SO4 [mg/L] | #N/A | #N/A | 96 | 59 | 39 | #N/A |
| | | Br [mg/L] | #N/A | #N/A | <3.0 | <3.0 | <3.0 | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | <0.3 | <0.3 | <0.3 | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | <0.6 | <0.6 | <0.6 | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | #N/A | <0.6 | <0.6 | <0.6 | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | <0.03 | <0.03 | 0.06 | #N/A |
| | | Hg [mg/L] | #N/A | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A |
| | | Al [mg/L] | #N/A | #N/A | 0.074 | 0.023 | 0.964 | #N/A |
| | | As [mg/L] | #N/A | #N/A | 0.0035 | 0.0030 | 0.0036 | #N/A |
| | | Ag [mg/L] | #N/A | #N/A | <0.00005 | 0.00007 | 0.00059 | #N/A |
| | | Ba [mg/L] | #N/A | #N/A | 0.231 | 0.749 | 0.0175 | #N/A |
| | | Be [mg/L] | #N/A | #N/A | 0.000018 | <0.000007 | <0.000007 | #N/A |
| | | B [mg/L] | #N/A | #N/A | 0.003 | 0.006 | 0.016 | #N/A |
| | | Bi [mg/L] | #N/A | #N/A | 0.000105 | 0.000020 | 0.000123 | #N/A |
| | | Ca [mg/L] | #N/A | #N/A | 13.9 | 18.2 | 4.12 | #N/A |
| | | Cd [mg/L] | #N/A | #N/A | <0.000003 | <0.000003 | <0.000003 | #N/A |
| | | Co [mg/L] | #N/A | #N/A | 0.000695 | 0.000083 | 0.000090 | #N/A |
| | | Cr [mg/L] | #N/A | #N/A | 0.131 | 0.0459 | 0.0116 | #N/A |
| | | Cu [mg/L] | #N/A | #N/A | 0.00126 | 0.00041 | 0.00046 | #N/A |
| | | Fe [mg/L] | #N/A | #N/A | 0.246 | 0.036 | 0.169 | #N/A |
| | | K [mg/L] | #N/A | #N/A | 36.3 | 110 | 88.0 | #N/A |
| | | Li [mg/L] | #N/A | #N/A | 0.0020 | 0.0156 | 0.0210 | #N/A |
| | | Mg [mg/L] | #N/A | #N/A | 23.2 | 15.7 | 1.74 | #N/A |
| | | Mn [mg/L] | #N/A | #N/A | 0.00325 | 0.00083 | 0.00338 | #N/A |
| | | Mo [mg/L] | #N/A | #N/A | 0.00441 | 0.0104 | 0.00976 | #N/A |
| | | Na [mg/L] | #N/A | #N/A | 7.63 | 5.25 | 37.3 | #N/A |
| | | Ni [mg/L] | #N/A | #N/A | 0.0133 | 0.0013 | 0.0004 | #N/A |
| | | P [mg/L] | #N/A | #N/A | <0.003 | 0.014 | 0.044 | #N/A |
| | | Pb [mg/L] | #N/A | #N/A | 0.00032 | 0.00009 | 0.00009 | #N/A |
| | | Sb [mg/L] | #N/A | #N/A | 0.0007 | 0.0024 | 0.0021 | #N/A |
| | | Se [mg/L] | #N/A | #N/A | 0.00235 | 0.00164 | 0.00087 | #N/A |
| | | Si [mg/L] | #N/A | #N/A | 22.0 | 16.4 | 2.70 | #N/A |
| | | Sn [mg/L] | #N/A | #N/A | 0.00004 | 0.00016 | 0.00007 | #N/A |
| | | Sr [mg/L] | #N/A | #N/A | 2.81 | 6.09 | 0.0574 | #N/A |
| | | Ti [mg/L] | #N/A | #N/A | 0.00237 | 0.00108 | 0.0151 | #N/A |
| | | Tl [mg/L] | #N/A | #N/A | 0.000041 | 0.000069 | 0.000046 | #N/A |
| | | U [mg/L] | #N/A | #N/A | 0.000056 | 0.000263 | 0.00304 | #N/A |
| | | V [mg/L] | #N/A | #N/A | 0.00968 | 0.0330 | 0.0420 | #N/A |
| | | Zn [mg/L] | #N/A | #N/A | <0.002 | <0.002 | <0.002 | #N/A |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | #N/A | #N/A | 0.4 | 0.4 | 0.4 | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 07 | EM - ORE - 08 | EM - ORE - 09 | EM - ORE - 10 | EM - Development - 01 | EM Development - 02 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | #N/A | #N/A | 1 | 1 | 1 | #N/A |
| | | Ext Volume [mL] | #N/A | #N/A | 400 | 400 | 400 | #N/A |
| | | Final pH | #N/A | #N/A | 9.50 | 9.61 | 9.54 | #N/A |
| | | F [mg/L] | #N/A | #N/A | <0.06 | <0.06 | <0.06 | #N/A |
| | | SO4 [mg/L] | #N/A | #N/A | 15 | 8.2 | 3.5 | #N/A |
| | | Cl [mg/L] | #N/A | #N/A | <2.0 | <2.0 | <2.0 | #N/A |
| | | Br [mg/L] | #N/A | #N/A | <3.0 | <3.0 | <3.0 | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | <0.3 | <0.3 | <0.3 | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | <0.6 | <0.6 | <0.6 | #N/A |
| | | Conductivity [uS/cm] | #N/A | #N/A | 86 | 82 | 64 | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | 23 | 27 | 26 | #N/A |
| | | pH [no unit] | #N/A | #N/A | 6.79 | 7.72 | 8.07 | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | <0.03 | <0.03 | <0.03 | #N/A |
| | | Hg [mg/L] | #N/A | #N/A | <0.00001 | 0.00001 | <0.00001 | #N/A |
| | | Al [mg/L] | #N/A | #N/A | 0.042 | 0.054 | 0.554 | #N/A |
| | | As [mg/L] | #N/A | #N/A | 0.0008 | 0.0004 | 0.0004 | #N/A |
| | | Ag [mg/L] | #N/A | #N/A | <0.00005 | <0.00005 | <0.00005 | #N/A |
| | | Ba [mg/L] | #N/A | #N/A | 0.263 | 0.660 | 0.00374 | #N/A |
| | | Be [mg/L] | #N/A | #N/A | <0.000007 | <0.000007 | <0.000007 | #N/A |
| | | B [mg/L] | #N/A | #N/A | <0.002 | <0.002 | <0.002 | #N/A |
| | | Bi [mg/L] | #N/A | #N/A | <0.000007 | <0.000007 | <0.000007 | #N/A |
| | | Ca [mg/L] | #N/A | #N/A | 9.10 | 9.50 | 4.86 | #N/A |
| | | Cd [mg/L] | #N/A | #N/A | <0.000003 | <0.000003 | <0.000003 | #N/A |
| | | Co [mg/L] | #N/A | #N/A | <0.000004 | <0.000004 | <0.000004 | #N/A |
| | | Cr [mg/L] | #N/A | #N/A | 0.00012 | 0.00027 | 0.00016 | #N/A |
| | | Cu [mg/L] | #N/A | #N/A | 0.00005 | 0.00025 | 0.00034 | #N/A |
| | | Fe [mg/L] | #N/A | #N/A | <0.007 | <0.007 | 0.014 | #N/A |
| | | K [mg/L] | #N/A | #N/A | 6.59 | 11.8 | 8.45 | #N/A |
| | | Li [mg/L] | #N/A | #N/A | 0.0004 | 0.0013 | 0.0026 | #N/A |
| | | Mg [mg/L] | #N/A | #N/A | 1.88 | 1.18 | 0.394 | #N/A |
| | | Mn [mg/L] | #N/A | #N/A | 0.00047 | 0.00037 | 0.00091 | #N/A |
| | | Mo [mg/L] | #N/A | #N/A | 0.00050 | 0.00035 | 0.00041 | #N/A |
| | | Na [mg/L] | #N/A | #N/A | 0.67 | 0.27 | 2.14 | #N/A |
| | | Ni [mg/L] | #N/A | #N/A | 0.0002 | <0.0001 | <0.0001 | #N/A |
| | | P [mg/L] | #N/A | #N/A | <0.003 | <0.003 | 0.007 | #N/A |
| | | Pb [mg/L] | #N/A | #N/A | <0.00001 | 0.00005 | <0.00001 | #N/A |
| | | Sb [mg/L] | #N/A | #N/A | <0.0002 | <0.0002 | <0.0002 | #N/A |
| | | Se [mg/L] | #N/A | #N/A | 0.00010 | 0.00014 | 0.00010 | #N/A |
| | | Si [mg/L] | #N/A | #N/A | 1.49 | 1.50 | 2.43 | #N/A |
| | | Sr [mg/L] | #N/A | #N/A | 1.06 | 2.51 | 0.0609 | #N/A |
| | | Sn [mg/L] | #N/A | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A |
| | | Ti [mg/L] | #N/A | #N/A | <0.00005 | <0.00005 | 0.00131 | #N/A |
| | | Tl [mg/L] | #N/A | #N/A | 0.000022 | <0.000005 | <0.000005 | #N/A |
| | | U [mg/L] | #N/A | #N/A | <0.000002 | <0.000002 | 0.000022 | #N/A |
| | | V [mg/L] | #N/A | #N/A | 0.00188 | 0.00454 | 0.00329 | #N/A |
| | | Zn [mg/L] | #N/A | #N/A | <0.002 | <0.002 | <0.002 | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 07 | EM - ORE - 08 | EM - ORE - 09 | EM - ORE - 10 | EM - Development - 01 | EM Development - 02 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | #N/A | #N/A | 20 | 20 | 20 | #N/A |
| | | Ext Fluid [#1 or #2] | #N/A | #N/A | 1 | 2 | 1 | #N/A |
| | | Ext Volume [mL] | #N/A | #N/A | 400 | 400 | 400 | #N/A |
| | | Final pH | #N/A | #N/A | 5.70 | 5.17 | 5.12 | #N/A |
| | | Conductivity [uS/cm] | #N/A | #N/A | 6360 | 5070 | 5270 | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | 2530 | 1830 | 1650 | #N/A |
| | | pH [no unit] | #N/A | #N/A | 5.77 | 5.22 | 5.14 | #N/A |
| | | SO4 [mg/L] | #N/A | #N/A | 14 | 8.7 | <2.0 | #N/A |
| | | Cl [mg/L] | #N/A | #N/A | <20.0 | <20.0 | <20.0 | #N/A |
| | | Br [mg/L] | #N/A | #N/A | <3.0 | <3.0 | <3.0 | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | <0.3 | <0.3 | <0.3 | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | <0.6 | <0.6 | <0.6 | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | #N/A | <0.6 | <0.6 | <0.6 | #N/A |
| | | F [mg/L] | #N/A | #N/A | <0.06 | <0.06 | 0.10 | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | <0.03 | <0.03 | <0.03 | #N/A |
| | | Hg [mg/L] | #N/A | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A |
| | | Al [mg/L] | #N/A | #N/A | 0.02 | 0.34 | 0.81 | #N/A |
| | | As [mg/L] | #N/A | #N/A | <0.002 | <0.002 | 0.002 | #N/A |
| | | Ag [mg/L] | #N/A | #N/A | <0.0005 | <0.0005 | <0.0005 | #N/A |
| | | Ba [mg/L] | #N/A | #N/A | 1.28 | 3.52 | 0.586 | #N/A |
| | | B [mg/L] | #N/A | #N/A | <0.02 | <0.02 | <0.02 | #N/A |
| | | Be [mg/L] | #N/A | #N/A | 0.00051 | 0.00314 | 0.00021 | #N/A |
| | | Bi [mg/L] | #N/A | #N/A | <0.00007 | 0.00013 | 0.00007 | #N/A |
| | | Ca [mg/L] | #N/A | #N/A | 435 | 1200 | 182 | #N/A |
| | | Cd [mg/L] | #N/A | #N/A | 0.00063 | 0.00266 | 0.00079 | #N/A |
| | | Cr [mg/L] | #N/A | #N/A | 0.0013 | 0.0478 | 0.0104 | #N/A |
| | | Co [mg/L] | #N/A | #N/A | 0.0135 | 0.0301 | 0.00536 | #N/A |
| | | Cu [mg/L] | #N/A | #N/A | 0.0061 | 0.0010 | 0.0051 | #N/A |
| | | Fe [mg/L] | #N/A | #N/A | 9.91 | 94.4 | 7.49 | #N/A |
| | | K [mg/L] | #N/A | #N/A | 50.6 | 97.1 | 32.5 | #N/A |
| | | Li [mg/L] | #N/A | #N/A | 0.005 | 0.009 | 0.010 | #N/A |
| | | Mg [mg/L] | #N/A | #N/A | 80.9 | 227 | 5.89 | #N/A |
| | | Mn [mg/L] | #N/A | #N/A | 6.43 | 15.1 | 3.74 | #N/A |
| | | Mo [mg/L] | #N/A | #N/A | 0.0002 | 0.0002 | 0.0002 | #N/A |
| | | Na [mg/L] | #N/A | #N/A | 1440 | 2.0 | 1500 | #N/A |
| | | Ni [mg/L] | #N/A | #N/A | 0.049 | 0.108 | 0.013 | #N/A |
| | | P [mg/L] | #N/A | #N/A | <0.03 | <0.03 | <0.03 | #N/A |
| | | Pb [mg/L] | #N/A | #N/A | 0.0025 | 0.104 | 0.0135 | #N/A |
| | | U [mg/L] | #N/A | #N/A | 0.00027 | 0.00073 | 0.00314 | #N/A |
| | | Sb [mg/L] | #N/A | #N/A | <0.002 | <0.002 | <0.002 | #N/A |
| | | Se [mg/L] | #N/A | #N/A | <0.0004 | <0.0004 | <0.0004 | #N/A |
| | | Si [mg/L] | #N/A | #N/A | 1.25 | 2.12 | 3.69 | #N/A |
| | | Sn [mg/L] | #N/A | #N/A | 0.0001 | <0.0001 | 0.0001 | #N/A |
| | | Sr [mg/L] | #N/A | #N/A | 3.60 | 12.9 | 0.576 | #N/A |
| | | Ti [mg/L] | #N/A | #N/A | <0.0005 | <0.0005 | 0.00273 | #N/A |
| | | Tl [mg/L] | #N/A | #N/A | 0.00108 | 0.00068 | <0.00005 | #N/A |
| | | V [mg/L] | #N/A | #N/A | <0.0001 | 0.0013 | 0.0011 | #N/A |
| | | Zn [mg/L] | #N/A | #N/A | 0.15 | 0.10 | 0.02 | #N/A |
| | | Weight [g] | #N/A | #N/A | 3657 | 1962 | 4030 | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 07 | EM - ORE - 08 | EM - ORE - 09 | EM - ORE - 10 | EM - Development - 01 | EM Development - 02 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Split | #N/A | #N/A | 1 | 1 | 1 | #N/A |
| | | Pulv200M [250g] | #N/A | #N/A | 1 | 1 | 1 | #N/A |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | #N/A | #N/A | 2.00 | 2.00 | 2.01 | #N/A |
| | | Initial pH | #N/A | #N/A | 9.97 | 9.80 | 9.67 | #N/A |
| | | Vol H2SO4 (mL) | #N/A | #N/A | 6.95 | 9.20 | 0.70 | #N/A |
| | | H2SO4 Normality | #N/A | #N/A | 1.00 | 1.00 | 1.00 | #N/A |
| | | Acisol-NP (kgCaCO3/tonne) | #N/A | #N/A | 174 | 230 | 17.4 | #N/A |
| | | AP (kgCaCO3/tonne) | #N/A | #N/A | 8.16 | 10.4 | 9.34 | #N/A |
| | | NNPkg CaCO3/tonne | #N/A | #N/A | 166 | 220 | 8.1 | #N/A |
| | | S Acid% | #N/A | #N/A | 0.261 | 0.332 | 0.299 | #N/A |
| | | LeachableSO4-S% | #N/A | #N/A | <0.02 | <0.02 | 0.03 | #N/A |
| | | Sulphide% | #N/A | #N/A | 0.27 | 0.32 | 0.27 | #N/A |
| | | C% | #N/A | #N/A | 2.14 | 3.15 | 0.126 | #N/A |
| | | CO3% (as %CO3) | #N/A | #N/A | 9.21 | 15.3 | 0.515 | #N/A |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | #N/A | #N/A | #N/A | 10.4 | 21.0 | #N/A |
| | | Talc (wt%) | #N/A | #N/A | #N/A | 18.0 | 0.0 | #N/A |
| | | Chlorite (wt%) | #N/A | #N/A | #N/A | 10.1 | 0.4 | #N/A |
| | | Muscovite (wt%) | #N/A | #N/A | #N/A | 0.0 | 9.1 | #N/A |
| | | Albite (wt%) | #N/A | #N/A | #N/A | 3.6 | 47.6 | #N/A |
| | | Microcline (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Biotite (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Magnesiohornblende (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Diopside (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.8 | #N/A |
| | | Phlogopite (wt%) | #N/A | #N/A | #N/A | 33.6 | 18.3 | #N/A |
| | | Magnetite (wt%) | #N/A | #N/A | #N/A | 0.2 | 0.0 | #N/A |
| | | Brucite (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Hematite (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Ilmenite (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Periclase (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Rutile (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.4 | #N/A |
| | | Iron (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Dolomite (wt%) | #N/A | #N/A | #N/A | 20.2 | 0.2 | #N/A |
| | | Calcite (wt%) | #N/A | #N/A | #N/A | 4.0 | 1.7 | #N/A |
| | | Magnesite (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Ankerite (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | Pyrite (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.4 | #N/A |
| | | Gypsum (wt%) | #N/A | #N/A | #N/A | 0.0 | 0.0 | #N/A |
| | | TOTAL (wt%) | #N/A | #N/A | #N/A | 100 | 100 | #N/A |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | #N/A | #N/A | 43.1 | 39.9 | 63.2 | #N/A |
| | | Al2O3% | #N/A | #N/A | 6.29 | 6.27 | 15.9 | #N/A |
| | | Fe2O3% | #N/A | #N/A | 8.48 | 8.93 | 5.55 | #N/A |
| | | MgO% | #N/A | #N/A | 20.2 | 17.3 | 2.89 | #N/A |
| | | CaO% | #N/A | #N/A | 6.87 | 8.47 | 2.33 | #N/A |
| | | Na2O% | #N/A | #N/A | 1.13 | 0.21 | 4.03 | #N/A |
| | | K2O% | #N/A | #N/A | 1.56 | 3.82 | 2.98 | #N/A |
| | | TiO2% | #N/A | #N/A | 0.30 | 0.34 | 0.57 | #N/A |
| | | P2O5% | #N/A | #N/A | 0.03 | 0.01 | 0.15 | #N/A |

| Test Phase | Analysis | Parameter | EM - ORE - 07 | EM - ORE - 08 | EM - ORE - 09 | EM - ORE - 10 | EM - Development - 01 | EM Development - 02 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | #N/A | #N/A | 0.15 | 0.15 | 0.07 | #N/A |
| | | Cr2O3% | #N/A | #N/A | 0.26 | 0.24 | 0.03 | #N/A |
| | | V2O5% | #N/A | #N/A | 0.03 | 0.03 | 0.02 | #N/A |
| | | LOI% | #N/A | #N/A | 10.9 | 13.2 | 1.81 | #N/A |
| | | Sum% | #N/A | #N/A | 99.3 | 98.9 | 99.5 | #N/A |

| Test Phase | Analysis | Parameter | EM - Development - 03 | EM Development - 04 | EM Development - 05 | EM Dilution Footwall - 01 | EM - Dilution Footwall - 02 | EM - Dilution Footwall - 03 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 1.90 | 2.20 | 1.90 | 1.40 | 4.99 | 4.00 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 0.11 | 0.13 | 0.12 | 0.06 | 0.17 | 0.16 |
| | | Aluminum (mg/kg) | 23000 | 22000 | 20000 | 10000 | 28000 | 18000 |
| | | Arsenic (mg/kg) | 0.6 | 0.8 | 1.3 | 0.9 | 3.9 | 0.6 |
| | | Boron (mg/kg) | 1 | 2 | 2 | 1 | 2 | 1 |
| | | Barium (mg/kg) | 510 | 300 | 250 | 6.9 | 210 | 130 |
| | | Beryllium (mg/kg) | 0.14 | 0.13 | 0.12 | 0.08 | 0.34 | 0.77 |
| | | Bismuth (mg/kg) | 0.28 | 0.50 | 0.62 | 0.12 | 0.98 | 0.24 |
| | | Calcium (mg/kg) | 3700 | 4600 | 3200 | 35000 | 12000 | 62000 |
| | | Cadmium (mg/kg) | 0.05 | 0.04 | 0.05 | 0.04 | <0.02 | 0.08 |
| | | Cobalt (mg/kg) | 24 | 23 | 21 | 37 | 80 | 43 |
| | | Chromium (mg/kg) | 190 | 170 | 150 | 650 | 1300 | 810 |
| | | Copper (mg/kg) | 47 | 48 | 50 | 49 | 96 | 52 |
| | | Iron (mg/kg) | 43000 | 44000 | 40000 | 32000 | 53000 | 41000 |
| | | Potassium (mg/kg) | 22000 | 21000 | 17000 | 1600 | 38000 | 18000 |
| | | Lithium (mg/kg) | 23 | 23 | 18 | 6 | 58 | 27 |
| | | Magnesium (mg/kg) | 19000 | 18000 | 15000 | 30000 | 63000 | 63000 |
| | | Manganese (mg/kg) | 410 | 420 | 360 | 590 | 450 | 1100 |
| | | Molybdenum (mg/kg) | 3.7 | 6.2 | 4.1 | 1.0 | 2.0 | 5.1 |
| | | Sodium (mg/kg) | 700 | 670 | 760 | 83 | 340 | 130 |
| | | Nickel (mg/kg) | 87 | 88 | 75 | 270 | 670 | 480 |
| | | Phosphorus (mg/kg) | 740 | 710 | 660 | 130 | 110 | 19 |
| | | Lead (mg/kg) | 4.1 | 2.9 | 4.8 | 0.79 | 0.85 | 8.1 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | 1.2 | 1.1 | 0.9 | <0.5 | <0.5 | <0.5 |
| | | Strontium (mg/kg) | 17 | 19 | 19 | 51 | 28 | 420 |
| | | Titanium (mg/kg) | 2300 | 2100 | 1500 | 110 | 1800 | 1100 |
| | | Thallium (mg/kg) | 0.28 | 0.47 | 0.29 | 0.02 | 0.90 | 0.30 |
| | | Uranium (mg/kg) | 1.1 | 1.1 | 1.7 | 0.018 | 0.035 | 0.062 |
| | | Vanadium (mg/kg) | 98 | 96 | 76 | 44 | 85 | 85 |
| | | Zinc (mg/kg) | 81 | 78 | 75 | 17 | 47 | 30 |
| | | Weight (mg/kg) | 5354 | 6720 | 2818 | 4347 | 4832 | 5296 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 2.01 | 1.96 | 2.05 | 2.01 | 2.01 | 2.05 |
| | | Initial pH | 9.70 | 9.56 | 9.60 | 9.74 | 9.75 | 9.76 |
| | | Vol H2SO4 (mL) | 0.70 | 0.70 | 0.65 | 3.55 | 1.50 | 9.00 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 17 | 18 | 16 | 88 | 37 | 220 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 6.72 | 9.47 | 10.9 | 4.16 | 47.3 | 3.19 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | 11 | 8.4 | 5.0 | 84 | -10.0 | 216 |
| | | Sulphur (total) (%) | 0.215 | 0.303 | 0.349 | 0.133 | 1.51 | 0.102 |
| | | Acid Leachable SO4-S (%) | 0.04 | 0.07 | 0.06 | 0.03 | 0.40 | 0.02 |
| | | Sulphide (%) | 0.17 | 0.23 | 0.29 | 0.10 | 1.11 | 0.08 |
| | | Carbon (total) (%) | 0.027 | 0.068 | 0.018 | 1.13 | 0.257 | 3.32 |
| | | Carbonate (%CO3) | 0.080 | 0.165 | 0.040 | 5.30 | 0.939 | 16.3 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | 100 | #N/A | #N/A | #N/A | 100 | 100 |
| | | Volume D.I. Water [mL] | 400 | #N/A | #N/A | #N/A | 400 | 400 |

| Test Phase | Analysis | Parameter | EM - Development - 03 | EM Development - 04 | EM Development - 05 | EM Dilution Footwall - 01 | EM - Dilution Footwall - 02 | EM - Dilution Footwall - 03 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | 9.06 | #N/A | #N/A | #N/A | 8.81 | 9.24 |
| | | Alkalinity [mg/L as CaCO3] | 127 | #N/A | #N/A | #N/A | 112 | 136 |
| | | pH [no unit] | 8.78 | #N/A | #N/A | #N/A | 8.22 | 8.67 |
| | | Conductivity [uS/cm] | 506 | #N/A | #N/A | #N/A | 1040 | 401 |
| | | F [mg/L] | 1.66 | #N/A | #N/A | #N/A | 1.64 | 1.00 |
| | | Cl [mg/L] | 2.4 | #N/A | #N/A | #N/A | 2.2 | 3.7 |
| | | SO4 [mg/L] | 45 | #N/A | #N/A | #N/A | 120 | 27 |
| | | Br [mg/L] | <3.0 | #N/A | #N/A | #N/A | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | <0.3 | #N/A | #N/A | #N/A | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | <0.6 | #N/A | #N/A | #N/A | <0.6 | <0.6 |
| | | NO2+NO3 [as N mg/L] | <0.6 | #N/A | #N/A | #N/A | <0.6 | <0.6 |
| | | Tot.Reactive P [mg/L] | 0.05 | #N/A | #N/A | #N/A | <0.03 | <0.03 |
| | | Hg [mg/L] | <0.00001 | #N/A | #N/A | #N/A | <0.00001 | <0.00001 |
| | | Al [mg/L] | 1.42 | #N/A | #N/A | #N/A | 0.057 | 0.005 |
| | | As [mg/L] | 0.0024 | #N/A | #N/A | #N/A | 0.0016 | 0.0042 |
| | | Ag [mg/L] | 0.00029 | #N/A | #N/A | #N/A | 0.00478 | 0.00008 |
| | | Ba [mg/L] | 0.0404 | #N/A | #N/A | #N/A | 0.261 | 0.0963 |
| | | Be [mg/L] | 0.000011 | #N/A | #N/A | #N/A | <0.000007 | <0.000007 |
| | | B [mg/L] | 0.011 | #N/A | #N/A | #N/A | 0.025 | 0.010 |
| | | Bi [mg/L] | 0.000071 | #N/A | #N/A | #N/A | 0.000193 | 0.000029 |
| | | Ca [mg/L] | 2.60 | #N/A | #N/A | #N/A | 19.1 | 10.3 |
| | | Cd [mg/L] | 0.000018 | #N/A | #N/A | #N/A | <0.000003 | <0.000003 |
| | | Co [mg/L] | 0.000673 | #N/A | #N/A | #N/A | 0.000203 | 0.000079 |
| | | Cr [mg/L] | 0.0253 | #N/A | #N/A | #N/A | 0.00303 | 0.00847 |
| | | Cu [mg/L] | 0.00188 | #N/A | #N/A | #N/A | 0.00333 | 0.00088 |
| | | Fe [mg/L] | 1.05 | #N/A | #N/A | #N/A | 0.064 | <0.007 |
| | | K [mg/L] | 88.1 | #N/A | #N/A | #N/A | 212 | 55.1 |
| | | Li [mg/L] | 0.0304 | #N/A | #N/A | #N/A | 0.107 | 0.0073 |
| | | Mg [mg/L] | 1.98 | #N/A | #N/A | #N/A | 15.7 | 15.5 |
| | | Mn [mg/L] | 0.0134 | #N/A | #N/A | #N/A | 0.00329 | 0.00065 |
| | | Mo [mg/L] | 0.0158 | #N/A | #N/A | #N/A | 0.0139 | 0.00801 |
| | | Na [mg/L] | 31.8 | #N/A | #N/A | #N/A | 20.5 | 8.85 |
| | | Ni [mg/L] | 0.0028 | #N/A | #N/A | #N/A | 0.0018 | 0.0008 |
| | | P [mg/L] | 0.054 | #N/A | #N/A | #N/A | 0.005 | <0.003 |
| | | Pb [mg/L] | 0.00098 | #N/A | #N/A | #N/A | 0.00002 | 0.00007 |
| | | Sb [mg/L] | 0.0034 | #N/A | #N/A | #N/A | 0.0039 | 0.0032 |
| | | Se [mg/L] | 0.00182 | #N/A | #N/A | #N/A | 0.00152 | 0.00306 |
| | | Si [mg/L] | 3.84 | #N/A | #N/A | #N/A | 9.14 | 10.4 |
| | | Sn [mg/L] | 0.00010 | #N/A | #N/A | #N/A | 0.00007 | 0.00010 |
| | | Sr [mg/L] | 0.0296 | #N/A | #N/A | #N/A | 0.289 | 0.211 |
| | | Ti [mg/L] | 0.0756 | #N/A | #N/A | #N/A | 0.00251 | 0.00020 |
| | | Tl [mg/L] | 0.000055 | #N/A | #N/A | #N/A | 0.000168 | 0.000048 |
| | | U [mg/L] | 0.00175 | #N/A | #N/A | #N/A | 0.000121 | 0.000052 |
| | | V [mg/L] | 0.0502 | #N/A | #N/A | #N/A | 0.00506 | 0.0105 |
| | | Zn [mg/L] | 0.003 | #N/A | #N/A | #N/A | <0.002 | <0.002 |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | 0.4 | #N/A | #N/A | #N/A | 0.4 | 0.4 |

| Test Phase | Analysis | Parameter | EM - Development - 03 | EM Development - 04 | EM Development - 05 | EM Dilution Footwall - 01 | EM - Dilution Footwall - 02 | EM - Dilution Footwall - 03 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | 1 | #N/A | #N/A | #N/A | 1 | 1 |
| | | Ext Volume [mL] | 400 | #N/A | #N/A | #N/A | 400 | 400 |
| | | Final pH | 9.39 | #N/A | #N/A | #N/A | 9.69 | 9.70 |
| | | F [mg/L] | 0.06 | #N/A | #N/A | #N/A | <0.06 | 0.06 |
| | | SO4 [mg/L] | 11 | #N/A | #N/A | #N/A | 4.6 | 2.5 |
| | | Cl [mg/L] | <2.0 | #N/A | #N/A | #N/A | <2.0 | <2.0 |
| | | Br [mg/L] | <3.0 | #N/A | #N/A | #N/A | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | <0.3 | #N/A | #N/A | #N/A | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | <0.6 | #N/A | #N/A | #N/A | <0.6 | <0.6 |
| | | Conductivity [uS/cm] | 76 | #N/A | #N/A | #N/A | 78 | 68 |
| | | Alkalinity [mg/L as CaCO3] | 22 | #N/A | #N/A | #N/A | 28 | 30 |
| | | pH [no unit] | 7.38 | #N/A | #N/A | #N/A | 7.59 | 8.19 |
| | | Tot.Reactive P [mg/L] | <0.03 | #N/A | #N/A | #N/A | <0.03 | <0.03 |
| | | Hg [mg/L] | <0.00001 | #N/A | #N/A | #N/A | <0.00001 | <0.00001 |
| | | Al [mg/L] | 0.558 | #N/A | #N/A | #N/A | 0.077 | 0.017 |
| | | As [mg/L] | 0.0006 | #N/A | #N/A | #N/A | 0.0038 | 0.0010 |
| | | Ag [mg/L] | <0.00005 | #N/A | #N/A | #N/A | <0.00005 | <0.00005 |
| | | Ba [mg/L] | 0.00885 | #N/A | #N/A | #N/A | 0.0979 | 0.0190 |
| | | Be [mg/L] | <0.000007 | #N/A | #N/A | #N/A | <0.000007 | <0.000007 |
| | | B [mg/L] | <0.002 | #N/A | #N/A | #N/A | 0.005 | 0.002 |
| | | Bi [mg/L] | <0.000007 | #N/A | #N/A | #N/A | 0.000021 | <0.000007 |
| | | Ca [mg/L] | 6.81 | #N/A | #N/A | #N/A | 3.38 | 6.07 |
| | | Cd [mg/L] | <0.000003 | #N/A | #N/A | #N/A | <0.000003 | <0.000003 |
| | | Co [mg/L] | <0.000004 | #N/A | #N/A | #N/A | 0.000019 | <0.000004 |
| | | Cr [mg/L] | 0.00017 | #N/A | #N/A | #N/A | 0.00173 | 0.00010 |
| | | Cu [mg/L] | 0.00010 | #N/A | #N/A | #N/A | 0.00028 | 0.00022 |
| | | Fe [mg/L] | 0.015 | #N/A | #N/A | #N/A | 0.045 | <0.007 |
| | | K [mg/L] | 8.28 | #N/A | #N/A | #N/A | 15.1 | 6.92 |
| | | Li [mg/L] | 0.0034 | #N/A | #N/A | #N/A | 0.0023 | 0.0009 |
| | | Mg [mg/L] | 0.519 | #N/A | #N/A | #N/A | 0.607 | 1.90 |
| | | Mn [mg/L] | 0.00104 | #N/A | #N/A | #N/A | 0.00105 | 0.00025 |
| | | Mo [mg/L] | 0.00033 | #N/A | #N/A | #N/A | 0.00028 | 0.00032 |
| | | Na [mg/L] | 2.03 | #N/A | #N/A | #N/A | 2.36 | 0.85 |
| | | Ni [mg/L] | <0.0001 | #N/A | #N/A | #N/A | 0.0008 | 0.0002 |
| | | P [mg/L] | 0.004 | #N/A | #N/A | #N/A | 0.003 | <0.003 |
| | | Pb [mg/L] | <0.00001 | #N/A | #N/A | #N/A | <0.00001 | <0.00001 |
| | | Sb [mg/L] | 0.0002 | #N/A | #N/A | #N/A | 0.0007 | 0.0004 |
| | | Se [mg/L] | 0.00014 | #N/A | #N/A | #N/A | 0.00047 | 0.00049 |
| | | Si [mg/L] | 1.88 | #N/A | #N/A | #N/A | 2.62 | 1.39 |
| | | Sr [mg/L] | 0.0571 | #N/A | #N/A | #N/A | 0.0499 | 0.0670 |
| | | Sn [mg/L] | <0.00001 | #N/A | #N/A | #N/A | 0.00001 | <0.00001 |
| | | Ti [mg/L] | 0.00153 | #N/A | #N/A | #N/A | 0.00152 | <0.00005 |
| | | Tl [mg/L] | <0.000005 | #N/A | #N/A | #N/A | 0.000009 | 0.000007 |
| | | U [mg/L] | 0.000034 | #N/A | #N/A | #N/A | 0.000055 | 0.000006 |
| | | V [mg/L] | 0.00310 | #N/A | #N/A | #N/A | 0.00681 | 0.00202 |
| | | Zn [mg/L] | <0.002 | #N/A | #N/A | #N/A | <0.002 | <0.002 |

| Test Phase | Analysis | Parameter | EM - Development - 03 | EM Development - 04 | EM Development - 05 | EM Dilution Footwall - 01 | EM - Dilution Footwall - 02 | EM - Dilution Footwall - 03 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | 20 | #N/A | #N/A | #N/A | 20 | 20 |
| | | Ext Fluid [#1 or #2] | 1 | #N/A | #N/A | #N/A | 1 | 1 |
| | | Ext Volume [mL] | 400 | #N/A | #N/A | #N/A | 400 | 400 |
| | | Final pH | 5.04 | #N/A | #N/A | #N/A | 5.48 | 5.84 |
| | | Conductivity [uS/cm] | 5130 | #N/A | #N/A | #N/A | 6100 | 6460 |
| | | Alkalinity [mg/L as CaCO3] | 1480 | #N/A | #N/A | #N/A | 2280 | 2570 |
| | | pH [no unit] | 5.06 | #N/A | #N/A | #N/A | 5.52 | 5.95 |
| | | SO4 [mg/L] | 4.7 | #N/A | #N/A | #N/A | 3.6 | <2.0 |
| | | Cl [mg/L] | <20.0 | #N/A | #N/A | #N/A | <20.0 | <20.0 |
| | | Br [mg/L] | <3.0 | #N/A | #N/A | #N/A | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | <0.3 | #N/A | #N/A | #N/A | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | <0.6 | #N/A | #N/A | #N/A | <0.6 | <0.6 |
| | | NO2+NO3 [as N mg/L] | <0.6 | #N/A | #N/A | #N/A | <0.6 | <0.6 |
| | | F [mg/L] | 0.08 | #N/A | #N/A | #N/A | 0.06 | 0.07 |
| | | Tot.Reactive P [mg/L] | <0.03 | #N/A | #N/A | #N/A | <0.03 | <0.03 |
| | | Hg [mg/L] | <0.00001 | #N/A | #N/A | #N/A | <0.00001 | <0.00001 |
| | | Al [mg/L] | 0.83 | #N/A | #N/A | #N/A | 0.09 | <0.01 |
| | | As [mg/L] | <0.002 | #N/A | #N/A | #N/A | <0.002 | <0.002 |
| | | Ag [mg/L] | <0.0005 | #N/A | #N/A | #N/A | <0.0005 | <0.0005 |
| | | Ba [mg/L] | 0.753 | #N/A | #N/A | #N/A | 2.50 | 0.444 |
| | | B [mg/L] | <0.02 | #N/A | #N/A | #N/A | <0.02 | <0.02 |
| | | Be [mg/L] | 0.00011 | #N/A | #N/A | #N/A | 0.00009 | 0.00027 |
| | | Bi [mg/L] | <0.00007 | #N/A | #N/A | #N/A | 0.00011 | <0.00007 |
| | | Ca [mg/L] | 106 | #N/A | #N/A | #N/A | 471 | 359 |
| | | Cd [mg/L] | 0.00074 | #N/A | #N/A | #N/A | 0.00032 | 0.00035 |
| | | Cr [mg/L] | 0.0110 | #N/A | #N/A | #N/A | 0.0140 | 0.0010 |
| | | Co [mg/L] | 0.00419 | #N/A | #N/A | #N/A | 0.00456 | 0.0185 |
| | | Cu [mg/L] | 0.0044 | #N/A | #N/A | #N/A | 0.0054 | 0.0013 |
| | | Fe [mg/L] | 6.34 | #N/A | #N/A | #N/A | 2.83 | 9.00 |
| | | K [mg/L] | 32.0 | #N/A | #N/A | #N/A | 81.3 | 49.4 |
| | | Li [mg/L] | 0.013 | #N/A | #N/A | #N/A | 0.009 | 0.007 |
| | | Mg [mg/L] | 4.32 | #N/A | #N/A | #N/A | 8.92 | 152 |
| | | Mn [mg/L] | 1.80 | #N/A | #N/A | #N/A | 6.21 | 6.38 |
| | | Mo [mg/L] | 0.0004 | #N/A | #N/A | #N/A | 0.0003 | <0.0001 |
| | | Na [mg/L] | 1470 | #N/A | #N/A | #N/A | 1520 | 1480 |
| | | Ni [mg/L] | 0.016 | #N/A | #N/A | #N/A | 0.037 | 0.095 |
| | | P [mg/L] | <0.03 | #N/A | #N/A | #N/A | <0.03 | <0.03 |
| | | Pb [mg/L] | 0.0164 | #N/A | #N/A | #N/A | 0.0046 | 0.0004 |
| | | U [mg/L] | 0.00439 | #N/A | #N/A | #N/A | 0.00017 | 0.00003 |
| | | Sb [mg/L] | <0.002 | #N/A | #N/A | #N/A | <0.002 | <0.002 |
| | | Se [mg/L] | <0.0004 | #N/A | #N/A | #N/A | <0.0004 | <0.0004 |
| | | Si [mg/L] | 3.50 | #N/A | #N/A | #N/A | 1.92 | 1.15 |
| | | Sn [mg/L] | <0.0001 | #N/A | #N/A | #N/A | <0.0001 | <0.0001 |
| | | Sr [mg/L] | 0.411 | #N/A | #N/A | #N/A | 1.31 | 2.08 |
| | | Ti [mg/L] | 0.00103 | #N/A | #N/A | #N/A | 0.00066 | <0.0005 |
| | | Tl [mg/L] | <0.00005 | #N/A | #N/A | #N/A | 0.00067 | 0.00041 |
| | | V [mg/L] | 0.0015 | #N/A | #N/A | #N/A | 0.0012 | <0.0001 |
| | | Zn [mg/L] | <0.02 | #N/A | #N/A | #N/A | 0.06 | <0.02 |
| | | Weight [g] | 5233 | #N/A | #N/A | #N/A | 4714 | 5166 |

| Test Phase | Analysis | Parameter | EM - Development - 03 | EM Development - 04 | EM Development - 05 | EM Dilution Footwall - 01 | EM - Dilution Footwall - 02 | EM - Dilution Footwall - 03 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Split | 1 | #N/A | #N/A | #N/A | 1 | 1 |
| | | Pulv200M [250g] | 1 | #N/A | #N/A | #N/A | 1 | 1 |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | 2.02 | #N/A | #N/A | #N/A | 1.99 | 1.98 |
| | | Initial pH | 9.72 | #N/A | #N/A | #N/A | 9.85 | 9.71 |
| | | Vol H2SO4 (mL) | 0.65 | #N/A | #N/A | #N/A | 1.30 | 9.40 |
| | | H2SO4 Normality | 1.00 | #N/A | #N/A | #N/A | 1.00 | 1.00 |
| | | Acisol-NP (kgCaCO3/tonne) | 16.1 | #N/A | #N/A | #N/A | 32.7 | 237 |
| | | AP (kgCaCO3/tonne) | 9.41 | #N/A | #N/A | #N/A | 44.3 | 3.94 |
| | | NNPkg CaCO3/tonne | 6.7 | #N/A | #N/A | #N/A | -11.6 | 233 |
| | | S Acid% | 0.301 | #N/A | #N/A | #N/A | 1.42 | 0.126 |
| | | LeachableSO4-S% | 0.10 | #N/A | #N/A | #N/A | 0.35 | <0.02 |
| | | Sulphide% | 0.20 | #N/A | #N/A | #N/A | 1.07 | 0.12 |
| | | C% | 0.069 | #N/A | #N/A | #N/A | 0.292 | 2.94 |
| | | CO3% (as %CO3) | 0.245 | #N/A | #N/A | #N/A | 1.18 | 15.1 |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | 22.6 | #N/A | #N/A | #N/A | 0.0 | 4.7 |
| | | Talc (wt%) | 0.0 | #N/A | #N/A | #N/A | 7.9 | 23.1 |
| | | Chlorite (wt%) | 0.3 | #N/A | #N/A | #N/A | 6.6 | 17.8 |
| | | Muscovite (wt%) | 6.2 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Albite (wt%) | 47.9 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Microcline (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Biotite (wt%) | 0.0 | #N/A | #N/A | #N/A | 28.2 | 15.2 |
| | | Magnesiohornblende (wt%) | 0.0 | #N/A | #N/A | #N/A | 50.4 | 7.4 |
| | | Diopside (wt%) | 0.7 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Phlogopite (wt%) | 20.4 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Magnetite (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 2.4 |
| | | Brucite (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.2 | 0.0 |
| | | Hematite (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Ilmenite (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Periclase (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Rutile (wt%) | 0.5 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Iron (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.8 | 0.0 |
| | | Dolomite (wt%) | 0.2 | #N/A | #N/A | #N/A | 0.0 | 29.0 |
| | | Calcite (wt%) | 0.9 | #N/A | #N/A | #N/A | 4.1 | 0.4 |
| | | Magnesite (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Ankerite (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | Pyrite (wt%) | 0.2 | #N/A | #N/A | #N/A | 1.8 | 0.0 |
| | | Gypsum (wt%) | 0.0 | #N/A | #N/A | #N/A | 0.0 | 0.0 |
| | | TOTAL (wt%) | 100 | #N/A | #N/A | #N/A | 100 | 100 |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | 63.6 | #N/A | #N/A | #N/A | 45.5 | 38.8 |
| | | Al2O3% | 15.7 | #N/A | #N/A | #N/A | 6.15 | 4.52 |
| | | Fe2O3% | 5.62 | #N/A | #N/A | #N/A | 10.9 | 9.06 |
| | | MgO% | 3.13 | #N/A | #N/A | #N/A | 20.1 | 21.5 |
| | | CaO% | 2.16 | #N/A | #N/A | #N/A | 6.44 | 8.92 |
| | | Na2O% | 4.30 | #N/A | #N/A | #N/A | 0.68 | 0.10 |
| | | K2O% | 2.72 | #N/A | #N/A | #N/A | 4.06 | 2.10 |
| | | TiO2% | 0.58 | #N/A | #N/A | #N/A | 0.38 | 0.26 |
| | | P2O5% | 0.17 | #N/A | #N/A | #N/A | 0.03 | <0.01 |

| Test Phase | Analysis | Parameter | EM - Development - 03 | EM Development - 04 | EM Development - 05 | EM Dilution Footwall - 01 | EM - Dilution Footwall - 02 | EM - Dilution Footwall - 03 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | 0.07 | #N/A | #N/A | #N/A | 0.16 | 0.17 |
| | | Cr2O3% | 0.04 | #N/A | #N/A | #N/A | 0.31 | 0.27 |
| | | V2O5% | 0.02 | #N/A | #N/A | #N/A | 0.03 | 0.03 |
| | | LOI% | 1.23 | #N/A | #N/A | #N/A | 3.25 | 13.5 |
| | | Sum% | 99.4 | #N/A | #N/A | #N/A | 98.0 | 99.2 |

| Test Phase | Analysis | Parameter | EM Dilution Footwall - 04 | EM - Dilution Footwall - 05 | EM Dilution Hanging Wall - 01 | EM Dilution Hanging Wall - 02 | EM Dilution Hanging Wall - 03 | EM Dilution Hanging Wall - 04 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 1.50 | 1.50 | 4.20 | 2.58 | 2.79 | 2.94 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 0.12 | 0.12 | 0.54 | 0.17 | 0.28 | 0.19 |
| | | Aluminum (mg/kg) | 18000 | 13000 | 20000 | 20000 | 27000 | 20000 |
| | | Arsenic (mg/kg) | 1.0 | 3.6 | 1.2 | 2.2 | 1.2 | 3.9 |
| | | Boron (mg/kg) | 1 | 2 | 2 | 1 | 2 | 1 |
| | | Barium (mg/kg) | 62 | 81 | 170 | 290 | 500 | 230 |
| | | Beryllium (mg/kg) | 0.45 | 0.38 | 0.63 | 0.21 | 0.16 | 0.20 |
| | | Bismuth (mg/kg) | 0.26 | 1.4 | 0.41 | 0.34 | 0.29 | 0.38 |
| | | Calcium (mg/kg) | 34000 | 42000 | 19000 | 10000 | 4800 | 9600 |
| | | Cadmium (mg/kg) | 0.03 | 0.03 | 0.04 | 0.04 | 0.06 | 0.04 |
| | | Cobalt (mg/kg) | 52 | 66 | 23 | 23 | 26 | 24 |
| | | Chromium (mg/kg) | 810 | 650 | 170 | 190 | 330 | 180 |
| | | Copper (mg/kg) | 59 | 76 | 53 | 51 | 54 | 61 |
| | | Iron (mg/kg) | 41000 | 36000 | 43000 | 45000 | 50000 | 43000 |
| | | Potassium (mg/kg) | 14000 | 6700 | 20000 | 21000 | 28000 | 22000 |
| | | Lithium (mg/kg) | 19 | 14 | 23 | 20 | 27 | 29 |
| | | Magnesium (mg/kg) | 50000 | 41000 | 18000 | 18000 | 25000 | 17000 |
| | | Manganese (mg/kg) | 810 | 900 | 590 | 490 | 540 | 500 |
| | | Molybdenum (mg/kg) | 6.4 | 1.3 | 3.2 | 3.7 | 3.7 | 9.6 |
| | | Sodium (mg/kg) | 160 | 100 | 610 | 570 | 580 | 570 |
| | | Nickel (mg/kg) | 460 | 350 | 84 | 87 | 130 | 85 |
| | | Phosphorus (mg/kg) | 110 | 93 | 840 | 810 | 840 | 750 |
| | | Lead (mg/kg) | 0.84 | 1.1 | 4.3 | 3.0 | 3.3 | 3.4 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | <0.5 | <0.5 | 0.7 | 0.8 | 1.1 | 0.9 |
| | | Strontium (mg/kg) | 140 | 140 | 58 | 33 | 19 | 21 |
| | | Titanium (mg/kg) | 700 | 350 | 2300 | 2200 | 2800 | 2700 |
| | | Thallium (mg/kg) | 0.26 | 0.12 | 0.35 | 0.27 | 0.39 | 0.36 |
| | | Uranium (mg/kg) | 0.013 | 0.019 | 0.94 | 0.93 | 0.88 | 1.0 |
| | | Vanadium (mg/kg) | 69 | 51 | 90 | 85 | 120 | 97 |
| | | Zinc (mg/kg) | 24 | 19 | 78 | 75 | 81 | 82 |
| | | Weight (mg/kg) | 5256 | 4270 | 4514 | 4892 | 5509 | 4144 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 2.00 | 2.02 | 2.04 | 2.03 | 2.02 | 2.00 |
| | | Initial pH | 9.72 | 9.76 | 9.50 | 9.57 | 9.70 | 9.76 |
| | | Vol H2SO4 (mL) | 3.80 | 5.20 | 1.15 | 1.75 | 0.70 | 1.00 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 95 | 129 | 28 | 43 | 17 | 25 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 9.91 | 20.4 | 17.2 | 11.4 | 10.3 | 13.1 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | 85 | 108 | 11 | 32 | 7.0 | 12 |
| | | Sulphur (total) (%) | 0.317 | 0.654 | 0.549 | 0.366 | 0.330 | 0.420 |
| | | Acid Leachable SO4-S (%) | 0.10 | 0.16 | 0.14 | 0.10 | 0.09 | 0.12 |
| | | Sulphide (%) | 0.22 | 0.49 | 0.41 | 0.27 | 0.24 | 0.30 |
| | | Carbon (total) (%) | 1.36 | 1.64 | 0.454 | 0.204 | 0.042 | 0.188 |
| | | Carbonate (%CO3) | 6.32 | 7.79 | 1.80 | 0.764 | 0.145 | 0.654 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | #N/A | 100 | 100 | 100 | #N/A | #N/A |
| | | Volume D.I. Water [mL] | #N/A | 400 | 400 | 400 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Footwall - 04 | EM - Dilution Footwall - 05 | EM Dilution Hanging Wall - 01 | EM Dilution Hanging Wall - 02 | EM Dilution Hanging Wall - 03 | EM Dilution Hanging Wall - 04 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | #N/A | 8.67 | 8.94 | 8.99 | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 72 | 106 | 114 | #N/A | #N/A |
| | | pH [no unit] | #N/A | 8.17 | 8.46 | 8.55 | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 432 | 486 | 496 | #N/A | #N/A |
| | | F [mg/L] | #N/A | 0.48 | 2.13 | 1.60 | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | 2.1 | 3.6 | 2.9 | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 66 | 51 | 46 | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | <3.0 | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | <0.3 | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | 0.03 | <0.03 | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.019 | 0.299 | 0.563 | #N/A | #N/A |
| | | As [mg/L] | #N/A | 0.0182 | 0.0032 | 0.0037 | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | 0.00038 | 0.00102 | 0.00049 | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 0.184 | 0.0109 | 0.0183 | #N/A | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | <0.000007 | <0.000007 | #N/A | #N/A |
| | | B [mg/L] | #N/A | 0.009 | 0.016 | 0.019 | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | 0.000031 | 0.000032 | 0.000032 | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 9.12 | 5.67 | 5.21 | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | <0.000003 | 0.000003 | 0.000010 | #N/A | #N/A |
| | | Co [mg/L] | #N/A | 0.000120 | 0.000072 | 0.000070 | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.0249 | 0.00717 | 0.00713 | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.00088 | 0.00142 | 0.00095 | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | 0.020 | 0.017 | 0.074 | #N/A | #N/A |
| | | K [mg/L] | #N/A | 55.5 | 80.0 | 78.4 | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.0075 | 0.0235 | 0.0276 | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 15.4 | 3.64 | 2.67 | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 0.00098 | 0.00173 | 0.00206 | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.00720 | 0.00893 | 0.0113 | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 8.17 | 29.0 | 28.9 | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | 0.0020 | 0.0006 | 0.0003 | #N/A | #N/A |
| | | P [mg/L] | #N/A | 0.003 | 0.017 | 0.030 | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | <0.00001 | 0.00003 | 0.00006 | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | 0.0012 | 0.0038 | 0.0028 | #N/A | #N/A |
| | | Se [mg/L] | #N/A | 0.00270 | 0.00070 | 0.00066 | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 13.6 | 2.75 | 2.95 | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.00008 | 0.00015 | 0.00010 | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 0.503 | 0.0741 | 0.0687 | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | 0.00040 | 0.00155 | 0.00640 | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | 0.000048 | 0.000046 | 0.000048 | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.000315 | 0.000776 | 0.00173 | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.0132 | 0.0175 | 0.0246 | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | <0.002 | <0.002 | 0.004 | #N/A | #N/A |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | #N/A | 0.4 | 0.4 | 0.4 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Footwall - 04 | EM - Dilution Footwall - 05 | EM Dilution Hanging Wall - 01 | EM Dilution Hanging Wall - 02 | EM Dilution Hanging Wall - 03 | EM Dilution Hanging Wall - 04 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | #N/A | 1 | 1 | 1 | #N/A | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | 400 | 400 | #N/A | #N/A |
| | | Final pH | #N/A | 9.45 | 9.54 | 9.48 | #N/A | #N/A |
| | | F [mg/L] | #N/A | <0.06 | 0.08 | <0.06 | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 8.8 | 3.8 | 5.5 | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | <2.0 | <2.0 | <2.0 | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | <3.0 | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | <0.3 | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 69 | 64 | 66 | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 21 | 25 | 24 | #N/A | #N/A |
| | | pH [no unit] | #N/A | 7.30 | 7.88 | 7.86 | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | 0.03 | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.030 | 0.513 | 0.567 | #N/A | #N/A |
| | | As [mg/L] | #N/A | 0.0025 | 0.0009 | 0.0006 | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | <0.00005 | <0.00005 | <0.00005 | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 0.274 | 0.00242 | 0.00577 | #N/A | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | <0.000007 | <0.000007 | #N/A | #N/A |
| | | B [mg/L] | #N/A | 0.003 | <0.002 | <0.002 | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | 0.000025 | <0.000007 | <0.000007 | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 6.80 | 5.57 | 6.02 | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | <0.000003 | <0.000003 | <0.000003 | #N/A | #N/A |
| | | Co [mg/L] | #N/A | 0.000026 | 0.000013 | <0.000004 | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.00036 | 0.00013 | 0.00015 | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.00045 | 0.00045 | 0.00032 | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | <0.007 | <0.007 | 0.012 | #N/A | #N/A |
| | | K [mg/L] | #N/A | 6.26 | 7.43 | 6.35 | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.0004 | 0.0024 | 0.0032 | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 1.21 | 0.483 | 0.584 | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 0.00055 | 0.00056 | 0.00085 | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.00113 | 0.00332 | 0.00039 | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 0.94 | 2.27 | 1.67 | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | 0.0004 | 0.0001 | <0.0001 | #N/A | #N/A |
| | | P [mg/L] | #N/A | <0.003 | 0.005 | 0.005 | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | <0.0002 | 0.0005 | <0.0002 | #N/A | #N/A |
| | | Se [mg/L] | #N/A | 0.00043 | 0.00006 | <0.00004 | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 1.32 | 1.91 | 2.26 | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 0.294 | 0.0473 | 0.0583 | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.00013 | <0.00001 | 0.00004 | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | 0.00008 | 0.00051 | 0.00105 | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | 0.000037 | <0.000005 | <0.000005 | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.000150 | 0.000022 | 0.000050 | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.00635 | 0.00329 | 0.00277 | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | <0.002 | <0.002 | <0.002 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Footwall - 04 | EM - Dilution Footwall - 05 | EM Dilution Hanging Wall - 01 | EM Dilution Hanging Wall - 02 | EM Dilution Hanging Wall - 03 | EM Dilution Hanging Wall - 04 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | #N/A | 20 | 20 | 20 | #N/A | #N/A |
| | | Ext Fluid [#1 or #2] | #N/A | 1 | 1 | 1 | #N/A | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | 400 | 400 | #N/A | #N/A |
| | | Final pH | #N/A | 6.20 | 5.82 | 5.16 | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 6780 | 6460 | 5470 | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 3080 | 2610 | 1730 | #N/A | #N/A |
| | | pH [no unit] | #N/A | 6.73 | 5.90 | 5.18 | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 9.3 | 2.1 | 3.2 | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | <20.0 | <20.0 | <20.0 | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | <3.0 | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | <0.3 | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | <0.6 | #N/A | #N/A |
| | | F [mg/L] | #N/A | <0.06 | 0.07 | 0.06 | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | <0.03 | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | <0.00001 | #N/A | #N/A |
| | | Al [mg/L] | #N/A | <0.01 | 0.06 | 0.67 | #N/A | #N/A |
| | | As [mg/L] | #N/A | <0.002 | <0.002 | <0.002 | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | <0.0005 | <0.0005 | <0.0005 | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 1.45 | 0.315 | 0.447 | #N/A | #N/A |
| | | B [mg/L] | #N/A | <0.02 | <0.02 | <0.02 | #N/A | #N/A |
| | | Be [mg/L] | #N/A | 0.00014 | 0.00031 | 0.00023 | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | <0.00007 | <0.00007 | <0.00007 | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 735 | 644 | 219 | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | 0.00044 | 0.00141 | 0.00063 | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.0012 | 0.0013 | 0.0092 | #N/A | #N/A |
| | | Co [mg/L] | #N/A | 0.00344 | 0.00316 | 0.0103 | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.0008 | 0.0026 | 0.0074 | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | 0.41 | 5.23 | 7.83 | #N/A | #N/A |
| | | K [mg/L] | #N/A | 37.0 | 44.7 | 25.2 | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.003 | 0.009 | 0.009 | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 15.2 | 5.71 | 7.59 | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 9.46 | 7.46 | 4.34 | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.0003 | 0.0004 | 0.0002 | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 1460 | 1490 | 1490 | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | 0.017 | 0.006 | 0.011 | #N/A | #N/A |
| | | P [mg/L] | #N/A | <0.03 | <0.03 | <0.03 | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | 0.0004 | 0.0074 | 0.0137 | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.00005 | 0.00075 | 0.00385 | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | <0.002 | <0.002 | <0.002 | #N/A | #N/A |
| | | Se [mg/L] | #N/A | <0.0004 | <0.0004 | <0.0004 | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 1.05 | 1.98 | 2.47 | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.0005 | <0.0001 | <0.0001 | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 1.81 | 1.48 | 0.621 | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | <0.0005 | <0.0005 | <0.0005 | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | 0.00047 | <0.00005 | <0.00005 | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.0002 | 0.0004 | 0.0009 | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | <0.02 | <0.02 | 0.02 | #N/A | #N/A |
| | | Weight [g] | #N/A | 4137 | 4408 | 4754 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Footwall - 04 | EM - Dilution Footwall - 05 | EM Dilution Hanging Wall - 01 | EM Dilution Hanging Wall - 02 | EM Dilution Hanging Wall - 03 | EM Dilution Hanging Wall - 04 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Split | #N/A | 1 | 1 | 1 | #N/A | #N/A |
| | | Pulv200M [250g] | #N/A | 1 | 1 | 1 | #N/A | #N/A |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | #N/A | 1.96 | 2.00 | 1.98 | #N/A | #N/A |
| | | Initial pH | #N/A | 9.67 | 9.76 | 9.53 | #N/A | #N/A |
| | | Vol H2SO4 (mL) | #N/A | 4.65 | 1.80 | 1.00 | #N/A | #N/A |
| | | H2SO4 Normality | #N/A | 1.00 | 1.00 | 1.00 | #N/A | #N/A |
| | | Acisol-NP (kgCaCO3/tonne) | #N/A | 119 | 45.0 | 25.3 | #N/A | #N/A |
| | | AP (kgCaCO3/tonne) | #N/A | 20.4 | 17.3 | 12.4 | #N/A | #N/A |
| | | NNPkg CaCO3/tonne | #N/A | 98 | 28 | 13 | #N/A | #N/A |
| | | S Acid% | #N/A | 0.652 | 0.554 | 0.398 | #N/A | #N/A |
| | | LeachableSO4-S% | #N/A | 0.11 | 0.13 | 0.09 | #N/A | #N/A |
| | | Sulphide% | #N/A | 0.54 | 0.42 | 0.31 | #N/A | #N/A |
| | | C% | #N/A | 1.47 | 0.458 | 0.181 | #N/A | #N/A |
| | | CO3% (as %CO3) | #N/A | 6.95 | 1.91 | 0.719 | #N/A | #N/A |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | #N/A | 0.0 | 20.9 | #N/A | #N/A | #N/A |
| | | Talc (wt%) | #N/A | 20.2 | 0.0 | #N/A | #N/A | #N/A |
| | | Chlorite (wt%) | #N/A | 28.9 | 3.6 | #N/A | #N/A | #N/A |
| | | Muscovite (wt%) | #N/A | 6.5 | 10.6 | #N/A | #N/A | #N/A |
| | | Albite (wt%) | #N/A | 0.0 | 40.4 | #N/A | #N/A | #N/A |
| | | Microcline (wt%) | #N/A | 0.0 | 2.2 | #N/A | #N/A | #N/A |
| | | Biotite (wt%) | #N/A | 7.6 | 15.5 | #N/A | #N/A | #N/A |
| | | Magnesiohornblende (wt%) | #N/A | 23.3 | 0.0 | #N/A | #N/A | #N/A |
| | | Diopside (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Phlogopite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Magnetite (wt%) | #N/A | 0.0 | 0.4 | #N/A | #N/A | #N/A |
| | | Brucite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Hematite (wt%) | #N/A | 0.5 | 0.3 | #N/A | #N/A | #N/A |
| | | Ilmenite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Periclase (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Rutile (wt%) | #N/A | 0.0 | 0.4 | #N/A | #N/A | #N/A |
| | | Iron (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Dolomite (wt%) | #N/A | 8.7 | 0.0 | #N/A | #N/A | #N/A |
| | | Calcite (wt%) | #N/A | 4.0 | 5.1 | #N/A | #N/A | #N/A |
| | | Magnesite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Ankerite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Pyrite (wt%) | #N/A | 0.4 | 0.6 | #N/A | #N/A | #N/A |
| | | Gypsum (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | TOTAL (wt%) | #N/A | 100 | 100 | #N/A | #N/A | #N/A |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | #N/A | 40.9 | 59.7 | 64.1 | #N/A | #N/A |
| | | Al2O3% | #N/A | 5.46 | 15.5 | 15.0 | #N/A | #N/A |
| | | Fe2O3% | #N/A | 10.5 | 5.96 | 5.27 | #N/A | #N/A |
| | | MgO% | #N/A | 23.2 | 3.24 | 3.11 | #N/A | #N/A |
| | | CaO% | #N/A | 7.64 | 3.14 | 2.42 | #N/A | #N/A |
| | | Na2O% | #N/A | 0.16 | 4.00 | 3.80 | #N/A | #N/A |
| | | K2O% | #N/A | 0.72 | 3.65 | 2.88 | #N/A | #N/A |
| | | TiO2% | #N/A | 0.34 | 0.59 | 0.55 | #N/A | #N/A |
| | | P2O5% | #N/A | 0.02 | 0.18 | 0.15 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Footwall - 04 | EM - Dilution Footwall - 05 | EM Dilution Hanging Wall - 01 | EM Dilution Hanging Wall - 02 | EM Dilution Hanging Wall - 03 | EM Dilution Hanging Wall - 04 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | #N/A | 0.16 | 0.08 | 0.07 | #N/A | #N/A |
| | | Cr2O3% | #N/A | 0.31 | 0.04 | 0.04 | #N/A | #N/A |
| | | V2O5% | #N/A | 0.02 | 0.02 | 0.02 | #N/A | #N/A |
| | | LOI% | #N/A | 9.64 | 2.69 | 1.71 | #N/A | #N/A |
| | | Sum% | #N/A | 99.1 | 98.7 | 99.2 | #N/A | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Hanging Wall - 05 | SH - ORE - 01 | SH - ORE - 02 | SH - ORE - 03 | SH - ORE - 04 | SH - ORE - 05 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 1.40 | 3.46 | 5.97 | 1.12 | 1.43 | <1.0 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 0.03 | 0.35 | 2.3 | 0.21 | 1.9 | 0.24 |
| | | Aluminum (mg/kg) | 3600 | 7900 | 28000 | 21000 | 3700 | 21000 |
| | | Arsenic (mg/kg) | <0.5 | 0.6 | 2.1 | 0.7 | 1.0 | 1.0 |
| | | Boron (mg/kg) | 2 | 1 | 2 | 1 | 1 | 1 |
| | | Barium (mg/kg) | 200 | 250 | 230 | 200 | 220 | 260 |
| | | Beryllium (mg/kg) | 0.37 | 0.58 | 1.7 | 1.5 | 0.34 | 0.70 |
| | | Bismuth (mg/kg) | 0.22 | 0.28 | 0.57 | 0.55 | 3.4 | 0.56 |
| | | Calcium (mg/kg) | 14000 | 20000 | 20000 | 32000 | 16000 | 56000 |
| | | Cadmium (mg/kg) | <0.02 | 0.05 | 0.03 | 0.08 | 0.18 | 0.10 |
| | | Cobalt (mg/kg) | 3.0 | 8.8 | 62 | 49 | 8.0 | 67 |
| | | Chromium (mg/kg) | 34 | 57 | 870 | 970 | 45 | 1200 |
| | | Copper (mg/kg) | 6.3 | 21 | 54 | 44 | 18 | 89 |
| | | Iron (mg/kg) | 8600 | 20000 | 41000 | 38000 | 17000 | 49000 |
| | | Potassium (mg/kg) | 1400 | 7800 | 23000 | 26000 | 3500 | 24000 |
| | | Lithium (mg/kg) | 2 | 16 | 45 | 36 | 5 | 31 |
| | | Magnesium (mg/kg) | 2800 | 9600 | 65000 | 56000 | 6400 | 55000 |
| | | Manganese (mg/kg) | 100 | 230 | 670 | 830 | 200 | 1200 |
| | | Molybdenum (mg/kg) | 0.4 | 0.6 | 6.3 | 1.4 | 5.6 | 1.9 |
| | | Sodium (mg/kg) | 1000 | 670 | 280 | 170 | 310 | 94 |
| | | Nickel (mg/kg) | 6.8 | 36 | 620 | 480 | 15 | 390 |
| | | Phosphorus (mg/kg) | 460 | 1100 | 59 | 140 | 810 | 130 |
| | | Lead (mg/kg) | 2.3 | 5.8 | 8.5 | 5.0 | 57 | 10 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | <0.5 | 0.6 | <0.5 | <0.5 | 0.6 | <0.5 |
| | | Strontium (mg/kg) | 100 | 540 | 250 | 280 | 910 | 230 |
| | | Titanium (mg/kg) | 150 | 810 | 990 | 1300 | 320 | 1400 |
| | | Thallium (mg/kg) | <0.02 | 0.14 | 0.65 | 0.66 | 0.10 | 0.50 |
| | | Uranium (mg/kg) | 1.2 | 0.93 | 0.31 | 0.20 | 0.74 | 0.065 |
| | | Vanadium (mg/kg) | 7 | 38 | 95 | 110 | 24 | 110 |
| | | Zinc (mg/kg) | 16 | 88 | 62 | 57 | 81 | 140 |
| | | Weight (mg/kg) | 2225 | 5720 | 6250 | 3294 | 4396 | 2958 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 1.97 | 2.12 | 1.97 | 2.00 | 2.04 | 2.03 |
| | | Initial pH | 9.58 | 9.57 | 9.75 | 9.81 | 9.64 | 9.81 |
| | | Vol H2SO4 (mL) | 1.25 | 1.95 | 4.25 | 5.30 | 2.55 | 7.65 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 32 | 46 | 108 | 132 | 62 | 188 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 2.75 | 11.5 | 40.3 | 17.7 | 36.8 | 20.2 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | 29 | 35 | 68 | 115 | 26 | 168 |
| | | Sulphur (total) (%) | 0.088 | 0.367 | 1.29 | 0.565 | 1.18 | 0.647 |
| | | Acid Leachable SO4-S (%) | 0.04 | 0.16 | 0.42 | 0.20 | 0.33 | 0.06 |
| | | Sulphide (%) | 0.05 | 0.21 | 0.87 | 0.36 | 0.85 | 0.59 |
| | | Carbon (total) (%) | 0.318 | 0.478 | 1.23 | 1.68 | 0.706 | 2.48 |
| | | Carbonate (%CO3) | 1.19 | 1.93 | 5.24 | 7.94 | 2.40 | 12.0 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | #N/A | 100 | #N/A | 100 | 100 | #N/A |
| | | Volume D.I. Water [mL] | #N/A | 400 | #N/A | 400 | 400 | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Hanging Wall - 05 | SH - ORE - 01 | SH - ORE - 02 | SH - ORE - 03 | SH - ORE - 04 | SH - ORE - 05 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | #N/A | 8.48 | #N/A | 9.52 | 8.85 | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 22 | #N/A | 78 | 95 | #N/A |
| | | pH [no unit] | #N/A | 7.55 | #N/A | 8.35 | 8.49 | #N/A |
| | | Conductivity [uS/cm] | #N/A | 938 | #N/A | 609 | 556 | #N/A |
| | | F [mg/L] | #N/A | 1.07 | #N/A | 0.94 | 0.36 | #N/A |
| | | Cl [mg/L] | #N/A | 8.6 | #N/A | <2.0 | <2.0 | #N/A |
| | | SO4 [mg/L] | #N/A | 380 | #N/A | 130 | 110 | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | #N/A | <3.0 | <3.0 | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | #N/A | <0.3 | <0.3 | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | #N/A | <0.6 | <0.6 | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | #N/A | <0.6 | <0.6 | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | #N/A | <0.03 | <0.03 | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | #N/A | <0.00001 | <0.00001 | #N/A |
| | | Al [mg/L] | #N/A | 0.073 | #N/A | 0.043 | 0.079 | #N/A |
| | | As [mg/L] | #N/A | 0.0011 | #N/A | 0.0124 | 0.0014 | #N/A |
| | | Ag [mg/L] | #N/A | 0.00019 | #N/A | 0.00017 | 0.00035 | #N/A |
| | | Ba [mg/L] | #N/A | 0.0773 | #N/A | 0.204 | 0.376 | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | #N/A | <0.000007 | <0.000007 | #N/A |
| | | B [mg/L] | #N/A | 0.029 | #N/A | 0.007 | 0.016 | #N/A |
| | | Bi [mg/L] | #N/A | 0.000056 | #N/A | 0.000213 | 0.000016 | #N/A |
| | | Ca [mg/L] | #N/A | 76.2 | #N/A | 17.5 | 33.7 | #N/A |
| | | Cd [mg/L] | #N/A | 0.000008 | #N/A | <0.000003 | 0.000006 | #N/A |
| | | Co [mg/L] | #N/A | 0.000061 | #N/A | 0.000270 | 0.000055 | #N/A |
| | | Cr [mg/L] | #N/A | 0.00103 | #N/A | 0.0178 | 0.00080 | #N/A |
| | | Cu [mg/L] | #N/A | 0.00094 | #N/A | 0.00103 | 0.00035 | #N/A |
| | | Fe [mg/L] | #N/A | <0.007 | #N/A | 0.076 | <0.007 | #N/A |
| | | K [mg/L] | #N/A | 44.5 | #N/A | 94.6 | 83.7 | #N/A |
| | | Li [mg/L] | #N/A | 0.0246 | #N/A | 0.0175 | 0.0159 | #N/A |
| | | Mg [mg/L] | #N/A | 14.1 | #N/A | 16.6 | 11.7 | #N/A |
| | | Mn [mg/L] | #N/A | 0.00719 | #N/A | 0.00160 | 0.00426 | #N/A |
| | | Mo [mg/L] | #N/A | 0.0185 | #N/A | 0.00410 | 0.0308 | #N/A |
| | | Na [mg/L] | #N/A | 57.6 | #N/A | 9.43 | 16.5 | #N/A |
| | | Ni [mg/L] | #N/A | 0.0003 | #N/A | 0.0030 | 0.0001 | #N/A |
| | | P [mg/L] | #N/A | <0.003 | #N/A | 0.005 | 0.015 | #N/A |
| | | Pb [mg/L] | #N/A | <0.00001 | #N/A | 0.00015 | 0.00020 | #N/A |
| | | Sb [mg/L] | #N/A | 0.0006 | #N/A | 0.0031 | 0.0024 | #N/A |
| | | Se [mg/L] | #N/A | 0.00024 | #N/A | 0.00142 | 0.00227 | #N/A |
| | | Si [mg/L] | #N/A | 4.73 | #N/A | 15.6 | 4.46 | #N/A |
| | | Sn [mg/L] | #N/A | 0.00010 | #N/A | 0.00007 | 0.00006 | #N/A |
| | | Sr [mg/L] | #N/A | 8.81 | #N/A | 2.36 | 1.15 | #N/A |
| | | Ti [mg/L] | #N/A | 0.00030 | #N/A | 0.00219 | 0.00013 | #N/A |
| | | Tl [mg/L] | #N/A | 0.000028 | #N/A | 0.000114 | 0.000030 | #N/A |
| | | U [mg/L] | #N/A | 0.00155 | #N/A | 0.000095 | 0.00111 | #N/A |
| | | V [mg/L] | #N/A | 0.00404 | #N/A | 0.0190 | 0.00330 | #N/A |
| | | Zn [mg/L] | #N/A | <0.002 | #N/A | <0.002 | <0.002 | #N/A |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | #N/A | 0 | #N/A | 0.4 | 0.4 | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Hanging Wall - 05 | SH - ORE - 01 | SH - ORE - 02 | SH - ORE - 03 | SH - ORE - 04 | SH - ORE - 05 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | #N/A | 1 | #N/A | 1 | 1 | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | #N/A | 400 | 400 | #N/A |
| | | Final pH | #N/A | 9.52 | #N/A | 9.51 | 9.46 | #N/A |
| | | F [mg/L] | #N/A | <0.06 | #N/A | <0.06 | <0.06 | #N/A |
| | | SO4 [mg/L] | #N/A | 64 | #N/A | 20 | 19 | #N/A |
| | | Cl [mg/L] | #N/A | <2.0 | #N/A | <2.0 | <2.0 | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | #N/A | <3.0 | <3.0 | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | #N/A | <0.3 | <0.3 | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | #N/A | <0.6 | <0.6 | #N/A |
| | | Conductivity [uS/cm] | #N/A | 190 | #N/A | 99 | 108 | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 12 | #N/A | 20 | 25 | #N/A |
| | | pH [no unit] | #N/A | 7.45 | #N/A | 6.94 | 8.19 | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | #N/A | <0.03 | 0.03 | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | #N/A | <0.00001 | <0.00001 | #N/A |
| | | Al [mg/L] | #N/A | 0.280 | #N/A | 0.069 | 0.216 | #N/A |
| | | As [mg/L] | #N/A | <0.0002 | #N/A | 0.0018 | 0.0010 | #N/A |
| | | Ag [mg/L] | #N/A | <0.00005 | #N/A | <0.00005 | <0.00005 | #N/A |
| | | Ba [mg/L] | #N/A | 0.440 | #N/A | 0.158 | 1.36 | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | #N/A | <0.000007 | <0.000007 | #N/A |
| | | B [mg/L] | #N/A | 0.005 | #N/A | 0.002 | <0.002 | #N/A |
| | | Bi [mg/L] | #N/A | <0.000007 | #N/A | <0.000007 | 0.000009 | #N/A |
| | | Ca [mg/L] | #N/A | 31.1 | #N/A | 8.77 | 23.4 | #N/A |
| | | Cd [mg/L] | #N/A | <0.000003 | #N/A | <0.000003 | <0.000003 | #N/A |
| | | Co [mg/L] | #N/A | 0.000005 | #N/A | <0.000004 | <0.000004 | #N/A |
| | | Cr [mg/L] | #N/A | <0.00003 | #N/A | 0.00023 | 0.00004 | #N/A |
| | | Cu [mg/L] | #N/A | 0.00004 | #N/A | 0.00007 | 0.00009 | #N/A |
| | | Fe [mg/L] | #N/A | <0.007 | #N/A | <0.007 | <0.007 | #N/A |
| | | K [mg/L] | #N/A | 5.31 | #N/A | 12.6 | 6.71 | #N/A |
| | | Li [mg/L] | #N/A | 0.0018 | #N/A | 0.0014 | 0.0009 | #N/A |
| | | Mg [mg/L] | #N/A | 0.558 | #N/A | 1.16 | 1.41 | #N/A |
| | | Mn [mg/L] | #N/A | 0.00261 | #N/A | 0.00050 | 0.00106 | #N/A |
| | | Mo [mg/L] | #N/A | 0.00019 | #N/A | 0.00041 | 0.00142 | #N/A |
| | | Na [mg/L] | #N/A | 2.60 | #N/A | 0.75 | 0.80 | #N/A |
| | | Ni [mg/L] | #N/A | <0.0001 | #N/A | 0.0002 | <0.0001 | #N/A |
| | | P [mg/L] | #N/A | <0.003 | #N/A | <0.003 | <0.003 | #N/A |
| | | Pb [mg/L] | #N/A | <0.00001 | #N/A | <0.00001 | 0.00010 | #N/A |
| | | Sb [mg/L] | #N/A | <0.0002 | #N/A | 0.0004 | 0.0002 | #N/A |
| | | Se [mg/L] | #N/A | <0.00004 | #N/A | 0.00014 | 0.00023 | #N/A |
| | | Si [mg/L] | #N/A | 1.54 | #N/A | 1.43 | 1.97 | #N/A |
| | | Sr [mg/L] | #N/A | 3.74 | #N/A | 0.576 | 8.64 | #N/A |
| | | Sn [mg/L] | #N/A | 0.00005 | #N/A | 0.00008 | 0.00003 | #N/A |
| | | Ti [mg/L] | #N/A | <0.00005 | #N/A | 0.00008 | <0.00005 | #N/A |
| | | Tl [mg/L] | #N/A | <0.000005 | #N/A | 0.000027 | 0.000005 | #N/A |
| | | U [mg/L] | #N/A | 0.000257 | #N/A | 0.000007 | 0.000070 | #N/A |
| | | V [mg/L] | #N/A | 0.00140 | #N/A | 0.00383 | 0.00093 | #N/A |
| | | Zn [mg/L] | #N/A | <0.002 | #N/A | <0.002 | <0.002 | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Hanging Wall - 05 | SH - ORE - 01 | SH - ORE - 02 | SH - ORE - 03 | SH - ORE - 04 | SH - ORE - 05 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | #N/A | 20 | #N/A | 20 | 20 | #N/A |
| | | Ext Fluid [#1 or #2] | #N/A | 1 | #N/A | 1 | 1 | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | #N/A | 400 | 400 | #N/A |
| | | Final pH | #N/A | 5.84 | #N/A | 5.81 | 5.52 | #N/A |
| | | Conductivity [uS/cm] | #N/A | 6600 | #N/A | 6500 | 6060 | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 2600 | #N/A | 2590 | 2310 | #N/A |
| | | pH [no unit] | #N/A | 5.96 | #N/A | 5.90 | 5.56 | #N/A |
| | | SO4 [mg/L] | #N/A | 64 | #N/A | 22 | 26 | #N/A |
| | | Cl [mg/L] | #N/A | <20.0 | #N/A | <20.0 | <20.0 | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | #N/A | <3.0 | <3.0 | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | #N/A | <0.3 | <0.3 | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | #N/A | <0.6 | <0.6 | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | #N/A | <0.6 | <0.6 | #N/A |
| | | F [mg/L] | #N/A | 0.06 | #N/A | <0.06 | <0.06 | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | #N/A | <0.03 | <0.03 | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | #N/A | <0.00001 | <0.00001 | #N/A |
| | | Al [mg/L] | #N/A | 0.05 | #N/A | 0.01 | 0.08 | #N/A |
| | | As [mg/L] | #N/A | <0.002 | #N/A | <0.002 | <0.002 | #N/A |
| | | Ag [mg/L] | #N/A | <0.0005 | #N/A | <0.0005 | <0.0005 | #N/A |
| | | Ba [mg/L] | #N/A | 2.26 | #N/A | 1.23 | 5.40 | #N/A |
| | | B [mg/L] | #N/A | <0.02 | #N/A | <0.02 | <0.02 | #N/A |
| | | Be [mg/L] | #N/A | 0.00022 | #N/A | 0.00037 | 0.00080 | #N/A |
| | | Bi [mg/L] | #N/A | <0.00007 | #N/A | <0.00007 | <0.00007 | #N/A |
| | | Ca [mg/L] | #N/A | 717 | #N/A | 569 | 469 | #N/A |
| | | Cd [mg/L] | #N/A | 0.00111 | #N/A | 0.00101 | 0.00180 | #N/A |
| | | Cr [mg/L] | #N/A | 0.0012 | #N/A | 0.0018 | 0.0026 | #N/A |
| | | Co [mg/L] | #N/A | 0.00205 | #N/A | 0.00897 | 0.00066 | #N/A |
| | | Cu [mg/L] | #N/A | 0.0042 | #N/A | <0.0002 | 0.0003 | #N/A |
| | | Fe [mg/L] | #N/A | 4.72 | #N/A | 10.3 | 23.3 | #N/A |
| | | K [mg/L] | #N/A | 29.8 | #N/A | 72.8 | 38.0 | #N/A |
| | | Li [mg/L] | #N/A | 0.005 | #N/A | 0.007 | 0.006 | #N/A |
| | | Mg [mg/L] | #N/A | 3.71 | #N/A | 41.8 | 38.2 | #N/A |
| | | Mn [mg/L] | #N/A | 6.18 | #N/A | 7.48 | 3.44 | #N/A |
| | | Mo [mg/L] | #N/A | 0.0007 | #N/A | <0.0001 | 0.0002 | #N/A |
| | | Na [mg/L] | #N/A | 1520 | #N/A | 1460 | 1480 | #N/A |
| | | Ni [mg/L] | #N/A | 0.003 | #N/A | 0.027 | 0.003 | #N/A |
| | | P [mg/L] | #N/A | <0.03 | #N/A | <0.03 | <0.03 | #N/A |
| | | Pb [mg/L] | #N/A | 0.0228 | #N/A | 0.0135 | 0.156 | #N/A |
| | | U [mg/L] | #N/A | 0.00325 | #N/A | 0.00022 | 0.00234 | #N/A |
| | | Sb [mg/L] | #N/A | <0.002 | #N/A | <0.002 | <0.002 | #N/A |
| | | Se [mg/L] | #N/A | <0.0004 | #N/A | <0.0004 | <0.0004 | #N/A |
| | | Si [mg/L] | #N/A | 0.95 | #N/A | 1.08 | 0.67 | #N/A |
| | | Sn [mg/L] | #N/A | 0.0008 | #N/A | <0.0001 | <0.0001 | #N/A |
| | | Sr [mg/L] | #N/A | 11.3 | #N/A | 3.60 | 20.9 | #N/A |
| | | Ti [mg/L] | #N/A | <0.0005 | #N/A | <0.0005 | <0.0005 | #N/A |
| | | Tl [mg/L] | #N/A | 0.00013 | #N/A | 0.00082 | 0.00063 | #N/A |
| | | V [mg/L] | #N/A | 0.0003 | #N/A | <0.0001 | <0.0001 | #N/A |
| | | Zn [mg/L] | #N/A | <0.02 | #N/A | 0.02 | 0.09 | #N/A |
| | | Weight [g] | #N/A | 5571 | #N/A | 3151 | 4282 | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Hanging Wall - 05 | SH - ORE - 01 | SH - ORE - 02 | SH - ORE - 03 | SH - ORE - 04 | SH - ORE - 05 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Split | #N/A | 1 | #N/A | 1 | 1 | #N/A |
| | | Pulv200M [250g] | #N/A | 1 | #N/A | 1 | 1 | #N/A |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | #N/A | 2.00 | #N/A | 2.02 | 2.02 | #N/A |
| | | Initial pH | #N/A | 9.50 | #N/A | 9.90 | 9.76 | #N/A |
| | | Vol H2SO4 (mL) | #N/A | 1.70 | #N/A | 5.25 | 2.25 | #N/A |
| | | H2SO4 Normality | #N/A | 1.00 | #N/A | 1.00 | 1.00 | #N/A |
| | | Acisol-NP (kgCaCO3/tonne) | #N/A | 42.5 | #N/A | 130 | 55.7 | #N/A |
| | | AP (kgCaCO3/tonne) | #N/A | 12.6 | #N/A | 17.7 | 40.7 | #N/A |
| | | NNPkg CaCO3/tonne | #N/A | 30 | #N/A | 112 | 15 | #N/A |
| | | S Acid% | #N/A | 0.403 | #N/A | 0.566 | 1.30 | #N/A |
| | | LeachableSO4-S% | #N/A | 0.12 | #N/A | 0.13 | 0.32 | #N/A |
| | | Sulphide% | #N/A | 0.28 | #N/A | 0.44 | 0.98 | #N/A |
| | | C% | #N/A | 0.476 | #N/A | 1.55 | 0.679 | #N/A |
| | | CO3% (as %CO3) | #N/A | 1.99 | #N/A | 7.84 | 2.67 | #N/A |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | #N/A | 14.6 | #N/A | 13.2 | 3.2 | #N/A |
| | | Talc (wt%) | #N/A | 0.0 | #N/A | 0.0 | 25.2 | #N/A |
| | | Chlorite (wt%) | #N/A | 3.1 | #N/A | 2.4 | 14.2 | #N/A |
| | | Muscovite (wt%) | #N/A | 2.8 | #N/A | 7.0 | 0.0 | #N/A |
| | | Albite (wt%) | #N/A | 55.4 | #N/A | 28.3 | 10.6 | #N/A |
| | | Microcline (wt%) | #N/A | 8.7 | #N/A | 21.0 | 0.0 | #N/A |
| | | Biotite (wt%) | #N/A | 6.2 | #N/A | 19.3 | 13.8 | #N/A |
| | | Magnesiohornblende (wt%) | #N/A | 0.0 | #N/A | 0.0 | 9.2 | #N/A |
| | | Diopside (wt%) | #N/A | 2.4 | #N/A | 0.0 | 0.0 | #N/A |
| | | Phlogopite (wt%) | #N/A | 0.0 | #N/A | 0.0 | 0.0 | #N/A |
| | | Magnetite (wt%) | #N/A | 0.2 | #N/A | 0.3 | 0.0 | #N/A |
| | | Brucite (wt%) | #N/A | 0.0 | #N/A | 0.0 | 0.0 | #N/A |
| | | Hematite (wt%) | #N/A | 1.0 | #N/A | 0.0 | 0.3 | #N/A |
| | | Ilmenite (wt%) | #N/A | 0.0 | #N/A | 0.0 | 0.6 | #N/A |
| | | Periclase (wt%) | #N/A | 0.0 | #N/A | 0.0 | 1.3 | #N/A |
| | | Rutile (wt%) | #N/A | 0.2 | #N/A | 0.0 | 0.0 | #N/A |
| | | Iron (wt%) | #N/A | 0.0 | #N/A | 0.0 | 0.0 | #N/A |
| | | Dolomite (wt%) | #N/A | 0.0 | #N/A | 0.0 | 16.5 | #N/A |
| | | Calcite (wt%) | #N/A | 5.2 | #N/A | 7.7 | 1.8 | #N/A |
| | | Magnesite (wt%) | #N/A | 0.0 | #N/A | 0.0 | 3.3 | #N/A |
| | | Ankerite (wt%) | #N/A | 0.0 | #N/A | 0.0 | 0.0 | #N/A |
| | | Pyrite (wt%) | #N/A | 0.3 | #N/A | 0.8 | 0.0 | #N/A |
| | | Gypsum (wt%) | #N/A | 0.0 | #N/A | 0.0 | 0.0 | #N/A |
| | | TOTAL (wt%) | #N/A | 100 | #N/A | 100 | 100 | #N/A |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | #N/A | 63.4 | 43.5 | 66.1 | 43.8 | #N/A |
| | | Al2O3% | #N/A | 14.9 | 7.41 | 12.6 | 6.10 | #N/A |
| | | Fe2O3% | #N/A | 3.52 | 9.06 | 2.77 | 9.63 | #N/A |
| | | MgO% | #N/A | 1.84 | 19.1 | 1.07 | 19.4 | #N/A |
| | | CaO% | #N/A | 2.69 | 6.08 | 2.38 | 6.91 | #N/A |
| | | Na2O% | #N/A | 5.96 | 1.48 | 1.89 | 0.28 | #N/A |
| | | K2O% | #N/A | 3.10 | 3.15 | 8.13 | 3.15 | #N/A |
| | | TiO2% | #N/A | 0.55 | 0.39 | 0.43 | 0.41 | #N/A |
| | | P2O5% | #N/A | 0.23 | 0.04 | 0.21 | 0.03 | #N/A |

| Test Phase | Analysis | Parameter | EM Dilution Hanging Wall - 05 | SH - ORE - 01 | SH - ORE - 02 | SH - ORE - 03 | SH - ORE - 04 | SH - ORE - 05 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | #N/A | 0.03 | 0.14 | 0.03 | 0.15 | #N/A |
| | | Cr2O3% | #N/A | 0.02 | 0.26 | 0.01 | 0.27 | #N/A |
| | | V2O5% | #N/A | 0.01 | 0.03 | <0.01 | 0.03 | #N/A |
| | | LOI% | #N/A | 2.78 | 7.90 | 3.23 | 7.96 | #N/A |
| | | Sum% | #N/A | 99.0 | 98.6 | 98.8 | 98.1 | #N/A |

| Test Phase | Analysis | Parameter | SH - ORE - 06 | SH - ORE - 07 | SH - ORE - 08 | SH - ORE - 09 | SH - ORE - 10 | SH Development - 01 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 2.45 | <1.0 | 2.30 | 2.30 | 6.28 | 1.00 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 0.66 | 0.70 | 0.75 | 0.47 | 0.37 | 0.08 |
| | | Aluminum (mg/kg) | 6400 | 1300 | 5000 | 23000 | 22000 | 18000 |
| | | Arsenic (mg/kg) | 0.6 | 0.8 | 0.7 | 1.0 | <0.5 | 1.0 |
| | | Boron (mg/kg) | 2 | 1 | 1 | 1 | 1 | 2 |
| | | Barium (mg/kg) | 230 | 110 | 240 | 290 | 390 | 92 |
| | | Beryllium (mg/kg) | 0.51 | 0.08 | 0.41 | 1.2 | 1.2 | 0.16 |
| | | Bismuth (mg/kg) | 0.70 | 0.38 | 0.61 | 1.4 | 1.4 | 0.15 |
| | | Calcium (mg/kg) | 15000 | 12000 | 20000 | 42000 | 55000 | 31000 |
| | | Cadmium (mg/kg) | 0.07 | 0.06 | 0.08 | 0.30 | 0.10 | 0.02 |
| | | Cobalt (mg/kg) | 11 | 5.7 | 6.4 | 57 | 47 | 49 |
| | | Chromium (mg/kg) | 140 | 46 | 34 | 850 | 900 | 900 |
| | | Copper (mg/kg) | 46 | 6.6 | 14 | 49 | 34 | 46 |
| | | Iron (mg/kg) | 20000 | 13000 | 16000 | 48000 | 39000 | 37000 |
| | | Potassium (mg/kg) | 7800 | 1800 | 4100 | 28000 | 26000 | 15000 |
| | | Lithium (mg/kg) | 12 | <2.0 | 8 | 33 | 27 | 20 |
| | | Magnesium (mg/kg) | 9500 | 5000 | 5800 | 51000 | 42000 | 55000 |
| | | Manganese (mg/kg) | 180 | 130 | 210 | 860 | 770 | 800 |
| | | Molybdenum (mg/kg) | 27 | 9.6 | 0.6 | 4.7 | 7.0 | 0.6 |
| | | Sodium (mg/kg) | 770 | 150 | 840 | 110 | 140 | 130 |
| | | Nickel (mg/kg) | 76 | 30 | 10 | 400 | 470 | 510 |
| | | Phosphorus (mg/kg) | 620 | 20 | 980 | 130 | 200 | 66 |
| | | Lead (mg/kg) | 13 | 3.7 | 8.7 | 44 | 19 | 0.95 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | 0.5 | <0.5 | 0.6 | <0.5 | 0.6 | <0.5 |
| | | Strontium (mg/kg) | 510 | 480 | 510 | 370 | 730 | 140 |
| | | Titanium (mg/kg) | 700 | 15 | 490 | 1500 | 1600 | 700 |
| | | Thallium (mg/kg) | 0.13 | <0.02 | 0.06 | 0.58 | 0.51 | 0.30 |
| | | Uranium (mg/kg) | 0.73 | 0.27 | 1.1 | 0.071 | 0.44 | 0.014 |
| | | Vanadium (mg/kg) | 44 | 3 | 31 | 120 | 98 | 65 |
| | | Zinc (mg/kg) | 35 | 14 | 66 | 67 | 53 | 23 |
| | | Weight (mg/kg) | 4911 | 5815 | 5399 | 5252 | 3961 | 5877 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 2.02 | 2.03 | 2.01 | 2.02 | 2.01 | 1.97 |
| | | Initial pH | 9.26 | 9.22 | 9.42 | 9.71 | 9.29 | 9.77 |
| | | Vol H2SO4 (mL) | 1.25 | 2.00 | 2.15 | 5.70 | 6.65 | 4.45 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 31 | 49 | 54 | 141 | 165 | 113 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 32.2 | 26.8 | 15.7 | 27.8 | 12.1 | 3.47 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | -1.3 | 23 | 38 | 113 | 153 | 109 |
| | | Sulphur (total) (%) | 1.03 | 0.856 | 0.503 | 0.890 | 0.388 | 0.111 |
| | | Acid Leachable SO4-S (%) | 0.36 | 0.22 | 0.08 | 0.19 | 0.10 | 0.05 |
| | | Sulphide (%) | 0.67 | 0.64 | 0.42 | 0.70 | 0.29 | 0.06 |
| | | Carbon (total) (%) | 0.285 | 0.615 | 0.606 | 1.70 | 1.93 | 1.44 |
| | | Carbonate (%CO3) | 0.989 | 2.25 | 2.36 | 7.94 | 8.74 | 6.74 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | #N/A | #N/A | #N/A | 100 | 100 | 100 |
| | | Volume D.I. Water [mL] | #N/A | #N/A | #N/A | 400 | 400 | 400 |

| Test Phase | Analysis | Parameter | SH - ORE - 06 | SH - ORE - 07 | SH - ORE - 08 | SH - ORE - 09 | SH - ORE - 10 | SH Development - 01 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | #N/A | #N/A | #N/A | 8.85 | 8.77 | 8.72 |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | #N/A | 45 | 14 | 83 |
| | | pH [no unit] | #N/A | #N/A | #N/A | 8.07 | 7.42 | 8.34 |
| | | Conductivity [uS/cm] | #N/A | #N/A | #N/A | 706 | 1430 | 355 |
| | | F [mg/L] | #N/A | #N/A | #N/A | 0.93 | 1.46 | 0.26 |
| | | Cl [mg/L] | #N/A | #N/A | #N/A | <2.0 | <2.0 | <2.0 |
| | | SO4 [mg/L] | #N/A | #N/A | #N/A | 6.8 | 610 | 47 |
| | | Br [mg/L] | #N/A | #N/A | #N/A | <3.0 | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | #N/A | <0.3 | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | #N/A | <0.6 | <0.6 | <0.6 |
| | | NO2+NO3 [as N mg/L] | #N/A | #N/A | #N/A | <0.6 | <0.6 | <0.6 |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | #N/A | <0.03 | 0.10 | <0.03 |
| | | Hg [mg/L] | #N/A | #N/A | #N/A | <0.00001 | <0.00001 | <0.00001 |
| | | Al [mg/L] | #N/A | #N/A | #N/A | 0.025 | 0.007 | 0.136 |
| | | As [mg/L] | #N/A | #N/A | #N/A | 0.0041 | 0.0039 | 0.0195 |
| | | Ag [mg/L] | #N/A | #N/A | #N/A | 0.00023 | 0.00030 | 0.00005 |
| | | Ba [mg/L] | #N/A | #N/A | #N/A | 0.150 | 0.0618 | 0.309 |
| | | Be [mg/L] | #N/A | #N/A | #N/A | <0.000007 | <0.000007 | <0.000007 |
| | | B [mg/L] | #N/A | #N/A | #N/A | 0.008 | 0.013 | 0.012 |
| | | Bi [mg/L] | #N/A | #N/A | #N/A | 0.000070 | 0.000022 | 0.000024 |
| | | Ca [mg/L] | #N/A | #N/A | #N/A | 35.1 | 143 | 6.93 |
| | | Cd [mg/L] | #N/A | #N/A | #N/A | 0.000006 | 0.000006 | <0.000003 |
| | | Co [mg/L] | #N/A | #N/A | #N/A | 0.000202 | 0.000107 | 0.000659 |
| | | Cr [mg/L] | #N/A | #N/A | #N/A | 0.0131 | 0.00210 | 0.0831 |
| | | Cu [mg/L] | #N/A | #N/A | #N/A | 0.00043 | 0.00069 | 0.00173 |
| | | Fe [mg/L] | #N/A | #N/A | #N/A | 0.083 | <0.007 | 0.191 |
| | | K [mg/L] | #N/A | #N/A | #N/A | 76.3 | 178 | 68.7 |
| | | Li [mg/L] | #N/A | #N/A | #N/A | 0.0156 | 0.0595 | 0.0074 |
| | | Mg [mg/L] | #N/A | #N/A | #N/A | 26.3 | 38.6 | 6.69 |
| | | Mn [mg/L] | #N/A | #N/A | #N/A | 0.00238 | 0.00829 | 0.00289 |
| | | Mo [mg/L] | #N/A | #N/A | #N/A | 0.0136 | 0.0258 | 0.00222 |
| | | Na [mg/L] | #N/A | #N/A | #N/A | 4.70 | 7.15 | 5.96 |
| | | Ni [mg/L] | #N/A | #N/A | #N/A | 0.0033 | 0.0008 | 0.0089 |
| | | P [mg/L] | #N/A | #N/A | #N/A | 0.008 | <0.003 | <0.003 |
| | | Pb [mg/L] | #N/A | #N/A | #N/A | 0.00106 | <0.00001 | 0.00009 |
| | | Sb [mg/L] | #N/A | #N/A | #N/A | 0.0040 | 0.0019 | 0.0088 |
| | | Se [mg/L] | #N/A | #N/A | #N/A | 0.00490 | 0.00185 | 0.00111 |
| | | Si [mg/L] | #N/A | #N/A | #N/A | 18.9 | 10.1 | 14.2 |
| | | Sn [mg/L] | #N/A | #N/A | #N/A | 0.00005 | 0.00013 | 0.00007 |
| | | Sr [mg/L] | #N/A | #N/A | #N/A | 3.57 | 8.99 | 0.944 |
| | | Ti [mg/L] | #N/A | #N/A | #N/A | 0.00115 | 0.00017 | 0.00421 |
| | | Tl [mg/L] | #N/A | #N/A | #N/A | 0.000094 | 0.000170 | 0.000066 |
| | | U [mg/L] | #N/A | #N/A | #N/A | 0.000126 | 0.000030 | 0.000043 |
| | | V [mg/L] | #N/A | #N/A | #N/A | 0.0129 | 0.0134 | 0.0202 |
| | | Zn [mg/L] | #N/A | #N/A | #N/A | <0.002 | <0.002 | <0.002 |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | #N/A | #N/A | #N/A | 0.4 | 0 | 0.4 |

| Test Phase | Analysis | Parameter | SH - ORE - 06 | SH - ORE - 07 | SH - ORE - 08 | SH - ORE - 09 | SH - ORE - 10 | SH Development - 01 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | #N/A | #N/A | #N/A | 1 | 1 | 1 |
| | | Ext Volume [mL] | #N/A | #N/A | #N/A | 400 | 400 | 400 |
| | | Final pH | #N/A | #N/A | #N/A | 9.01 | 9.72 | 9.51 |
| | | F [mg/L] | #N/A | #N/A | #N/A | <0.06 | 0.07 | <0.06 |
| | | SO4 [mg/L] | #N/A | #N/A | #N/A | 44 | 120 | 8.9 |
| | | Cl [mg/L] | #N/A | #N/A | #N/A | <2.0 | <2.0 | <2.0 |
| | | Br [mg/L] | #N/A | #N/A | #N/A | <3.0 | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | #N/A | <0.3 | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | #N/A | <0.6 | <0.6 | <0.6 |
| | | Conductivity [uS/cm] | #N/A | #N/A | #N/A | 153 | 327 | 77 |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | #N/A | 25 | 9 | 24 |
| | | pH [no unit] | #N/A | #N/A | #N/A | 7.19 | 6.84 | 8.75 |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | #N/A | <0.03 | <0.03 | <0.03 |
| | | Hg [mg/L] | #N/A | #N/A | #N/A | <0.00001 | <0.00001 | <0.00001 |
| | | Al [mg/L] | #N/A | #N/A | #N/A | 0.048 | 0.072 | 0.023 |
| | | As [mg/L] | #N/A | #N/A | #N/A | 0.0009 | 0.0003 | 0.0014 |
| | | Ag [mg/L] | #N/A | #N/A | #N/A | <0.00005 | <0.00005 | <0.00005 |
| | | Ba [mg/L] | #N/A | #N/A | #N/A | 0.248 | 0.284 | 0.426 |
| | | Be [mg/L] | #N/A | #N/A | #N/A | <0.000007 | <0.000007 | <0.000007 |
| | | B [mg/L] | #N/A | #N/A | #N/A | 0.003 | 0.006 | 0.006 |
| | | Bi [mg/L] | #N/A | #N/A | #N/A | 0.000008 | 0.000008 | <0.000007 |
| | | Ca [mg/L] | #N/A | #N/A | #N/A | 15.7 | 51.5 | 6.27 |
| | | Cd [mg/L] | #N/A | #N/A | #N/A | <0.000003 | 0.000028 | <0.000003 |
| | | Co [mg/L] | #N/A | #N/A | #N/A | <0.000004 | <0.000004 | <0.000004 |
| | | Cr [mg/L] | #N/A | #N/A | #N/A | 0.00019 | 0.00013 | 0.00029 |
| | | Cu [mg/L] | #N/A | #N/A | #N/A | 0.00009 | 0.00006 | 0.00007 |
| | | Fe [mg/L] | #N/A | #N/A | #N/A | <0.007 | <0.007 | <0.007 |
| | | K [mg/L] | #N/A | #N/A | #N/A | 14.8 | 19.0 | 11.3 |
| | | Li [mg/L] | #N/A | #N/A | #N/A | 0.0016 | 0.0019 | 0.0007 |
| | | Mg [mg/L] | #N/A | #N/A | #N/A | 1.76 | 2.16 | 1.03 |
| | | Mn [mg/L] | #N/A | #N/A | #N/A | 0.00096 | 0.00491 | 0.00028 |
| | | Mo [mg/L] | #N/A | #N/A | #N/A | 0.00368 | 0.00330 | 0.00011 |
| | | Na [mg/L] | #N/A | #N/A | #N/A | 0.45 | 0.56 | 0.69 |
| | | Ni [mg/L] | #N/A | #N/A | #N/A | <0.0001 | 0.0001 | <0.0001 |
| | | P [mg/L] | #N/A | #N/A | #N/A | <0.003 | <0.003 | <0.003 |
| | | Pb [mg/L] | #N/A | #N/A | #N/A | <0.00001 | <0.00001 | <0.00001 |
| | | Sb [mg/L] | #N/A | #N/A | #N/A | 0.0005 | 0.0002 | 0.0011 |
| | | Se [mg/L] | #N/A | #N/A | #N/A | 0.00028 | 0.00015 | 0.00009 |
| | | Si [mg/L] | #N/A | #N/A | #N/A | 1.83 | 1.88 | 1.61 |
| | | Sr [mg/L] | #N/A | #N/A | #N/A | 1.11 | 3.53 | 0.545 |
| | | Sn [mg/L] | #N/A | #N/A | #N/A | 0.00026 | 0.00038 | <0.00001 |
| | | Ti [mg/L] | #N/A | #N/A | #N/A | <0.00005 | <0.00005 | 0.00006 |
| | | Tl [mg/L] | #N/A | #N/A | #N/A | 0.000009 | 0.000012 | 0.000038 |
| | | U [mg/L] | #N/A | #N/A | #N/A | 0.000004 | 0.000022 | 0.000003 |
| | | V [mg/L] | #N/A | #N/A | #N/A | 0.00291 | 0.00179 | 0.00673 |
| | | Zn [mg/L] | #N/A | #N/A | #N/A | <0.002 | <0.002 | <0.002 |

| Test Phase | Analysis | Parameter | SH - ORE - 06 | SH - ORE - 07 | SH - ORE - 08 | SH - ORE - 09 | SH - ORE - 10 | SH Development - 01 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | #N/A | #N/A | #N/A | 20 | 20 | 20 |
| | | Ext Fluid [#1 or #2] | #N/A | #N/A | #N/A | 1 | 2 | 1 |
| | | Ext Volume [mL] | #N/A | #N/A | #N/A | 400 | 400 | 400 |
| | | Final pH | #N/A | #N/A | #N/A | 6.49 | 5.63 | 5.61 |
| | | Conductivity [uS/cm] | #N/A | #N/A | #N/A | 6950 | 5960 | 6180 |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | #N/A | 3230 | 2480 | 2400 |
| | | pH [no unit] | #N/A | #N/A | #N/A | 7.36 | 5.77 | 5.66 |
| | | SO4 [mg/L] | #N/A | #N/A | #N/A | 67 | 120 | 6.7 |
| | | Cl [mg/L] | #N/A | #N/A | #N/A | <20.0 | <20.0 | <20.0 |
| | | Br [mg/L] | #N/A | #N/A | #N/A | <3.0 | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | #N/A | <0.3 | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | #N/A | <0.6 | <0.6 | <0.6 |
| | | NO2+NO3 [as N mg/L] | #N/A | #N/A | #N/A | <0.6 | <0.6 | <0.6 |
| | | F [mg/L] | #N/A | #N/A | #N/A | 0.06 | 0.08 | <0.06 |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | #N/A | <0.03 | <0.03 | <0.03 |
| | | Hg [mg/L] | #N/A | #N/A | #N/A | <0.00001 | <0.00001 | <0.00001 |
| | | Al [mg/L] | #N/A | #N/A | #N/A | <0.01 | 0.08 | 0.02 |
| | | As [mg/L] | #N/A | #N/A | #N/A | <0.002 | <0.002 | <0.002 |
| | | Ag [mg/L] | #N/A | #N/A | #N/A | <0.0005 | <0.0005 | <0.0005 |
| | | Ba [mg/L] | #N/A | #N/A | #N/A | 1.47 | 1.65 | 1.60 |
| | | B [mg/L] | #N/A | #N/A | #N/A | <0.02 | <0.02 | <0.02 |
| | | Be [mg/L] | #N/A | #N/A | #N/A | 0.00008 | 0.00052 | 0.00008 |
| | | Bi [mg/L] | #N/A | #N/A | #N/A | <0.00007 | <0.00007 | <0.00007 |
| | | Ca [mg/L] | #N/A | #N/A | #N/A | 871 | 1970 | 371 |
| | | Cd [mg/L] | #N/A | #N/A | #N/A | 0.00210 | 0.00339 | 0.00023 |
| | | Cr [mg/L] | #N/A | #N/A | #N/A | 0.0010 | 0.0063 | 0.0041 |
| | | Co [mg/L] | #N/A | #N/A | #N/A | 0.00233 | 0.00817 | 0.0112 |
| | | Cu [mg/L] | #N/A | #N/A | #N/A | 0.0003 | 0.0069 | 0.0008 |
| | | Fe [mg/L] | #N/A | #N/A | #N/A | 0.20 | 28.7 | 16.0 |
| | | K [mg/L] | #N/A | #N/A | #N/A | 81.8 | 81.2 | 66.7 |
| | | Li [mg/L] | #N/A | #N/A | #N/A | 0.008 | 0.006 | 0.005 |
| | | Mg [mg/L] | #N/A | #N/A | #N/A | 14.0 | 32.2 | 98.0 |
| | | Mn [mg/L] | #N/A | #N/A | #N/A | 9.79 | 18.6 | 8.01 |
| | | Mo [mg/L] | #N/A | #N/A | #N/A | 0.0001 | 0.0012 | 0.0010 |
| | | Na [mg/L] | #N/A | #N/A | #N/A | 1500 | 1.5 | 1530 |
| | | Ni [mg/L] | #N/A | #N/A | #N/A | 0.024 | 0.030 | 0.051 |
| | | P [mg/L] | #N/A | #N/A | #N/A | <0.03 | <0.03 | <0.03 |
| | | Pb [mg/L] | #N/A | #N/A | #N/A | 0.0127 | 0.127 | 0.0035 |
| | | U [mg/L] | #N/A | #N/A | #N/A | 0.00012 | 0.00119 | 0.00004 |
| | | Sb [mg/L] | #N/A | #N/A | #N/A | <0.002 | <0.002 | <0.002 |
| | | Se [mg/L] | #N/A | #N/A | #N/A | <0.0004 | <0.0004 | <0.0004 |
| | | Si [mg/L] | #N/A | #N/A | #N/A | 1.77 | 2.07 | 1.35 |
| | | Sn [mg/L] | #N/A | #N/A | #N/A | 0.0002 | 0.0006 | 0.0001 |
| | | Sr [mg/L] | #N/A | #N/A | #N/A | 6.19 | 19.4 | 1.94 |
| | | Ti [mg/L] | #N/A | #N/A | #N/A | <0.0005 | <0.0005 | <0.0005 |
| | | Tl [mg/L] | #N/A | #N/A | #N/A | 0.00069 | 0.00065 | 0.00079 |
| | | V [mg/L] | #N/A | #N/A | #N/A | 0.0001 | 0.0004 | <0.0001 |
| | | Zn [mg/L] | #N/A | #N/A | #N/A | <0.02 | <0.02 | <0.02 |
| | | Weight [g] | #N/A | #N/A | #N/A | 5144 | 3858 | 5776 |

| Test Phase | Analysis | Parameter | SH - ORE - 06 | SH - ORE - 07 | SH - ORE - 08 | SH - ORE - 09 | SH - ORE - 10 | SH Development - 01 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Split | #N/A | #N/A | #N/A | 1 | 1 | 1 |
| | | Pulv200M [250g] | #N/A | #N/A | #N/A | 1 | 1 | 1 |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | #N/A | #N/A | #N/A | 1.97 | 1.99 | 2.05 |
| | | Initial pH | #N/A | #N/A | #N/A | 9.88 | 9.57 | 9.87 |
| | | Vol H2SO4 (mL) | #N/A | #N/A | #N/A | 5.10 | 5.50 | 4.65 |
| | | H2SO4 Normality | #N/A | #N/A | #N/A | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (kgCaCO3/tonne) | #N/A | #N/A | #N/A | 129 | 138 | 113 |
| | | AP (kgCaCO3/tonne) | #N/A | #N/A | #N/A | 27.2 | 12.2 | 3.81 |
| | | NNPkg CaCO3/tonne | #N/A | #N/A | #N/A | 102 | 126 | 110 |
| | | S Acid% | #N/A | #N/A | #N/A | 0.871 | 0.389 | 0.122 |
| | | LeachableSO4-S% | #N/A | #N/A | #N/A | 0.22 | 0.13 | 0.03 |
| | | Sulphide% | #N/A | #N/A | #N/A | 0.65 | 0.26 | 0.09 |
| | | C% | #N/A | #N/A | #N/A | 1.55 | 1.64 | 1.35 |
| | | CO3% (as %CO3) | #N/A | #N/A | #N/A | 7.52 | 8.28 | 6.02 |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 1.3 |
| | | Talc (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 20.0 |
| | | Chlorite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 22.0 |
| | | Muscovite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Albite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Microcline (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Biotite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 10.9 |
| | | Magnesiohornblende (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 23.8 |
| | | Diopside (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 3.5 |
| | | Phlogopite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Magnetite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 1.9 |
| | | Brucite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Hematite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Ilmenite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Periclase (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Rutile (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Iron (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Dolomite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 15.0 |
| | | Calcite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 1.1 |
| | | Magnesite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Ankerite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | Pyrite (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.6 |
| | | Gypsum (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 0.0 |
| | | TOTAL (wt%) | #N/A | #N/A | #N/A | #N/A | #N/A | 100 |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | #N/A | #N/A | #N/A | 49.2 | #N/A | 41.9 |
| | | Al2O3% | #N/A | #N/A | #N/A | 6.25 | #N/A | 5.51 |
| | | Fe2O3% | #N/A | #N/A | #N/A | 7.93 | #N/A | 9.97 |
| | | MgO% | #N/A | #N/A | #N/A | 12.3 | #N/A | 23.9 |
| | | CaO% | #N/A | #N/A | #N/A | 10.7 | #N/A | 6.19 |
| | | Na2O% | #N/A | #N/A | #N/A | 1.09 | #N/A | 0.14 |
| | | K2O% | #N/A | #N/A | #N/A | 2.95 | #N/A | 1.93 |
| | | TiO2% | #N/A | #N/A | #N/A | 0.33 | #N/A | 0.30 |
| | | P2O5% | #N/A | #N/A | #N/A | 0.08 | #N/A | 0.02 |

| Test Phase | Analysis | Parameter | SH - ORE - 06 | SH - ORE - 07 | SH - ORE - 08 | SH - ORE - 09 | SH - ORE - 10 | SH Development - 01 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | #N/A | #N/A | #N/A | 0.14 | #N/A | 0.15 |
| | | Cr2O3% | #N/A | #N/A | #N/A | 0.22 | #N/A | 0.32 |
| | | V2O5% | #N/A | #N/A | #N/A | 0.03 | #N/A | 0.03 |
| | | LOI% | #N/A | #N/A | #N/A | 7.01 | #N/A | 8.96 |
| | | Sum% | #N/A | #N/A | #N/A | 98.3 | #N/A | 99.3 |

| Test Phase | Analysis | Parameter | SH Development - 02 | SH Development - 03 | SH Development - 04 | SH Development - 05 | SH Development - 06 | SH Development - 07 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 3.97 | 1.89 | 3.84 | 5.09 | <1.0 | 4.88 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 0.16 | 0.19 | 0.08 | 0.12 | 0.03 | 0.20 |
| | | Aluminum (mg/kg) | 20000 | 26000 | 6700 | 6900 | 12000 | 6700 |
| | | Arsenic (mg/kg) | 0.8 | 0.9 | 0.6 | 0.7 | 2.2 | 0.8 |
| | | Boron (mg/kg) | 2 | 1 | 2 | 2 | 11 | 2 |
| | | Barium (mg/kg) | 250 | 400 | 800 | 290 | 1.6 | 360 |
| | | Beryllium (mg/kg) | 0.47 | 0.81 | 0.45 | 0.51 | 0.04 | 0.55 |
| | | Bismuth (mg/kg) | 0.84 | 0.49 | 0.19 | 0.45 | 0.24 | 1.3 |
| | | Calcium (mg/kg) | 37000 | 39000 | 25000 | 25000 | 6200 | 20000 |
| | | Cadmium (mg/kg) | 0.05 | 0.04 | 0.05 | 0.06 | <0.02 | 0.08 |
| | | Cobalt (mg/kg) | 46 | 54 | 7.0 | 6.8 | 67 | 6.9 |
| | | Chromium (mg/kg) | 840 | 530 | 34 | 25 | 860 | 45 |
| | | Copper (mg/kg) | 53 | 120 | 12 | 15 | 33 | 13 |
| | | Iron (mg/kg) | 47000 | 68000 | 23000 | 23000 | 45000 | 18000 |
| | | Potassium (mg/kg) | 21000 | 32000 | 6700 | 7400 | 360 | 5600 |
| | | Lithium (mg/kg) | 24 | 35 | 12 | 15 | <2.0 | 13 |
| | | Magnesium (mg/kg) | 48000 | 50000 | 6100 | 5900 | 49000 | 6800 |
| | | Manganese (mg/kg) | 840 | 1000 | 240 | 230 | 260 | 240 |
| | | Molybdenum (mg/kg) | 1.8 | 1.4 | 1.0 | 0.5 | 0.2 | 1.6 |
| | | Sodium (mg/kg) | 130 | 230 | 1500 | 1400 | 180 | 1000 |
| | | Nickel (mg/kg) | 420 | 270 | 7.8 | 7.3 | 970 | 11 |
| | | Phosphorus (mg/kg) | 180 | 390 | 1300 | 1300 | 60 | 1000 |
| | | Lead (mg/kg) | 9.8 | 3.1 | 5.7 | 4.9 | 0.87 | 33 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | <0.5 | <0.5 | 0.7 | 0.8 | <0.5 | 0.8 |
| | | Strontium (mg/kg) | 260 | 280 | 380 | 570 | 15 | 180 |
| | | Titanium (mg/kg) | 1000 | 2600 | 980 | 750 | 110 | 880 |
| | | Thallium (mg/kg) | 0.37 | 0.64 | 0.05 | 0.11 | <0.02 | 0.10 |
| | | Uranium (mg/kg) | 0.17 | 0.013 | 1.0 | 1.1 | 0.021 | 1.2 |
| | | Vanadium (mg/kg) | 98 | 200 | 39 | 49 | 64 | 46 |
| | | Zinc (mg/kg) | 56 | 71 | 67 | 78 | 15 | 77 |
| | | Weight (mg/kg) | 6693 | 7065 | 5839 | 4511 | 4472 | 6130 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 2.04 | 2.05 | 1.98 | 2.00 | 2.06 | 2.00 |
| | | Initial pH | 9.54 | 9.41 | 9.78 | 9.76 | 9.94 | 9.69 |
| | | Vol H2SO4 (mL) | 4.10 | 3.90 | 2.05 | 2.00 | 1.50 | 2.00 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 100 | 95 | 52 | 50 | 36 | 50 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 7.81 | 15.6 | 6.78 | 3.25 | 2.34 | 1.69 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | 93 | 80 | 45 | 47 | 34 | 48 |
| | | Sulphur (total) (%) | 0.250 | 0.498 | 0.217 | 0.104 | 0.075 | 0.054 |
| | | Acid Leachable SO4-S (%) | 0.19 | 0.17 | 0.07 | 0.04 | 0.02 | 0.03 |
| | | Sulphide (%) | 0.06 | 0.33 | 0.15 | 0.06 | 0.05 | 0.02 |
| | | Carbon (total) (%) | 1.17 | 1.12 | 0.556 | 0.541 | 0.189 | 0.513 |
| | | Carbonate (%CO3) | 5.57 | 5.08 | 2.19 | 2.19 | 0.744 | 2.08 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | #N/A | #N/A | 100 | #N/A | 100 | 100 |
| | | Volume D.I. Water [mL] | #N/A | #N/A | 400 | #N/A | 400 | 400 |

| Test Phase | Analysis | Parameter | SH Development - 02 | SH Development - 03 | SH Development - 04 | SH Development - 05 | SH Development - 06 | SH Development - 07 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | #N/A | #N/A | 9.24 | #N/A | 9.20 | 9.38 |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | 63 | #N/A | 48 | 80 |
| | | pH [no unit] | #N/A | #N/A | 8.63 | #N/A | 8.49 | 9.00 |
| | | Conductivity [uS/cm] | #N/A | #N/A | 516 | #N/A | 279 | 356 |
| | | F [mg/L] | #N/A | #N/A | 1.93 | #N/A | 0.08 | 1.79 |
| | | Cl [mg/L] | #N/A | #N/A | 4.4 | #N/A | <2.0 | 6.6 |
| | | SO4 [mg/L] | #N/A | #N/A | 140 | #N/A | 23 | 52 |
| | | Br [mg/L] | #N/A | #N/A | <3.0 | #N/A | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | <0.3 | #N/A | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | <0.6 | #N/A | <0.6 | <0.6 |
| | | NO2+NO3 [as N mg/L] | #N/A | #N/A | <0.6 | #N/A | <0.6 | <0.6 |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | <0.03 | #N/A | <0.03 | <0.03 |
| | | Hg [mg/L] | #N/A | #N/A | <0.00001 | #N/A | <0.00001 | <0.00001 |
| | | Al [mg/L] | #N/A | #N/A | 0.246 | #N/A | 0.010 | 0.319 |
| | | As [mg/L] | #N/A | #N/A | 0.0015 | #N/A | 0.0012 | 0.0086 |
| | | Ag [mg/L] | #N/A | #N/A | <0.00005 | #N/A | 0.00008 | <0.00005 |
| | | Ba [mg/L] | #N/A | #N/A | 0.170 | #N/A | 0.00440 | 0.0651 |
| | | Be [mg/L] | #N/A | #N/A | <0.000007 | #N/A | <0.000007 | <0.000007 |
| | | B [mg/L] | #N/A | #N/A | 0.019 | #N/A | 0.033 | 0.028 |
| | | Bi [mg/L] | #N/A | #N/A | 0.000016 | #N/A | 0.000028 | 0.000016 |
| | | Ca [mg/L] | #N/A | #N/A | 15.4 | #N/A | 8.33 | 3.79 |
| | | Cd [mg/L] | #N/A | #N/A | <0.000003 | #N/A | <0.000003 | 0.000009 |
| | | Co [mg/L] | #N/A | #N/A | 0.000010 | #N/A | 0.000236 | 0.000043 |
| | | Cr [mg/L] | #N/A | #N/A | 0.00145 | #N/A | 0.135 | 0.00167 |
| | | Cu [mg/L] | #N/A | #N/A | 0.00036 | #N/A | 0.00018 | 0.00036 |
| | | Fe [mg/L] | #N/A | #N/A | <0.007 | #N/A | <0.007 | 0.008 |
| | | K [mg/L] | #N/A | #N/A | 30.0 | #N/A | 14.2 | 20.6 |
| | | Li [mg/L] | #N/A | #N/A | 0.0358 | #N/A | 0.0046 | 0.0118 |
| | | Mg [mg/L] | #N/A | #N/A | 1.90 | #N/A | 15.8 | 0.955 |
| | | Mn [mg/L] | #N/A | #N/A | 0.00098 | #N/A | 0.00026 | 0.00063 |
| | | Mo [mg/L] | #N/A | #N/A | 0.00322 | #N/A | 0.00360 | 0.00280 |
| | | Na [mg/L] | #N/A | #N/A | 62.9 | #N/A | 6.62 | 51.3 |
| | | Ni [mg/L] | #N/A | #N/A | <0.0001 | #N/A | 0.0088 | 0.0003 |
| | | P [mg/L] | #N/A | #N/A | 0.008 | #N/A | <0.003 | 0.014 |
| | | Pb [mg/L] | #N/A | #N/A | 0.00001 | #N/A | <0.00001 | 0.00021 |
| | | Sb [mg/L] | #N/A | #N/A | 0.0008 | #N/A | 0.0024 | 0.0011 |
| | | Se [mg/L] | #N/A | #N/A | 0.00041 | #N/A | 0.00046 | 0.00162 |
| | | Si [mg/L] | #N/A | #N/A | 4.34 | #N/A | 5.41 | 3.95 |
| | | Sn [mg/L] | #N/A | #N/A | 0.00016 | #N/A | 0.00002 | 0.00008 |
| | | Sr [mg/L] | #N/A | #N/A | 5.89 | #N/A | 0.0404 | 0.366 |
| | | Ti [mg/L] | #N/A | #N/A | 0.00037 | #N/A | 0.00016 | 0.00084 |
| | | Tl [mg/L] | #N/A | #N/A | 0.000016 | #N/A | 0.000028 | 0.000010 |
| | | U [mg/L] | #N/A | #N/A | 0.00118 | #N/A | 0.000026 | 0.004056 |
| | | V [mg/L] | #N/A | #N/A | 0.0471 | #N/A | 0.00110 | 0.0658 |
| | | Zn [mg/L] | #N/A | #N/A | <0.002 | #N/A | <0.002 | <0.002 |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | #N/A | #N/A | 0.4 | #N/A | 0.4 | 0.4 |

| Test Phase | Analysis | Parameter | SH Development - 02 | SH Development - 03 | SH Development - 04 | SH Development - 05 | SH Development - 06 | SH Development - 07 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | #N/A | #N/A | 1 | #N/A | 1 | 1 |
| | | Ext Volume [mL] | #N/A | #N/A | 400 | #N/A | 400 | 400 |
| | | Final pH | #N/A | #N/A | 9.88 | #N/A | 9.54 | 9.02 |
| | | F [mg/L] | #N/A | #N/A | 0.10 | #N/A | <0.06 | <0.06 |
| | | SO4 [mg/L] | #N/A | #N/A | 20 | #N/A | 2.4 | 4.2 |
| | | Cl [mg/L] | #N/A | #N/A | <2.0 | #N/A | <2.0 | <2.0 |
| | | Br [mg/L] | #N/A | #N/A | <3.0 | #N/A | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | <0.3 | #N/A | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | <0.6 | #N/A | <0.6 | <0.6 |
| | | Conductivity [uS/cm] | #N/A | #N/A | 106 | #N/A | 57 | 61 |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | 25 | #N/A | 25 | 24 |
| | | pH [no unit] | #N/A | #N/A | 7.84 | #N/A | 7.93 | 7.74 |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | 0.04 | #N/A | <0.03 | <0.03 |
| | | Hg [mg/L] | #N/A | #N/A | <0.00001 | #N/A | <0.00001 | <0.00001 |
| | | Al [mg/L] | #N/A | #N/A | 0.281 | #N/A | 0.006 | 0.492 |
| | | As [mg/L] | #N/A | #N/A | 0.0003 | #N/A | 0.0006 | 0.0019 |
| | | Ag [mg/L] | #N/A | #N/A | <0.00005 | #N/A | <0.00005 | <0.00005 |
| | | Ba [mg/L] | #N/A | #N/A | 0.588 | #N/A | 0.00573 | 0.240 |
| | | Be [mg/L] | #N/A | #N/A | <0.000007 | #N/A | <0.000007 | <0.000007 |
| | | B [mg/L] | #N/A | #N/A | <0.002 | #N/A | 0.038 | 0.002 |
| | | Bi [mg/L] | #N/A | #N/A | <0.000007 | #N/A | <0.000007 | <0.000007 |
| | | Ca [mg/L] | #N/A | #N/A | 19.7 | #N/A | 6.81 | 7.87 |
| | | Cd [mg/L] | #N/A | #N/A | <0.000003 | #N/A | <0.000003 | <0.000003 |
| | | Co [mg/L] | #N/A | #N/A | <0.000004 | #N/A | <0.000004 | 0.000034 |
| | | Cr [mg/L] | #N/A | #N/A | <0.00003 | #N/A | 0.00336 | 0.00003 |
| | | Cu [mg/L] | #N/A | #N/A | 0.00010 | #N/A | 0.00023 | 0.00025 |
| | | Fe [mg/L] | #N/A | #N/A | <0.007 | #N/A | <0.007 | <0.007 |
| | | K [mg/L] | #N/A | #N/A | 4.80 | #N/A | 1.60 | 3.52 |
| | | Li [mg/L] | #N/A | #N/A | 0.0031 | #N/A | 0.0002 | 0.0011 |
| | | Mg [mg/L] | #N/A | #N/A | 0.407 | #N/A | 2.43 | 0.444 |
| | | Mn [mg/L] | #N/A | #N/A | 0.00116 | #N/A | 0.00001 | 0.00057 |
| | | Mo [mg/L] | #N/A | #N/A | 0.00056 | #N/A | 0.00025 | 0.00024 |
| | | Na [mg/L] | #N/A | #N/A | 4.91 | #N/A | 0.42 | 2.36 |
| | | Ni [mg/L] | #N/A | #N/A | <0.0001 | #N/A | 0.0010 | 0.0001 |
| | | P [mg/L] | #N/A | #N/A | 0.003 | #N/A | <0.003 | 0.003 |
| | | Pb [mg/L] | #N/A | #N/A | <0.00001 | #N/A | <0.00001 | 0.00010 |
| | | Sb [mg/L] | #N/A | #N/A | <0.0002 | #N/A | 0.0005 | <0.0002 |
| | | Se [mg/L] | #N/A | #N/A | <0.00004 | #N/A | 0.00005 | 0.00012 |
| | | Si [mg/L] | #N/A | #N/A | 2.74 | #N/A | 5.79 | 2.46 |
| | | Sr [mg/L] | #N/A | #N/A | 7.09 | #N/A | 0.0705 | 0.632 |
| | | Sn [mg/L] | #N/A | #N/A | <0.00001 | #N/A | 0.00002 | <0.00001 |
| | | Ti [mg/L] | #N/A | #N/A | 0.00010 | #N/A | <0.00005 | 0.00044 |
| | | Tl [mg/L] | #N/A | #N/A | <0.000005 | #N/A | 0.000011 | <0.000005 |
| | | U [mg/L] | #N/A | #N/A | 0.000219 | #N/A | 0.000002 | 0.000249 |
| | | V [mg/L] | #N/A | #N/A | 0.00270 | #N/A | 0.00323 | 0.00285 |
| | | Zn [mg/L] | #N/A | #N/A | <0.002 | #N/A | <0.002 | <0.002 |

| Test Phase | Analysis | Parameter | SH Development - 02 | SH Development - 03 | SH Development - 04 | SH Development - 05 | SH Development - 06 | SH Development - 07 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | #N/A | #N/A | 20 | #N/A | 20 | 20 |
| | | Ext Fluid [#1 or #2] | #N/A | #N/A | 1 | #N/A | 1 | 1 |
| | | Ext Volume [mL] | #N/A | #N/A | 400 | #N/A | 400 | 400 |
| | | Final pH | #N/A | #N/A | 6.36 | #N/A | 5.12 | 5.40 |
| | | Conductivity [uS/cm] | #N/A | #N/A | 6950 | #N/A | 5320 | 5970 |
| | | Alkalinity [mg/L as CaCO3] | #N/A | #N/A | 3180 | #N/A | 1670 | 2150 |
| | | pH [no unit] | #N/A | #N/A | 7.42 | #N/A | 5.14 | 5.43 |
| | | SO4 [mg/L] | #N/A | #N/A | 23 | #N/A | <2.0 | 3.3 |
| | | Cl [mg/L] | #N/A | #N/A | <20.0 | #N/A | <20.0 | <20.0 |
| | | Br [mg/L] | #N/A | #N/A | <3.0 | #N/A | <3.0 | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | #N/A | #N/A | <0.3 | #N/A | <0.3 | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | #N/A | #N/A | <0.6 | #N/A | <0.6 | <0.6 |
| | | NO2+NO3 [as N mg/L] | #N/A | #N/A | <0.6 | #N/A | <0.6 | <0.6 |
| | | F [mg/L] | #N/A | #N/A | 0.10 | #N/A | <0.06 | 0.08 |
| | | Tot.Reactive P [mg/L] | #N/A | #N/A | <0.03 | #N/A | <0.03 | <0.03 |
| | | Hg [mg/L] | #N/A | #N/A | 0.00002 | #N/A | <0.00001 | <0.00001 |
| | | Al [mg/L] | #N/A | #N/A | <0.01 | #N/A | 0.38 | 0.29 |
| | | As [mg/L] | #N/A | #N/A | <0.002 | #N/A | <0.002 | <0.002 |
| | | Ag [mg/L] | #N/A | #N/A | <0.0005 | #N/A | <0.0005 | <0.0005 |
| | | Ba [mg/L] | #N/A | #N/A | 4.72 | #N/A | 0.0208 | 2.93 |
| | | B [mg/L] | #N/A | #N/A | <0.02 | #N/A | 0.07 | <0.02 |
| | | Be [mg/L] | #N/A | #N/A | 0.00008 | #N/A | 0.00013 | 0.00048 |
| | | Bi [mg/L] | #N/A | #N/A | <0.00007 | #N/A | <0.00007 | <0.00007 |
| | | Ca [mg/L] | #N/A | #N/A | 844 | #N/A | 117 | 443 |
| | | Cd [mg/L] | #N/A | #N/A | 0.00164 | #N/A | 0.00006 | 0.00107 |
| | | Cr [mg/L] | #N/A | #N/A | 0.0008 | #N/A | 0.109 | 0.0100 |
| | | Co [mg/L] | #N/A | #N/A | 0.00274 | #N/A | 0.0373 | 0.00909 |
| | | Cu [mg/L] | #N/A | #N/A | 0.0028 | #N/A | 0.0044 | 0.0050 |
| | | Fe [mg/L] | #N/A | #N/A | 1.32 | #N/A | 1.40 | 5.39 |
| | | K [mg/L] | #N/A | #N/A | 29.5 | #N/A | 3.45 | 15.1 |
| | | Li [mg/L] | #N/A | #N/A | 0.008 | #N/A | 0.002 | 0.003 |
| | | Mg [mg/L] | #N/A | #N/A | 4.76 | #N/A | 53.6 | 3.32 |
| | | Mn [mg/L] | #N/A | #N/A | 7.11 | #N/A | 1.59 | 4.73 |
| | | Mo [mg/L] | #N/A | #N/A | 0.0002 | #N/A | 0.0003 | 0.0004 |
| | | Na [mg/L] | #N/A | #N/A | 1460 | #N/A | 1530 | 1500 |
| | | Ni [mg/L] | #N/A | #N/A | 0.001 | #N/A | 0.465 | 0.004 |
| | | P [mg/L] | #N/A | #N/A | <0.03 | #N/A | 0.03 | <0.03 |
| | | Pb [mg/L] | #N/A | #N/A | 0.0013 | #N/A | 0.0028 | 0.0333 |
| | | U [mg/L] | #N/A | #N/A | 0.00243 | #N/A | 0.00011 | 0.00332 |
| | | Sb [mg/L] | #N/A | #N/A | <0.002 | #N/A | <0.002 | <0.002 |
| | | Se [mg/L] | #N/A | #N/A | <0.0004 | #N/A | <0.0004 | <0.0004 |
| | | Si [mg/L] | #N/A | #N/A | 1.48 | #N/A | 5.26 | 0.98 |
| | | Sn [mg/L] | #N/A | #N/A | <0.0001 | #N/A | <0.0001 | <0.0001 |
| | | Sr [mg/L] | #N/A | #N/A | 18.9 | #N/A | 0.319 | 3.14 |
| | | Ti [mg/L] | #N/A | #N/A | <0.0005 | #N/A | <0.0005 | <0.0005 |
| | | Tl [mg/L] | #N/A | #N/A | <0.00005 | #N/A | <0.00005 | <0.00005 |
| | | V [mg/L] | #N/A | #N/A | 0.0001 | #N/A | 0.0002 | 0.0008 |
| | | Zn [mg/L] | #N/A | #N/A | <0.02 | #N/A | <0.02 | <0.02 |
| | | Weight [g] | #N/A | #N/A | 4413 | #N/A | 4386 | 6002 |

| Test Phase | Analysis | Parameter | SH Development - 02 | SH Development - 03 | SH Development - 04 | SH Development - 05 | SH Development - 06 | SH Development - 07 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Split | #N/A | #N/A | 1 | #N/A | 1 | 1 |
| | | Pulv200M [250g] | #N/A | #N/A | 1 | #N/A | 1 | 1 |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | #N/A | #N/A | 1.97 | #N/A | 2.05 | 2.07 |
| | | Initial pH | #N/A | #N/A | 9.63 | #N/A | 9.83 | 9.76 |
| | | Vol H2SO4 (mL) | #N/A | #N/A | 1.95 | #N/A | 1.00 | 1.80 |
| | | H2SO4 Normality | #N/A | #N/A | 1.00 | #N/A | 1.00 | 1.00 |
| | | Acisol-NP (kgCaCO3/tonne) | #N/A | #N/A | 49.5 | #N/A | 24.4 | 43.5 |
| | | AP (kgCaCO3/tonne) | #N/A | #N/A | 3.25 | #N/A | 2.56 | 2.59 |
| | | NNPkg CaCO3/tonne | #N/A | #N/A | 46 | #N/A | 22 | 41 |
| | | S Acid% | #N/A | #N/A | 0.104 | #N/A | 0.082 | 0.083 |
| | | LeachableSO4-S% | #N/A | #N/A | 0.03 | #N/A | 0.04 | 0.02 |
| | | Sulphide% | #N/A | #N/A | 0.07 | #N/A | 0.04 | 0.06 |
| | | C% | #N/A | #N/A | 0.536 | #N/A | 0.174 | 0.543 |
| | | CO3% (as %CO3) | #N/A | #N/A | 2.28 | #N/A | 0.794 | 2.37 |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | #N/A | #N/A | 10.4 | #N/A | #N/A | 18.6 |
| | | Talc (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Chlorite (wt%) | #N/A | #N/A | 1.7 | #N/A | #N/A | 2.7 |
| | | Muscovite (wt%) | #N/A | #N/A | 4.0 | #N/A | #N/A | 1.4 |
| | | Albite (wt%) | #N/A | #N/A | 70.8 | #N/A | #N/A | 56.6 |
| | | Microcline (wt%) | #N/A | #N/A | 1.9 | #N/A | #N/A | 10.0 |
| | | Biotite (wt%) | #N/A | #N/A | 3.9 | #N/A | #N/A | 4.2 |
| | | Magnesiohornblende (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Diopside (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Phlogopite (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Magnetite (wt%) | #N/A | #N/A | 0.9 | #N/A | #N/A | 0.9 |
| | | Brucite (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Hematite (wt%) | #N/A | #N/A | 0.5 | #N/A | #N/A | 0.3 |
| | | Ilmenite (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Periclase (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Rutile (wt%) | #N/A | #N/A | 0.7 | #N/A | #N/A | 0.6 |
| | | Iron (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Dolomite (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Calcite (wt%) | #N/A | #N/A | 5.1 | #N/A | #N/A | 4.7 |
| | | Magnesite (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Ankerite (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | Pyrite (wt%) | #N/A | #N/A | 0.3 | #N/A | #N/A | 0.1 |
| | | Gypsum (wt%) | #N/A | #N/A | 0.0 | #N/A | #N/A | 0.0 |
| | | TOTAL (wt%) | #N/A | #N/A | 100 | #N/A | #N/A | 100 |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | #N/A | #N/A | 64.0 | #N/A | 42.5 | 64.6 |
| | | Al2O3% | #N/A | #N/A | 15.6 | #N/A | 5.65 | 15.1 |
| | | Fe2O3% | #N/A | #N/A | 3.26 | #N/A | 10.8 | 3.10 |
| | | MgO% | #N/A | #N/A | 1.05 | #N/A | 26.0 | 1.21 |
| | | CaO% | #N/A | #N/A | 2.86 | #N/A | 7.20 | 3.15 |
| | | Na2O% | #N/A | #N/A | 6.78 | #N/A | 0.40 | 6.18 |
| | | K2O% | #N/A | #N/A | 2.32 | #N/A | 0.07 | 2.60 |
| | | TiO2% | #N/A | #N/A | 0.54 | #N/A | 0.29 | 0.49 |
| | | P2O5% | #N/A | #N/A | 0.24 | #N/A | 0.03 | 0.24 |

| Test Phase | Analysis | Parameter | SH Development - 02 | SH Development - 03 | SH Development - 04 | SH Development - 05 | SH Development - 06 | SH Development - 07 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | #N/A | #N/A | 0.04 | #N/A | 0.17 | 0.03 |
| | | Cr2O3% | #N/A | #N/A | 0.01 | #N/A | 0.33 | 0.01 |
| | | V2O5% | #N/A | #N/A | 0.01 | #N/A | 0.03 | 0.02 |
| | | LOI% | #N/A | #N/A | 2.76 | #N/A | 6.69 | 2.54 |
| | | Sum% | #N/A | #N/A | 99.4 | #N/A | 100.1 | 99.3 |

| Test Phase | Analysis | Parameter | SH Dilution - 01 | SH - Dilution - 02 | SH - Dilution - 03 | SH Dilution - 04 | SH Dilution - 05 | SH Dilution - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 4.39 | 2.17 | 3.15 | 1.58 | 1.48 | 4.09 |
| | | Bromide (mg/kg) | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 | <1.5 |
| | | Mercury (mg/kg) | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| | | Silver (mg/kg) | 0.10 | 0.36 | 0.06 | 0.21 | 0.08 | 0.07 |
| | | Aluminum (mg/kg) | 7100 | 6400 | 19000 | 19000 | 12000 | 5500 |
| | | Arsenic (mg/kg) | <0.5 | 0.7 | <0.5 | <0.5 | 2.1 | 0.6 |
| | | Boron (mg/kg) | 2 | 1 | 2 | 1 | 2 | 2 |
| | | Barium (mg/kg) | 270 | 220 | 270 | 220 | 18 | 330 |
| | | Beryllium (mg/kg) | 0.39 | 0.64 | 0.66 | 0.61 | 0.11 | 0.49 |
| | | Bismuth (mg/kg) | 0.43 | 0.72 | 0.20 | 0.24 | 0.11 | 0.34 |
| | | Calcium (mg/kg) | 22000 | 26000 | 44000 | 45000 | 38000 | 19000 |
| | | Cadmium (mg/kg) | 0.05 | 0.09 | 0.07 | 0.08 | 0.03 | 0.06 |
| | | Cobalt (mg/kg) | 8.1 | 15 | 40 | 48 | 59 | 7.4 |
| | | Chromium (mg/kg) | 36 | 120 | 900 | 900 | 630 | 26 |
| | | Copper (mg/kg) | 13 | 100 | 34 | 74 | 53 | 20 |
| | | Iron (mg/kg) | 22000 | 27000 | 41000 | 43000 | 33000 | 17000 |
| | | Potassium (mg/kg) | 6100 | 6600 | 24000 | 22000 | 6700 | 5200 |
| | | Lithium (mg/kg) | 10 | 7 | 28 | 19 | 11 | 11 |
| | | Magnesium (mg/kg) | 6800 | 12000 | 58000 | 50000 | 49000 | 5700 |
| | | Manganese (mg/kg) | 260 | 320 | 960 | 950 | 850 | 200 |
| | | Molybdenum (mg/kg) | 0.4 | 3.9 | 0.4 | 3.4 | 0.7 | 0.3 |
| | | Sodium (mg/kg) | 1000 | 750 | 85 | 93 | 110 | 950 |
| | | Nickel (mg/kg) | 12 | 66 | 440 | 420 | 440 | 7.8 |
| | | Phosphorus (mg/kg) | 1100 | 890 | 91 | 130 | 78 | 1100 |
| | | Lead (mg/kg) | 7.1 | 11 | 3.2 | 7.0 | 2.5 | 5.4 |
| | | Antimony (mg/kg) | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 | <0.8 |
| | | Selenium (mg/kg) | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 | <0.7 |
| | | Tin (mg/kg) | 0.5 | 0.7 | <0.5 | <0.5 | <0.5 | 0.7 |
| | | Strontium (mg/kg) | 340 | 540 | 480 | 240 | 200 | 390 |
| | | Titanium (mg/kg) | 910 | 630 | 1200 | 1100 | 230 | 790 |
| | | Thallium (mg/kg) | 0.08 | 0.14 | 0.45 | 0.35 | 0.15 | 0.08 |
| | | Uranium (mg/kg) | 0.74 | 0.80 | 0.052 | 0.044 | 0.032 | 1.1 |
| | | Vanadium (mg/kg) | 34 | 58 | 84 | 80 | 47 | 41 |
| | | Zinc (mg/kg) | 67 | 37 | 160 | 51 | 17 | 57 |
| | | Weight (mg/kg) | 3556 | 1767 | 6201 | 1970 | 5060 | 5829 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 2.00 | 2.06 | 2.03 | 2.04 | 1.99 | 2.02 |
| | | Initial pH | 9.32 | 9.53 | 9.78 | 9.82 | 9.74 | 9.40 |
| | | Vol H2SO4 (mL) | 2.00 | 3.20 | 7.60 | 6.30 | 6.05 | 1.75 |
| | | H2SO4 (Normality) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 50 | 78 | 187 | 154 | 152 | 43 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 5.97 | 34.8 | 1.62 | 5.31 | 7.94 | 3.22 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | 44 | 43 | 186 | 149 | 144 | 40 |
| | | Sulphur (total) (%) | 0.191 | 1.11 | 0.052 | 0.170 | 0.254 | 0.103 |
| | | Acid Leachable SO4-S (%) | 0.12 | 0.30 | <0.02 | 0.03 | 0.06 | 0.04 |
| | | Sulphide (%) | 0.07 | 0.81 | 0.04 | 0.14 | 0.19 | 0.06 |
| | | Carbon (total) (%) | 0.493 | 0.926 | 2.20 | 1.88 | 1.95 | 0.461 |
| | | Carbonate (%CO3) | 1.96 | 3.56 | 10.9 | 9.08 | 9.13 | 1.81 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | #N/A | 100 | 100 | #N/A | #N/A | #N/A |
| | | Volume D.I. Water [mL] | #N/A | 400 | 400 | #N/A | #N/A | #N/A |

| Test Phase | Analysis | Parameter | SH Dilution - 01 | SH - Dilution - 02 | SH - Dilution - 03 | SH Dilution - 04 | SH Dilution - 05 | SH Dilution - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | #N/A | 8.88 | 9.11 | #N/A | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 113 | 95 | #N/A | #N/A | #N/A |
| | | pH [no unit] | #N/A | 8.51 | 8.52 | #N/A | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 541 | 324 | #N/A | #N/A | #N/A |
| | | F [mg/L] | #N/A | 0.80 | 0.66 | #N/A | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | 4.4 | <2.0 | #N/A | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 97 | 41 | #N/A | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | #N/A | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | #N/A | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | #N/A | #N/A | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | #N/A | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | #N/A | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | #N/A | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.070 | 0.059 | #N/A | #N/A | #N/A |
| | | As [mg/L] | #N/A | 0.0008 | 0.0110 | #N/A | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | 0.00162 | <0.00005 | #N/A | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 0.182 | 1.04 | #N/A | #N/A | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | 0.000010 | #N/A | #N/A | #N/A |
| | | B [mg/L] | #N/A | 0.017 | 0.009 | #N/A | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | 0.000023 | 0.000048 | #N/A | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 12.8 | 14.0 | #N/A | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | <0.000003 | 0.000006 | #N/A | #N/A | #N/A |
| | | Co [mg/L] | #N/A | 0.000036 | 0.000594 | #N/A | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.00046 | 0.0628 | #N/A | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.00251 | 0.00236 | #N/A | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | <0.007 | 0.174 | #N/A | #N/A | #N/A |
| | | K [mg/L] | #N/A | 31.3 | 57.5 | #N/A | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.0185 | 0.0048 | #N/A | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 9.23 | 9.54 | #N/A | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 0.00228 | 0.00266 | #N/A | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.0168 | 0.00108 | #N/A | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 60.0 | 3.34 | #N/A | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | 0.0002 | 0.0103 | #N/A | #N/A | #N/A |
| | | P [mg/L] | #N/A | 0.012 | 0.006 | #N/A | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | 0.00002 | 0.00045 | #N/A | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | 0.0016 | 0.0085 | #N/A | #N/A | #N/A |
| | | Se [mg/L] | #N/A | 0.00170 | 0.00179 | #N/A | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 5.68 | 19.9 | #N/A | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.00007 | 0.00008 | #N/A | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 1.87 | 5.11 | #N/A | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | 0.00080 | 0.00300 | #N/A | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | 0.000012 | 0.000052 | #N/A | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.000588 | 0.000026 | #N/A | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.0114 | 0.0158 | #N/A | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | <0.002 | 0.002 | #N/A | #N/A | #N/A |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | #N/A | 0.4 | 0.4 | #N/A | #N/A | #N/A |

| Test Phase | Analysis | Parameter | SH Dilution - 01 | SH - Dilution - 02 | SH - Dilution - 03 | SH Dilution - 04 | SH Dilution - 05 | SH Dilution - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | #N/A | 1 | 1 | #N/A | #N/A | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | 400 | #N/A | #N/A | #N/A |
| | | Final pH | #N/A | 9.72 | 8.86 | #N/A | #N/A | #N/A |
| | | F [mg/L] | #N/A | <0.06 | 0.07 | #N/A | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 9.4 | 9.7 | #N/A | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | <2.0 | <2.0 | #N/A | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | #N/A | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | #N/A | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | #N/A | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 79 | 82 | #N/A | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 25 | 23 | #N/A | #N/A | #N/A |
| | | pH [no unit] | #N/A | 7.56 | 8.68 | #N/A | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | #N/A | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | #N/A | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.316 | 0.026 | #N/A | #N/A | #N/A |
| | | As [mg/L] | #N/A | 0.0006 | 0.0026 | #N/A | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | <0.00005 | <0.00005 | #N/A | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 0.962 | 0.931 | #N/A | #N/A | #N/A |
| | | Be [mg/L] | #N/A | <0.000007 | <0.000007 | #N/A | #N/A | #N/A |
| | | B [mg/L] | #N/A | <0.002 | 0.005 | #N/A | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | <0.000007 | <0.000007 | #N/A | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 8.98 | 9.73 | #N/A | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | <0.000003 | <0.000003 | #N/A | #N/A | #N/A |
| | | Co [mg/L] | #N/A | <0.000004 | 0.000050 | #N/A | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.00006 | 0.00026 | #N/A | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | 0.00011 | 0.00018 | #N/A | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | <0.007 | <0.007 | #N/A | #N/A | #N/A |
| | | K [mg/L] | #N/A | 6.53 | 11.6 | #N/A | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.0012 | 0.0011 | #N/A | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 1.03 | 1.17 | #N/A | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 0.00051 | 0.00034 | #N/A | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.00044 | 0.00031 | #N/A | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 2.87 | 0.24 | #N/A | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | <0.0001 | 0.0004 | #N/A | #N/A | #N/A |
| | | P [mg/L] | #N/A | <0.003 | <0.003 | #N/A | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | <0.00001 | 0.00003 | #N/A | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | <0.0002 | 0.0011 | #N/A | #N/A | #N/A |
| | | Se [mg/L] | #N/A | 0.00008 | 0.00010 | #N/A | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 1.90 | 1.87 | #N/A | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 1.23 | 2.66 | #N/A | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | 0.00003 | <0.00001 | #N/A | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | <0.00005 | 0.00007 | #N/A | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | 0.000010 | 0.000009 | #N/A | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.000011 | <0.000002 | #N/A | #N/A | #N/A |
| | | V [mg/L] | #N/A | 0.00187 | 0.00296 | #N/A | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | <0.002 | <0.002 | #N/A | #N/A | #N/A |

| Test Phase | Analysis | Parameter | SH Dilution - 01 | SH - Dilution - 02 | SH - Dilution - 03 | SH Dilution - 04 | SH Dilution - 05 | SH Dilution - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | #N/A | 20 | 20 | #N/A | #N/A | #N/A |
| | | Ext Fluid [#1 or #2] | #N/A | 1 | 1 | #N/A | #N/A | #N/A |
| | | Ext Volume [mL] | #N/A | 400 | 400 | #N/A | #N/A | #N/A |
| | | Final pH | #N/A | 5.89 | 5.91 | #N/A | #N/A | #N/A |
| | | Conductivity [uS/cm] | #N/A | 6510 | 6480 | #N/A | #N/A | #N/A |
| | | Alkalinity [mg/L as CaCO3] | #N/A | 2660 | 2670 | #N/A | #N/A | #N/A |
| | | pH [no unit] | #N/A | 6.02 | 6.05 | #N/A | #N/A | #N/A |
| | | SO4 [mg/L] | #N/A | 9.7 | 11 | #N/A | #N/A | #N/A |
| | | Cl [mg/L] | #N/A | <20.0 | <20.0 | #N/A | #N/A | #N/A |
| | | Br [mg/L] | #N/A | <3.0 | <3.0 | #N/A | #N/A | #N/A |
| | | Nitrite, NO2 [as N mg/L] | #N/A | <0.3 | <0.3 | #N/A | #N/A | #N/A |
| | | Nitrate, NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | #N/A | #N/A | #N/A |
| | | NO2+NO3 [as N mg/L] | #N/A | <0.6 | <0.6 | #N/A | #N/A | #N/A |
| | | F [mg/L] | #N/A | <0.06 | <0.06 | #N/A | #N/A | #N/A |
| | | Tot.Reactive P [mg/L] | #N/A | <0.03 | <0.03 | #N/A | #N/A | #N/A |
| | | Hg [mg/L] | #N/A | <0.00001 | <0.00001 | #N/A | #N/A | #N/A |
| | | Al [mg/L] | #N/A | 0.01 | <0.01 | #N/A | #N/A | #N/A |
| | | As [mg/L] | #N/A | <0.002 | <0.002 | #N/A | #N/A | #N/A |
| | | Ag [mg/L] | #N/A | <0.0005 | <0.0005 | #N/A | #N/A | #N/A |
| | | Ba [mg/L] | #N/A | 5.80 | 4.01 | #N/A | #N/A | #N/A |
| | | B [mg/L] | #N/A | <0.02 | <0.02 | #N/A | #N/A | #N/A |
| | | Be [mg/L] | #N/A | 0.00039 | 0.00020 | #N/A | #N/A | #N/A |
| | | Bi [mg/L] | #N/A | <0.00007 | <0.00007 | #N/A | #N/A | #N/A |
| | | Ca [mg/L] | #N/A | 647 | 489 | #N/A | #N/A | #N/A |
| | | Cd [mg/L] | #N/A | 0.00156 | 0.00033 | #N/A | #N/A | #N/A |
| | | Cr [mg/L] | #N/A | 0.0011 | 0.0010 | #N/A | #N/A | #N/A |
| | | Co [mg/L] | #N/A | 0.00351 | 0.0136 | #N/A | #N/A | #N/A |
| | | Cu [mg/L] | #N/A | <0.0002 | 0.0004 | #N/A | #N/A | #N/A |
| | | Fe [mg/L] | #N/A | 10.7 | 7.41 | #N/A | #N/A | #N/A |
| | | K [mg/L] | #N/A | 48.7 | 83.3 | #N/A | #N/A | #N/A |
| | | Li [mg/L] | #N/A | 0.005 | 0.006 | #N/A | #N/A | #N/A |
| | | Mg [mg/L] | #N/A | 23.1 | 101 | #N/A | #N/A | #N/A |
| | | Mn [mg/L] | #N/A | 6.04 | 8.19 | #N/A | #N/A | #N/A |
| | | Mo [mg/L] | #N/A | 0.0002 | 0.0004 | #N/A | #N/A | #N/A |
| | | Na [mg/L] | #N/A | 1490 | 1540 | #N/A | #N/A | #N/A |
| | | Ni [mg/L] | #N/A | 0.008 | 0.052 | #N/A | #N/A | #N/A |
| | | P [mg/L] | #N/A | <0.03 | <0.03 | #N/A | #N/A | #N/A |
| | | Pb [mg/L] | #N/A | 0.0161 | 0.0004 | #N/A | #N/A | #N/A |
| | | U [mg/L] | #N/A | 0.00096 | 0.00009 | #N/A | #N/A | #N/A |
| | | Sb [mg/L] | #N/A | <0.002 | <0.002 | #N/A | #N/A | #N/A |
| | | Se [mg/L] | #N/A | <0.0004 | <0.0004 | #N/A | #N/A | #N/A |
| | | Si [mg/L] | #N/A | 0.82 | 1.78 | #N/A | #N/A | #N/A |
| | | Sn [mg/L] | #N/A | <0.0001 | <0.0001 | #N/A | #N/A | #N/A |
| | | Sr [mg/L] | #N/A | 7.84 | 8.52 | #N/A | #N/A | #N/A |
| | | Ti [mg/L] | #N/A | <0.0005 | <0.0005 | #N/A | #N/A | #N/A |
| | | Tl [mg/L] | #N/A | 0.00052 | 0.00092 | #N/A | #N/A | #N/A |
| | | V [mg/L] | #N/A | <0.0001 | <0.0001 | #N/A | #N/A | #N/A |
| | | Zn [mg/L] | #N/A | 0.03 | <0.02 | #N/A | #N/A | #N/A |
| | | Weight [g] | #N/A | 1639 | 6094 | #N/A | #N/A | #N/A |

| Test Phase | Analysis | Parameter | SH Dilution - 01 | SH - Dilution - 02 | SH - Dilution - 03 | SH Dilution - 04 | SH Dilution - 05 | SH Dilution - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Split | #N/A | 1 | 1 | #N/A | #N/A | #N/A |
| | | Pulv200M [250g] | #N/A | 1 | 1 | #N/A | #N/A | #N/A |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | #N/A | 2.01 | 2.01 | #N/A | #N/A | #N/A |
| | | Initial pH | #N/A | 9.70 | 9.86 | #N/A | #N/A | #N/A |
| | | Vol H2SO4 (mL) | #N/A | 2.90 | 7.15 | #N/A | #N/A | #N/A |
| | | H2SO4 Normality | #N/A | 1.00 | 1.00 | #N/A | #N/A | #N/A |
| | | Acisol-NP (kgCaCO3/tonne) | #N/A | 72.1 | 178 | #N/A | #N/A | #N/A |
| | | AP (kgCaCO3/tonne) | #N/A | 36.9 | 1.19 | #N/A | #N/A | #N/A |
| | | NNPkg CaCO3/tonne | #N/A | 35 | 177 | #N/A | #N/A | #N/A |
| | | S Acid% | #N/A | 1.18 | 0.038 | #N/A | #N/A | #N/A |
| | | LeachableSO4-S% | #N/A | 0.37 | <0.02 | #N/A | #N/A | #N/A |
| | | Sulphide% | #N/A | 0.81 | 0.04 | #N/A | #N/A | #N/A |
| | | C% | #N/A | 0.882 | 2.33 | #N/A | #N/A | #N/A |
| | | CO3% (as %CO3) | #N/A | 3.62 | 11.2 | #N/A | #N/A | #N/A |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | #N/A | 9.8 | 2.2 | #N/A | #N/A | #N/A |
| | | Talc (wt%) | #N/A | 0.5 | 30.0 | #N/A | #N/A | #N/A |
| | | Chlorite (wt%) | #N/A | 1.7 | 17.8 | #N/A | #N/A | #N/A |
| | | Muscovite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Albite (wt%) | #N/A | 73.1 | 0.0 | #N/A | #N/A | #N/A |
| | | Microcline (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Biotite (wt%) | #N/A | 5.6 | 24.1 | #N/A | #N/A | #N/A |
| | | Magnesiohornblende (wt%) | #N/A | 0.0 | 1.8 | #N/A | #N/A | #N/A |
| | | Diopside (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Phlogopite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Magnetite (wt%) | #N/A | 0.4 | 5.0 | #N/A | #N/A | #N/A |
| | | Brucite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Hematite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Ilmenite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Periclase (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Rutile (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Iron (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Dolomite (wt%) | #N/A | 3.3 | 17.8 | #N/A | #N/A | #N/A |
| | | Calcite (wt%) | #N/A | 4.4 | 1.4 | #N/A | #N/A | #N/A |
| | | Magnesite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Ankerite (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | Pyrite (wt%) | #N/A | 1.3 | 0.0 | #N/A | #N/A | #N/A |
| | | Gypsum (wt%) | #N/A | 0.0 | 0.0 | #N/A | #N/A | #N/A |
| | | TOTAL (wt%) | #N/A | 100 | 100 | #N/A | #N/A | #N/A |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | #N/A | 60.9 | 39.5 | #N/A | #N/A | #N/A |
| | | Al2O3% | #N/A | 14.9 | 5.10 | #N/A | #N/A | #N/A |
| | | Fe2O3% | #N/A | 3.66 | 10.3 | #N/A | #N/A | #N/A |
| | | MgO% | #N/A | 2.36 | 23.3 | #N/A | #N/A | #N/A |
| | | CaO% | #N/A | 3.30 | 6.12 | #N/A | #N/A | #N/A |
| | | Na2O% | #N/A | 7.93 | 0.04 | #N/A | #N/A | #N/A |
| | | K2O% | #N/A | 0.72 | 2.62 | #N/A | #N/A | #N/A |
| | | TiO2% | #N/A | 0.50 | 0.32 | #N/A | #N/A | #N/A |
| | | P2O5% | #N/A | 0.20 | 0.02 | #N/A | #N/A | #N/A |

| Test Phase | Analysis | Parameter | SH Dilution - 01 | SH - Dilution - 02 | SH - Dilution - 03 | SH Dilution - 04 | SH Dilution - 05 | SH Dilution - 06 |
|---|---|---|---|---|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | #N/A | 0.04 | 0.15 | #N/A | #N/A | #N/A |
| | | Cr2O3% | #N/A | 0.03 | 0.30 | #N/A | #N/A | #N/A |
| | | V2O5% | #N/A | 0.02 | 0.02 | #N/A | #N/A | #N/A |
| | | LOI% | #N/A | 3.56 | 11.3 | #N/A | #N/A | #N/A |
| | | Sum% | #N/A | 98.1 | 99.1 | #N/A | #N/A | #N/A |

| Test Phase | Analysis | Parameter | SH - Dilution - 07 |
|---|---|---|---|
| Phase 1 Analysis | Solids Contents | Fluoride (mg/kg) | 4.53 |
| | | Bromide (mg/kg) | <1.5 |
| | | Mercury (mg/kg) | <0.05 |
| | | Silver (mg/kg) | 0.11 |
| | | Aluminum (mg/kg) | 7000 |
| | | Arsenic (mg/kg) | 0.8 |
| | | Boron (mg/kg) | 2 |
| | | Barium (mg/kg) | 160 |
| | | Beryllium (mg/kg) | 0.31 |
| | | Bismuth (mg/kg) | 0.22 |
| | | Calcium (mg/kg) | 16000 |
| | | Cadmium (mg/kg) | 0.07 |
| | | Cobalt (mg/kg) | 6.3 |
| | | Chromium (mg/kg) | 30 |
| | | Copper (mg/kg) | 13 |
| | | Iron (mg/kg) | 18000 |
| | | Potassium (mg/kg) | 5800 |
| | | Lithium (mg/kg) | 10 |
| | | Magnesium (mg/kg) | 6200 |
| | | Manganese (mg/kg) | 210 |
| | | Molybdenum (mg/kg) | 2.5 |
| | | Sodium (mg/kg) | 890 |
| | | Nickel (mg/kg) | 9.5 |
| | | Phosphorus (mg/kg) | 1100 |
| | | Lead (mg/kg) | 5.6 |
| | | Antimony (mg/kg) | <0.8 |
| | | Selenium (mg/kg) | <0.7 |
| | | Tin (mg/kg) | 0.8 |
| | | Strontium (mg/kg) | 360 |
| | | Titanium (mg/kg) | 1100 |
| | | Thallium (mg/kg) | 0.09 |
| | | Uranium (mg/kg) | 0.92 |
| | | Vanadium (mg/kg) | 35 |
| | | Zinc (mg/kg) | 87 |
| | | Weight (mg/kg) | 5732 |
| Phase 1 Analysis | Acid Base Accounting | Sample weight (g) | 1.98 |
| | | Initial pH | 9.04 |
| | | Vol H2SO4 (mL) | 1.55 |
| | | H2SO4 (Normality) | 1.00 |
| | | Acisol-NP (t CaCO3/1000 t) | 39 |
| | | Acisol-AP (Total Sulphur) (t CaCO3/1000 t) | 7.78 |
| | | Net Acisol-NP (kg CaCO3/ tonne) | 31 |
| | | Sulphur (total) (%) | 0.249 |
| | | Acid Leachable SO4-S (%) | 0.16 |
| | | Sulphide (%) | 0.09 |
| | | Carbon (total) (%) | 0.371 |
| | | Carbonate (%CO3) | 1.37 |
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Sample weight [g] | 100 |
| | | Volume D.I. Water [mL] | 400 |

| Test Phase | Analysis | Parameter | SH - Dilution - 07 |
|---|---|---|---|
| Phase 2 Analysis | CTEU-9 Lixiviation à l'eau | Final pH | 8.35 |
| | | Alkalinity [mg/L as CaCO3] | 13 |
| | | pH [no unit] | 7.35 |
| | | Conductivity [uS/cm] | 1600 |
| | | F [mg/L] | 1.02 |
| | | Cl [mg/L] | 3.2 |
| | | SO4 [mg/L] | 790 |
| | | Br [mg/L] | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | <0.6 |
| | | NO2+NO3 [as N mg/L] | <0.6 |
| | | Tot.Reactive P [mg/L] | <0.03 |
| | | Hg [mg/L] | <0.00001 |
| | | Al [mg/L] | 0.115 |
| | | As [mg/L] | 0.0007 |
| | | Ag [mg/L] | 0.00028 |
| | | Ba [mg/L] | 0.0629 |
| | | Be [mg/L] | <0.000007 |
| | | B [mg/L] | 0.031 |
| | | Bi [mg/L] | 0.000008 |
| | | Ca [mg/L] | 257 |
| | | Cd [mg/L] | 0.000012 |
| | | Co [mg/L] | 0.000114 |
| | | Cr [mg/L] | 0.00074 |
| | | Cu [mg/L] | 0.00080 |
| | | Fe [mg/L] | <0.007 |
| | | K [mg/L] | 46.4 |
| | | Li [mg/L] | 0.0300 |
| | | Mg [mg/L] | 10.5 |
| | | Mn [mg/L] | 0.0187 |
| | | Mo [mg/L] | 0.0207 |
| | | Na [mg/L] | 54.6 |
| | | Ni [mg/L] | 0.0002 |
| | | P [mg/L] | <0.003 |
| | | Pb [mg/L] | <0.00001 |
| | | Sb [mg/L] | 0.0009 |
| | | Se [mg/L] | 0.00037 |
| | | Si [mg/L] | 3.92 |
| | | Sn [mg/L] | 0.00012 |
| | | Sr [mg/L] | 8.04 |
| | | Ti [mg/L] | 0.00024 |
| | | Tl [mg/L] | 0.000030 |
| | | U [mg/L] | 0.00126 |
| | | V [mg/L] | 0.00423 |
| | | Zn [mg/L] | <0.002 |
| Phase 2 Analysis | Neutralization Capacity | Neutralization Capacity eq/kg | 0 |

| Test Phase | Analysis | Parameter | SH - Dilution - 07 |
|---|---|---|---|
| Phase 2 Analysis | SPLP Synthetic Precipitation Leaching Procedure | Ext Fluid [#1 or #2] | 1 |
| | | Ext Volume [mL] | 400 |
| | | Final pH | 8.72 |
| | | F [mg/L] | 0.07 |
| | | SO4 [mg/L] | 150 |
| | | Cl [mg/L] | <2.0 |
| | | Br [mg/L] | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | <0.6 |
| | | Conductivity [uS/cm] | 392 |
| | | Alkalinity [mg/L as CaCO3] | 11 |
| | | pH [no unit] | 6.68 |
| | | Tot.Reactive P [mg/L] | 0.03 |
| | | Hg [mg/L] | <0.00001 |
| | | Al [mg/L] | 0.245 |
| | | As [mg/L] | 0.0004 |
| | | Ag [mg/L] | <0.00005 |
| | | Ba [mg/L] | 0.218 |
| | | Be [mg/L] | <0.000007 |
| | | B [mg/L] | 0.005 |
| | | Bi [mg/L] | <0.000007 |
| | | Ca [mg/L] | 75.2 |
| | | Cd [mg/L] | 0.000005 |
| | | Co [mg/L] | <0.000004 |
| | | Cr [mg/L] | <0.00003 |
| | | Cu [mg/L] | 0.00007 |
| | | Fe [mg/L] | <0.007 |
| | | K [mg/L] | 7.75 |
| | | Li [mg/L] | 0.0016 |
| | | Mg [mg/L] | 0.476 |
| | | Mn [mg/L] | 0.00446 |
| | | Mo [mg/L] | 0.00041 |
| | | Na [mg/L] | 2.63 |
| | | Ni [mg/L] | <0.0001 |
| | | P [mg/L] | <0.003 |
| | | Pb [mg/L] | <0.00001 |
| | | Sb [mg/L] | <0.0002 |
| | | Se [mg/L] | <0.00004 |
| | | Si [mg/L] | 1.55 |
| | | Sr [mg/L] | 3.57 |
| | | Sn [mg/L] | <0.00001 |
| | | Ti [mg/L] | <0.00005 |
| | | Tl [mg/L] | <0.000005 |
| | | U [mg/L] | 0.000496 |
| | | V [mg/L] | 0.00128 |
| | | Zn [mg/L] | <0.002 |

| Test Phase | Analysis | Parameter | SH - Dilution - 07 |
|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | Sample weight [g] | 20 |
| | | Ext Fluid [#1 or #2] | 1 |
| | | Ext Volume [mL] | 400 |
| | | Final pH | 5.55 |
| | | Conductivity [uS/cm] | 6320 |
| | | Alkalinity [mg/L as CaCO3] | 2360 |
| | | pH [no unit] | 5.59 |
| | | SO4 [mg/L] | 170 |
| | | Cl [mg/L] | <20.0 |
| | | Br [mg/L] | <3.0 |
| | | Nitrite, NO2 [as N mg/L] | <0.3 |
| | | Nitrate, NO3 [as N mg/L] | <0.6 |
| | | NO2+NO3 [as N mg/L] | <0.6 |
| | | F [mg/L] | 0.06 |
| | | Tot.Reactive P [mg/L] | <0.03 |
| | | Hg [mg/L] | <0.00001 |
| | | Al [mg/L] | 0.17 |
| | | As [mg/L] | <0.002 |
| | | Ag [mg/L] | <0.0005 |
| | | Ba [mg/L] | 0.842 |
| | | B [mg/L] | <0.02 |
| | | Be [mg/L] | 0.00031 |
| | | Bi [mg/L] | <0.00007 |
| | | Ca [mg/L] | 640 |
| | | Cd [mg/L] | 0.00128 |
| | | Cr [mg/L] | 0.0030 |
| | | Co [mg/L] | 0.00176 |
| | | Cu [mg/L] | 0.0011 |
| | | Fe [mg/L] | 6.30 |
| | | K [mg/L] | 23.0 |
| | | Li [mg/L] | 0.004 |
| | | Mg [mg/L] | 3.34 |
| | | Mn [mg/L] | 4.71 |
| | | Mo [mg/L] | 0.0004 |
| | | Na [mg/L] | 1440 |
| | | Ni [mg/L] | 0.001 |
| | | P [mg/L] | <0.03 |
| | | Pb [mg/L] | 0.0070 |
| | | U [mg/L] | 0.00292 |
| | | Sb [mg/L] | <0.002 |
| | | Se [mg/L] | <0.0004 |
| | | Si [mg/L] | 1.28 |
| | | Sn [mg/L] | <0.0001 |
| | | Sr [mg/L] | 7.41 |
| | | Ti [mg/L] | <0.0005 |
| | | Tl [mg/L] | <0.00005 |
| | | V [mg/L] | 0.0011 |
| | | Zn [mg/L] | <0.02 |
| | | Weight [g] | 5608 |

| Test Phase | Analysis | Parameter | SH - Dilution - 07 |
|---|---|---|---|
| Phase 2 Analysis | TCLP Toxicity Characteristic Leaching Procedure | | |
| | | Split | 1 |
| | | Pulv200M [250g] | 1 |
| Phase 2 Analysis | Acid Base Accounting | Sample weight (g) | 2.01 |
| | | Initial pH | 9.30 |
| | | Vol H2SO4 (mL) | 1.40 |
| | | H2SO4 Normality | 1.00 |
| | | Acisol-NP (kgCaCO3/tonne) | 34.8 |
| | | AP (kgCaCO3/tonne) | 8.03 |
| | | NNPkg CaCO3/tonne | 27 |
| | | S Acid% | 0.257 |
| | | LeachableSO4-S% | 0.17 |
| | | Sulphide% | 0.09 |
| | | C% | 0.374 |
| | | CO3% (as %CO3) | 1.62 |
| Phase 2 Analysis | Rietveld XRD | Quartz (wt%) | 10.8 |
| | | Talc (wt%) | 0.0 |
| | | Chlorite (wt%) | 1.4 |
| | | Muscovite (wt%) | 4.7 |
| | | Albite (wt%) | 57.7 |
| | | Microcline (wt%) | 14.6 |
| | | Biotite (wt%) | 3.9 |
| | | Magnesiohornblende (wt%) | 0.0 |
| | | Diopside (wt%) | 0.0 |
| | | Phlogopite (wt%) | 0.0 |
| | | Magnetite (wt%) | 1.2 |
| | | Brucite (wt%) | 0.0 |
| | | Hematite (wt%) | 0.0 |
| | | Ilmenite (wt%) | 0.0 |
| | | Periclase (wt%) | 0.0 |
| | | Rutile (wt%) | 0.7 |
| | | Iron (wt%) | 0.0 |
| | | Dolomite (wt%) | 0.1 |
| | | Calcite (wt%) | 3.6 |
| | | Magnesite (wt%) | 0.0 |
| | | Ankerite (wt%) | 0.4 |
| | | Pyrite (wt%) | 0.4 |
| | | Gypsum (wt%) | 0.6 |
| | | TOTAL (wt%) | 100 |
| Phase 2 Analysis | Whole Rock Analysis | SiO2% | 62.9 |
| | | Al2O3% | 16.1 |
| | | Fe2O3% | 3.30 |
| | | MgO% | 1.11 |
| | | CaO% | 3.01 |
| | | Na2O% | 6.18 |
| | | K2O% | 3.17 |
| | | TiO2% | 0.56 |
| | | P2O5% | 0.25 |

| Test Phase | Analysis | Parameter | SH - Dilution - 07 |
|---|---|---|---|
| Phase 2 Analysis | Whole Rock Analysis | MnO% | 0.03 |
| | | Cr2O3% | 0.01 |
| | | V2O5% | <0.01 |
| | | LOI% | 2.30 |
| | | Sum% | 98.9 |

# APPENDIX C

## Directive 019 Evaluation Criteria

# 1.0 Directive 019

*Directive 019* is a guidance document from the Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC, 2012) presenting requirements for various mining activities with the purposes of environmental protection.

The low-risk *Directive 019* materials evaluation criteria are summarized as follows.

## 1.1 Directive 019 Classification – Acid Base Accounting

*Directive 019* presents criteria for evaluating the acid generation potential of a material. These criteria are discussed in **Section 3.1** of this report. The recommended ABA characterization criterion for the East Malartic and Sheehan mine rock and ore, see **Section 3.1.2.1**, also satisfies the *Directive 019* criteria.

## 1.2 Directive 019 Classification - Metals Contents and Leachability Criteria

In addition to the acid generation potential characteristics used to classify mine materials as low-risk, *Directive 019* presents characterization criteria based on metals contents and leachability criteria. The metals contents (mg/kg) criteria are the first screening criteria that can be applied to categorize materials as low-risk. However, if materials are not classified as low-risk based on their metals contents, they can be classified as low-risk based on leachability criteria. The metals contents results determine which parameters should be evaluated by leachability criteria.

### 1.2.1 Directive 019 Low-Risk Classification - Metals Contents Criteria

*Directive 019* recommends the screening of the solids contents in mine materials versus the '*politique de protection des sols et de réhabilitation des terraines contaminés'* (PPSRTC) criteria. However, these criteria are currently under review and revised criteria from Annexe 1 and 2 of the *Guide d'intervention – Protection des sols et réhabilitation des terrains contaminés (Guide d'intervention*) (MELCC, 2019) are recommended. These revised criteria are shown in **Table 1-1**.

If more than 90% of the samples are less than the level 'A' generic soil criteria, for all parameters, then that sample can be classified as low-risk. If more than 10% of the samples analyzed are found to exceed the level 'A' generic soil criteria for a particular parameter, then that parameter can be carried forward for leachability criteria comparison as an alternative to the soil criteria comparison.

**Table 1-1: Solids Contents Criteria for Mine Materials Classification**

| Parameter | Critères Génériques pour les sols 'A'[1] (mg/kg) |
|---|---|
| Silver (Ag) | 0.5 |
| Arsenic (As) | 5 |
| Barium (Ba) | 240 |
| Cadmium (Cd) | 0.9 |
| Cobalt (Co) | 30 |
| Chromium (Cr) | 100 |
| Copper (Cu) | 65 |
| Tin (Sn) | 5 |
| Manganese (Mn) | 1000 |
| Mercury (Hg) | 0.3 |
| Molybdenum (Mo) | 8 |
| Nickel (Ni) | 50 |
| Lead (Pb) | 40 |
| Selenium (Se) | 3 |
| Zinc (Zn) | 150 |

**Note:**

1) Solids contents are for the geological province of 'Supérieur' in which the MCM operation resides.

### 1.2.2 Directive 019 Low-Risk Classification - Leachability Criteria

As per *Directive 019*, materials can be considered low-risk if leachate quality is below 'leachable materials' criteria. These 'leachable materials' are classified by TCLP leach test (MA.100-Lix.com.1.1) results. The TCLP concentrations are required to be less than the criteria for groundwater protection (protection des eaux souterraines) to be classified as low risk. Samples with TCLP concentrations greater than the groundwater criteria but less than the « *Directive 019 Annexe II Tableau 1* » criteria are classified as 'elevated risk materials'. The applicable groundwater protection criteria are the « *Annexe 7 Grille des Critères de qualitè des eaux souterraines* » for « *résurgence dans l'eau de surface* » from the *Guide d'intervention* (MELCC, 2019), as shown in **Table 1-2**.

**Table 1-2: Résurgence dans l'eau de surface Criteria**

| Parameter | Résurgence dans l'eau de surface |
|---|---|
| | (mg/L) |
| Antimony | 1.1 |
| Silver | 0.00062 |
| Arsenic | 0.34 |
| Barium | 0.6 |
| Boron | 28 |
| Cadmium | 0.0011 |
| Chromium (III) | 1 |
| Chromium (VI) | 0.016 |
| Cobalt | 0.37 |
| Copper | 0.0073 |
| Manganese | 2.3 |
| Molybdenum | 29 |
| Nickel | 0.26 |
| Lead | 0.034 |
| Selenium | 0.062 |
| Uranium | 0.32 |
| Zinc | 0.067 |

To account for the variability in individual samples the parameter concentrations are not considered to exceed the groundwater protection criteria unless at least 10% of the samples exceed the applicable criteria per parameter. For example, if 15% of TCLP test samples reported cadmium concentrations greater than 10 times the « *résurgence dans l'eau de surface criteria* » (0.0011 mg/L) then these samples would be considered to exceed the criteria and would not be categorized as low-risk. As an additional example, if only five percent of TCLP test samples reported copper concentrations greater than the « *résurgence dans l'eau* » criteria (0.0073 mg/L) then copper would not be a parameter considered for TCLP criteria comparison and these samples would be categorized as low-risk.

TCLP testing (MA. 100 – Lix.com. 1.1) uses prepared acetic acid solutions having pH values as low as 2.9. Low pH conditions like this are not expected for the non-potentially acid generating mine materials (e.g. mine rock with $carbon_{total}$/$sulphur_{total}$ ratios greater than 0.68), and therefore, the TCLP testing is considered to be an extreme test to assess leachability of constituents for non-potentially acid generating East Malartic and Sheehan materials.

The TCLP testing is also considered to classify materials with elevated risk if the leach results exceed the criteria of « *Directive 019 Annexe II Tableau 1* ».

# ANNEXE

# D

# LISTE DES AUTORISATIONS ET COPIE DU BAIL DE LOCATION DE SURFACE

| Liste des permis et autorisations - Mine Canadian Malartic (Janvier 2021) | | |
|---|---|---|
| **Ministère de l'Environnement et de la Lutte contre les changements climatiques (MELCC)** | | |
| **Décrets** | | |
| Numéro de référence | Date | Objet |
| Décret 914-2009 | 2009-08-19 | Projet minier aurifère Canadian Malartic |
| Décret 617-2010 | 2010-07-07 | Contrat de location des terrains et d'octroi des droits du domaine de l'État requis pour la construction et le maintien du barrage situé sur le ruisseau Raymond |
| Décret 405-2011(DEM-1) | 2011-04-13 | Modification du décret 914-2009 (NI 98-01) |
| Décret 964-2012 (DEM-2) | 2012-10-18 | Modification du décret 914-2009 (sautage exceptionnel) |
| Décret 98-2013 (DEM-3) | 2013-02-13 | Modification du décret 914-2009 (mur nord et conditions sautage) |
| Décret 171-2014 | 2014-02-26 | Modification du décret 914-2009 (Gouldie) |
| Décret 763-2014 | 2014-08-26 | Modification du décret 914-2009 (changement de nom) |
| Décret 721-2015 | 2015-08-19 | Modification du décret 914-2009 (Phase II modifiée) |
| Décret 357-2016 | 2016-05-04 | Modification du décret 617-2010 |
| Décret 387-2017 | 2017-04-12 | La déviation de la route 117 à l'entrée Est de la Ville de Malartic |
| Décret 388-2017 | 2017-04-12 | Modification du décret 914-2009 (Phase III modifiée) |
| Décret 1370-2018 | 2018-11-28 | Modification du décret 914-2009 (réaliser le projet Odyssey prévoyant l'exploitation minière souterraine des zones minéralisées East Malartic et Jeffrey) |
| **Certificats d'autorisation-Québec** | | |
| Numéro de référence | Date | Objet |
| CA-1 | 2017-06-22 | Déboisement de l'emprise de la route 117 (décret 387-2017) |
| CA-2 | 2017-07-28 | Construction d'un pont et chemins d'accès temporaires - projet de la déviation de la route 117 (décret 387-2017) |
| CA-3 | 2017-08-11 | Écran acoustique temporaire - projet de la Déviation de la 117 (décret 387-2017) |
| CA-4 | 2017-09-21 | Ponceaux, drains et surcharges pour le projet de déviation de la route 117 (décret 387-2017) |
| CA-5 | 2018-05-22 | Construction de la déviation de la route 117 (décret 387-2017) |

| | | |
|---|---|---|
| CA-6 | 2018-06-27 | Construction de la butte-écran déviation (décret 387-2017) |
| CA-7 | 2019-09-25 | Démantèlement de la route 117 à la suite de la mise en service de la déviation de la route 117 (décret 3211-16-013) |
| **Certificats d'autorisation-Régionaux** | | |
| Numéro de référence | Date | Objet |
| 7610-08-01-70167-28 | 2009-08-24 | Établissement d'une usine mobile de béton- Terminé (non cédé par Osisko) |
| 7610-08-01-70167-29 | 2009-08-27 | Assises et fondations de différents bâtiments - Terminé (non cédé par Osisko) |
| 7610-08-01-70167-29 | modifié 2012-09-14 | Construction d'un nouveau bâtiment annexé au coin nord-ouest de l'usine de traitement - Terminé (non cédé par Osisko) |
| 7610-08-01-70167-30 | 2009-08-28 | Préparation des fondations – Digues A et B - Terminé (non cédé par Osisko) |
| 7610-08-01-70167-31 | 2010-01-26 | Construction du Bassin Sud-Est |
| 7610-08-01-70167-32 | 2009-12-18 | Établissement d'un dépôt pétrolier-Non cédé par Osisko |
| 7610-08-01-70167-32 401648340 | 2017-12-12 | Modification du dépôt pétrolier |
| 7610-08-01-70167-33 | 2009-12-17 | Réseau d'aqueduc et d'égout(à raccorder au réseau municipal + station pompage) -Non cédé par Osisko |
| 7610-08-01-70167-34 | 2010-01-12 et modifié 22-06-2010 | Prélèvement de roc dans l'extrémité sud-est de la future fosse -Terminé (non cédé par Osisko) |
| 7610-08-01-70167-35 | 2010-02-09 | Établissement des installations de l'atelier mécanique du bâtiment de services (+ réservoirs et sys. traitement eau) |
| 7610-08-01-70167-35 401534424 | modifié 2016-11-21 | Autorisation d'amener les eaux usées du nouveau garage vers la baie de lavage de l'atelier mécanique |
| 7610-08-01-70167-36 | 2010-04-13 | Construction du barrage et mise en eau du bassin Johnson |
| 7610-08-01-70167-37 | 2010-04-16 | Construction et aménagement d'une butte écran et d'un parc linéaire |
| 7610-08-01-70167-37 | modifié 2019-01-14 | Modification: Construction et aménagement d'une butte écran et d'un parc linéaire (projet extension) |
| 7610-08-01-70167-39 401621269 | 2017-08-16 | Décapage du secteur des infrastructures du projet d'extension |
| 7610-08-01-70167-39 401808108 | modifié 2019-05-15 | Décapage du secteur des infrastructures du projet d'extension (étendre la zone de décapage) |

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| 7610-08-01-70167-41 | 2010-11-03 | Construction d'un bassin d'urgence |
| 7610-08-01-70167-42 | 2010-11-24 | Travaux préparatoires à l'exploitation -Non cédé à CMGP |
| 7610-08-01-70167-42 | modifié 03-03-2011 | Travaux préparatoires à l'exploitation (ajout du démarrage des équipements à l'usine)- Non cédé à CMGP |
| 7610-08-01-70167-43 400875966 | 2011-11-23 | Construction du concasseur secondaire - Non cédé à CMGP |
| 7610-08-01-70167-44 400857011 | 2011-09-13 | Construction des fondations pour le concassage secondaire- Non cédé à CMGP |
| 7610-08-01-70167-45 400865643 | 2011-10-20 | Installation de dépoussiéreurs dans la carothèque du bureau régional d'exploration- Non cédé à CMGP |
| 7610-08-01-70167-46 400874962 | 2011-11-15 | Opération de deux unités portatives de concassage secondaire- Révoqué |
| 7610-08-01-70167-47 400876922 | 2011-11-23 | Installation d'un dépoussiéreur Processair 144-SA-82 (concasseur secondaire)- Non cédé à CMGP |
| 7610-08-01-70167-48 400898292 | 2012-02-22 | Opération d'un concasseur secondaire |
| 7610-08-01-70167-49 | 2011-03-31 | Exploitation - Projet minier aurifère Canadian Malartic |
| 7610-08-01-70167-49 | modifié 21-02-2013 | Exploitation (accès au mur nord et conditions sautages) |
| 7610-08-01-70167-49 | modifié 27-03-2014 | Exploitation (Gouldie 30 mois) |
| 7610-08-01-70167-49 401266128 | modifié 2015-07-02 | Exploitation triangle secteur Est de la fosse CM |
| 7610-08-01-70167-49 401283745 | modifié 2015-08-21 | Rehausser les digues nord et sud du bassin de polissage existant jusqu'à l'élévation 324.5m pour créer une cellule de déposition |
| 7610-08-01-70167-49 401288667 | modifié 2015-09-10 | Rehausser de 2 mètres les parois de l'épaississeur des résidus (retrofit) |
| 7610-08-01-70167-49 401545889 | modifié 2016-12-08 | Mise à jour du programme de suivi environnemental de mars 2011 |
| 7610-08-01-70167-49 401647623 | modifié 2017-12-14 | Mettre à jour le suivi du bruit ambian |
| 7610-08-01-70167-49 401647623 | modifié 2018-06-06 | Mettre à jour le suivi de la qualité de l'air, les suivis social et économique ainsi que les suivis des sautages |

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| 7610-08-01-70167-49 401734451 | modifié 2018-08-31 | Exploitation fosse Jeffrey |
| 7610-08-01-70167-49 401776233 | modifié 2019-01-29 | Travaux préparatoires fosse Barnat |
| 7610-08-01-70167-49 401776234 | modifié 2019-03-07 | Matelassage |
| 7610-08-01-70167-49 401788573 | modifié 2019-03-08 | Parc à résidus |
| 7610-08-01-70167-49 401820524 | modifié 2019-06-20 | exploitation Barnat |
| 7610-08-01-70167-49 401874161 | modifié 2019-11-27 | Agrandissement du Bassin Sud Ouest |
| 7610-08-01-70167-49 401915524 | modifié 2020-04-20 | Aménagement d'une halde à mort-terrain sur la halde à stérile |
| 7610-08-01-70167-49 401940359 | modifié 2020-09-23 | Agrandir la fosse Barnat dans sa limite nord et aménager un chemin de service au nord de cette fosse. |
| 7610-08-01-70167-50 400979230 | 2012-11-14 | Exploitation d'un concasseur (à galets) |
| 7610-08-01-70167-51 | 2012-09-14 | Installation et opération d'un dépoussiéreur (usine)-Non cédé à CMGP |
| 7610-08-01-70167-52 | 2013-02-14 | Travaux de sécurisation dans le secteur du vieux parc à résidus Barnat-Sladen |
| 7610-08-01-70167-53 401041103 | 2013-06-21 | Opération d'un concasseur mobile temporaire (pour une durée de 8 mois) -Révoqué |
| 7610-08-1-70167-53 401202522 | modifié 2014-06-03 | Opération d'un concasseur mobile temporaire (jusqu'au 31 déc 2014) -Révoqué |
| | modifié 2015-03-05 | Opération d'un concasseur temporaire (opération jusqu'au 31 déc. 15) -Révoqué |
| | modifié 2015-12-17 | Opération d'un concasseur temporaire (opération jusqu'à l'obtention du CA de la nouvelle station de concassage) |
| 7610-08-01-70167-54 401116619 | 2014-03-25 | Construction et opération d'une usine de traitement de l'effluent |
| 7610-08-01-70167-56 401116416 | 2014-03-25 | Installation d'un dépoussiéreur à l'usine de traitement de l'effluent (réservoir de mélange du sulfate de cuivre) |
| 7610-08-01-70167-57 401116490 | 2014-03-25 | Installation d'un dépoussiéreur à l'usine de traitement de l'effluent (réservoir de mélange du sulfate ferreux) |

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| 7610-08-01-70167-58 401078081 | 2013-10-22 | Disposition de résidus miniers sur la cellule 1- Non cédé à CMGP |
| 7610-08-01-70167-59 | 2014-03-25 | Entreposage de stériles miniers sur la cellule 2-Non cédé à CMGP |
| 7610-08-01-70167-60 | 2014-02-25 | Construction d'une digue filtrante dans le bassin sud-est |
| 7610-08-01-70167-61 401188369 | 2014-10-24 | Exploitation d'un procédé de destruction des cyanures avec l'acide de Caro |
| 7610-08-01-70167-62 401248604 | 2015-05-14 | Aménagement d'un four à induction à la raffinerie |
| 7610-08-01-70167-63 401239724 | modifié 2015-05-14 | Installation d'un dépoussiéreur à cartouches à la raffinerie |
| 7610-08-01-70167-65 401282307 | 2015-08-20 | Construction et opération d'un bassin de polissage |
| 7610-08-01-70167-65 401758036 | modifié 2018-11-21 | Installer et opérer des géotubes |
| 7610-08-01-70167-66 401282307 | 2015-08-20 | Construction d'un déversoir d'urgence au BSE |
| 7610-08-01-70167-67 401308462 | 2015-11-27 | Dérivation du cours d'eau Raymond (dérivation Nord) vers la dérivation Sud |
| 7610-08-01-70167-68 401319396 | 2016-02-25 | Aménagement d'une halde mixte |
| 7610-08-01-70167-68 401847048 | modifié 2019-08-28 | Aménagement d'une halde mixte |
| 7610-08-01-70167-69 401617409 | 2017-07-25 | Opération d'un système de traitement d'appoint des eaux de surface - Décapage |
| 7610-08-01-70167-70 401308399 | 2015-12-22 | Aménagement et exploitation d'un lieu d'élimination de neiges usées |
| 7610-08-01-70167-70 401644367 | modifié 2017-12-20 | Modification de l'aménagement et exploitation d'un lieu d'élimination de neiges usées |
| 7610-08-01-70167-71 401327441 | 2016-02-15 | Opération d'un concasseur mobile |
| 7610-08-01-70167-71 401619152 | modifé 2017-08-02 | Modification du CA-71 Opération d'un concasseur mobile |
| 7610-08-01-70167-72 401358485 | 2016-06-03 | Construction et exploitation d'une trémie de chargement de minerai concassé (Trémie 2H) |
| 7610-08-01-70167-73 401384796 | 2016-08-26 | Élargissement du chemin du concasseur en littoral |
| 7610-08-01-70167-74 401538536 | 2016-12-05 | Installation de dépoussiéreurs à la trémie de chargement de minerai concassé (Trémie 2H) |
| 7610-08-01-70167-75 401591998 | 2017-06-16 | Valorisation de stériles miniers de la mine Canadian Malartic comme matérieau de construction |

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| 7610-08-01-70167-76 401591998 | 2017-08-01 | Remblayage de l'effondrement Barnat et de la fosse Buckshot |
| 7610-08-01-70167-77 401620934 | 2017-08-16 | Aménagement d'une Halde à mort-terrain |
| 7610-08-01-70167-77 401655771 | modifé 2018-01-29 | Modification de l'aménagement de la halde à mor-terrain |
| 7610-08-01-70167-78 401620708 | 2017-08-16 | Aménagement d'un drain sous le prolongement du parc à résidus et de la halde à stériles |
| 7610-08-01-70167-79 401620708 | 2017-09-21 | Prolongement du parc à résidus vers l'Est |
| 7610-08-01-70167-79 401620709 | modifié 2019-09-27 | Prolongement du parc à résidus vers l'Est |
| 7610-08-01-70167-80 401630594 | 2017-09-12 | Remblayage d'une acnienne ouverture minière historique de la mine Barnat- Chantier 12-9 |
| 7610-08-01-70167-81 | 2017-10-31 | Aménagement de la halde à stériles du projet d'extension |
| 7610-08-01-70167-81 | modifié 2018-08-10 | Modification du bassin Nord-Est |
| 7610-08-01-70167-81 | modifié 2020-01-16 | Modification du bassin Nord-Est (division en deux parties distinctes) |
| 7610-08-01-70167-82 401644347 | 2017-12-20 | Aménagement et exploitation d'un lieu d'élimination de neiges usées- Projet Extenstion Malartic |
| 7610-08-01-70167-83 401644417 | 2017-12-20 | Aménagement et exploitation d'un lieu d'élimination de neiges usées- Secteur Parc à Résidus, bassin sud-est |
| 7610-08-01-70167-84 401749812 | 2019-06-14 | Prélèvement d'eau- Puits Barrette, fosse Gouldie, fosse Jeffrey |
| 7610-08-01-70167-84 401882515 | modifé 2019-12-20 | Prélèvement d'eau- modification Deep Well, Odyssey, Goldie, Jeffrey |
| 7610-08-01-70167-85 401644417 | 2018-12-21 | Exploration avancée du projet Odyssey, zone Sud |
| 7610-08-01-70167-85 401644418 | modifié 2019-09-03 | Modification Exploration avancée du projet Odyssey, zone Sud |
| 7610-08-01-70167-86 401895115 | 2020-05-01 | Usine de production d'eau potable pour le projet Odyssey |
| 7610-08-01-70167-87 401815260 | 2019-06-05 | Remblai du secteur sud de la halde mixte |
| 7610-08-01-70167-88 401791934 | 2019-03-26 | Utilisation de systèmes mobiles de traitement d'eau de type Mudwizard |
| 7610-08-01-70167-89 401799133 | 2019-04-12 | Utilisation d'un concasseur mobile saisonnier |

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| 7610-08-01-70167-90 401968032 | 2020-11-05 | Installation d'un réseau de distribution d'eau potable |
| 7610-08-01-70167-90 401963141 | RECTIFIÉ le 22 décembre 2020 | Rectification - Installation d'un réseau de distribution d'eau potable |
| 7610-08-01-70167-91 401917989 | 2020-04-20 | Ouvrage de protection contre les inondations, Ruisseau CE1 |
| 7610-08-01-70167-92 401946133 | 2020-08-14 | Système de traitement des eaux usées - Projet Odyssey |
| 7610-08-01-70167-93 401963880 | 2020-10-19 | Travaux en milieux humides - Modification de la limite nord de la fosse Barnat et construction d'un chemin d'accès (MHH) |
| 7610-08-01-70167-94 401961421 | 2020-10-16 | Travaux en milieux humides - Secteur du projet Odyssey |
| 3211-16-013 | 2019-09-25 | Démantèlement de la route 117 à la suite de la mise en service de la déviation de la route 117 |
| 7610-08-01-60088-00 | 2009-03-09 | Forage dans un lac, un cours d'eau et en rive – Zone Gouldie – Site East Malartic |
| 7311-08-01-84210-16 | 2007-11-05 | Demande d'autorisation pour réaliser un projet d'aqueduc et d'égout pour une rue « de démonstration » dans le cadre d'un nouveau développement domiciliaire – Rues A et B et Avenue A – Ville de Malartic |
| X2117777 | 2010-06-04 | Construction du barrage situé sur le ruisseau Raymond (bassin Johnson) |
| 7311-08-01-89015-09 | 2011-07-22 | Ouvrage de captage d'eau souterraine pour alimenter le réseau d'aqueduc municipal |
| **Certificats d'autorisation-Bancs d'emprunt** | | |
| Numéro de référence | Date | Objet |
| 7610-08-01-80621-00 | 2015-10-23 | En lien avec le bail non exclusif d'exploitation de moraine numéro 40193 |
| 7610-08-01-80856-00 | modifié 2015-11-06 | En lien avec le bail non exclusif d'exploitation de moraine numéro 40194 |
| **Ministère de l'Énergie et des ressources naturelles (MERN)** | | |
| Numéro de BNE | Date d'expiration | Description |
| BNE 40193 | 2021-03-31 | Bail non exclusif d'exploitation de moraine (en lien avec le CA#7610-08-01-80621-00) |
| BNE 40194 | 2021-03-31 | Bail non exclusif d'exploitation de gravier (en lien avec le CA#7610-08-01-80856-00) |
| BNE 41986 | 2021-03-31 | Bail non exclusif d'exploitation de gravier et sable |

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| BNE 43254 | 2021-03-31 | Bail non exclusif d'exploitation de sable et gravier |
| BNE 43427 | 2021-03-31 | Bail non exclusif d'exploitation de sable et gravier |
| **Baux miniers** | | |
| Numéro de référence | Date | Objet |
| 892 | 2009-11-25 | Exploitation du minerai- Fosse CM |
| 1007 | 2011-04-27 | Exploitation du minerai- Fosse CM |
| 1011 | 2011-05-14 | Exploitation du minerai- Fosse CM |
| CM 226 | 2012-12-06 | Exploitation du minerai- Fosse CM |
| 1020 | 2014-03-03 | Exploitation du minerai- Fosse Gouldie |
| 1008 | 2017-07-28 | Exploitation du minerai- Fosse Barnat |
| **Droits de surface** | | |
| Numéro de référence | Date | Objet ou responsable |
| 822597 00 000 | 26-août-09 | Bail pour fins industrielles |
| 823099 00 000 | 31-août-09 | Bail pour fins industrielles (parc à résidus) |
| 2000855 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2000857 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2000858 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2000859 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2000911 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2000913 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2000917 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2001055 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2398785 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2398787 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |

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| 2398789 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2398790 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2398791 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2399596 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2399894 | - | Abitibi Royalties Inc. (85988) 15 %; Corporation Canadian Malartic (93604) 85 % (responsable) |
| 2515273 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 2515274 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 56923 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 56924 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 61518 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 61520 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 61521 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 61523 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 72271 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 72287 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 72289 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 72291 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73332 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73333 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73334 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73335 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73336 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73337 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |

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| 73338 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73339 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73340 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73341 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73343 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73344 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73349 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73350 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73351 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73352 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73353 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 73361 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 74686 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 74687 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 74688 | - | Canadian Malartic GP (Mine Canadian Malartic) (93465) 100 % (responsable) |
| 1370 20 908 | 02-juin-20 | Bail pour fins industrielles (instruments géotechniques pour suivi de la stabilité du pilier de surface CH11-48-51) |
| **Ministère des Forêts, de la Faune et des Parcs** | | |
| Numéro de permis | Date d'émission | Description |
| PM3025852 | 2020-04-06 | Permis d'intervention (forages-sentiers-mise en forme-prises d'eau) |
| PM3025807 | 2020-04-02 | Permis d'intervention (coupe et transport de bois) |

Énergie et Ressources naturelles
Québec

# Bail

Numéro de dossier : 823099 00 000

Le MINISTRE DE L'ÉNERGIE ET DES RESSOURCES NATURELLES, pour et au nom du gouvernement du Québec, dûment habilité en vertu de la Loi sur les terres du domaine de l'État (RLRQ, chapitre T-8.1), représenté par Linda Tremblay, directrice générale, dont le bureau est situé au 5700, 4e Avenue Ouest, Québec (Québec) G1H 6R1, dûment autorisé(e) par le Règlement sur la signature de certains actes, documents et écrits du ministère des Ressources naturelles et de la Faune (RLRQ, chapitre M-25.2, r. 1);

ci-après nommé le « MINISTRE »,

LOUE À

Canadian Malartic GP, ayant son siège social au 2140, rue Saint-Mathieu, Montréal (Québec) H3H 2J4
Représentant : Monsieur Éric Labbé, directeur des services juridiques, dûment autorisé,

ci-après nommé le "LOCATAIRE",

aux charges, clauses et conditions suivantes :

Le présent bail annule et remplace le bail émis antérieurement pour ce dossier.

1. FINS ET OBJET : Le MINISTRE loue au LOCATAIRE, exclusivement à des fins de parc à résidus miniers, le terrain ci-après désigné et décrit, d'une superficie approximative de 1477 hectares:

Canton Fournière, Bloc 11, NON DIVISÉE NONDIV
Canton Fournière, Bloc 22, NON DIVISÉE NONDIV
Canton Fournière, Bloc 23, NON DIVISÉE NONDIV
Canton Fournière, Bloc 6, NON DIVISÉE NONDIV
Canton Fournière, Bloc 7, NON DIVISÉE NONDIV
Canton Fournière, Bloc 8, NON DIVISÉE NONDIV
Canton Fournière, Bloc 9, NON DIVISÉE NONDIV
Canton Fournière, Rang IX, Lot 30
Canton Fournière, Rang VIII-NORD, Lot 30 À 49
Canton Fournière, Rang VIII-SUD, Lot 29 À 47
(Feuillet 32D01-200-0102, NAD 83, coord. MTM nord 5331712, est 408692)

Un emplacement mesurant approximativement 5 kilomètres de largeur sur 3,5 kilomètres de profondeur tel qu'il est illustré sur le croquis annexé au bail.

2. DURÉE ET LOYER DU BAIL : Le bail est consenti pour une durée d'un (1) an à compter du 1er août 2017. Le LOCATAIRE paiera au MINISTRE un loyer annuel de 147 700 $ payable d'avance le 1er août de chaque année. Un intérêt au taux fixé en vertu de l'article 28 de la Loi sur l'administration fiscale (RLRQ, chapitre A-6.002) sera exigé pour tout paiement effectué en retard. Tout chèque qui n'est pas honoré par l'institution sur laquelle il est tiré est assujetti aux frais édictés selon l'article 12.2 de la Loi sur l'administration fiscale (RLRQ, chapitre A-6.002).

3. RENOUVELLEMENT DU BAIL ET AJUSTEMENT DU LOYER : Le présent bail sera renouvelé automatiquement tous les ans, à la date anniversaire du bail, à moins d'avis contraire du MINISTRE transmis par écrit au moins trente (30) jours avant cette date.

Si le MINISTRE doit mettre fin au bail pour un motif d'intérêt public, il ne procédera pas par non-renouvellement mais par révocation et il indemnisera le LOCATAIRE conformément à l'article 65 de la Loi sur les terres du domaine de l'État (RLRQ, chapitre T-8.1). Dans une telle éventualité, le LOCATAIRE accepte que l'indemnité soit versée, jusqu'à concurrence de sa créance, au créancier hypothécaire de toute construction érigée ou mise en place sur le terrain loué et dont la sûreté a fait l'objet d'un avis écrit au MINISTRE.

Une copie de l'avis de non-renouvellement ou de révocation est transmise par le MINISTRE au créancier hypothécaire de toute construction érigée ou mise en place sur le terrain loué et dont la sûreté a fait l'objet d'un avis écrit au MINISTRE.

L'avis de paiement sera transmis annuellement, au moins trente (30) jours avant la date anniversaire du bail, à la dernière adresse connue du LOCATAIRE.

Lors du renouvellement, le loyer annuel pourra être ajusté selon la réglementation en vigueur.

Le LOCATAIRE qui souhaite ne pas renouveler son bail doit envoyer un avis écrit au MINISTRE dans les trente (30) jours qui suivent la réception de l'avis de paiement du loyer. Sur réception de cet avis, le MINISTRE avise le créancier hypothécaire de toute construction érigée ou mise en place sur le terrain loué et dont la sûreté a fait l'objet d'un avis écrit au MINISTRE. Le créancier peut alors obtenir la cession et le renouvellement du bail en sa faveur.

4. RENONCIATION AU BÉNÉFICE DE L'ACCESSION ET PROPRIÉTÉ SUPERFICIAIRE : Le MINISTRE reconnaît que le bail concédé au premier locataire du terrain décrit dans le bail d'origine contenait, du fait des termes employés, une renonciation tacite au bénéfice de l'accession en faveur dudit locataire lui permettant de détenir en propriété superficiaire les constructions qu'il réaliserait ou installerait en cours de bail sur les lieux loués. Le MINISTRE reconnaît de plus que la renonciation tacite au bénéfice de l'accession alors consentie profitait également à celui qui, étant aux droits de ce locataire quant à la propriété superficiaire des constructions, obtiendrait, par transfert de bail ou autrement, la jouissance légale et paisible du terrain sur lequel sont situées lesdites constructions. Cette reconnaissance de renonciation tacite du MINISTRE est faite sous réserve des dispositions prévues à l'article 6 du présent bail et de l'exercice de ses droits à la fin du présent bail.

Le MINISTRE reconnaît que le LOCATAIRE pouvait et peut toujours consentir des sûretés (hypothèques) relatives à toute construction érigée ou mise en place sur le terrain loué en faveur d'un créancier. Le MINISTRE doit être avisé par écrit de l'octroi et de l'extinction d'une telle sûreté (hypothèque) déjà consentie ou à être consentie et des coordonnées du créancier hypothécaire.

Si un créancier exerce des droits hypothécaires à l'égard des constructions, le MINISTRE consent à transférer le bail en faveur du créancier ou de l'acquéreur des constructions et reconnaît le droit dudit créancier ou dudit acquéreur aux avantages de la renonciation au bénéfice de l'accession et de la propriété superficiaire mentionnées à l'alinéa ci-dessus. Le créancier ou l'acquéreur des constructions devra donner avis écrit au MINISTRE du transfert de propriété des constructions en sa faveur. À la réception de cet avis, le MINISTRE procédera au transfert conformément à l'article 11 du présent bail.

5. RENSEIGNEMENTS PERSONNELS : Le LOCATAIRE qui consent des sûretés (hypothèques) relatives à toute construction érigée ou mise en place sur le terrain loué en faveur d'un créancier autorise le MINISTRE à transmettre au créancier hypothécaire une copie des avis se rapportant au paiement, au non-renouvellement, à la résiliation ou à la révocation du présent bail.

6. FIN DU BAIL ET LIBÉRATION DES LIEUX : Le LOCATAIRE dont le bail prend fin, soit par non-renouvellement ou par résiliation, conserve la propriété de ses constructions. Il renonce toutefois au droit de devenir propriétaire du terrain loué peu importe la valeur des constructions et il doit, dans un délai raisonnable compte tenu des circonstances, libérer le terrain loué de toute construction et amélioration et remettre les lieux en bon état, le tout conformément à la loi et aux règlements. À défaut de libérer les lieux, le MINISTRE pourra intenter les procédures en éviction prévues par la loi.

7. MODIFICATION DU BAIL : Le MINISTRE doit aviser par écrit le LOCATAIRE de toute modification au bail, au moins trente (30) jours avant la date anniversaire du bail.

8. DÉFAUT : Le LOCATAIRE sera en défaut s'il occupe le terrain loué à d'autres fins que celles mentionnées dans le bail ou s'il ne respecte pas l'une ou l'autre de ses obligations. Le MINISTRE pourra alors exiger que les correctifs soient apportés dans un délai qu'il fixe et, à défaut, résilier le bail ou le révoquer conformément aux dispositions de la Loi sur les terres du domaine de l'État (RLRQ, chapitre T-8.1).

Un préavis de non-renouvellement, de résiliation ou de révocation de trente (30) jours sera notifié, avec une copie de l'avis de défaut transmis au LOCATAIRE, à tout créancier détenant une sûreté (hypothèque) sur toute construction et dont la sûreté (hypothèque) a fait l'objet d'un avis écrit au MINISTRE. Le créancier peut alors remédier au défaut du LOCATAIRE et obtenir le transfert du bail en sa faveur.

9. DROIT DE PASSAGE DE TIERS : Le LOCATAIRE sera tenu d'accorder sans frais un droit de passage à pied et en voiture, à l'endroit indiqué par le MINISTRE, à toute personne qui lui en a démontré la nécessité.

10. SERVITUDES OU AUTRES DROITS : Le présent bail est sujet aux servitudes ou autres droits consentis par le MINISTRE ou le gouvernement, notamment à toute servitude d'utilité publique.

En cas de conflit d'usages entre les constructions ou les ouvrages du LOCATAIRE et ces servitudes ou autres droits déjà consentis, le LOCATAIRE s'engage à prendre toutes les mesures appropriées pour favoriser l'exercice de ces droits par leurs détenteurs.

11. TRANSFERT DU BAIL : Le LOCATAIRE qui désire transférer le présent bail doit aviser le MINISTRE du nom et de l'adresse du nouveau LOCATAIRE en remplissant le formulaire de demande de transfert de bail qui doit être signé par le LOCATAIRE actuel et le nouveau ou fournir tout document légal confirmant le transfert. S'il existe une sûreté (hypothèque) grevant toute construction, il doit en mentionner l'existence dans ce formulaire ou dans le document légal de transfert. Le MINISTRE doit aviser le créancier hypothécaire de ce transfert. Dans le cas d'un transfert en faveur d'un groupe, le MINISTRE transférera le bail au nom du représentant choisi par le groupe.

Si le LOCATAIRE décède, fait faillite ou si le bâtiment situé sur le terrain loué a fait l'objet d'une vente en justice, d'une vente pour taxes ou de l'exercice d'un droit hypothécaire, le MINISTRE transfère le bail en faveur de l'héritier, du syndic, du créancier hypothécaire ou de l'acquéreur des constructions.

Lors d'un transfert à la suite d'une vente pour taxes, le LOCATAIRE, si le droit de retrait est exercé, transfère le bail en faveur de l'ancien locataire.

Le MINISTRE procédera au transfert des droits dans le bail sur paiement des frais inhérents et de tout loyer dû par l'ancien locataire et un nouveau bail sera conclu avec le nouveau locataire.

12. CHANGEMENT D'ADRESSE ET TOUT AUTRE AVIS : Tout changement d'adresse et autre avis doivent être transmis par le locataire au MINISTRE.

13. RESPONSABILITÉ : Le LOCATAIRE s'engage à prendre toutes les dispositions nécessaires pour que le MINISTRE ne soit pas tenu responsable des dommages et dépens résultant de réclamations, poursuites ou recours quelconques en raison de l'exercice des droits qui lui sont consentis par les présentes. Il en est de même de tout dommage direct ou indirect qui pourrait être causé aux installations faisant l'objet du présent bail.

14. SIGNATAIRE MANDATÉ : Si le LOCATAIRE agit au nom d'un groupe de personnes, il déclare agir en son nom personnel et au nom du groupe de personnes, tous colocataires au même titre et détenant des parts indivises dans le présent bail, conformément aux termes d'une entente intervenue entre eux avant la signature des présentes et autorisant le signataire à signer en leurs noms.

15. PARC À RÉSIDUS MINIERS : Le LOCATAIRE pourra utiliser le terrain présentement loué seulement lorsqu'il aura obtenu toutes les autorisations ou approbations requises en vertu de la Loi sur les mines (RLRQ, chapitre M-13.1) et de la Loi sur la qualité de l'environnement (RLRQ, chapitre Q-2).

Avant de mettre fin à son bail, le LOCATAIRE s'engage à obtenir du secteur des Mines du ministère de l'Énergie et des Ressources naturelles (MERN), un document attestant que :

- les travaux de réaménagement et de restauration du parc à résidus miniers sont conformes au plan approuvé par ce secteur, ou que le parc à résidus miniers n'est pas visé par l'obligation de déposer un plan de restauration;

- le LOCATAIRE a effectué les travaux de réaménagement et de restauration du parc à résidus miniers requis par le MERN en vertu de l'article 231.11 de la Loi sur les mines (RLRQ, chapitre M-13.1), ou que le LOCATAIRE n'a pas à effectuer de tels travaux;

- le LOCATAIRE a effectué les travaux requis par le MERN pour prévenir tout dommage en vertu de l'article 231 de la Loi sur les mines (RLRQ, chapitre M-13.1), ou que le LOCATAIRE n'a pas à effectuer de tels travaux.

16. ARPENTAGE : Lorsque le terrain n'est pas arpenté, le LOCATAIRE sera tenu de le faire arpenter à ses frais, si les circonstances contraignent le MINISTRE à l'exiger.

La présente description du terrain sera alors modifiée en conséquence. L'expression "arpenter" signifie la délimitation du terrain sur les lieux par un arpenteur-géomètre qui devra, avant de procéder, obtenir l'autorisation et les instructions nécessaires du Bureau de l'arpenteur général du Québec, au 1 418 627-6263.

17. LOIS ET RÈGLEMENTS : Le LOCATAIRE est tenu de se conformer à toutes les lois fédérales et provinciales, aux règlements qui en découlent et aux règlements municipaux concernant ses activités sur le terrain.

18. RESPONSABILITÉ ENVIRONNEMENTALE : Le LOCATAIRE s'engage à tenir indemne le MINISTRE de tout recours en dommages qui pourrait être intenté contre lui et à prendre fait et cause pour ce dernier dans tous les cas où il serait poursuivi en raison de l'état environnemental du site loué ou à la suite de la présence de contaminants dans le sol résultant de l'usage des lieux loués ou de l'exercice des droits consentis par les présentes. Dans cette optique, le LOCATAIRE, ses successeurs et ses ayants cause, assumeront, le cas échéant, les coûts liés aux dommages causés par l'état environnemental des sols et à leur remise en état, le tout conformément aux textes législatifs et normes applicables en matière environnementale.

19. INTERPRÉTATION : Dans le présent bail, l'expression « LOCATAIRE » comprend tout cessionnaire du bail, le cas échéant.

Signé en deux (2) exemplaires :

LE MINISTRE

À Québec, le 2017/09/26.

Par : _____
Linda Tremblay
Directrice générale

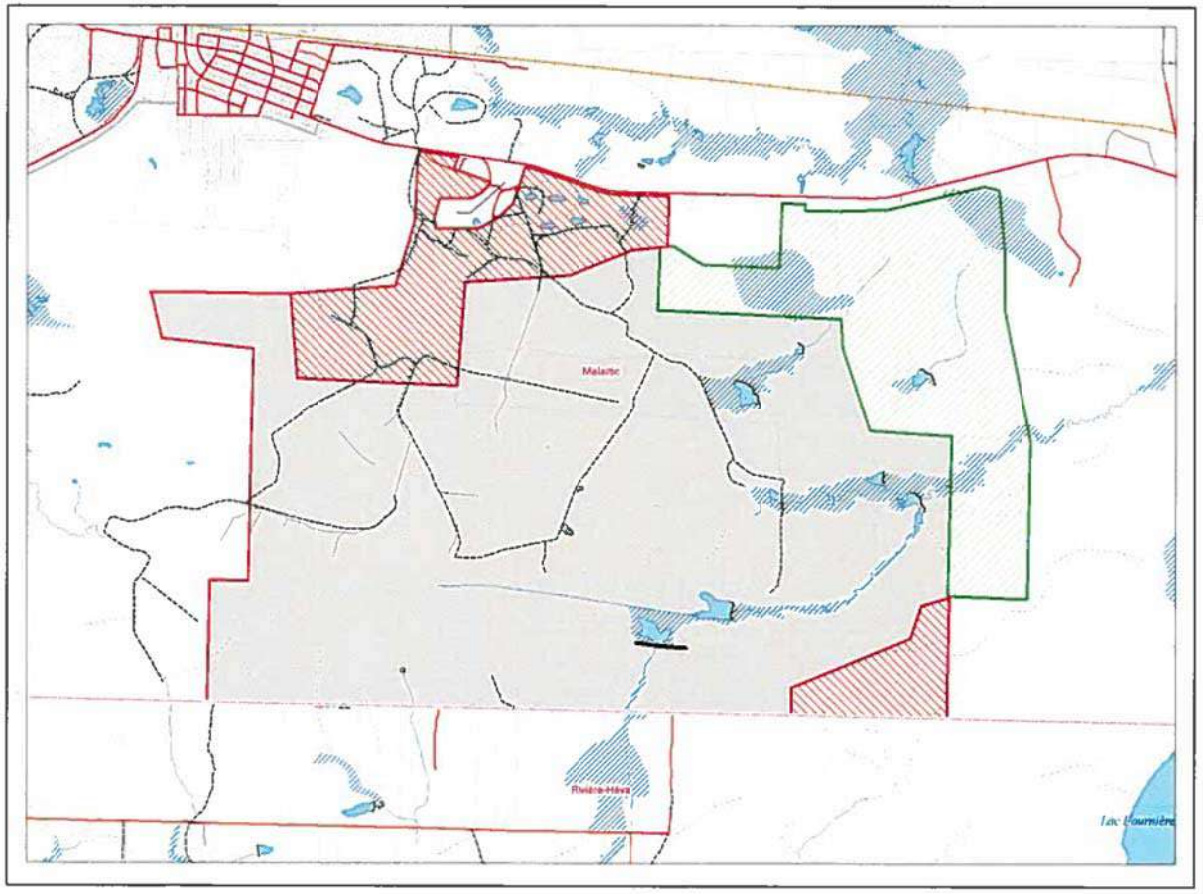
LE LOCATAIRE

À Montréal, le 12 sept 2017

_____
Éric Labbé, directeur des services juridiques
Canadian Malartic GP

# Mine Canadian Malartic - Bail de surface

Dossier 823099




Bail 823099 00 000

- Ajout au bail
- Retrait au bail actuel
- Bail actuel

Foncier

- Lot au cadastre

Réseau routier (AQ)

- Route nationale
- Route régionale
- Accès aux ressources
- Accès aux localités isolées
- Route collectrice
- Route locale
- Autre
- Voie ferrée

Limites administratives

- Municipalité
- MRC
- Périmètre d'urbanisation

Hydrographie

- Cours d'eau
- Lac, rivière
- Milieu humide

0 0.2 0.4 0.6 0.8 km

1 / 25 000

Projection cartographique

Mercator transverse modifiée (MTM), zone 9

Sources

Référence cartographique, MERN, 2017 (BDTQ 20k)

Réalisation

Ministère de l'Énergie et des Ressources naturelles
Direction régionale de l'Abitibi-Témiscamingue

Note : Le présent document n'a aucune portée légale.

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Énergie et Ressources naturelles
Québec

# ANNEXE

# E

# ÉTAT INITIAL DE LA QUALITÉ DES EAUX SOUTERRAINES, TAUX DE PERCOLATION ET ÉTUDE DE MODÉLISATION (GOLDER ASSOCIÉS, 2020)

CONFIDENTIEL

**RAPPORT**

# État initial de la qualité des eaux souterraines, taux de percolation et étude de modélisation pour le projet Odyssey, Mine Canadian Malartic, Québec

Soumettre à :

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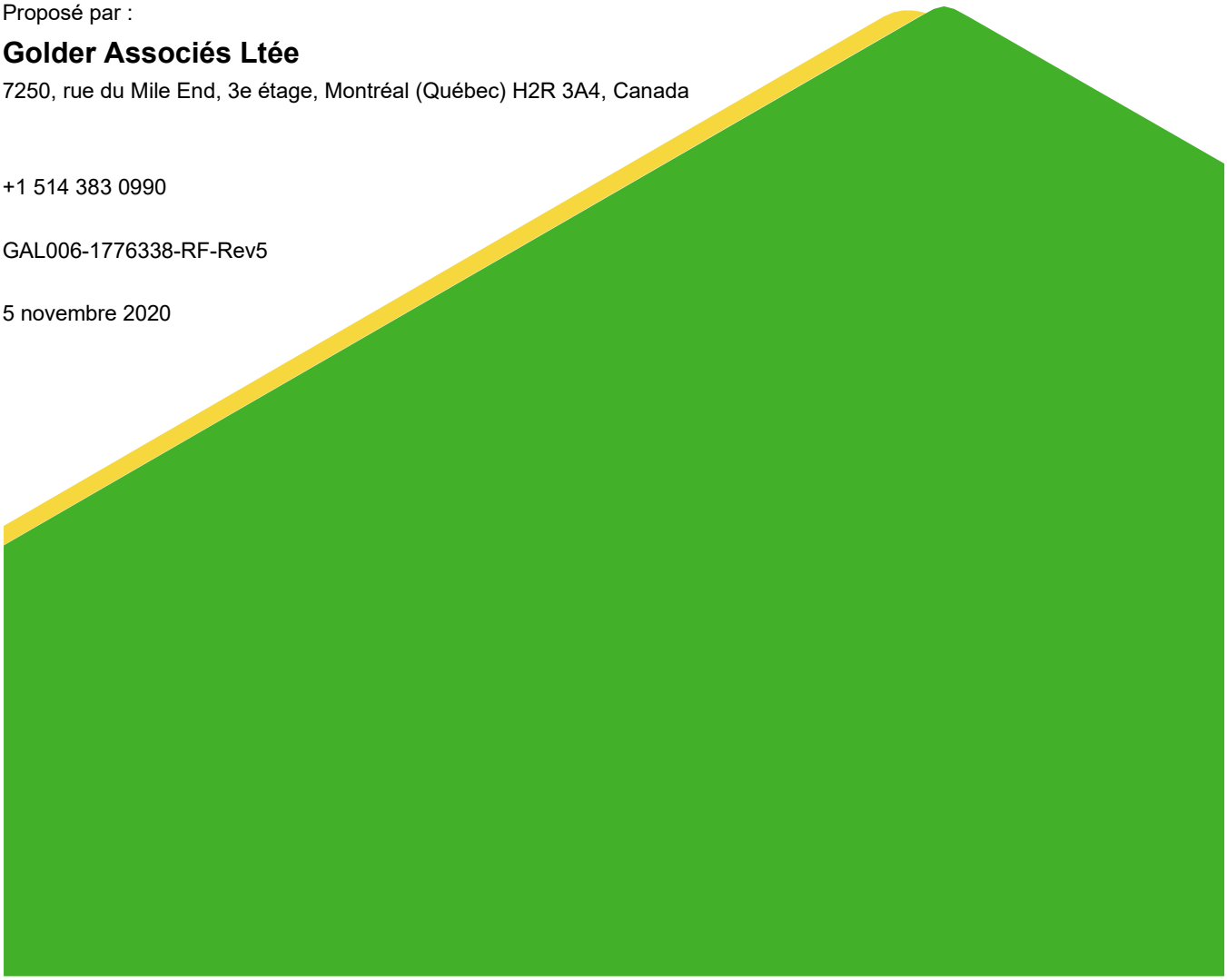
GAL006-1776338-RF-Rev5

5 novembre 2020



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1 version électronique : Mine Canadian Malartic, Malartic, Québec

1 exemplaire : Golder Associés Ltée, Montréal, Québec

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# 1.0 INTRODUCTION

## 1.1 Contexte

Dans le cadre du projet Odyssey, le partenariat Canadian Malartic (CMGP) envisage d'exploiter par mine souterraine l'extension des zones minéralisées actuellement exploitées par mine à ciel à ouvert. Ainsi, la continuité des zones East Malartic, Sladen, Barnat, Sheehan et Jeffrey sera exploitée au moyen de galeries souterraines situées à proximité de la mine Canadian Malartic (MCM). Ce projet nécessitera, entre autres, l'aménagement d'un puits et d'une rampe afin d'accéder au gisement.

La figure A (après le texte) illustre la position du gisement et des principales infrastructures de surface projetées pour Odyssey. Pour plus de clarté, les zones minéralisées sont regroupées selon quatre zones (East Malartic, Odyssey Nord et Sud et East-Gouldie).

Dans le cadre d'une demande de modification de décret pour le projet Odyssey à la suite de changements apportés au projet, Golder Associés Ltée (Golder) a été mandatée pour mettre à jour la présente étude qui comprend l'état initial de la qualité des eaux souterraines, le calcul du taux de percolation dans le secteur des aménagements de surface du projet et l'évaluation des impacts potentiels des aménagements de surface sur la qualité de l'eau souterraine.

## 1.2 Localisation du projet Odyssey

La propriété de MCM est entièrement située dans le canton de Fournière, au sud de la ville de Malartic et à environ 25 km à l'ouest de la ville de Val-d'Or. La figure A (après le texte) présente une vue d'ensemble des principales infrastructures du projet Odyssey. L'empreinte du projet Odyssey est entièrement située à l'intérieur du secteur du projet Extension Canadian Malartic (l'Extension), lequel a été approuvé par décret au début de 2017.

## 1.3 Objectifs de l'étude

Les objectifs spécifiques de l'étude sont les suivants :

- Établir l'état de référence de la qualité de l'eau souterraine dans le secteur du projet;
- Prédire le taux de percolation dans le secteur des aménagements de surface du projet;
- Prédire les impacts potentiels des aménagements de surface sur la qualité de l'eau souterraine.

En considérant que des informations acquises dans le cadre du développement et de l'exploitation de MCM et de l'Extension sont déjà disponibles, celles-ci ont été utilisées pour les besoins de cette étude.

# 2.0 CONTEXTE HYDROGÉOLOGIQUE

## 2.1 Dépôts meubles

Le secteur où s'insère le projet Odyssey est principalement caractérisé par la présence de dépôts dont l'origine remonte à la dernière glaciation. Les dépôts observés se divisent en trois groupes distincts, soit le till, les dépôts d'origine fluvioglaciaire et les dépôts d'origine glaciolacustre (Veillette, 2003). Selon les informations provenant des travaux d'investigation antérieurs ainsi que de la littérature, ces unités sont spatialement hétérogènes et sont d'épaisseurs variables.

L'unité à la base de la stratigraphie est le till. Il s'agit d'un dépôt résultant de l'érosion et du transport de sédiments par les glaciers. Le till est principalement présent sur les hauts topographiques (ou collines) et son épaisseur est généralement de moins d'un mètre à ces endroits. Les portions inférieures des pentes des collines sont généralement couvertes par un dépôt continu de till d'épaisseur généralement de plus d'un mètre, alors que dans les portions supérieures et sur les sommets, la couverture de till est discontinue et d'une épaisseur inférieure à un mètre. Les discontinuités du till de ces formes de relief ont pour conséquence d'exposer le roc à la surface.

Le retrait glaciaire a mis en place des dépôts fluvioglaciaires, principalement sous la forme d'eskers, qui sont présents dans la région. Ceux-ci sont principalement composés de sable et de gravier. Des dépôts correspondant vraisemblablement à des segments d'esker ou à des zones d'épandage fluvioglaciaire sont localement en place dans le secteur Odyssey et sa périphérie. Ces dépôts forment des structures plus ou moins allongées et étroites, dont l'expression en surface crée une morphologie convexe.

Les dépôts glaciolacustres sont les sédiments en suspension qui étaient présents dans le paléolac Barlow-Ojibway et qui se sont déposés sur les terres immergées. Les dépôts typiques d'un environnement glaciolacustre sont les argiles varvées composées de couches estivales en alternance avec les couches hivernales. La couche estivale est généralement plus épaisse, à granulométrie plus grossière, silteuse et de couleur plus claire. La couche hivernale est moins épaisse, à granulométrie plus fine, argileuse et de couleur plus foncée. Les dépôts glaciolacustres ont une épaisseur variable qui peut atteindre plus de 10 mètres dans le secteur Odyssey. Les dépôts glaciolacustres sont généralement observés dans les secteurs où l'élévation du sol est inférieure à 330 mètres. Des dépôts plus grossiers, associés à des environnements sublittoraux ou littoraux du paléolac Barlow-Ojibway, se sont également déposés antérieurement aux argiles et au silt argileux lors de la phase transgressive de ce dernier.

Postérieurement au retrait du lac Barlow-Ojibway, les dépôts glaciolacustres ont été mis à découvert. C'est à ce moment que s'est développé le système de drainage suivant la pente du terrain. Les dépôts mis en place par le développement du système de drainage sont les alluvions. Ceux-ci sont principalement composés de sable silteux, de silt argileux, de sable et de gravier, et leur épaisseur varie généralement de un à cinq mètres (m). Ces dépôts se retrouvent notamment dans la vallée du ruisseau Raymond.

À la suite de la déposition des alluvions, les tourbières se sont formées. Les tourbières sont composées de dépôts organiques à décomposition très lente, puisqu'elles sont la plupart du temps submergées. Un horizon de dépôts organiques est localement observé directement en surface ou sous le remblai, lorsque présent. Cet horizon organique est généralement mince et absent des hauts topographiques. Là où cet horizon est présent, son épaisseur varie généralement entre 0,1 m et 0,6 m, et atteint localement 2 m.

La qualité chimique des dépôts meubles a été évaluée sur le site de MCM, pour le projet initial et celui de l'Extension. Ces résultats sont présentés dans les études d'impact pour ces deux projets (Genivar, 2008 et WSP, 2015). Dans les secteurs non impactés par d'anciennes activités minières ou industrielles, comme dans le secteur Odyssey, la qualité des sols est généralement typique des teneurs de fond du Grenville.

## 2.2 Socle rocheux

De façon sommaire, la majeure partie du socle rocheux recouvrant le secteur se compose de roches métasédimentaires siliceuses, en l'occurrence le conglomérat polygénique du Groupe de Piché et le grauwacke du Groupe de Pontiac. Le substratum est également composé de roches volcaniques, intrusives ultramafiques,

mafiques (basalte) et intrusives felsiques (tonalite). La zone de la faille de Cadillac, d'orientation est-ouest, entrecoupe la région à l'étude et sépare le Groupe de Piché au nord et le Groupe de Pontiac au sud.

La faille Raymond se situe au sud de la ville de Malartic et traverse le site de MCM. Il existe une intrusion relativement étendue de granodiorite au sud-est de cette faille.

## 2.3 Hydrostratigraphie

Dix unités hydrostratigraphiques peuvent être distinguées dans le secteur de MCM. Leur occurrence varie toutefois d'un endroit à l'autre, en raison du fait qu'aucune unité de dépôts meubles n'est continue sur tout le secteur. Dans le secteur Odyssey, huit unités ont été observées. La séquence stratigraphique selon laquelle ces différentes unités peuvent être présentes est constituée (de la surface au roc) :

1) d'un horizon de matière organique : Un horizon de matière organique est observé directement en surface, dans les secteurs plats et topographiquement bas, notamment dans le secteur Odyssey.

2) d'un sable silteux/silt sableux : l'unité de sable silteux/silt sableux est un faciès des dépôts glaciolacustres. Dans la vallée du ruisseau Raymond, des dépôts alluviaux de granulométrie semblable s'ajoutent aux dépôts glaciolacustres sublittoraux pour compléter cette unité hydrostratigraphique. L'unité est présente dans la séquence stratigraphique en position affleurante ou subaffleurante, dans ce dernier cas sous des dépôts organiques.

3) d'un argile/argile silteuse à silt argileux : l'unité d'argile/argile silteuse à silt argileux cohérent est un faciès des dépôts glaciolacustres. Cette unité est généralement présente et son épaisseur est significative dans le secteur Odyssey où l'élévation de la topographie est inférieure à 320 m.

4) d'un silt/silt sableux : l'unité de silt/silt sableux est un faciès de dépôts glaciolacustres. Elle est généralement observée dans les secteurs où l'élévation de la topographie est inférieure à 330 m.

5) d'un sable : l'unité de sable est un faciès de dépôts glaciolacustres. Elle est discontinue et se situe entre les dépôts glaciolacustres fins et les dépôts glaciaires. Dans le secteur de l'étude, cette unité est essentiellement constituée de sable fin ou fin à moyen.

6) d'un sable et gravier : l'unité de sable et gravier est de nature fluvioglaciaire (épandage proglaciaire et/ou sédiments granulaires). Son occurrence se limite à deux ensembles de dépôts de forme plus ou moins allongée et étroite, présents en position affleurante ou subaffleurante. Ces deux ensembles, possiblement connectés entre eux, s'étendent au sud et à l'est du secteur d'étude.

7) d'un till : l'unité de till, d'origine glaciaire, est généralement rencontrée entre les sédiments glaciolacustres et le roc. Alternativement, elle se retrouve sous le sable et le gravier fluvioglaciaire lorsque celui-ci est présent. Elle recouvre le roc sur la majeure partie du secteur.

8) de Roc : le roc, qui se trouve à la base de la séquence stratigraphique, est majoritairement composé des roches métasédimentaires du Groupe de Pontiac au sud de la faille Cadillac.

Le tableau 1 dresse le récapitulatif des caractéristiques propres aux différentes unités hydrostratigraphiques en place dans le secteur Odyssey et sa périphérie. La figure B (Après le texte) illustre les sondages du secteur. L'annexe A présente les journaux de sondage.

**Tableau 1 : Caractéristiques des unités hydrostratigraphiques du secteur Odyssey**

| Unité hydrostratigraphique | Occurrence spatiale / épaisseur | Caractéristique hydraulique |
|---|---|---|
| Horizon de matière organique | Présence discontinue<br>Épaisseur : 0,1 – 2,7 m | Unité semi-perméable |
| Sable silteux/silt sableux | Présence ponctuelle<br>Épaisseur : 0,1 – 3,8 m | Unité semi-perméable |
| Argile/argile silteuse à silt argileux | Présence discontinue<br>Épaisseur : 1,0 – 11,6 m | Unité aquitard |
| Silt/silt sableux | Présence discontinue<br>Épaisseur 0,9 – 3,2 m | Unité aquitard |
| Sable | Présence discontinue<br>Épaisseur : 0,9 – 9,4 m | Unité perméable |
| Sable et gravier et till | Présence discontinue<br>Épaisseur : 0,1 – 14,0 m | Unité perméable/semi-perméable |
| Roc | Aquifère régional de roc fracturé (continu) | |

## 2.4 Conductivité hydraulique

À l'échelle de la propriété de MCM, des valeurs de conductivité hydraulique du roc ont été obtenues par des essais de type Packer, des essais Lugeon et des essais de perméabilité in situ (Golder, 2008). Les conductivités hydrauliques obtenues varient entre $10^{-10}$ m/s et $10^{-5}$ m/s et diminuent de façon marquée avec la profondeur.

À proximité du secteur du projet Odyssey, les conductivités hydrauliques estimées par les essais de perméabilité réalisés dans les puits aménagés au roc (BH11-06, BH11-13, BH11-17R, PZ-13-34) varient entre 2 x $10^{-8}$ m/s et 1 x $10^{-5}$ m/s (Golder, 2014a). La valeur minimale de conductivité hydraulique du roc a été mesurée au puits PZ-13-34, alors que la valeur maximale l'a été au puits BH11-17R. Le tableau 2 présente le récapitulatif des données de conductivité hydraulique obtenues pour les formations en place dans le secteur de l'étude, dans l'ensemble des mandats d'investigation réalisés dans le secteur.

**Tableau 2 : Sommaire de l'interprétation des essais de perméabilité – secteur Odyssey et périphérie**

| Puits | Unité hydrostratigraphique | Conductivité hydraulique (m/sec) | Type d'essai | Référence |
|---|---|---|---|---|
| BH11-06 | Roc | 3E-07 | Descendant | 11-1221-0105-1000 |
| BH11-07 | Sable et gravier | 3E-06 | Ascendant | 11-1221-0105-1000 & 10-1221-0063-6002 |
| | | 1E-06 | Descendant | |
| BH11-09 | Sable fin | 2E-06 | Ascendant | 11-1221-0105-1000 |
| | | 2E-06 | Descendant | |
| BH11-13 | Roc | 6E-06 | Ascendant | 11-1221-0105-1000 |
| | | 6E-06 | Descendant | |
| BH11-17R | Roc | 1E-05 | Ascendant | 10-1221-0063-6002 |
| BH11-17D | Sable fin | 6E-04 | Ascendant | 10-1221-0063-6002 |
| PO-17-04 | Roc | 1E-07 | Ascendant | 1776338 |
| PZ-13-34 | Roc | 2E-08 | Ascendant | 13-1221-0020-3010 |
| PZ-13-36 | Sable fin | 1E-05 | Ascendant | 13-1221-0020-3010 |

## 2.5 Écoulement des eaux souterraines

Les élévations des niveaux d'eau mesurées dans les puits d'observation du secteur de 2011 à 2019 sont présentées dans le tableau 3. La figure B présente l'interprétation de la piézométrie de la portion supérieure du roc calculée. En considérant que les données piézométriques indiquent clairement une relation entre la topographie du roc et l'élévation de la nappe d'eau (les hauts et les bas piézométriques correspondent généralement aux hauts et aux bas topographiques de la surface du roc, respectivement), la topographie du roc a été utilisée pour soutenir l'interprétation de la piézométrie et des directions d'écoulement.

Les eaux souterraines du secteur Odyssey s'écoulent vers la rivière Malartic au nord avec une légère influence de la fosse Jeffrey et du puits n° 1 situés à l'ouest. De façon générale, l'écoulement est en relation avec la topographie accidentée du socle rocheux. Là où le socle rocheux est plus élevé (au niveau des hauts topographiques), l'absence de dépôts glaciolacustres (silt et argile) peut favoriser l'infiltration d'eau et la recharge de l'aquifère de roc peut y être plus importante.

La rivière Malartic serait le récepteur potentiel des eaux souterraines circulant dans les unités hydrostratigraphiques en place dans le secteur Odyssey.

**Tableau 3 : Niveaux d'eau dans les puits d'observation du secteur Odyssey et sa périphérie**

| Puits | Unité stratigraphique | Élévation (m) | | Élévation du niveau d'eau (m) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sol | Margelle | Déc.-11 | Mai-12 | Sept.-12 | Juil.-13 | Déc.-14 | Nov.-16 | Nov.-18 | Déc.-18 | Juin-19 | Oct.-19 |
| BH11-06 | Roc | 311,36 | 312,09 | 310,29 | 309,72 | 309,15 | - | 310,08 | - | - | - | - | - |
| BH11-07 | Sable et gravier | 314,49 | 315,51 | 310,49 | 310,43 | 310,35 | - | 310,49 | - | - | - | - | - |
| BH11-09 | Sable fin | 313,84 | 314,69 | 311,72 | 311,50 | 310,86 | - | 311,86 | - | 309,45 | - | 309,39 | 310,39 |
| PZ-14-37 | Sable fin | 307,15 | 307,96 | - | - | - | - | 306,85 | - | - | - | - | - |
| BH11-13 | Roc | 308,31 | 309,17 | 307,91 | 307,06 | 306,36 | - | 307,28 | - | 304,08 | - | 298,98 | 299,14 |
| BH11-17D | Sable fin | 313,02 | 313,95 | - | - | 306,72 | 306,92 | - | - | - | - | - | - |
| BH11-17R | Roc | 312,97 | 313,90 | - | - | 306,66 | 306,83 | 306,89 | - | 306,19 | - | 306,12 | 306,15 |
| PZ-11-18R | Roc | 314,03 | 314,90 | | 312,97 | 312,22 | 313,21 | 313,22 | 312,82 | - | - | - | - |
| PZ10-05R | Roc | 313,27 | 314,28 | 306,71 | 305,14 | 304,05 | 305,93 | 305.,1 | 305,47 | 305,21 | - | 305,72 | 304,42 |
| BH-08-38 | Roc | 316,78 | 317,24 | - | 312,56 | 312,29 | 312,07 | 312,38 | 310,78 | - | - | - | - |

| Puits | Unité stratigraphique | Élévation (m) | | Élévation du niveau d'eau (m) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sol | Margelle | Déc.-11 | Mai-12 | Sept.-12 | Juil.-13 | Déc.-14 | Nov.-16 | Nov.-18 | Déc.-18 | Juin-19 | Oct.-19 |
| PZ11-17R | Roc | 316,43 | 317,39 | 307,28 | 305,62 | sec | 306,77 | - | 306,35 | 306,79 | - | 307,27 | - |
| PZ-13-34 | Roc | 306,65 | 307,51 | - | - | - | 306,88 | 306,93 | - | - | - | - | - |
| PZ-13-36 | Sable fin | 306,99 | 307,96 | - | - | - | 306,97 | 307,04 | - | - | - | - | - |
| PZ-18-60R | Roc | 308,33 | 309,19 | - | - | - | - | - | - | 305,07 | 304,93 | sec | 303,19 |
| PZ-18-61R | Roc | 308,64 | 309,57 | - | - | - | - | - | - | 303,78 | 304,02 | sec | sec |
| PZ-18-62R | Till/Roc | 308,90 | 309,95 | - | - | - | - | - | - | 304,63 | 304,52 | 301,95 | 301,43 |
| PZ-19-63R | Roc | 311,97 | 313,08 | - | - | - | - | - | - | - | - | 307,76 | 307,12 |

La vitesse d'écoulement de l'eau souterraine peut être estimée à l'aide de la Loi de Darcy selon l'équation suivante :

$$V = \frac{K\,i}{n_e}$$

où :

v = vitesse d'écoulement
K = conductivité hydraulique
i = gradient hydraulique
$n_e$ = porosité effective

En utilisant un gradient hydraulique moyen dans le secteur d'étude de 0,005 m/m, une porosité effective de 0,01 et une conductivité hydraulique maximale de l'ordre de 1 x $10^{-5}$ m/s, représentative du roc en surface, une vitesse d'écoulement de l'ordre de 0,5 m/j est estimée dans l'aquifère de roc.

## 2.6 Classification de l'aquifère de roc

Des propriétés se situant à l'extérieur du réseau de l'aqueduc municipal de Malartic (résidentielles, agricoles ou commerciales) ont été identifiées comme étant alimentées en eau potable par un puits domestique, installé dans les dépôts meubles ou dans le roc. Les propriétés se retrouvent principalement au sud, le long de l'avenue des Merles et du chemin du Lac Mourier, et au nord de la ville de Malartic, le long de la route 117.

En considérant la présence de puits d'alimentation en eau potable, et selon la procédure décrite dans le *Guide de classification des eaux souterraines du Québec* du MELCC[1] (1999), l'aquifère de roc est de classe II. Un aquifère de classe II représente une formation hydrogéologique qui est une source courante ou potentielle d'alimentation en eau.

# 3.0 QUALITÉ DE L'EAU SOUTERRAINE

## 3.1 Identification des critères de qualité applicables

La procédure d'intervention applicable à l'eau souterraine lors d'une étude de caractérisation environnementale est guidée par la présence ou non de récepteurs potentiels dans le secteur. Les critères de qualité applicables pour l'eau souterraine sont déterminés en fonction des récepteurs potentiels qui sont identifiés. À titre de récepteurs potentiels, le MELCC identifie les puits d'approvisionnement en eau, les aquifères de classes I et II, les eaux de surface, les réseaux d'égout et les bâtiments.

En considérant que le roc est un aquifère de classe II et la présence d'eau de surface tels le ruisseau Raymond et la rivière Malartic, où l'eau souterraine pourrait faire résurgence, les critères applicables pour l'eau souterraine sont les critères *Eau de consommation* (EC) et les critères de *Résurgence* dans les eaux de surface (RES) du MELCC (2019).

[1] MELCC : ministère de l'Environnement et de la Lutte contre les changements climatiques du Québec anciennement connu comme le ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC), le ministère du Développement durable, de l'Environnement, de la Faune et des Parcs du Québec (MDDEFP), le ministère du Développement durable, de l'Environnement et des Parcs du Québec (MDDEP), le ministère de l'Environnement du Québec (MENV) ou le ministère de l'Environnement et de la Faune du Québec (MEF)

## 3.2 Résultats analytiques

L'annexe B présente les résultats analytiques pour les échantillons prélevés lors des huit campagnes d'échantillonnage réalisées dans le secteur d'étude, en comparaison avec les critères de qualité applicables. Les certificats analytiques du laboratoire de 2011 à 2013 sont présentés dans le rapport de Golder (2014a), alors que ceux de 2017, 2018 et 2019 font partie des rapports de suivi annuel (Golder 2018, 2019 et 2020a) ainsi que dans l'annexe C. La localisation des puits d'observation est illustrée sur la figure B.

De façon générale, aucun des paramètres analysés ne montre des concentrations en excès des critères EC, à l'exception de l'aluminium, de l'arsenic et de l'azote ammoniacal. Le cuivre a été détecté dans deux puits d'observation et le phosphore total dans un puits en excès du critère RES. Les résultats analytiques sont décrits ci-dessous par famille de paramètres analytiques. Depuis mars 2019, il n'y a plus de critère mentionné dans le guide d'intervention du MDDELCC pour les cyanures totaux et les cyanures libres, mais il y a des critères additionnels pour les cyanures disponibles, l'azote ammoniacal total, les nitrates et le phosphore total comme présentés à l'annexe B.

### *Métaux*

Le cuivre présente un dépassement du critère RES dans les deux puits d'observation BH11-06 et BH11-13, tous deux aménagés dans le roc. Dans ces deux puits, ainsi qu'au puits BH11-17D, l'aluminium présente un dépassement du critère EC. Les dépassements observés à ces puits sont survenus uniquement lors du premier échantillonnage. Les résultats des échantillonnages subséquents ont montré des concentrations en cuivre et en aluminium inférieures à la limite de détection du laboratoire. Ainsi, il est probable que la présence de ces paramètres en excès des critères soit causée par les opérations de forage. Par exemple, l'utilisation d'eau lors des opérations de forage pourrait avoir modifié temporairement les conditions physicochimiques locales (à l'échelle du puits). Les dépassements des critères en aluminium et en cuivre à ces puits ne sont donc pas considérés comme représentatifs de la qualité de l'eau souterraine dans ce secteur, et les échantillonnages subséquents indiquent un retour à la normale de la qualité de l'eau souterraine, représentatifs de l'état initial.

Par ailleurs, plusieurs dépassements des critères EC pour l'arsenic et l'azote ammoniacal ont été notés. Pour l'arsenic, ce critère correspond à la concentration d'arsenic dans l'eau potable qui représente un risque sanitaire « essentiellement négligeable ». Ce critère de qualité est utilisé dans un contexte de prévention de la contamination de l'eau souterraine et c'est pourquoi il est différent de la norme d'eau potable, qui est de 10 µg/L. Seulement un des échantillons du puits PZ-18-62R situé dans le roc, prélevé en juin 2019, dépasse la norme d'eau potable avec une valeur égale à 17 µg/L.

Un projet d'acquisition de connaissances sur les eaux souterraines (PACES) a été mené pour le territoire de l'Abitibi-Témiscamingue par le groupe de recherche sur l'eau souterraine (GRES) de l'Université du Québec en Abitibi-Témiscamingue (UQAT). Cette étude de PACES (Cloutier et al., 2013) et une étude menée par la Direction régionale de la santé publique (Poissant, 1997) indiquent que la présence d'arsenic était le plus important des problèmes reliés aux métaux présents dans l'eau souterraine de la région de l'Abitibi-Témiscamingue. L'étude de Poissant (1997) a permis aussi de valider l'hypothèse selon laquelle les puits présentant de plus fortes concentrations d'arsenic étaient associés à la roche archéenne sédimentaire située en bordure des zones de faille, elle-même fréquemment associée à certains gisements aurifères. De plus, cette étude souligne qu'il y a une contamination naturelle à l'arsenic de puits d'alimentation privés dans plusieurs municipalités en Abitibi telles que Dubuisson et Rivière-Héva, toutes deux situées à proximité de la Mine.

Les concentrations des autres métaux mesurées dans les échantillons prélevés aux différents puits respectent les critères applicables.

### *Paramètres inorganiques*

Les concentrations des paramètres inorganiques respectaient les critères applicables, à l'exception du phosphore total pour le puits BH11-09 situé dans le sable fin où des dépassements significatifs du critère ont été observés en 2012. Les concentrations en phosphore total au puits BH11-09 devraient être analysées et surveillées lors des prochaines campagnes d'échantillonnage.

Il est à noter que les cyanures ont été détectés dans plusieurs puits. Les concentrations mesurées étaient égales ou légèrement supérieures aux limites de détection du laboratoire. Il faut aussi souligner que depuis mars 2019, il n'y a plus de critère mentionné dans le guide d'intervention du MELCC pour les cyanures totaux et libres. Il y a toutefois un critère pour les cyanures disponibles. Les concentrations en cyanures disponibles sont toutes inférieures à la limite de détection du laboratoire.

### *Mesures de paramètres in situ*

De façon générale, le pH mesuré in situ varie de 5,6 à 9,8 dans les échantillons. Par ailleurs, la conductivité électrique mesurée in situ varie entre 18 µS/cm et 1 688 µS/cm pour l'ensemble des échantillons.

## 4.0 TAUX DE PERCOLATION

La stratigraphie dans le secteur du projet Odyssey a été analysée dans le cadre du projet d'extension de la Mine. Selon la Directive 019 sur l'industrie minière (MDDELCC, 2012), un aménagement à risques doit être effectué de manière à éviter toute dégradation significative de la qualité des eaux souterraines pendant et après les activités minières. De fait, les matériaux constituant le substrat de cet aménagement doivent posséder une perméabilité suffisamment faible, afin de minimiser le flux d'eau pouvant percoler jusqu'à l'aquifère sous-jacent, et ainsi de limiter l'apport en solutés jusqu'aux eaux souterraines circulant sous cette aire d'accumulation. Pour le projet Odyssey, les aménagements à risques sont les aires d'entreposage temporaires de stériles et de minerai et l'aire de réservoirs pétroliers (Figure A). On s'intéresse donc au degré d'étanchéité des dépôts naturellement en place, afin de connaître le potentiel de percolation à travers ceux-ci, en considérant que ces aménagements seront déposés directement à la surface du sol.

## 4.1 Évaluation du débit de percolation à travers les dépôts meubles dans le secteur Odyssey

Afin de préserver l'intégrité et la qualité environnementale des eaux souterraines circulant dans l'aquifère de roc, la conception des aménagements doit prendre en compte le potentiel de percolation à travers les dépôts meubles qui en formeront l'assise. L'information, amassée dans le cadre des différentes phases d'investigation géotechnique et hydrogéologique du secteur, permet la définition du modèle d'écoulement vertical sur la base duquel le débit de percolation vers l'aquifère de roc peut être évalué.

En vue d'évaluer le degré d'étanchéité des formations qui constitueront le substrat des aménagements, il est considéré que les aménagements seront mis en place directement sur les dépôts meubles affleurant au niveau des empreintes envisagées, à la suite de l'excavation de l'horizon de matières organiques. Le calcul du débit de percolation résultant permettra d'évaluer la validité de cette approche et de statuer sur le besoin ou non d'améliorer l'étanchéité du substrat.

### 4.1.1 Modèle d'écoulement vertical

Le modèle d'écoulement vertical est d'abord constitué de la séquence stratigraphique de dépôts meubles effectivement présente à l'emplacement des aménagements. À la séquence stratigraphique des aires d'entreposage, s'ajoutent les stériles ou le minerai qui seront déposés en surface des dépôts affleurants.

Les stériles ou le minerai qui seront mis en place dans les aires d'entreposage seront des matériaux pratiquement secs, ou désaturés. Ces aires d'entreposage sont donc considérées comme des piles sèches où il n'y aura pas d'accumulation d'eau significative à l'intérieur des matériaux. Par conséquent, le potentiel de percolation à travers les dépôts sous-jacents aux matériaux sera limité par la quantité d'eau de précipitations pouvant s'infiltrer en surface des aires d'entreposage. Durant l'exploitation, le débit de percolation sera nécessairement inférieur au taux de recharge à travers les stériles en raison des précipitations, considérant qu'une partie de cette recharge pourra simplement servir à humecter les particules et fragments des matériaux, alors qu'une autre partie ruissellera à la base des aires d'entreposage jusqu'aux fossés périphériques. En période postfermeture, ces aires d'entreposage temporaire auront été démantelées.

La percolation de l'eau à travers la colonne de dépôts meubles s'effectue selon la perméabilité (ou conductivité hydraulique) des unités en place et leur épaisseur respective. L'hypothèse avancée est que le profil vertical des dépôts meubles est entièrement saturé et que la percolation s'effectue en régime permanent.

La quantité d'eau s'infiltrant en surface des aires d'entreposage est égale à la différence entre les précipitations reçues et la proportion des précipitations qui vont ruisseler en surface des aires, et donc qui ne participeront pas à la recharge. Durant l'exploitation, la proportion des précipitations qui vont ruisseler en surface des aires d'entreposage sur une base annuelle, qui correspond au coefficient de ruissellement volumétrique, est évaluée à 60 % (Golder, 2014b). Les précipitations totales moyennes enregistrées à la station d'Environnement Canada à Val-d'Or entre les années 1951 et 2012 se chiffrent à 903 mm/an (Golder, 2014c). Les précipitations enregistrées durant l'année la plus humide (1979) au cours de cette même période se chiffrent quant à elles à 1183 mm/an. La hauteur d'eau s'infiltrant dans les aires d'entreposage lors d'une année moyenne est ainsi estimée à 361 mm, alors qu'elle atteindrait 473 mm au cours d'une année considérée comme humide, c'est-à-dire comparable à l'année la plus humide de la période 1951-2012. En posant l'hypothèse que toute l'eau s'infiltrant en surface des aires d'entreposage percole jusqu'aux dépôts meubles à sa base, ce qui est non réaliste en considérant que le débit de percolation sera nécessairement inférieur au taux de recharge comme mentionné ci-dessus, il s'avère que le débit de percolation quotidien qui pourrait être atteint à travers les dépôts meubles sous-jacents serait de 1,0 L/m² pour une année moyenne, et de 1,3 L/m² pour une année humide. Ces deux valeurs sont inférieures au débit de percolation quotidien maximal de 3,3 L/m² recommandé par la Directive 019 pour les aires d'accumulation requérant des mesures de protection de niveau A.

Un total de cinq unités hydrostratigraphiques distinctes est considéré dans le modèle d'écoulement vertical, sur la base de la stratigraphie réelle du secteur ciblé pour les aménagements d'Odyssey. Chaque unité s'est vu attribuer une conductivité hydraulique verticale égale ou proche de la valeur maximale mesurée pour le type de dépôt correspondant, afin que l'évaluation soit prudente. Les unités du modèle, de même que la valeur de conductivité hydraulique verticale attribuée à chacune, sont présentées au tableau 4.

**Tableau 4 : Unités hydrostratigraphiques considérées dans le modèle d'écoulement vertical**

| Unité | Conductivité hydraulique verticale $K_{vi}$ (m/s) |
|---|---|
| Sable silteux/silt sableux | 1 x $10^{-6}$ m/s |
| Argile (incluant argile silteuse et silt argileux) | 5 x $10^{-10}$ m/s |
| Silt (incluant silt sableux) | 5 x $10^{-9}$ m/s |
| Sable fin | 5 x $10^{-4}$ m/s |
| Till (incluant sable et gravier fluvioglaciaire) | 5 x $10^{-7}$ m/s |

### 4.1.2 Évaluation du débit de percolation

L'estimation du débit de percolation entre la surface des dépôts meubles sous-jacents aux aménagements et l'aquifère du roc est réalisée à l'aide de l'équation de Darcy, en l'occurrence $q = K\,dh/dl$, paramétrée pour le calcul du flux vertical ($q = q_v$), en posant $K = K_v$ et en considérant un gradient hydraulique ($dh/dl$) correspondant au gradient hydraulique vertical ($dh/dz$). La conductivité verticale est d'abord évaluée à toutes les positions où un sondage a permis la définition stratigraphique des dépôts, dans le secteur du projet Odyssey. La localisation de ces sondages est illustrée sur la figure B. Le système multicouche naturel est modélisé par un système à une seule couche qui possède une conductivité hydraulique verticale équivalente ($K_{v\ equ}$) qui est fonction de l'épaisseur ($b_i$) et de la conductivité hydraulique verticale ($K_{vi}$) de chacune des unités de dépôts meubles en place à la position considérée. Les unités qui ne sont pas présentes au droit de la position ne sont pas incluses dans le calcul de la conductivité hydraulique verticale équivalente.

La conductivité hydraulique verticale équivalente d'un profil à $n$ unités de dépôts meubles est déterminée à l'aide de l'équation suivante :

$$K_{v\ equ} = \frac{\sum_{i=1}^{n} b_i}{\sum_{i=1}^{n} \frac{b_i}{K_{vi}}}$$

Le tableau 5 présente les conductivités hydrauliques verticales équivalentes pour les sondages réalisés dans le secteur du projet Odyssey. Il est important de souligner que les sondages réalisés dans l'unité de sable et gravier, au sud et à l'est du secteur où se trouve les aménagements de surface, n'ont pas été considérés dans l'évaluation, cette stratigraphie n'étant pas représentative du secteur Odyssey. Comme indiqué au tableau 5, la moyenne géométrique de ces conductivités hydrauliques ($K_v$) est de 2 x $10^{-9}$ m/s, ce qui représente la conductivité hydraulique verticale moyenne dans le secteur du projet Odyssey.

**Tableau 5 : Calcul de la conductivité hydraulique verticale au niveau du secteur Odyssey et sa périphérie**

| Sondage | Coordonnées | | Épaisseurs des unités de dépôts meubles (m) | | | | | | Kv equ (m/s) |
|---|---|---|---|---|---|---|---|---|---|
| | X (m) | Y (m) | Sable silteux à silt sableux | Argile | Silt | Sable fin à sable graveleux | Sable et gravier et till | Roc | |
| BH11-06 | 718515 | 5333985 | - | - | 0,89 | - | - | 3,12 | 5E-09 |
| BH11-07 | 718009 | 5333868 | 1,82 | 1,08 | 1,69 | 9,43 | 14,02 | 28,65 | 1E-08 |
| BH11-13 | 717717 | 5334586 | - | 6,60 | 2,60 | - | 1,83 | 11,43 | 8E-10 |
| BH11-14 | 717400 | 5334360 | - | 10,28 | 1,53 | - | 3,70 | 16,81 | 7E-10 |
| BH11-15 | 718118 | 5334484 | - | 6,20 | 3,25 | - | 3,69 | 13,75 | 1E-09 |
| BH11-16 | 717704 | 5333858 | 3,82 | 2,42 | 2,23 | - | - | 7,87 | 2E-09 |
| BH-17-01 | 717940 | 5334321 | - | 8,58 | 2,08 | - | 2,25 | 2,75 | 7E-10 |
| BH-17-02 | 717960 | 5334306 | - | 7,33 | 2,74 | - | - | 3,36 | 7E-10 |
| BH-17-03 | 717934 | 5334301 | - | 5,24 | 3,05 | - | 0,21 | 3,70 | 8E-10 |
| BH-17-05 | 717923 | 5334315 | - | 8,42 | 3,00 | - | 3,56 | 3,54 | 9E-10 |
| PZ11-18R | 716873 | 5334255 | - | 3,81 | 2,90 | - | - | 6,86 | 8E-10 |
| PZ-13-34 | 718445 | 5334649 | - | 11,58 | - | 4,75 | 2,57 | - | 8E-10 |
| TE13-09 | 717708 | 5333860 | - | 2,50 | 2,20 | - | 0,10 | - | 9E-10 |
| TE13-12 | 718201 | 5334030 | 0,50 | - | - | 1,60 | - | - | 4E-06 |
| TP-08-366 | 718498 | 5334289 | - | 3,00 | - | - | - | - | 5E-10 |
| TP-08-368 | 718428 | 5334164 | 1,80 | - | - | 2,50 | - | - | 2E-06 |
| TP-08-370 | 718451 | 5333909 | - | 2,10 | - | - | 1,80 | - | 9E-10 |
| TP-08-371 | 718372 | 5333872 | - | 3,00 | - | - | 0,70 | - | 6E-10 |
| TP-08-375 | 718178 | 5334456 | - | 3,80 | - | - | - | - | 5E-10 |

| Sondage | Coordonnées | | Épaisseurs des unités de dépôts meubles (m) | | | | | | Kv equ (m/s) |
|---|---|---|---|---|---|---|---|---|---|
| | X (m) | Y (m) | Sable silteux à silt sableux | Argile | Silt | Sable fin à sable graveleux | Sable et gravier et till | Roc | |
| TP-08-376 | 718498 | 5334209 | 1,60 | 2,20 | - | - | - | - | 9E-10 |
| TP-08-379 | 718404 | 5334224 | - | 1,00 | - | - | - | - | 5E-10 |
| TP-08-383 | 718258 | 5333828 | - | 2,10 | 1,50 | - | - | - | 8E-10 |
| TP-08-384 | 718107 | 5333798 | - | 3,80 | - | - | - | - | 5E-10 |
| TP-08-385 | 718248 | 5333760 | 0,70 | 2,90 | - | - | - | - | 6E-10 |
| TP-08-479 | 717913 | 5333933 | 1,90 | - | 1,00 | 0,90 | - | - | 2E-08 |
| PZ18-60R | 717906 | 5334556 | - | 2,69 | - | - | - | 1,76 | 5E-10 |
| PZ18-61R | 717847 | 5334462 | - | 3,77 | 1,33 | - | - | 2,54 | 7E-10 |
| PZ18-62R | 717949 | 5334410 | 6,40 | 3,06 | - | - | 3,35 | 0,51 | 2E-09 |
| PZ10-05R | | | - | 4,17 | 1,52 | 1,22 | - | - | 8E-10 |
| BH13-03 | 716864 | 5334681 | - | 5,98 | 0,91 | - | 2,01 | 1,86 | 7E-10 |
| BH13-04 | 716784 | 5334624 | - | 6,34 | 2,16 | - | 2,72 | 1,83 | 9E-10 |
| PZ19-63R | | | - | - | - | 0,61 | 1,65 | 17,66 | 7E-07 |
| **Moyenne géométrique (Kv) :** | | | | | | | | | **2E-09** |

En supposant l'existence d'un gradient hydraulique unitaire dans le profil vertical ($dh/dz$ = 1 m), on peut estimer le taux de percolation ($q_v$) dans le secteur du projet Odyssey avec l'équation de Darcy ($q_v = K_v\, dh/dz$). Le taux de percolation ainsi calculé est de 0,2 L/m²/j. L'emploi d'un gradient hydraulique unitaire à travers le profil vertical représente un cas extrême pour les aires d'entreposage, car il suppose une source infinie d'eau qui s'infiltre dans le profil vertical. De plus, un gradient hydraulique unitaire présume que le niveau d'eau dans l'aquifère de roc est au contact des dépôts meubles alors qu'il est généralement plus élevé sur le site, souvent près de la surface. Ainsi, le gradient hydraulique vertical réellement attendu sera plus faible.

Par conséquent, les résultats de l'évaluation du débit de percolation sous les aménagements indiquent une valeur de 0,2 L/m²/j, soit bien inférieure au débit limite de 3,3 L/m²/j défini dans la Directive 019 pour les mesures d'étanchéité de Niveau A. Ainsi, sur la base d'une estimation prudente, les matériaux constituant le substrat des aménagements projetés possèdent une perméabilité suffisamment faible pour minimiser le flux d'eau pouvant percoler jusqu'à l'aquifère sous-jacent.

# 5.0 ÉTUDE DE MODÉLISATION

Une étude de modélisation du transport des contaminants a été réalisée pour le projet Extension en 2014. Pour atteindre cet état initial, un scénario d'analyse de sensibilité de cette étude, considérant la halde à stériles de l'Extension comme une source de contamination en métaux, a été effectué. Ce scénario a été utilisé pour évaluer les impacts potentiels des aires d'entreposage d'Odyssey sur la qualité des eaux souterraines. Il s'agit d'une approche très prudente, en considérant que ce sont des aires d'entreposage temporaire et de petite envergure en comparaison avec la halde à stériles de l'Extension, projet à plus grande échelle où l'entreposage sera permanent.

## 5.1 Définition des concentrations sources

L'identification des contaminants d'intérêt pour la halde de l'Extension a considéré les résultats de l'analyse des métaux extractibles et des essais de lixiviation (SPLP et TCLP) réalisés sur 41 échantillons de minerai ainsi que sur 245 échantillons de stériles provenant des études géochimiques réalisées pour la MCM. Les résultats de ces essais sont présentés à l'annexe D. La géochimie du projet Odyssey (EcoMetrix, 2017; SGS, 2019; et Golder, 2020b) présente des résultats de lixiviation généralement inférieurs (les valeurs moyennes des essais TCLP sont présentées dans le tableau 6), ce qui contribue à rendre l'approche prudente. Des statistiques ont été calculées sur les résultats des essais SPLP et TCLP réalisés pour MCM pour chaque paramètre analysé, pour l'ensemble des échantillons. Lorsque la concentration d'un paramètre était sous la limite de détection, une valeur égale à la moitié de la limite de détection a été attribuée pour le calcul des statistiques. Pour chacun des paramètres, le ratio entre la moyenne des concentrations ($M_C$) et le critère le plus restrictif ($C_R$) a été calculé ($M_C/C_R$). Les contaminants d'intérêt sont ceux qui présentent un ratio $M_C/C_R$ supérieur à 1 et qui excédaient le critère A de la Politique (1999) lors de l'analyse des métaux extractibles. Le tableau 6 présente les contaminants d'intérêt et leurs statistiques.

**Tableau 6 : Contaminants d'intérêt pour les haldes**

| Essai | Paramètre | Concen-tration médiane MCM (mg/L) [1] | Concen-tration moyenne - MCM (mg/L) | Moyenne – Odyssey Nord et Sud (mg/L) | Moyenne – Odyssey EM (mg/L) | Critère RES (mg/L) | Critère EC (mg/L) | Ratio $M_C/C_R$ [2] |
|---|---|---|---|---|---|---|---|---|
| **SPLP** | Zn | *0,003* | 0,063 | - | - | 0,067 | 5 | 0,95 |
| | Ni | *0,001* | 0,0032 | - | - | 0,26 | 0,07 | 0,05 |
| | Cu | *0,001* | 0,0018 | - | - | 0,0073 | 1 | 0,24 |
| | Pb | *0,001* | 0,0020 | - | - | 0,034 | 0,01 | 0,20 |
| **TCLP** | Ni | 0,021 | 0,058 | 0,010 | 0,037 | 0,26 | 0,07 | 0,82 |
| | **Cu** | 0,0015 | 0,011 | 0,001 | 0,007 | 0,0073 | 1 | **1,5** |
| | **Pb** | 0,015 | 0,025 | 0,014 | 0,029 | 0,034 | 0,01 | **2,5** |

[1] : les valeurs en italique correspondent à la limite de détection du paramètre. Ceci signifie que le paramètre était non détecté dans plus de la moitié des échantillons analysés
[2] : concentration moyenne (MCM)/critère le plus restrictif

Les essais SPLP donnent généralement des résultats plus représentatifs des processus hydrochimiques susceptibles de se produire dans un empilement tel que les aires d'entreposage projetées, par rapport aux résultats des essais TCLP. En effet, l'essai TCLP est réalisé en milieu acétique, ce qui n'est pas représentatif des conditions qui prévalent dans un empilement de stériles ou de minerai. Dans une optique d'utiliser une approche de modélisation prudente, les résultats des essais TCLP ont néanmoins été analysés et interprétés.

L'analyse des essais SPLP a révélé qu'aucun paramètre ne présente une moyenne des concentrations excédant le critère le plus restrictif (un ratio $M_C/C_R$ supérieur à 1). Le ratio $M_C/C_R$ maximal évalué est de 0,95, et il correspond au zinc. À titre indicatif, les données propres au nickel, au cuivre et au plomb sont également rapportées, dans le tableau 6. Sur la base des résultats des essais SPLP, il apparaît que le lixiviat qui pourra percoler des aires d'entreposage vers les formations géologiques sous-jacentes respectera les critères de qualité de l'eau souterraine les plus restrictifs.

Les ratios calculés à partir des résultats des essais TCLP montrent que le cuivre et le plomb présentent des ratios $M_C/C_R$ supérieurs à 1. Ces contaminants ont donc été retenus pour l'analyse de sensibilité. Deux scénarios d'analyse de sensibilité ont donc été développés : un pour la simulation de la migration du cuivre (scénario no 10), et un autre pour le plomb (scénario no 11).

Les concentrations sources considérées pour le scénario d'analyse de sensibilité du modèle numérique sont présentés au tableau 7. Une concentration source égale aux concentrations moyennes en plomb et en cuivre obtenues lors des essais TCLP a été imposée dans l'ensemble de la masse de la halde à stériles de l'Extension, à son stade ultime de développement. Cette concentration représente ainsi une masse finie de contaminants disponibles à la migration. Une concentration initiale égale à zéro a été définie pour le reste des unités du modèle. Les concentrations simulées n'incluent donc pas les teneurs de fond, soit celles pouvant déjà être présentes dans l'environnement. Ainsi, la concentration « réelle » correspondrait à la somme de la valeur simulée et de la teneur de fond. Toutefois, les teneurs de fond pour les contaminants d'intérêt sont généralement sous les limites de détection du laboratoire et leur contribution n'est donc pas jugée significative. Pour le parc à résidus, intégré au modèle numérique, les concentrations sources ont été définies sur la moyenne des résultats d'analyses obtenue à partir d'échantillons d'eau interstitielle prélevés à cinq reprises entre septembre 2013 et mai 2015 à partir de quatre puits d'observation.

**Tableau 7 : Concentrations sources en contaminants considérées pour la simulation**

| Paramètres | Concentration source parc à résidus (mg/L) | Concentration source halde à stériles (mg/L) |
|---|---|---|
| Plomb | 0,02 | 0,025 |
| Cuivre | 451 | 0,011 |

## 5.2 Résultats

Les figures 1 et 2, ci-dessous montrent respectivement l'évolution des concentrations simulées en cuivre et en plomb dans l'eau souterraine, en fonction du temps, en considérant le parc à résidus et la halde à stériles de l'Extension comme source de contamination des eaux souterraines. Il est observé sur ces figures que les concentrations en plomb et en cuivre à la limite aval de la halde à stériles seraient faibles et n'excèderaient pas les critères RES et *Eau de consommation* du MELCC.

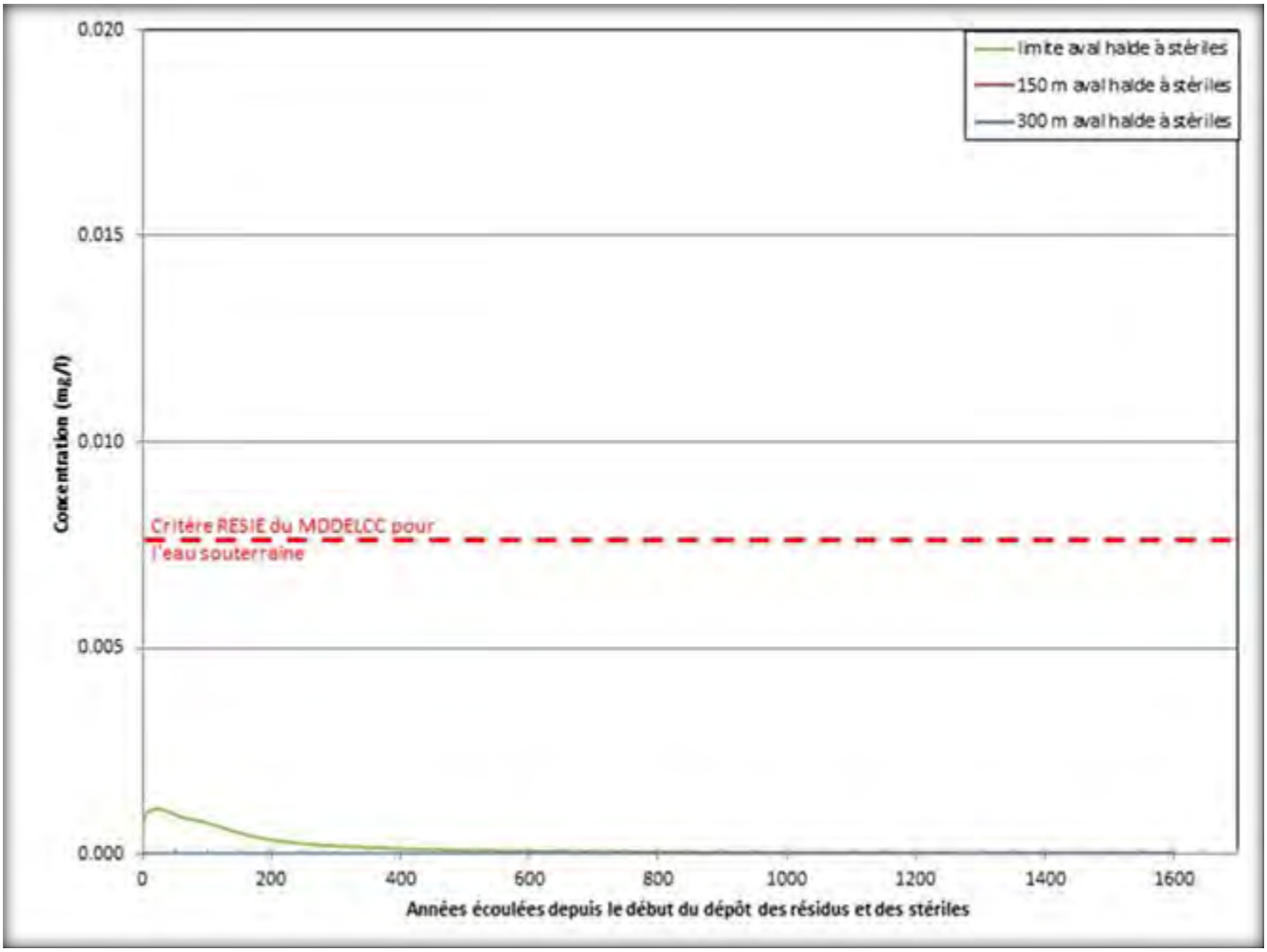


**Figure 1 : Variation temporelle des concentrations en cuivre dans l'eau souterraine en prenant en compte la halde à stériles de l'extension comme source de contamination des eaux souterraines – scénario no 10**

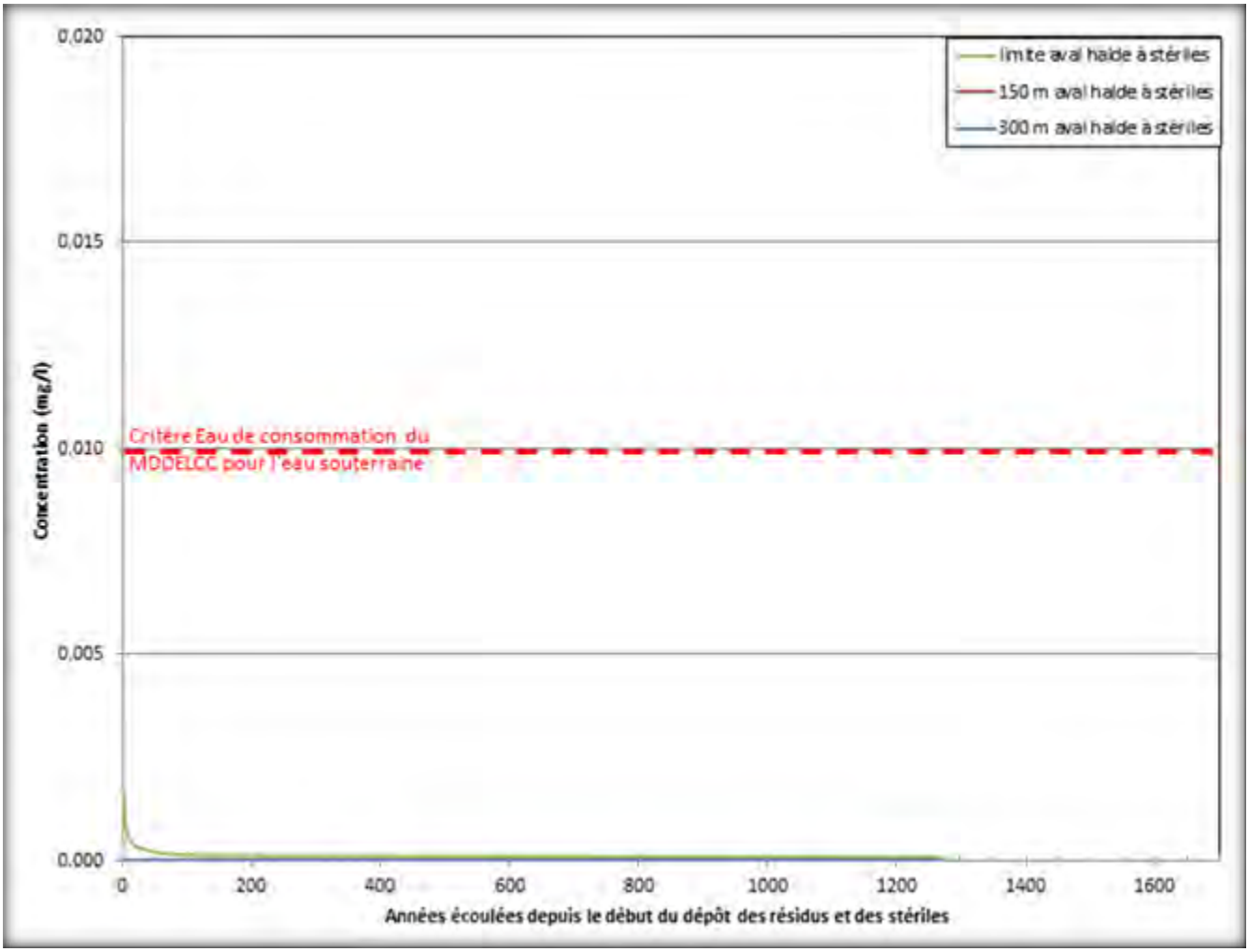


**Figure 2 : Variation temporelle des concentrations en plomb dans l'eau souterraine en prenant en compte la halde à stériles de l'extension comme source de contamination des eaux souterraines – scénario no 11**

Les résultats de la modélisation indiquent que le concept des aménagements du projet Odyssey présentement envisagé permettra de respecter les objectifs de protection des eaux souterraines de la Directive 019. Par ailleurs, le modèle numérique construit pour l'Extension prédit que les stériles ne causeront aucune dégradation significative de la qualité de l'eau souterraine de l'aquifère de roc directement à l'aval de la halde à stériles. En considérant que les aires d'entreposage du projet Odyssey sont temporaires et de plus petites envergures que la halde à stériles de l'Extension, l'utilisation du modèle numérique de l'Extension s'avère une approche prudente pour évaluer les impacts des aires d'entreposage du projet Odyssey. Ainsi, étant donné l'approche prudente de modélisation, aucun impact aux récepteurs d'eau souterraine n'est appréhendé pour les aménagements du projet Odyssey.

# 6.0 CONCLUSIONS ET RECOMMANDATIONS

Les travaux réalisés dans le cadre de cette étude hydrogéologique visaient à établir l'état de référence de la qualité de l'eau souterraine dans le secteur du projet Odyssey ainsi qu'à prédire le taux de percolation sous les aménagements de surface et les impacts potentiels de ces aménagements sur la qualité de l'eau souterraine. Les informations acquises dans le cadre du développement et de l'exploitation de MCM ont été utilisées pour les besoins de cette étude.

Premièrement, l'étude a permis d'évaluer le contexte hydrogéologique du secteur Odyssey, notamment :

- les principales unités hydrostratigraphiques du secteur, où l'argile est généralement présente et de bonne épaisseur;
- l'écoulement de l'eau souterraine dans le roc, qui est généralement vers la rivière Malartic au nord;
- la qualité de l'eau souterraine dans ce secteur, évaluée lors de campagnes d'échantillonnage de 2011 à 2019.

Deuxièmement, le débit de percolation à travers les dépôts meubles dans le secteur Odyssey a été évalué. Les résultats indiquent une valeur de 0,2 L/m²/j sous les aménagements, soit inférieure au débit limite de 3,3 L/m²/j défini dans la Directive 019 pour les mesures d'étanchéité de Niveau A. Ainsi, sur la base d'une estimation prudente, les matériaux constituant le substrat des aménagements projetés possèdent une perméabilité suffisamment faible pour minimiser le flux d'eau pouvant percoler jusqu'à l'aquifère sous-jacent.

Finalement, une étude de modélisation a été réalisée pour évaluer si le concept des aménagements du projet Odyssey permettra de respecter les objectifs de protection des eaux souterraines de la Directive 019. De fait, le modèle numérique construit pour l'Extension prédit que les stériles ne causeront aucune dégradation significative de la qualité de l'eau souterraine de l'aquifère de roc. L'approche de modélisation étant prudente, aucun impact aux récepteurs d'eau souterraine n'est appréhendé pour les aménagements du projet Odyssey.

Par ailleurs, il est recommandé de conserver, si possible, les puits qui sont situés à l'aval hydraulique des futurs aménagements miniers, notamment les puits PZ-18-60R, PZ-18-61R et PZ-18-62R, et d'en ajouter trois autres (PZ-20-64R,PZ-20-65D et PZ-20-66D) directement en aval hydraulique des nouveaux emplacements des aires d'entreposage et des réservoirs illustrés sur la figure B. Les puits existants, qui sont aménagés à proximité des futurs aménagements miniers, ont été intégrés au programme de surveillance de la qualité de l'eau souterraine de MCM en 2018 et permettent d'établir un historique de la qualité de l'eau avant le début de l'exploitation du projet Odyssey. Il est d'ailleurs recommandé d'ajouter l'analyse du phosphore total au puits BH-11-09 lors des prochaines campagnes de ce programme de surveillance.

# 7.0 LIMITATIONS

Cette étude et les travaux s'y rattachant sont soumis aux limitations générales associées à une expertise technique, présentées à l'annexe E.

# 8.0 SIGNATURES

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*Chargée de projet*

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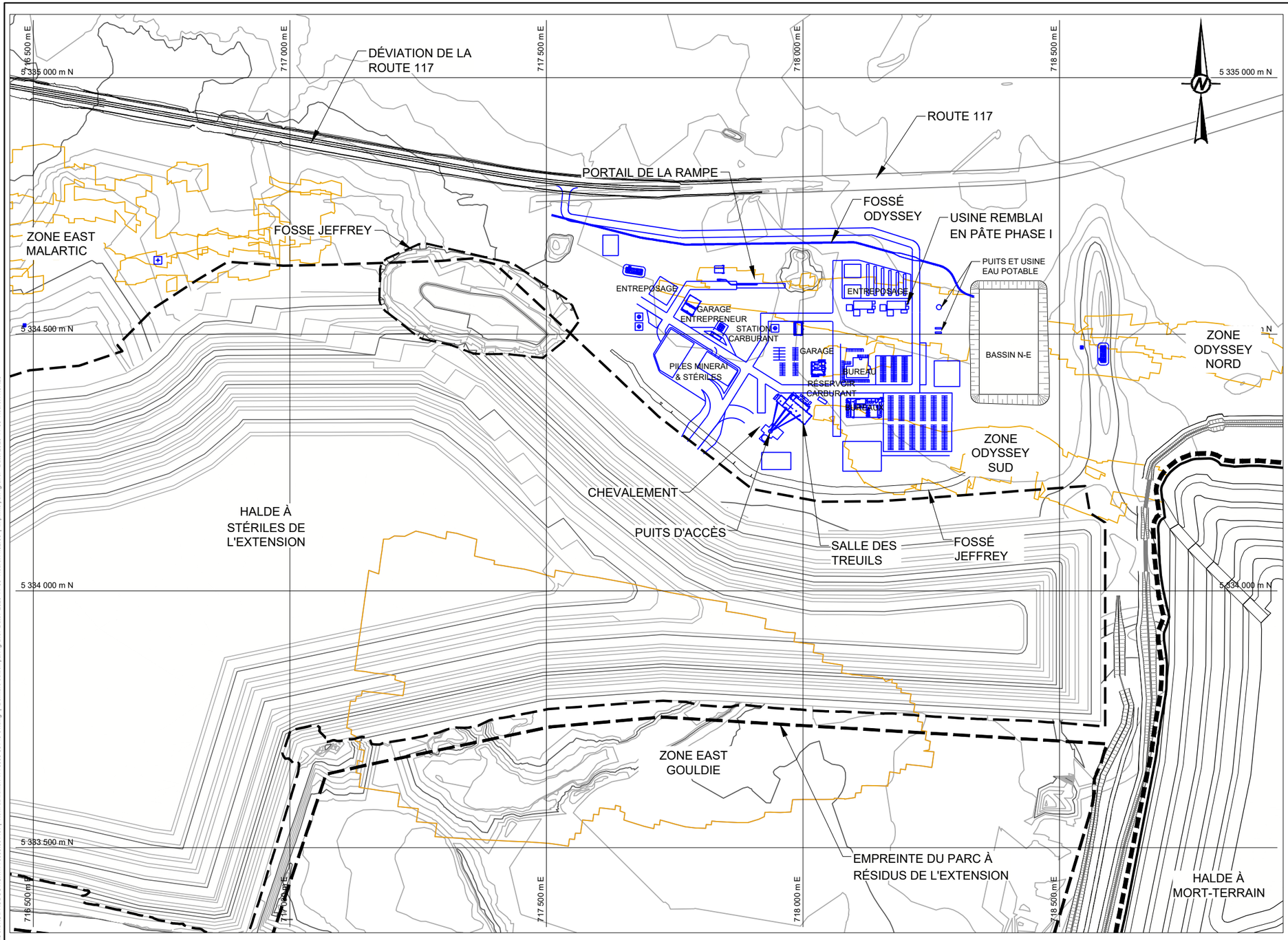


**LÉGENDE**

- COURBES TOPOGRAPHIQUES
- EMPREINTE DES INFRASTRUCTURES PROJETÉES DE L'EXTENSION DE LA MINE CANADIAN MALARTIC
- GISEMENT ODYSSEY (ZONES EAST MALARTIC, ODYSSEY NORD ET SUD ET EAST GOULDIE)
- INFRASTRUCTURES DE SURFACE PROJETÉES DU PROJET ODYSSEY

**NOTE**

- SYSTÈME DE COORDONNÉES: UTM, NAD 83, ZONE 17

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2. LES EMPREINTES DES HALDES DE L'EXTENSION PROVIENNENT DE MCM (JUILLET 2017).
3. LES INFRASTRUCTURES DU PROJET ODYSSEY PROVIENNENT DU DESSIN "Site Odyssey_16oct.dwg" FOURNI PAR MCM.
4. LE GISEMENT ODYSSEY PROVIENT DES DESSINS:
   - Export_DetailledPEA20ktp_STOPES_ODN_07-2020.dxf;
   - Export_DetailledPEA20ktp_STOPES_EM_0-600_07-2020.dxf;
   - Export_DetailledPEA20ktp_STOPES_EM_600-+07-2020.dxf;
   - Export_DetailledPEA20ktp_STOPES_ODS_07-2020.dxf;

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| APPROUVÉ | P. Groleau |

PROJET
ÉTAT INITIAL DE LA QUALITÉ DES EAUX SOUTERRAINES, TAUX DE PERCOLATION ET ÉTUDE DE MODÉLISATION POUR LE PROJET ODYSSEY

TITRE
**VUE D'ENSEMBLE DES PRINCIPALES INFRASTRUCTURES DE SURFACE DU PROJET ODYSSEY**

| N° PROJET | PHASE | RÉV. | PLAN |
|---|---|---|---|
| 1776338 | 30140 | 5 | A |

SI LA MESURE NE CORRESPOND PAS À L'ÉCHELLE, LA TAILLE DE LA FEUILLE A ÉTÉ MODIFIÉE. ANSI B

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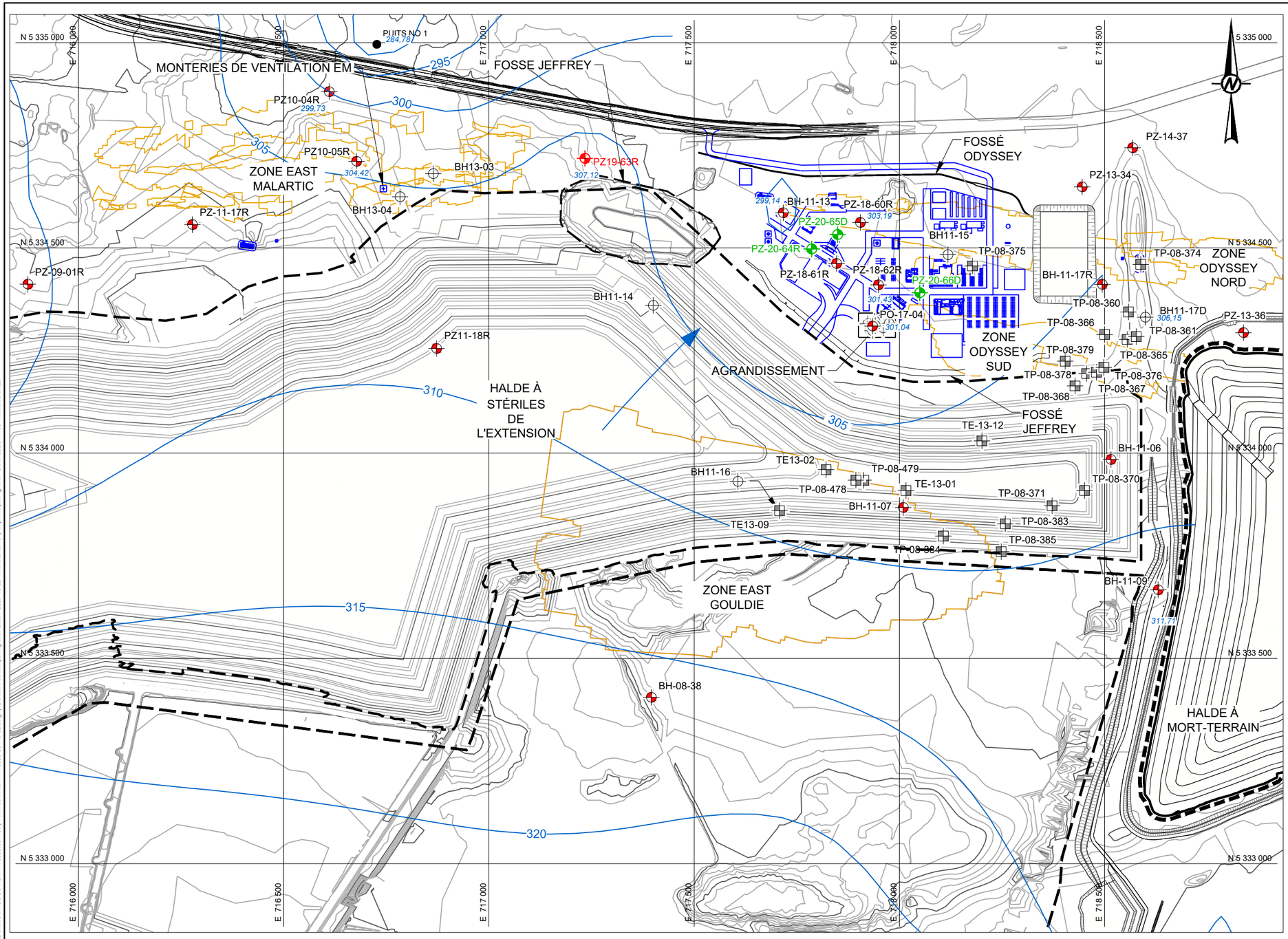


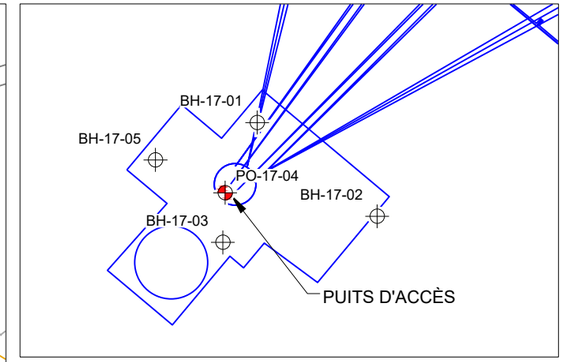


AGRANDISSEMENT

ÉCHELLE 1 : 1000

**LÉGENDE**

- PUITS D'OBSERVATION PROPOSÉ
- PUITS D'OBSERVATION (2019)
- PUITS D'OBSERVATION
- FORAGE
- TRANCHÉE D'EXPLORATION
- COURBES TOPOGRAPHIQUES
- EMPREINTE DES INFRASTRUCTURES PROJETÉES DE L'EXTENSION DE LA MINE CANADIAN MALARTIC
- GISEMENT ODYSSEY (ZONES EAST MALARTIC, ODYSSEY NORD ET SUD ET EAST GOULDIE)
- INFRASTRUCTURES DE SURFACE PROJETÉES DU PROJET ODYSSEY
- 340 — COURBE ISOPIÈZE INFÉRÉE (m)
- DIRECTION D'ÉCOULEMENT DE L'EAU SOUTERRAINE INFÉRÉE
- 301,04 — ÉLÉVATION DU NIVEAU D'EAU SOUTERRAINE (m) EN OCTOBRE 2019

**NOTE**

- SYSTÈME DE COORDONNÉES: UTM, NAD 83, ZONE 17

**RÉFÉRENCES**

1. L'EMPREINTE DE LA FOSSE JEFFREY PROVIENT DE MCM (AVRIL 2017).
2. LES EMPREINTES DES HALDES DE L'EXTENSION PROVIENNENT DE MCM (JUILLET 2017).
3. LES INFRASTRUCTURES DU PROJET ODYSSEY PROVIENNENT DU DESSIN "Site Odyssey_16oct.dwg" FOURNI PAR MCM.
4. LE GISEMENT ODYSSEY PROVIENT DES DESSINS:
   - Export_DetailledPEA20ktp_STOPES_ODN_07-2020.dxf;
   - Export_DetailledPEA20ktp_STOPES_EM_0-600_07-2020.dxf;
   - Export_DetailledPEA20ktp_STOPES_EM_600-+07-2020.dxf;
   - Export_DetailledPEA20ktp_STOPES_ODS_07-2020.dxf;

   FOURNIS PAR MCM (AOUT 2020)

0 — 250 — 500

1:10 000 — MÈTRES

CONFIDENTIEL

CLIENT
MINE CANADIAN MALARTIC

CONSULTANT
GOLDER

| | |
|---|---|
| AAAA-MM-JJ | 2020-08-20 |
| DESSINÉ | A. Touchette |
| PROJETÉ | J. Lallier |
| RÉVISÉ | J. Lallier |
| APPROUVÉ | P. Groleau |

PROJET
ÉTAT INITIAL DE LA QUALITÉ DES EAUX SOUTERRAINES, TAUX DE PERCOLATION ET ÉTUDE DE MODÉLISATION POUR LE PROJET ODYSSEY

TITRE
**LOCALISATION DES SONDAGES ET PUITS D'OBSERVATION**

| N° PROJET | PHASE | RÉV. | PLAN |
|---|---|---|---|
| 1776338 | 30140 | 5 | B |

SI LA MESURE NE CORRESPOND PAS À L'ÉCHELLE, LA TAILLE DE LA FEUILLE A ÉTÉ MODIFIÉE | ANSI B

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**ANNEXE A**

# Journaux de sondage et d’aménagement de puits d’observation

# TERMINOLOGIE RELIÉE À LA DESCRIPTION GÉOTECHNIQUE DU ROC ET DE SA LITHOLOGIE

## ÉTAT D'ALTÉRATION

**Frais (W1):** aucun signe visible d'altération

**Légèrement altéré (W2):** altération pénétrante se développant à la surface des discontinuités ouvertes avec seulement une faible altération du roc même.

**Modérément altéré (W3):** l'altération s'étend dans la masse du roc mais celui-ci est n'est pas friable.

**Fortement altéré (W4):** l'altération s'étend dans toute la masse du roc et celui-ci est partiellement friable.

**Complètement altéré (W5):** le roc est complètement décomposé et possède une condition friable mais sa texture et sa structure sont préservées.

**Sol résiduel (W6) :** le roc est complètement décomposé. La structure et la texture de la masse rocheuse sont détruites.

## ÉPAISSEUR DES LITS

| Terme | Epaisseur des lits |
|---|---|
| Litage très épais | Plus de 2 m |
| Litage épais | 0,6 m à 2 m |
| Litage moyen | 0,2 m à 0,6 m |
| Litage mince | 60 mm à 0,2 m |
| Litage très mince | 20 mm à 60 mm |
| Laminé | 6 mm à 20 mm |
| Finement laminé | Moins de 6 mm |

## JOINT OU ESPACEMENT DE LA FOLIATION

| Terme | Espacement |
|---|---|
| Très large | Plus de 3 m |
| Large | 1 à 3 m |
| Modérément rapproché | 0,3 à 1 m |
| Rapproché | 50 à 300 mm |
| Très rapproché | Moins de 50 mm |

## GROSSEUR DES GRAINS

| Terme | Taille |
|---|---|
| Très gros grains | Plus de 60 mm |
| Gros grains | 2 à 60 mm |
| Grains moyens | 60 microns à 2 mm |
| Grains fins | 2 à 60 microns |
| Grains très fins | Moins de 2 microns |

## RÉSISTANCE DU ROC

| Terme | Résistance en compression uniaxiale |
|---|---|
| Extrêmement faible (R0) | 0,25 à 1 MPa |
| Très faible (R1) | 1 à 5 MPa |
| Faible (R2) | 5 à 25 MPa |
| Moyenne (R3) | 25 à 50 MPa |
| Forte (R4) | 50 à 100 MPa |
| Très forte (R5) | 100 à 250 MPa |
| Extrêmement forte (R6) | Plus de 250 MPa |

## CONDITION DES CAROTTES

### Récupération totale de la carotte (TCR)

Le pourcentage de roc récupéré, sans égard à la longueur ou à la qualité des morceaux. Ce pourcentage se mesure relativement à la course totale forée.

### Récupération solide de la carotte (ASCR)

Le pourcentage de carotte de forage solide récupérée, mesuré dans l'axe de la carotte mais sans égard à la longueur des morceaux. Ce pourcentage se mesure relativement à la course totale forée.

### Indice de désignation de la qualité du roc (RQD)

Le pourcentage de carotte de forage solide récupérée dont les morceaux ont plus de 100 mm de longueur. Ce pourcentage se mesure relativement à la course totale forée et ne tient pas compte des fractures d'origine mécanique.

| Terme | RQD |
|---|---|
| Très mauvais | 0 à 25% |
| Mauvais | 25 à 50% |
| Moyen | 50 à 75% |
| Bon | 75 à 90% |
| Excellent | 90 à 100% |

## DONNÉES SUR LES DISCONTINUITÉS

### Indice de fracturation

Le nombre de discontinuités naturelles (séparations physiques) par mètre de carotte de roc.

### Pendage par rapport à l'axe de la carotte

L'angle de la discontinuité relativement à l'axe longitudinal de la carotte. Dans un forage vertical, une discontinuité ayant un angle de 90$^{o}$ est horizontale.

### Description et notes

Une description abrégée des discontinuités, soit celles d'origine naturelle telles les fractures, les plans de litage et de foliation ou les cassures d'origine mécanique causées par le forage, telles l'éclatement du roc et la séparation mécanique des surfaces de foliation ou de litage. Des informations additionnelles concernant la nature des surfaces fracturées et le remplissage des joints sont également fournies.

**Abréviations**

JN Joint
FLT Faille
SH Cisaillement
VN Veine
FR Fracture
BD Litage
CO Contact
AXJ Joint axial
KV Vide karstique
MB Joint mécanique

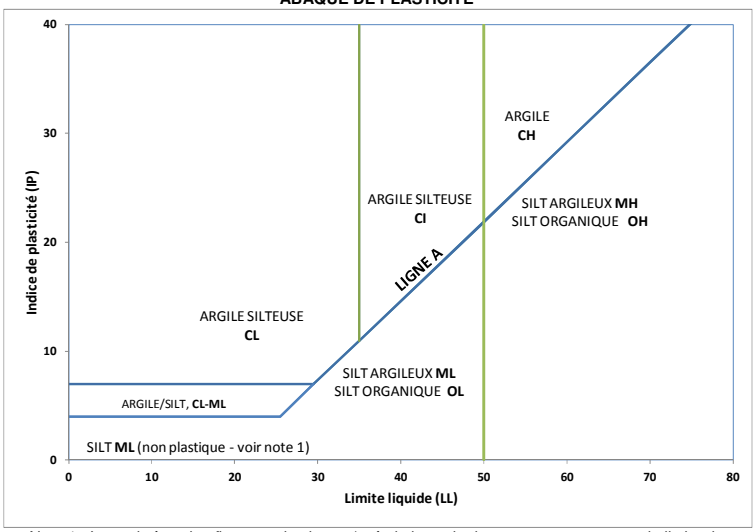
PL Plan
CU Incurvé
UN Ondulé
IR Irrégulier
PO Poli
SM Adouci
SR Légèrement rugueux
RO Rugueux
VR Très rugueux

# MÉTHODE DE CLASSIFICATION DES SOLS

| Organique ou Inorganique | Groupe de sol | Type de Sol | | Granulométrie ou plasticité | $Cu = \frac{D_{60}}{D_{10}}$ | $Cc = \frac{D_{30}^2}{D_{10} x D_{60}}$ | Contenu organique | Symbole du groupe SUCS | Nom du groupe |
|---|---|---|---|---|---|---|---|---|---|
| INORGANIQUE (Contenu organique <30% en masse) | SOLS À GRAINS GROSSIERS (>50% en masse est plus gros que 0,075 mm) | GRAVIERS (> 50 % en masse des grains grossiers plus gros que 4,75 mm) | Graviers contenant < 12 % de fines (masse) | Mal étalé | <4 | ≤1 ou ≥3 | <30% | GP | GRAVIER |
| | | | | Bien étalé | ≥4 | 1 à 3 | | GW | GRAVIER |
| | | | Graviers contenant > 12 % de fines (masse) | En-dessous de la ligne A | n/a | | | GM | GRAVIER SILTEUX |
| | | | | Au-dessus de la ligne A | n/a | | | GC | GRAVIER ARGILEUX |
| | | SABLES (> 50 % en masse des grains grossiers plus petits que 4,75 mm) | Sables contenant< 12 % de fines (en masse) | Mal étalé | <6 | ≤1 ou ≥3 | | SP | SABLE |
| | | | | Bien étalé | ≥6 | 1 à 3 | | SW | SABLE |
| | | | Sables contenant > 12 % de fines (en masse) | En-dessous de la ligne A | n/a | | | SM | SABLE SILTEUX |
| | | | | Au-dessus de la ligne A | n/a | | | SC | SABLE ARGILEUX |

| Organique ou inorganique | Groupe de sol | Type de sol | Essai de laboratoire | Indicateurs de terrain | | | | Contenu organique | Symbole du groupe SUCS | Nom du groupe |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Dilatance | Résistance à sec | Diamètre du cylindre | Résistance (cylindre =3 mm) | | | |
| INORGANIQUE (Teneur en matière organique < 30 % en masse) | SOLS À GRAINS FINS (dont > 50 % en masse est composé de grains plus petits que 0,075 mm) | SILTS (En-dessous de la ligne A) | Limite de liquidité< 50 | Rapide | Aucune | > 6 mm | s/o (impossible de rouler un cylindre=3 mm) | < 5 % | ML | SILT |
| | | | | Lente | Aucune à faible | 3 mm à 6 mm | Absence à faible | < 5 % | ML | SILT ARGILEUX |
| | | | | Lente à très lente | Faible à moyenne | 3 mm à 6 mm | Faible | 5 % à 30 % | OL | SILT ORGANIQUE |
| | | | Limite de liquidité > 50 | Lente à très lente | Faible à moyenne | 3 mm à 6 mm | Faible à moyenne | < 5 % | MH | SILT ARGILEUX |
| | | | | Aucune | Moyenne à élevée | 1 mm à 3 mm | Moyenne à élevée | 5 % à 30 % | OH | SILT ORGANIQUE |
| | | ARGILES (Au-dessus de la ligne A) | Limite de liquidité < 35 | Aucune | Faible à moyenne | ~ 3 mm | Faible à moyenne | 0 % à 30 % | CL | ARGILE SILTEUSE |
| | | | Limite de liquidité : 35 à 50 | Aucune | Moyenne à élevée | 1 mm à 3 mm | Moyenne | | CI | ARGILE SILTEUSE |
| | | | Limite de liquidité > 50 | Aucune | Élevée | <1 mm | Élevée | | CH | ARGILE |
| SOLS À FORTE COMPOSANTE ORGANIQUE (Contenu en matières organiques > 30 % en masse) | | Mélanges de tourbe et de sols minéraux | | | | | | 30 % à 75 % | PT | TOURBE SILTEUSE ou SABLEUSE |
| | | Prédominance de tourbe; peut contenir un peu de sol minéral, tourbe fibreuse ou amorphe | | | | | | 75 % à 100 % | | TOURBE |

**ABAQUE DE PLASTICITÉ**




Note 1 : Les sols à grains fins non plastiques (c.-à-d., les sols dont on ne peut mesurer la limite de plasticité LP) sont appelés SILT.

Symbole composé — Un symbole composé est formé de deux symboles séparés par un trait d'union (p.ex. GP-GM, SW-SC, CL-ML). Ce type de symbole est employé lorsque le sol contient entre 5 et 12 % de particules fines (c.-à-d., se situant entre le sable « propre » et « sale ») ou lorsque les valeurs de la limite de liquidité et de l'indice de plasticité se situent dans la région dédiée au CL-ML dans le graphique de plasticité.

Symbole de limite — Un symbole de limite est formé de deux symboles séparés par une barre oblique (p.ex. CL/CI, GM/SM, CL/ML). Il convient d'utiliser ce symbole lorsque le sol a été identifié comme ayant des propriétés qui se situent dans la transition entre des matériaux similaires.

Note : Toutes les proportions sont exprimées sous forme de masse.

# SYMBOLES ET TERMES UTILISÉS SUR LES JOURNAUX DE FORAGE ET RAPPORTS DE TRANCHÉE EXPLORATOIRE

### CLASSES GRANULOMÉTRIQUES

| Classes | Sous-classes | Millimètres | Pouces (tamis standard US) |
|---|---|---|---|
| BLOC | - | >300 | >12 |
| CAILLOU | - | 75 à 300 | 3 à 12 |
| GRAVIER | grossier<br>fin | 19 à 75<br>4,75 à 19 | 0,75 à 3<br>(4) à 0,75 |
| SABLE | grossier<br>moyen<br>fin | 2,0 à 4,75<br>0,425 à 2,0<br>0,075 à 0,425 | (10) à (4)<br>(40) à (10)<br>(200) à (40) |
| SILT/ARGILE | classé selon la plasticité | <0,075 | < (200) |

### QUALIFICATIFS DES COMPOSANTES SECONDAIRES ET MINEURES

| Pourcentage en masse | Qualificatif |
|---|---|
| ≤ 5 | trace |
| 5 à 12 | un peu de |
| 12 à 35 | Nom de sol primaire avec l'adjectif "graveleux, sableux, SILTEUX ou ARGILEUX" |
| >35 | 'et' est utilisé pour combiner les composantes majeures (*i.e.,* SABLE et GRAVIER, SABLE et ARGILE) |

### RÉSISTANCE À LA PÉNÉTRATION

**Résistance à la pénétration standard, N:**

Le nombre de coups d'un marteau de 63,5 kg, tombant d'une hauteur de 760 mm, nécessaire pour enfoncer un échantillonneur de 50 mm de diamètre sur une longueur de 300 mm.

**PTI:** Échantillonneur avancé par le poids de l'échantillonneur et des tiges
**MAN:** Échantillonneur avancé par pression manuelle
**PM:** Échantillonneur avancé par le poids statique du marteau
**PH:** Échantillonneur avancé par pression hydraulique

**Essai au piézocône (CPT)**

Un pénétromètre à pointe conique de 60° et de 10 cm$^2$ de surface, poussé dans le sol à une vitesse de 2 cm/s. Des capteurs électroniques mesurent la résistance en pointe ($q_t$), la pression interstitielle (u) et la friction latérale à des intervalles de pénétration de 25 mm.

**Résistance à la pénétration au cône dynamique, $N_d$:**

Le nombre de coups d'un marteau de 63,5 kg, tombant d'une hauteur de 760 mm, nécessaire pour enfoncer sans tubage et sur une longueur de 300 mm un cône de 60°et de 50 mm de diamètre, attaché à des tiges de forage de calibre "A".

### TYPES D'ÉCHANTILLON

| | |
|---|---|
| EB | Échantillon en bloc |
| ED | Échantillon délavé |
| EF | Échantillon de fragments |
| EP | Échantillonneur à piston |
| ET | Échantillon à la tarière |
| CF | Cuillère fendue |
| CR | Carotte de roc |
| CS | Carotte de sol (Géoprobe) |
| TS | Tube Shelby |

### ANALYSES

| | |
|---|---|
| w | Teneur en eau |
| LP | Limite plastique |
| LL | Limite liquide |
| C | Consolidation oedométrique |
| AC | Analyse chimique (se référer au texte) |
| $D_R$ | Densité relative des grains solides |
| M | Granulométrie par tamisage mécanique |
| MH | Granulométrie combinée par tamisage et à l'aide d'un hydromètre (H) |
| MO | Teneur en matière organique |
| $SO_4$ | Concentration en sulfates solubles |
| $\gamma$ | Poids volumique |

### SIGNES VISUELS DE CONTAMINATION

| | |
|---|---|
| A | Absent |
| F | Faible |
| M | Modéré |
| P | Prononcé |

Si une odeur a été consignée pour les échantillons, il s'agit de celle qui a été perçue de façon fortuite au cours des travaux. Les échantillons de sol n'ont pas été sentis de façon délibérée.

### SOLS PULVÉRULENTS (DÉPOURVUS DE COHÉSION)

**Compacité**

| Terme | 'N' (coups/0,3m) [1] [2] |
|---|---|
| Très lâche | 0 à 4 |
| Lâche | 4 à 10 |
| Compact | 10 à 30 |
| Dense | 30 à 50 |
| Très Dense | >50 |

1. Valeurs 'N' conformes à la norme ASTM D 1586 mais non corrigées pour les effets de la contrainte verticale ou le transfert d'énergie.
2. La définition des descriptions de compacité est basée sur les intervalles de valeurs 'N' établies par Terzaghi et Peck (1967) et correspond à des valeurs moyennes typiques $N_{60}$.

**Condition d'humidité au chantier**

| Terme | Description |
|---|---|
| Sec | Le sol s'écoule librement entre les doigts. |
| Humide | Le sol est plus foncé qu'à l'état sec et peut sembler frais au toucher. |
| Saturé | Semblable à humide, mais avec présence d'eau libre lorsque manipulé. |

### SOLS COHÉRENTS

**Consistence**

| Terme | Résistance au cisaillement non drainé (kPa) | 'N' (coups/0,3m) |
|---|---|---|
| Très mou | <12 | 0 à 2 |
| Mou | 12 à 25 | 2 à 4 |
| Ferme | 25 à 50 | 4 à 8 |
| Raide | 50 à 100 | 8 à 15 |
| Très raide | 100 à 200 | 15 à 30 |
| Dur | >200 | >30 |

1. Valeurs 'N' conformes à la norme ASTM D 1586 mais non corrigées pour les effets de la contrainte verticale ou le transfert d'énergie.

**Teneur en eau**

| Terme | Description |
|---|---|
| w < LP | Le matériau est estimé être plus sec que sa limite plastique. |
| w ~ LP | Le matériau est estimé être près de sa limite plastique. |
| w > LP | Le matériau est estimé être plus humide que sa limite plastique. |

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**Golder Associés**

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# JOURNAL DE SONDAGE BH-11-06

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2011-10-09



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 718515 E, 5333985 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 311.36 | | Surface | | | | | | Élévation du CPV: 312.09 m |
| 0 | FORAGE PAR ROTATION TUBAGE NW (88.9 mm) | 0.00 | | REMBLAI: SILT, gris, un peu de sable, traces de gravier et d'argile, présence de cailloux, dense. | | | | | | |
| 1 | | | | | 1 | CF | 77 | 40 | | Sable de silice |
| | | 309.84 / 1.52 | | Devenant compact. | | | | | | Élévation: 310.50 m (2011-11-29) |
| 2 | | | | | 2 | CF | 46 | 17 | | Bentonite |
| | | 309.13 / 2.23 | | SILT, brun-gris, un peu de sable, traces d'argile, compact. | | | | | M | |
| 3 | | | | | 3 | CF | 48 | 11 | H | |
| | | 308.24 / 3.12 | | SOCLE ROCHEUX: GRAUWACKE, gris foncé, frais, très fracturé, veinules de quartz de 2 mm approx., roc de très pauvre qualité. | 4 | CF | 0 | R | | |
| 4 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | | | | 5 | CR | 84 | 16 | | Sable de silice |
| | | 306.97 / 4.39 | | Devenant de pauvre qualité. | | | | | | |
| 5 | | | | | 6 | CR | 67 | 38 | | Crépine CPV Dia.: 38mm Ouv.: 0.51mm Longueur: 1.52m |
| | | 305.96 / 5.40 | | Veine de quartz de 2 cm d'épaisseur approx. | | | | | | |
| 6 | | | | | 7 | CR | 55 | 31 | | |
| | | 305.16 / 6.20 | | FIN DU FORAGE. | | | | | | |
| 7 | | | | | | | | | | |

OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇; TENEUR EN EAU (%) Wp Wn Wl; RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕; échelle 0 20 40 60 80 100

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# JOURNAL DE SONDAGE BH-11-07

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2011-10-07/08



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 718009 E, 5333868 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE STRATI-GRAPHIE | STRATIGRAPHIE DESCRIPTION | ÉCHANTILLONS NUMÉRO | ÉCHANTILLONS TYPE | ÉCHANTILLONS % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN WATER (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. + Rem. ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 314.49 | | Surface | | | | | | | Élévation du CPV: 315.51 m |
| 0 | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | 0.00 | | REMBLAI: SABLE, brun, un peu de gravier. | | | | | | | Sable de silice |
| | | 313.88 / 0.61 | | SOL NATUREL: SILT, brun, un peu d'argile, traces de sable, très lâche. | 1 | CF | 66 | 1 | | | |
| 1 | | 313.39 / 1.10 | | SILT argileux, un peu de sable, raide à très raide. | 2 | CF | 84 | 7 | | | |
| 2 | | 312.51 / 1.98 | | SABLE fin, brun, traces de silt, lâche à compact. | 3 | CF | 77 | 10 | | | Bentonite |
| | | 312.06 / 2.43 | | ARGILE SILTEUSE, gris-beige, ferme à raide. | 4 | CF | 74 | 0 | | | |
| 3 | | 310.98 / 3.51 | | SILT, gris-beige, un peu d'argile, traces de sable, très lâche, non-plastique. Alternance de minces couches d'argile silteuse. | 5 | CF | 44 | 4 | | M H | Élévation: 310.52m (2011-11-30) |
| 4 | | 310.09 / 4.40 | | Devenant avec un peu de sable. | 6 | CF | 48 | 7 | | | |
| 5 | | 309.29 / 5.20 | | SABLE fin silteux, brun, compact, saturé. | 7 | CF | 33 | 10 | | | |
| 6 | | 308.55 / 5.94 | | Devenant lâche. | 8 | CF | 43 | 6 | | M | Sable de silice |
| 7 | | | | | 9 | CF | 36 | 8 | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# JOURNAL DE SONDAGE BH-11-07

**PROJET:** 11-1221-0105 **PAGE** 2 **DE** 4

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE STRATI-GRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | ÉCHANTILLONS TYPE | ÉCHANTILLONS % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | | | Devenant lâche. | | | | | | | |
| | | 305.99 / 8.50 | | Devenant moyen, brun-foncé. | | | | | | | |
| 9 | | | | | 10 | CF | 44 | 7 | | | |
| 10 | | | | | 11 | CF | 41 | 7 | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | 12 | CF | 0 | 7 | | | Sable de silice |
| 13 | | 301.38 / 13.11 | | Devenant compact. | | | | | | | |
| | | | | | 13 | CF | 40 | 18 | | | |
| 14 | | | | | | | | | | | |
| | | 299.86 / 14.63 | | GRAVIER et sable, brun, traces de silt, présence de cailloux et/ou bloc, lâche. | 14 | CF | 13 | 7 | | M | |
| 15 | | | | | | | | | | | |
| 16 | | | | | 15 | CF | 31 | 8 | | | |
| 17 | | | | *SUITE À LA PAGE 3* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# *JOURNAL DE SONDAGE BH-11-07*

**PROJET:** 11-1221-0105 **PAGE** 3 **DE** 4

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATI-GRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 2* | | | | | | | |
| | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | 296.81 / 17.68 | | Devenant compact. | | | | | | | Sable de silice |
| 18 | | | | | 16 | CF | 0 | 10 | | | |
| 19 | | | | | 17 | CF | - | R | | | Crépine CPV Dia.: 38mm Ouv.: 0.51mm Longueur: 3.05m |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | 18 | CF | 11 | 18 | | | |
| 23 | | | | | | | | | | | |
| 24 | | 290.72 / 23.77 | | SABLE et gravier, présence de cailloux et de bloc (TILL). | | | | | | | Bentonite |
| 25 | | | | | 19 | CR | - | - | | | |
| 26 | | | | | | | | | | | |
| | | | | | 20 | CR | 95 | 79 | | | |
| | | | | *SUITE À LA PAGE 4* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# *JOURNAL DE SONDAGE BH-11-07*

**PROJET:** 11-1221-0105 **PAGE** 4 **DE** 4

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE STRATI-GRAPHIE | STRATIGRAPHIE DESCRIPTION | ÉCHANTILLONS NUMÉRO | ÉCHANTILLONS TYPE | ÉCHANTILLONS % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 3* | | | | | | | |
| 27 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | | | SABLE et gravier, présence de cailloux et de bloc (TILL). | | | | | | | |
| 28 | | | | | 20 | CR | 95 | 79 | | | |
| | | 285.84 / 28.65 | | SOCLE ROCHEUX: GRAUWACKE, gris-foncé, de moyenne qualité: Présence des joints subverticaux entre 29,8 et 30,5m. | | | | | | | Bentonite |
| 29 | | | | | | | | | | | |
| 30 | | | | | 21 | CR | 100 | 54 | | | |
| | | 283.96 / 30.53 | | FIN DU FORAGE. | | | | | | | |
| 31 | | | | | | | | | | | |
| 32 | | | | | | | | | | | |
| 33 | | | | | | | | | | | |
| 34 | | | | | | | | | | | |
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ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# JOURNAL DE SONDAGE BH-11-09

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2011-10-10



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 718631 E, 5333667 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE STRATI-GRAPHIE | STRATIGRAPHIE DESCRIPTION | ÉCHANTILLONS NUMÉRO | ÉCHANTILLONS TYPE | ÉCHANTILLONS % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. + Rem. ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Élévation du CPV: 314.69 m |
| 0 | | 313.84 | | Surface | | | | | | | |
| | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | 0.00 | | REMBLAI: SABLE, SILT, GRAVIER ET CAILLOUX, présence de végétation et de racines. | | | | | | | Sable de silice |
| | | 313.24 / 0.60 | | SILT, gris, un peu d'argile, traces de sable, de gravier, présence de racines, très lâche, non-plastique. | 1 | CF | 72 | 2 | | | |
| 1 | | 312.47 / 1.37 | | Devenant lâche. | 2 | CF | 56 | 5 | | | |
| 2 | | | | | 3 | CF | 44 | 6 | | | Bentonite Élévation: 311.92m (2011-11-30) |
| | | 310.99 / 2.85 | | SILT, gris, un peu d'argile, présence de racines, lâche. | 4 | CF | 30 | 5 | | | |
| 3 | | 310.39 / 3.45 | | SABLE fin, gris et brun, un peu de silt, traces d'argile, lâche. | 5 | CF | 69 | 6 | | | Sable de silice |
| | | | | | 6 | CF | 70 | 4 | | | Crépine CPV Dia.: 38mm Ouv.: 0.51mm Longueur: 1.52m |
| 4 | | | | | | | | | | | |
| | | 308.81 / 5.03 | | SOCLE ROCHEUX: GRAUWACKE, gris foncé, à grains fins à moyens, joints subhorizontaux aux 5 à 30 cm, roc de pauvre à bonne qualité. | 7 | CR | 62 | 37 | | | |
| 5 | | | | | | | | | | | |
| | FORAGE PAR ROTATION / CAROTTIER NQ (75.7 mm) | | | | | | | | | | Bentonite |
| 6 | | | | | | | | | | | |
| | | | | | 8 | CR | 78 | 78 | | | |
| 7 | | 306.42 / 7.42 | | FIN DU FORAGE. | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# JOURNAL DE SONDAGE BH-11-13

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2011-10-24



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 717717 E, 5334586 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE / TENEUR EN EAU (%) / RÉSIS. CISAILLEMENT Cu, kPa | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 308.31<br>0.00 | | Surface<br>TERRE VÉGÉTALE. | | | | | | | Élévation du CPV: 309.17 m |
| | | 307.91<br>0.40 | | ARGILE SILTEUSE, grise, traces de sable, ferme, saturée (CH-CI). | | | | | | | Sable de silice<br>Élévation: 307.92m<br>(2011-11-29) |
| 1 | | 307.40<br>0.91 | | Devenant très raide. | 1 | CF | 100 | 0 | | Cu>100 | |
| | | | | | 2 | TS | 100 | - | | Cu>100<br>Cône | |
| 2 | | | | | | | | | | | |
| | | | | | 3 | CF | 100 | 0 | | Cu>100 | |
| 3 | | 305.26<br>3.05 | | Devenant molle. | | | | | | | |
| 4 | | | | | 4 | CF | 100 | 0 | | | Bentonite |
| 5 | | | | | | | | | | | |
| | | | | | 5 | CF | 100 | 0 | | | |
| 6 | | 302.21<br>6.10 | | Devenant ferme. | | | | | | | |
| 7 | | 301.31<br>7.00 | | SILT ARGILEUX, gris, traces de sable, ferme, saturé. | 6 | CF | 54 | 3 | | | |
| | | 300.69 | | | 7 | TS | 100 | - | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇
TENEUR EN EAU (%) Wp — Wn — Wl
RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕
0 20 40 60 80 100

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# JOURNAL DE SONDAGE BH-11-13

**PROJET:** 11-1221-0105 **PAGE** 2 **DE** 2

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa (0 20 40 60 80 100) Nat. : + Rem. : ⊕ | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION — TUBAGE NW (88.9 mm) | 7.62 | | SILT gris, traces de sable, lâche, non-plastique. Alternance de minces horizons d'argile silteuse. | 7 | TS | 100 | - | | | |
| 9 | | | | | 8 | CF | 38 | 4 | | | |
| 10 | | 298.71<br>9.60 | | SABLE et gravier, gris, un peu de silt, traces d'argile, compact, humide (TILL). | 9 | CF | 16 | 20 | | | Bentonite |
| 11 | | | | | | | | | | | |
| 12 | FORAGE PAR ROTATION — CAROTTIER NQ (75.7 mm) | 296.88<br>11.43 | | SOCLE ROCHEUX: GRAUWACKE, gris foncé, pauvre à excellente qualité. | 10 | CR | 96 | 62 | | | Sable de silice |
| 13 | | | | | | | | | | | |
| 14 | | | | | 11 | CR | 100 | 99 | | | Crépine CPV<br>Dia.: 38mm<br>Ouv.: 0.25mm<br>Longueur: 1.52m |
| 15 | | 293.07<br>15.24 | | FIN DU FORAGE. | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# JOURNAL DE SONDAGE BH-11-14

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2011-10-23



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 717400.24E, 5334360.11N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 309,33 | | Surface | | | | | | |
| | | 0.00 | | Sol organique, saturé. | | | | | | |
| 1 | | 308,13 | | | | | | | | |
| | | 1,20<br>308,03<br>1,30 | | SILT ARGILEUX, gris, présence de matière organique (racines), dense. | 1 | CF | 80 | 1 | | |
| 2 | | | | Devenant ARGILE SILTEUSE, grise, traces de sable, ferme (CH). | 2 | TS | 100 | - | | |
| 3 | | 305,83 | | | | | | | | |
| | | 3,50 | | Devenant molle. | | | | | | |
| 4 | | | | | 3 | CF | 100 | 0 | | |
| 5 | | | | | 4 | TS | 100 | - | Oed<br>H<br>Cône | |
| 6 | | | | | | | | | | |
| 7 | | | | | 5 | CF | 100 | 0 | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇

TENEUR EN EAU (%) Wp Wn Wl

RÉSIS. CISAILLEMENT Cu, kPa (Nat. : ⊕, Rem. : ⊕) 0 20 40 60 80 100

44,19
39,49
31,03
17,87
23,04
23,04
21,63

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL_LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

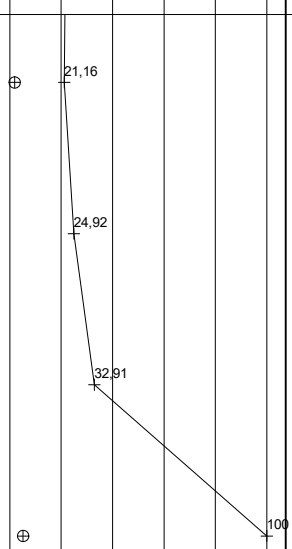
# JOURNAL DE SONDAGE BH-11-14

**PROJET:** 11-1221-0105 **PAGE** 2 **DE** 3

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | NUMÉRO | TYPE | % RÉCUPÉRA. | COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | | | Devenant molle. | | | | | | | |
| 9 | | | | | 6 | CF | 100 | 0 | | | |
| 10 | | 299,33<br>10,00 | | Devenant ferme. | | | | | | | |
| 11 | | 298,33<br>11,00 | | Devenant très raide. | | | | | | | |
| 12 | | 297,75<br>11,58 | | SILT gris, traces d'argile, lâche, non-plastique. | 7 | CF | 69 | 6 | | H | |
| | | | | | 8 | TS | 100 | - | | | |
| 13 | | 296,22<br>13,11 | | SABLE SILTEUX, gris, traces d'argile, traces de gravier, compact, saturé (TILL). | 9 | CF | 39 | 20 | | | |
| 14 | | 294,73<br>14,60 | | SABLE SILTEUX ET GRAVIER, gris, compact, saturé. | | | | | | | |
| 15 | | | | | 10 | CF | 0 | 17 | | | |
| 16 | | | | | 11 | CF | 48 | 17 | | | |
| 17 | | 292,52<br>16,81 | | | 12 | CR | 100 | 77 | | | |
| | | | | | 13 | CR | 100 | 75 | | | |
| | | | | *SUITE À LA PAGE 3* | | | | | | | |

OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇; TENEUR EN EAU (%) Wp, Wn, Wl; RÉSIS. CISAILLEMENT Cu, kPa (Nat. : ⊕, Rem. : ⊕); 0 20 40 60 80 100




ESSAIS DE LABORATOIRE: Cu >100

ÉCHELLE VERTICALE
1 : 50

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

**Golder Associés**

GENERAL_LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

# JOURNAL DE SONDAGE BH-11-14

**PROJET:** 11-1221-0105 **PAGE** 3 **DE** 3

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 2* | | | | | | | |
| 18 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | | | SOCLE ROCHEUX: GRAUWACKE, gris foncé, moyenne à excellente qualité de roc. | 13 | CR | 100 | 75 | | | |
| 19 | | | | | 14 | CR | 97 | 67 | | | |
| 20 | | 289,23 | | | 15 | CR | 100 | 93 | | | |
| | | 20,10 | | FIN DU FORAGE. | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 26 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

# *JOURNAL DE SONDAGE BH-11-15*

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2011-10-26



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 718118.05E, 5334483.51N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 307,91 | | Surface | | | | | | |
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 0.00<br>307,30 | | TERRE VÉGÉTALE, saturée. | | | | | | |
| | | 0,61 | | ARGILE SILTEUSE, brune, traces de sable, présence de matière organique, ferme, humide (CH). | 1 | CF | 54 | 0 | | |
| 1 | | | | | 2 | TS | 100 | - | H<br>Cône | |
| 2 | | 305,46 | | | | | | | | |
| | | 2,45 | | Devenant grise, molle, très humide. | 3 | CF | 100 | 0 | | |
| 3 | | | | | | | | | | |
| 4 | | | | | 4 | CF | 100 | 0 | | |
| | | 302,91 | | | | | | | | |
| 5 | | 5,00<br>302,42 | | ARGILE SILTEUSE à SILT ARGILEUX (CL), grise, ferme, saturée. | | | | | | |
| | | 5,49 | | Devenant molle. | 5 | CF | 100 | 0 | H | |
| 6 | | | | | 6 | TS | 100 | - | CIU<br>H | |
| | | 301,10 | | | | | | | | |
| | | 6,81 | | SILT, gris, un peu d'argile, lâche, saturé, non-plastique . | 7 | CF | 51 | 8 | M | |
| | | | | *SUITE À LA PAGE 2* | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇
TENEUR EN EAU (%) Wp Wn Wl
RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕
0 20 40 60 80 100

46,07
36,67
15,98
20,69
46,07
24,45
27,27

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

# JOURNAL DE SONDAGE BH-11-15

**PROJET:** 11-1221-0105 **PAGE** 2 **DE** 3

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION TUBAGE NW (88.9 mm) | | | SILT, gris, un peu d'argile, lâche, saturé, non-plastique . | | | | | | | |
| | | 299,41 | | | | | | | | | |
| | | 8,50 | | Devenant avec traces de sable. | 8 | CF | 100 | 8 | I O | H | |
| 9 | | | | | | | | | | | |
| | | 297,85 | | | | | | | | | |
| 10 | | 10,06 | | SABLE fin, SILT ET GRAVIER, gris, compact à dense, humide (TILL). | 9 | CF | 34 | 24 | | | |
| | | 296,48 | | | | | | | | | |
| 11 | | 11,43 | | Devenant très dense. | | | | | | | |
| 12 | | | | | 10 | CR | 39 | - | | | |
| 13 | | | | | 11 | CR | 46 | 36 | | | |
| | | 294,16 | | | | | | | | | |
| | | 13,75 | | SOCLE ROCHEUX: roc d'origine ultramafique volcanique, vert pâle à vert foncé, qualité trés pauvre à bonne à partir de 16,6 m de profondeur. Foliation subverticale. Texture schisteuse. | 12 | CR | 30 | 0 | | | |
| 14 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | | | | | | | | | | |
| 15 | | | | | 13 | CR | 80 | 20 | | | |
| 16 | | | | | 14 | CR | - | 0 | | | |
| | | | | | 15 | CR | 100 | 0 | | | |
| 17 | | | | | 16 | CR | 100 | 89 | | | |
| | | | | *SUITE À LA PAGE 3* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

# *JOURNAL DE SONDAGE BH-11-15*

**PROJET:** 11-1221-0105 **PAGE** 3 **DE** 3

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa (0 20 40 60 80 100) Nat. : + Rem. : ⊕ | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 2* | | | | | | | |
| | | | | | 16 | CR | 100 | 89 | | | |
| 18 | | 289,98<br>17,93 | | FIN DU FORAGE. | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |
| 26 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

# *JOURNAL DE SONDAGE BH-11-16*

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2011-10-20



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 717703.74E, 5333858.16N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE / TENEUR EN EAU (%) / RÉSIS. CISAILLEMENT Cu, kPa | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 315,68 | | Surface | | | | | | | |
| | | 0.00<br>315,28 | | TERRE VÉGÉTALE, saturée. | | | | | | | |
| 1 | | 0,40<br>314,16 | | ARGILE SILTEUSE, beige, traces de sable, traces de racines, très raide. | 1 | CF | 90 | 6 | | | |
| 2 | | 1,52<br>312,93 | | SILT, beige, un peu d'argile, traces de sable, lâche, non-plastique. | 2<br>3 | TS<br>CF | 100<br>70 | -<br>9 | | | |
| 3 | | 2,75<br>311,63 | | ARGILE SILTEUSE à SILT ARGILEUX, beige, traces de sable, très raide. | 4 | CF | 100 | 10 | | | |
| 4 | | 4,05 | | SILT sablonneux, brun, traces d'argile et de gravier, lâche à compact. | 5 | CF | 76 | - | | | |
| 5 | | | | | 6 | CF | 36 | 10 | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | | 7 | CF | 57 | 8 | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇
TENEUR EN EAU (%) Wp — Wn — Wl
RÉSIS. CISAILLEMENT Cu, kPa (Nat. : + Rem. : ⊕)
0 20 40 60 80 100

100 Cu=120.35
100 Cu>100
100 Cu=152.32
100 Cu=110.95
M
H
100 Cône Cu=101.55
75.22
100 Cu=101.55
100 Cu>100
100 Cu=133.52
M
H

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL_LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

# JOURNAL DE SONDAGE BH-11-16

**PROJET:** 11-1221-0105 **PAGE** 2 **DE** 2

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | 307,81<br>7,87 | | SOCLE ROCHEUX: GRAUWACKE, à grain fin gris, pauvre qualité de roc. | | | | | | | |
| 9 | | | | | 8 | CR | 75 | 37 | | | |
| | | 306,28<br>9,40 | | Roc d'origine ultramafique volcanique, vert pâle à vert foncé, qualité très pauvre. Foliation subverticale. Texture schisteuse. | | | | | | | |
| 10 | | | | | 9 | CR | 46 | 24 | | | |
| 11 | | 304,66<br>11,02 | | Devenant de pauvre qualité. | | | | | | | |
| 12 | | | | | 10 | CR | 100 | 46 | | | |
| | | 303,18<br>12,50 | | FIN DU FORAGE. | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 9-5-17 S.B.

# *JOURNAL DE SONDAGE BH-11-17D*

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2012-07-01

**PAGE** 1 **DE** 1

**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 718599 E, 5334331 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. + Rem. ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 313.02 | | Surface | | | | | | | Élévation du CPV: 313.95 m |
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 0.00 | | SABLE fin à grossier graveleux, brun, un peu de silt, présence de matière organique, hétérogène, bien étalé, lâche, sec. | | | | | | | Sable |
| | | 312.26<br>0.76 | | GRAVIER sablonneux, un peu de silt, traces d'argile, compact. | | | | | | | |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | | | |
| 3 | | | | | | | | | | | Bentonite |
| | | 309.37<br>3.65 | | Devenant à grains grossiers. | | | | | | | |
| 4 | | 308.77<br>4.25 | | SABLE fin, brun, uniforme, trace de silt et de gravier, compact. | | | | | | | |
| 5 | | 307.52<br>5.50 | | Devenant humide. | | | | | | | |
| 6 | | | | | | | | | | | Élévation: 306.72m (2012-09-10) |
| 7 | | | | | | | | | | | Sable de silice |
| 8 | | | | | | | | | | | Crépine CPV<br>Dia.: 38mm<br>Ouv.: 0.25mm<br>Longueur: 1.52m |
| 9 | | 303.98<br>9.04 | | FIN DU FORAGE.. | | | | | | | Sable de silice |

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# *JOURNAL DE SONDAGE BH-11-17R*

**PROJET:** 11-1221-0105

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

**CLIENT:** Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2012-06-27/29



**DATUM:** UTM Nad 83, Zone 17

**COORDONNÉES:** 718599 E, 5334333 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE STRATI-GRAPHIE | STRATIGRAPHIE DESCRIPTION | ÉCHANTILLONS NUMÉRO | ÉCHANTILLONS TYPE | ÉCHANTILLONS % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN WP Wn WI / RÉSIS. CISAILLEMENT Cu, kPa Nat. + Rem. ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 312.97 | | Surface | | | | | | | Élévation du CPV: 313.90 m |
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 0.00 | | SABLE fin à grossier graveleux, brun, un peu de silt, présence de matière organique, hétérogène, bien étalé, lâche, sec. | 1 | CF | 28 | 8 | | | Bentonite |
| | | 312.21<br>0.76 | | GRAVIER sablonneux, un peu de silt, traces d'argile, compact. | 2 | CF | 100 | 22 | | M<br>H | |
| 1 | | | | | | | | | | | |
| 2 | | | | | 3 | CF | 25 | 20 | | | |
| | | | | | 4 | CF | 30 | 14 | | | |
| 3 | | | | | | | | | | | |
| | | | | | 5 | CF | 44 | 14 | | | |
| | | 309.32<br>3.65 | | Devenant à grains grossiers. | 6 | CF | 33 | 13 | | | |
| 4 | | 308.72<br>4.25 | | SABLE fin, brun, uniforme, trace de silt et de gravier, non-cohérent, compact. | 7 | CF | 67 | 13 | | | Coulis ciment-bentonite |
| | | | | | 8 | CF | 70 | 16 | | | |
| 5 | | 307.47<br>5.50 | | Devenant humide. | | | | | | | |
| | | | | | 9 | CF | 100 | 12 | | M<br>H | |
| 6 | | | | | 10 | CF | 100 | 15 | | | Élévation: 306.66m (2012-09-10) |
| | | | | | 11 | CF | 69 | 13 | | | |
| 7 | | | | | 12 | CF | 54 | 15 | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# JOURNAL DE SONDAGE BH-11-17R

**PROJET:** 11-1221-0105 **PAGE** 2 **DE** 3

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | | | Devenant humide. | 12 | CF | 54 | 15 | | | |
| | | | | | 13 | CF | 69 | 17 | | | |
| 9 | | | | | 14 | CF | 49 | 12 | | | |
| | | | | | 15 | CF | 61 | 17 | | | |
| 10 | | 303.07 / 9.90 | | SABLE et GRAVIER, moyen à grossier, gris, présence de cailloux et de blocs, compact, humide (TILL). | 16 | CF | 11 | 24 | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | 17 | ED | 63 | - | | | Coulis ciment-bentonite |
| 13 | | | | | | | | | | | |
| | | | | | 18 | CF | 54 | 25 | | | |
| 14 | | | | | 19 | ED | - | - | | | |
| 15 | | 297.97 / 15.00 | | GRAVIER et SABLE gris et brun, un peu de silt, compact à dense. | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| | | | | *SUITE À LA PAGE 3* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# *JOURNAL DE SONDAGE BH-11-17R*

**PROJET:** 11-1221-0105 **PAGE** 3 **DE** 3

**LOCALISATION:** Mine Canadian Malartic, Malartic, Qué.

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa (0 20 40 60 80 100) Nat. : + Rem. : ⊕ | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 2* | | | | | | | |
| 18 | FORAGE PAR ROTATION TUBAGE NW (88.9 mm) | | | GRAVIER et SABLE gris et brun, un peu de silt, compact à dense. | 20 | CF | 39 | 45 | | M H | |
| 19 | | | | | | | | | | | Coulis ciment-bentonite |
| 20 | | | | | | | | | | | |
| 21 | | 291.92 / 21.05 | | SOCLE ROCHEUX: GRAUWACKE: légèrement altéré (verdâtre), dépôt de calcaire sur faces fracturées, grains fins à moyen, présence de veinules de calcite, gris, non-poreux, présence de la pyrite visible, moyenne à excellente qualité de roc | | | | | | | |
| 22 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | | | | 21 | CR | 100 | 97 | | | Bentonite |
| 23 | | | | | | | | | | | Sable de silice |
| | | 289.53 / 23.44 | | Devenant de moyenne qualité. | | | | | | | Crépine CPV Dia.: 38mm Ouv.: 0.25mm Longueur: 1.52m |
| 24 | | | | | 22 | CR | 100 | 73 | | | |
| 25 | | 287.95 / 25.02 | | END OF BOREHOLE. | | | | | | | |
| 26 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: J. Giroux
VÉRIFIÉ PAR: R. Zawadzki

GENERAL LOGS BH 11-1221-0105_V1.GPJ GENERAL.GDT 03-10-14 S.B.

# *JOURNAL DE SONDAGE PZ-11-18R*

**PROJET:** Forage Osisko
**LOCALISATION:** Malartic, Québec
**CLIENT:** OSISKO
**ENTREPRENEUR:** Forage Giroux
**DATE DU FORAGE:** 04-05-2011



**DATUM:** Géodésique
**COORDONNÉES:** 716872.553 E, 5334255.02 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE STRATI-GRAPHIE | STRATIGRAPHIE DESCRIPTION | ÉCHANTILLONS NUMÉRO | ÉCHANTILLONS TYPE | ÉCHANTILLONS % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. + Rem. ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Élévation du CPV: 314,899 m |
| 0 | FORAGE PAR ROTATION / TUBAGE HW (114.2 mm) | 314.03 | | Surface | | | | | | | |
| | | 0.15 | | TERRE VÉGÉTALE, noir. | | | | | | | |
| | | | | ARGILE SILTEUSE,brune, très molle, humide. | | | | | | | |
| 1 | | | | | 1 | CF | 100 | 1 | | | |
| | | | | | 1 | TS | 100 | - | | | |
| 2 | | 311.74 | | | | | | | | | |
| | | 2.29 | | ARGILE SILTEUSE, grise, avec couche de silt au 15cm d'une épaisseur de 1/4", très molle, saturée. | 2 | CF | 100 | - | | | |
| 3 | | | | | | | | | | | Coulis ciment-bentonite |
| 4 | | 310.07 | | | | | | | | | |
| | | 3.96 | | SILT ARGILEUX, gris, lâche, saturé. | 2 | TS | 100 | - | | | |
| | | | | | 3 | CF | 46 | 6 | | | |
| 5 | | | | | | | | | | | |
| | | | | | 4 | CF | 46 | 4 | | | |
| 6 | | | | | | | | | | | |
| | | 307.17 | | | | | | | | | |
| 7 | | 6.86 | | ROC. | 1 | CR | 100 | 50% | | | Bentonite |
| | | | | | 2 | CR | 100 | 74% | | | Sable de silice |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: E. Bouchard
VÉRIFIÉ PAR: V. Blais

GENERAL 1012210107-3001-ROC.GPJ GENERAL.GDT 27-3-12 L.F.

# *JOURNAL DE SONDAGE PZ-11-18R*

**PROJET:** Forage Osisko

**PAGE** 2 **DE** 2

**LOCALISATION:** Malartic, Québec

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION / CAROTTIER HQ (96 mm) | | | ROC. | 2 | CR | 100 | 74% | | | Sable de silice |
| 9 | | | | | 3 | CR | 100 | 0% | | | |
| 10 | | | | | 4 | CR | 100 | 92% | | | Crépine CPV Dia.: 40mm Ouv.: 0.25mm Longueur: 1.52m |
| | | 303.36 / 10.67 | | FIN DU FORAGE. | | | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | | | | | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
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ÉCHELLE VERTICALE

1 : 50

**Golder Associés**

JOURNAL PAR: E. Bouchard

VÉRIFIÉ PAR: V. Blais

GENERAL 1012210107-3001-ROC.GPJ GENERAL.GDT 27-3-12 L.F.

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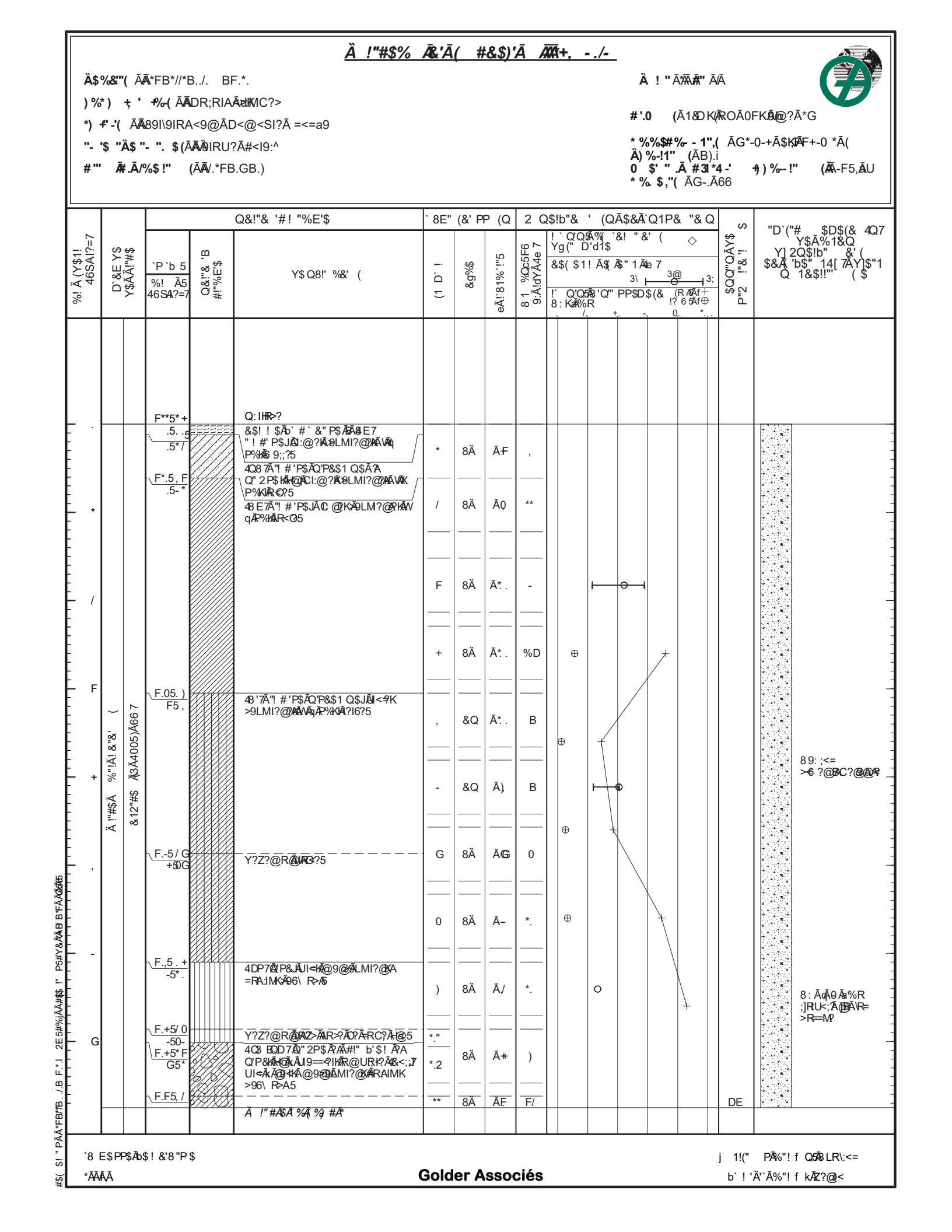


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**Golder Associés**

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**Golder Associés**

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**Golder Associés**

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# *JOURNAL DE SONDAGE PZ13-34*

**PROJET:** Canadian Malartic
**LOCALISATION:** Malartic, Qué.
**CLIENT:** Corporation Minière Osisko
**ENTREPRENEUR:** Forage Giroux
**DATE DU FORAGE:** 2013-07-02/03



**DATUM:** Géodésique
**COORDONNÉES:** 718445 E, 5334649 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE STRATI-GRAPHIE | STRATIGRAPHIE DESCRIPTION | ÉCHANTILLONS NUMÉRO | ÉCHANTILLONS TYPE | ÉCHANTILLONS % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa 0 20 40 60 80 100 Nat. ⊕ Rem. ⊕ | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 306.65 | | Surface | | | | | | | Élévation du CPV: 307.51m |
| | | 0.00 | | (PT) TOURBE fibreuse, présence de racines (zone marécageuse); brune, non cohérente, saturée, très lâche. | 1 | CF | 0 | PM | | | Élévation du niveau d'eau: 306.69m (2013-07-08) |
| 1 | | 306.04<br>0.61 | | (CI) ARGILE SILTEUSE, trace de matière organique; grise, cohérente, w > LP, ferme. | 2 | CF | 64 | 5 | | | |
| | | 305.13<br>1.52 | | Devenant sans trace de matière organique. | | | | | | | |
| 2 | | 304.95<br>1.70 | | Devenant raide. | 3 | CF | 100 | PM | | | |
| | | 304.36<br>2.29 | | Devenant ferme. | 4 | TS | 51 | - | | | |
| 3 | | 303.65<br>3.00 | | Devenant molle. | 5 | CF | 100 | PM | | | |
| 4 | | | | | | | | | | | Coulis ciment-bentonite |
| 5 | | | | | 6 | CF | 100 | PM | | | |
| | | | | | 7 | TS | 79 | - | | C CIU | |
| 6 | | | | | | | | | | | |
| 7 | | | | | 8 | TS | 66 | - | | CIU | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: S. Chapuis
VÉRIFIÉ PAR: à venir

GENERAL 07-1221-0028-BH.GPJ GENERAL.GDT 03-10-14 R.G.

# JOURNAL DE SONDAGE PZ13-34

**PROJET:** Canadian Malartic

**LOCALISATION:** Malartic, Qué.



| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : ⊕ Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 8 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | | | Devenant molle. | | | | | | | |
| 9 | | 297.51<br>9.14 | | Devenant ferme. | 9 | CF | 90 | 9 | | | |
| 10 | | 295.98<br>10.67 | | (ML) SILT; gris, non cohérent, saturé, lâche. | 10 | CF | 67 | 7 | | | |
| 11 | | | | | | | | | | | |
| 12 | | 294.46<br>12.19 | | (ML-SM) SILT et SABLE, fin; gris, non cohérent, saturé, lâche. | 11 | CF | 41 | 6 | | MH | Coulis ciment-bentonite |
| 13 | | | | | 12 | CF | 56 | 4 | | | |
| 14 | | | | | 13 | CF | 0 | 9 | | | |
| 15 | | | | Présence de cailloux ou de blocs vers 14.63m. | | | | | | | Cu > 72 kPa l'argile n'a pas cassée |
| 16 | | 291.41<br>15.24 | | (SM) SABLE SILTEUX, fin à moyen; gris, non cohérent, saturé, lâche. | 14 | CF | 52 | 8 | | MH | |
| 17 | | 289.71<br>16.94 | | | 15 | CF | 38 | 32 | | | Bentonite |
| | | | | *SUITE À LA PAGE 3* | | | | | | | |

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: S. Chapuis
VÉRIFIÉ PAR: à venir

GENERAL 07-1221-0028-BH.GPJ GENERAL.GDT 03-10-14 R.G.

# JOURNAL DE SONDAGE PZ13-34

**PROJET:** Canadian Malartic

**LOCALISATION:** Malartic, Qué.



| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 2* | | | | | | | |
| 18 | FORAGE PAR ROTATION TUBAGE NW (88.9 mm) | | | (SWG) SABLE et GRAVIER, fin à grossier, angulaire, un peu de fines non plastiques (Till); gris à noir, non cohérent, saturé, très dense. | | | | | | | |
| | | | | | 16 | CF | 97 | 79 | | MH | |
| 19 | | 287.14 / 19.51 | | SOCLE ROCHEUX: GRAUWACKE, gris foncé, légèrement altéré, grains très fins, très faible résistance, mauvaise qualité. | | | | | | | Bentonite |
| 20 | | | | | 17 | CR | 67 | 39 | | | |
| 21 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | 285.62 / 21.03 | | Devenant de faible résistance, excellente qualité. | | | | | | | |
| 22 | | | | | 18 | CR | 97 | 93 | | | Sable de silice |
| | | 284.10 / 22.55 | | Devenant de moyenne qualité. | | | | | | | |
| 23 | | | | | 19 | CR | 100 | 76 | | | |
| 24 | | | | | | | | | | | Crépine CPV Dia.: 38mm Ouv.: 0.25mm Longueur: 3.05m |
| 25 | | | | | 20 | CR | 100 | 72 | | | |
| | | 281.03 / 25.62 | | FIN DU FORAGE. | | | | | | | |
| 26 | | | | | | | | | | | |

ÉCHELLE VERTICALE

1 : 50

**Golder Associés**

JOURNAL PAR: S. Chapuis

VÉRIFIÉ PAR: à venir

GENERAL 07-1221-0028-BH.GPJ GENERAL.GDT 03-10-14 R.G.

# JOURNAL DE SONDAGE PZ13-36

**PROJET:** Canadian Malartic

**LOCALISATION:** Malartic, Qué.

**CLIENT:** Corporation Minière Osisko

**ENTREPRENEUR:** Forage Giroux

**DATE DU FORAGE:** 2013-06-29 et 2013-07-01



**DATUM:** Géodésique

**COORDONNÉES:** 718838 E, 5334293 N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE / TENEUR EN EAU (%) / RÉSIS. CISAILLEMENT Cu, kPa | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 306.99 | | Surface | | | | | | | Élévation du CPV: 307.96m |
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 0.00<br>0.05 | | (PT) TOURBE fibreuse ; brune, présence de morceaux de bois, non cohérent, humide, très lâche. | 1 | CF | 26 | 2 | | | Élévation du niveau d'eau: 306.95m (2013-07-08) |
| | | | | (CH) ARGILE; grise, cohérente, w > LP, raide. | | | | | | | |
| 1 | | | | | 2 | CF | 90 | 4 | | | |
| 2 | | | | | 3 | CF | 100 | PM | | | Cu > 87 kPa l'argile n'a pas cassée |
| | | | | | 4 | TS | 77 | - | | | |
| 3 | | 303.94<br>3.05 | | Devenant ferme. | 5 | CF | 100 | PM | | | |
| 4 | | 303.18<br>3.81 | | (CI) ARGILE SILTEUSE; grise, cohérente, w > LP, ferme. | 6 | CF | 100 | PM | | | Coulis ciment-bentonite |
| 5 | | | | | 7 | CF | 100 | PM | | | |
| 6 | | | | | 8 | CF | 100 | PM | | | |
| | | | | | 9 | TS | 80 | - | | | |
| 7 | | | | | 10 | CF | 100 | PM | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇
TENEUR EN EAU (%) Wp Wn Wl
RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕
0 20 40 60 80 100

ÉCHELLE VERTICALE
1 : 50

**Golder Associés**

JOURNAL PAR: S. Chapuis
VÉRIFIÉ PAR: à venir

GENERAL 07-1221-0028-BH.GPJ GENERAL.GDT 03-10-14 R.G.

# JOURNAL DE SONDAGE PZ13-36

**PROJET:** Canadian Malartic

**LOCALISATION:** Malartic, Qué.



| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | |
| 8 | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | | | (Cl) ARGILE SILTEUSE; grise, cohérente, w > LP, ferme. | | | | | | |
| | | | | | 11 | CF | 100 | PM | | |
| 9 | | | | | | | | | | |
| 10 | | | | | 12 | CF | 59 | 10 | | |
| | | 296.59 / 10.40 | | Devenant raide. | | | | | | |
| 11 | | | | | | | | | | Coulis ciment-bentonite |
| | | 295.56 / 11.43 | | (ML) SILT; gris, non cohérent, saturé. | 13 | TS | 84 | - | | |
| 12 | | | | | 14A | | | | | |
| | | 294.66 / 12.33 | | (ML) SILT sableux, fin; gris, non cohérent, saturé, compact. | 14B | CF | 43 | 13 | MH | |
| 13 | | | | | 15 | CF | 0 | 10 | | |
| | | 293.27 / 13.72 | | (SP) SABLE fin; gris, non cohérent, saturé, compact. | 16 | CF | 64 | 10 | | |
| 14 | | | | | | | | | | Bentonite |
| | | | | | 17 | CF | 59 | 14 | | |
| 15 | | 291.75 / 15.24 | | (SP) SABLE fin à moyen, un peu de fines non plastiques; gris, non cohérent, saturé, lâche. | 18 | CF | 41 | 6 | MH | |
| | | | | | | | | | | Sable de silice |
| 16 | | 290.99 / 16.00 | | Devenant compact. | 19 | CF | 92 | 15 | MH CD composite | |
| | | 290.23 / 16.76 | | Devenant lâche. | | | | | | Crépine CPV Dia.: 38mm Ouv.: 0.25mm Longueur: 3.05m |
| 17 | | | | | 20 | CF | 90 | 7 | MH CD composite | |
| | | | | *SUITE À LA PAGE 3* | | | | | | |

OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇; TENEUR EN EAU (%) Wp, Wn, Wl; RÉSIS. CISAILLEMENT Cu, kPa (0 20 40 60 80 100) Nat. : ⊕ Rem. : ⊕

ÉCHELLE VERTICALE

1 : 50

**Golder Associés**

JOURNAL PAR: S. Chapuis

VÉRIFIÉ PAR: à venir

GENERAL 07-1221-0028-BH.GPJ GENERAL.GDT 03-10-14 R.G.

# JOURNAL DE SONDAGE PZ13-36

**PROJET:** Canadian Malartic

**LOCALISATION:** Malartic, Qué.



| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 2* | | | | | | |
| 18 | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | | | Devenant lâche. | | | | | | |
| | | 288.71 / 18.28 | | Devenant très dense. | 21 | CF | 100 | 54 | MH CD composite | Crépine CPV Dia.: 38mm Ouv.: 0.25mm Longueur: 3.05m |
| 19 | | | | | | | | | | |
| 20 | FORAGE PAR ROTATION / CAROTTIER NQ (75.7 mm) | 287.34 / 19.65 | | SOCLE ROCHEUX: GRAUWACKE, gris foncé, légèrement altéré, grains très fins, moyenne résistance, moyenne qualité. | 22 | CR | 100 | 53 | | Bentonite |
| 21 | | | | | 23 | CR | 100 | 42 | | |
| | | 285.39 / 21.60 | | FIN DU FORAGE. | | | | | | |
| 22 | | | | | | | | | | |
| 23 | | | | | | | | | | |
| 24 | | | | | | | | | | |
| 25 | | | | | | | | | | |
| 26 | | | | | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇

TENEUR EN EAU (%) Wp — Wn — Wl

RÉSIS. CISAILLEMENT Cu, kPa (0 20 40 60 80 100) Nat. : + Rem. : ⊕

ÉCHELLE VERTICALE
1 : 50

JOURNAL PAR: S. Chapuis

VÉRIFIÉ PAR: à venir

**Golder Associés**

GENERAL 07-1221-0028-BH.GPJ GENERAL.GDT 03-10-14 R.G.

# *FICHE DE TRANCHÉE D'EXPLORATION*

**Projet:** Mine Canadian Malartic
**Endroit:** SENTIERS EST BANC D'EMPRUNT
**No. de projet:** 13-1221-0020-3010
**Description du site:**

**Effectué par:** S.Bilodeau
**Date:** 2013-07-11

**Tranchée No.:** **TE-13-09**

**Photographie:** **OUI** ■ **NON** □
**Face(s) décrite(s):** Est
**Datum:** UTM, Nad 83, Zone 17
**Coordonnées:** 5333860 N, 717708 E

| PROFONDEUR (mètres) | SOLS EN PLACE (nature, composition, couleur, consistance, compacité, humidité, etc.) | | ÉCHANTILLONS | | ANALYSES | |
|---|---|---|---|---|---|---|
| | ÉLÉV. / PROF. (m) | DESCRIPTION VISUELLE | PROF. (m) | NUMÉRO | COV (ppm) | PARAMÈTRES |
| 0 | 315,00<br>0.00 | SURFACE | | | | |
| | 314,80<br>0,20 | (PT) TOURBE et TERRE VÉGÉTALE; brun à noir, humide. | | | | |
| | | (CI) ARGILE SILTEUSE; brune, cohérente, W<LP, raide à très raide. | 0<br>20-2<br>70 | TE-13-09-A | | MH |
| 1 | 314,00<br>1,00 | Devenant W~LP, saturée. | | | | |
| 2 | | | | | | |
| | 312,30<br>2,70 | (ML) SILT; gris, présence de lits de sable fin brun, non cohérent, humide, compact. | 2<br>70-4<br>90 | TE-13-09-B | | |
| 3 | | | | | | |
| 4 | | | | | | |

## EXCAVATION

**ÉQUIPEMENT UTILISÉ:** Pelle mécanique John Deere 200 D
**PROFONDEUR MAXIMALE:** 5,00 m
**DIMENSIONS:** 1.8m x 4.0m
**ORIENTATION:** N-S

## REMARQUES

ÉCHELLE VERTICALE
1 : 40

**Golder Associés**

VÉRIFIÉ PAR: -

TESTPIT-FR 13-1221-0020-3010-TP.GPJ TEST_PIT.GDT 8-5-17 M.C.

# *FICHE DE TRANCHÉE D'EXPLORATION*

**Projet:** Mine Canadian Malartic
**Endroit:** SENTIERS EST BANC D'EMPRUNT
**No. de projet:** 13-1221-0020-3010
**Description du site:**

**Effectué par:** S.Bilodeau
**Date:** 2013-07-11

**Tranchée No.:** **TE-13-09**

**Photographie:** **OUI** ■ **NON** □
**Face(s) décrite(s):** Est
**Datum:** UTM, Nad 83, Zone 17
**Coordonnées:** 5333860 N, 717708 E

| PROFONDEUR (mètres) | ÉLÉV. / PROF. (m) | SOLS EN PLACE — DESCRIPTION VISUELLE (nature, composition, couleur, consistance, compacité, humidité, etc.) | ÉCHANTILLONS — PROF. (m) | ÉCHANTILLONS — NUMÉRO | ANALYSES — COV (ppm) | ANALYSES — PARAMÈTRES |
|---|---|---|---|---|---|---|
| 5 | 310,10<br>4,90<br>310,00<br>5,00 | (SW) SABLE fin à grossier et GRAVIER fin à moyen, un peu de fines non plastiques; gris et jaune, non cohérent, saturé, lâche.<br>FIN DE LA TRANCHÉE.<br>VENUES D'EAU. | 4<br>90-500 | TE-13-09-C | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |

## EXCAVATION

**ÉQUIPEMENT UTILISÉ:** Pelle mécanique John Deere 200 D
**PROFONDEUR MAXIMALE:** 5,00 m
**DIMENSIONS:** 1.8m x 4.0m
**ORIENTATION:** N-S

## REMARQUES

ÉCHELLE VERTICALE
1 : 40

**Golder Associés**

VÉRIFIÉ PAR: -

M.C. 8-5-17 TESTPIT-FR 13-1221-0020-3010-TP.GPJ TEST_PIT.GDT

# *FICHE DE TRANCHÉE D'EXPLORATION*

**Projet:** Mine Canadian Malartic
**Endroit:** SENTIERS EST BANC D'EMPRUNT
**No. de projet:** 13-1221-0020-3010
**Description du site:**

**Effectué par:** S.Bilodeau
**Date:** 2013-07-11

**Tranchée No.:** **TE-13-12**

**Photographie:** **OUI** ■ **NON** □
**Face(s) décrite(s):** Est
**Datum:** UTM, Nad 83, Zone 17
**Coordonnées:** 5334030 N, 718201 E

| PROFONDEUR (mètres) | SOLS EN PLACE (nature, composition, couleur, consistance, compacité, humidité, etc.) | | ÉCHANTILLONS | | ANALYSES | |
|---|---|---|---|---|---|---|
| | ÉLÉV. / PROF. (m) | DESCRIPTION VISUELLE | PROF. (m) | NUMÉRO | COV (ppm) | PARAMÈTRES |
| 0 | 311,00 | SURFACE | | | | |
| | 0.00 / 310,70 | (PT) TOURBE et TERRE VÉGÉTALE; brun à noir, humide, lâche. | | | | |
| | 0,30 / 310,20 | (SW) SABLE SILTEUX, fin à grossier, un peu de cailloux arrondis à angulaires; orangé, présence de racines, non cohérent, humide, compact. | 0<br>30-0<br>80 | TE-13-12-A | | |
| 1 | 0,80 / 309,50 | (SW) SABLE fin à moyen, un peu de fines non plastiques; gris-brun, présence de matière organique, non cohérent, humide, compact. | | | | |
| | 1,50 / 309,00 | Devenant saturé. | | | | |
| 2 | 2,00 / 308,60 | (SW) SABLE fin à grossier, un peu de gravier fin, traces de fine non plastiques; gris, non cohérent, saturé, lâche. | | | | |
| | 2,40 | FIN DE LA TRANCHÉE.<br>VENUES D'EAU À PARTIR DE 1.5m. | | | | |
| 3 | | | | | | |
| 4 | | | | | | |

## EXCAVATION

**ÉQUIPEMENT UTILISÉ:** Pelle mécanique John Deere 200 D
**PROFONDEUR MAXIMALE:** 2,40 m
**DIMENSIONS:** 1.5m x 2.7m
**ORIENTATION:** N-S

## REMARQUES

ÉCHELLE VERTICALE
1 : 40

**Golder Associés**

VÉRIFIÉ PAR: -

**Journaux de sondage, autres tranchées d'exploration**

| Tranchée exploratoire | Coordonnées | Profondeur (m) | Stratigraphie | Analyse |
|---|---|---|---|---|
| TP-08-366 | 718498<br>5334289 | 0-0,4<br>0,4-2,0<br>2,0-3,4<br>3,4 | Terre brun foncé,<br>Argile brune, saturée<br>Argile grise molle<br>Arrêt | |
| TP-08-368 | 718428<br>5334164 | 0-0,2<br>0,2-2,0<br>2-4,5<br>4,5<br>4,5 | Terre brun foncé<br>Sable argileux gris, humide*<br>Sable fin brun, saturé<br>Arrêt, infiltration importante<br>Arrêt, infiltration d'eau importante | *Gravier: 1,7%, Sable 96.3% Silt+argile : 2,0%<br>$W_N$: 8,6% |
| TP-08-370 | 718451<br>5333909 | 0-0,3<br>0,3-2,4<br>2,4-4,2 | Terre brun foncé<br>Argile sableuse brune<br>Till sableux, très humide | |
| TP-08-371 | 718372<br>5333872 | 0-0,3<br>0,3-3,0<br>3,0-3,3<br>3,3-4,0<br>4,0 | Terre brun foncé<br>Argile brune, humide<br>Argile brune, saturée<br>Till sableux<br>Roc/Refus | |
| TP-08-375 | 718178<br>5334456 | 0-0,2<br>0,2-2,9<br>2,9-4,0<br>4,0 | Terre brun foncé<br>Argile brune, humide<br>Argile grise, molle, humide<br>Arrêt | |
| TP-08-376 | 718498<br>5334209 | 0-0,2<br>0,2-2,4<br>2,4-4,0<br>4,0 | Terre brun foncé<br>Argile brune silteuse, humide<br>Sable silteux gris, saturé<br>Arrêt | |

**Journaux de sondage, autres tranchées d'exploration**

| Tranchée exploratoire | Coordonnées | Profondeur (m) | Stratigraphie | Analyse |
|---|---|---|---|---|
| TP-08-379 | 718404<br>5334224 | 0-0,4<br>0,4 | Terre noire<br>Argile brune grise | |
| TP-08-383 | 718258<br>5333828 | 0-0,2<br>0,2-2,3<br>2,3-3,8<br>3,8 | Terre argileuse brun foncé<br>Argile beige, humide<br>Silt<br>Roc/Refus | |
| TP-08-384 | 718107<br>5333798 | 0-0,2<br>0,2-3,4<br>3,4-4,0<br>4,0 | Terre brun foncé<br>Argile brune<br>Argile grise silteuse<br>Arrêt | |
| TP-08-385 | 718248<br>5333760 | 0-0,2<br>0,2-3,1<br>3,1-3,8<br>3,8 | Terre végétale<br>Argile brune, sèche à humide*<br>Sable, silt argileux<br>Roc/Refus | *Sable: 1,7%, Silt et argile: 98,3%<br>Masse vol. sèche : 1672 kg/$m^3$, $W_{opt}$:22,5%<br>$W_N$:25,1, $W_P$:23%, $W_L$: 29%, $I_P$:6% |
| TP-08-479 | 717913<br>5333933 | 0-0,2<br>0,2-2,1<br>2,1-3,0<br>3,0-4,0<br>4,0 | Terre noire foncé, saturée, infiltration d'eau<br>Silt sableux, traces d'argile, gris, humide<br>Sable fin à moyen beige, brun, saturé<br>Silt gris, compact, traces de sable<br>Arrêt, trop d'éboulement | |

# JOURNAL DE SONDAGE BH-17-01

**PROJET:** 1776338 - 40100

**LOCALISATION:** Malartic

**CLIENT:** Canadian Malartic GP

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**DATE DU FORAGE:** 29-03-2017



**DATUM:** NAD83 UTM 17

**COORDONNÉES:** 717940E, 5334321.3N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa (Nat. : + Rem. : ⊕) 0 20 40 60 80 100 | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION / TARIÈRE (200 mm) / TUBAGE NW (88.9 mm) | 309,30 | | Surface | | | | | | | |
| | | 0.00 | | Neige. | | | | | | | |
| | | 308,69 | | | | | | | | | |
| | | 0,61 | | TOURBE fibreuse, brune-noire, saturée, très lâche. | 1 | CF | 0 | PM | | | |
| 1 | | | | | | | | | | | |
| | | | | | 2 | CF | 20 | PM | | | |
| 2 | | 307,21 | | | | | | | | | |
| | | 2,09 | | (CL) ARGILE SILTEUSE, grise, cohérente, w > LP, molle. | 3 | CF | 51 | 3 | | | |
| 3 | | 306,25 | | | | | | | | | |
| | | 3,05 | | Devenant très molle. | 4 | TS | 100 | - | | | |
| 4 | | | | | 5 | CF | 100 | PM | | | |
| | | | | | 6 | TS | 100 | - | ⊢ o | MH LL LP w | Déblais de forage |
| 5 | | | | | 7 | CF | 100 | PM | | | |
| 6 | | | | | 8 | CF | 100 | PM | | | |
| 7 | | | | | 9 | TS | 100 | - | | | |
| 8 | | | | | 10 | CF | 100 | PM | | | |
| | | | | | 11 | CF | 100 | PM | | | |
| 9 | | | | | 12 | CF | 100 | PM | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# JOURNAL DE SONDAGE BH-17-01

**PROJET:** 1776338 - 40100 **PAGE** 2 **DE** 2

**LOCALISATION:** Malartic

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | NUMÉRO | TYPE | % RÉCUPÉRA. | COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 10 | FORAGE PAR ROTATION — TARIÈRE (200 mm) / TUBAGE NW (88.9 mm) | 298,63 | | Devenant très molle. | 12 | CF | 100 | PM | | MH LL LP w | Déblais de forage |
| | | | | | 13 | CF | 79 | 3 | | | |
| 11 | | 10,67 | | (ML) SILT ARGILEUX, gris, cohérent, w > LP, raide. | 14 | CF | 53 | 8 | | | |
| | | | | | 15 | CF | 56 | 10 | | | |
| 12 | | | | | 16 | CF | 41 | 8 | | | |
| | | 296,55 | | | | | | | | | |
| 13 | | 12,75 | | (GW) GRAVIER, fin à grossier et SABLE fin, silteux, gris, saturé, compact (till). | 17 | CF | 31 | 23 | | MH w | |
| | | 295,80 | | | | | | | | | |
| 14 | | 13,50 | | (GW) GRAVIER sableux, un peu de fines non plastiques, gris, saturé, très dense (till). | 18 | CF | 39 | R | | | |
| | | 295,05 | | | | | | | | | |
| | | 14,25 | | Devenant avec présence de cailloux. | 20 | CR | - | - | | | |
| 15 | | 294,30 | | | | | | | | | |
| | FORAGE PAR ROTATION — CAROTTIER NQ (75.7 mm) | 15,00 | | Massif rocheux : basalte, gris foncé à noir, non-poreux, pyrite, veines de Quartz, R4, W2, excellente qualité. | 21 | CR | 100 | 100 | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | 22 | CF | 100 | 100 | | | |
| | | 291,55 | | | | | | | | | |
| | | 17,75 | | FIN DU FORAGE. | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

OBSERVATIONS ET RÉSULTATS : RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ ; TENEUR EN EAU (%) Wp Wn Wl ; RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ ; 0 20 40 60 80 100

ÉCHELLE VERTICALE
1 : 60

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

**Golder Associés**

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# JOURNAL DE SONDAGE BH-17-02

**PROJET:** 1776338 - 40100

**LOCALISATION:** Malartic

**CLIENT:** Canadian Malartic GP

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**DATE DU FORAGE:** 30-03-2017



**DATUM:** NAD83 UTM 17

**COORDONNÉES:** 717960.1E, 5334305.6N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa (0 20 40 60 80 100) Nat. : + Rem. : ⊕ | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION / TARIÈRE (200 mm) / TUBAGE NW (88.9 mm) | 309,20 | | Surface | | | | | | | |
| | | 0.00 | | Neige. | | | | | | | |
| | | 308,59 | | | | | | | | | |
| | | 0,61 | | TOURBE, brune à noire, saturée, très lâche. | 1 | CF | 0 | PM | | | |
| 1 | | | | | | | | | | | |
| | | 307,29 | | | 2 | CF | 38 | PM | | | |
| 2 | | 1,91 | | (CI) ARGILE SILTEUSE, grise, cohérente, w > LP, molle, trace de matières organiques (racines). | | | | | | | |
| | | | | | 3 | CF | 100 | 4 | | | |
| 3 | | 306,15 | | | | | | | | | |
| | | 3,05 | | Devenant sans matière organique. | 4 | CF | 100 | 3 | | | |
| | | 305,39 | | | | | | | | | |
| | | 3,81 | | Devenant très molle. | 5 | TS | 100 | - | | C MH DR TX LL LP w | |
| 4 | | | | | | | | | | | |
| | | | | | 6 | CF | 100 | PM | | | |
| 5 | | | | | | | | | | | |
| | | | | | 7 | CF | 100 | PM | | | |
| 6 | | | | | | | | | | | |
| | | | | | 8 | TS | 100 | - | | | |
| 7 | | | | | 9 | CF | 100 | PM | | MH LL LP w | |
| | | | | | | | | | | | |
| 8 | | | | | 10 | CF | 100 | PM | | | |
| | | | | | | | | | | | |
| | | | | | 11 | TS | 87 | - | | | |
| 9 | | 299,96 | | | | | | | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

Déblais de forage

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# JOURNAL DE SONDAGE BH-17-02

**PROJET:** 1776338 - 40100 **PAGE** 2 **DE** 2

**LOCALISATION:** Malartic

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | NUMÉRO | TYPE | % RÉCUPÉRA. | COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 10 | FORAGE PAR ROTATION | 9,24 | | (ML) SILT ARGILEUX, gris, cohérent, w > LP, ferme. | 12 | CF | 51 | 6 | | MH | |
| | | | | | 12 | CF | 51 | 6 | | MH | |
| | | | | | 13 | CF | 41 | 6 | | w NP | |
| 11 | | | | | 14 | CF | 43 | 7 | | | |
| 12 | | 297,22 | | | 15 | CF | 38 | PM | | | |
| | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | 11,98 | | Massif rocheux : basalte, gris foncé à noir, non-poreux, pyrite, veines de quartz, R4, W2, excellente qualité. | 16 | CR | 100 | 79 | | | Déblais de forage |
| 13 | | | | | 17 | CR | 100 | 100 | | | |
| 14 | | | | | 18 | CR | 100 | 100 | | | |
| 15 | | 293,86 | | | 19 | CR | 100 | 100 | | | |
| | | 15,34 | | FIN DU FORAGE. | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇

TENEUR EN EAU (%) Wp — Wn — Wl

RÉSIS. CISAILLEMENT Cu, kPa (Nat. : +, Rem. : ⊕) 0 20 40 60 80 100

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# *JOURNAL DE SONDAGE BH-17-03*

**PROJET:** 1776338 - 40100

**LOCALISATION:** Malartic

**CLIENT:** Canadian Malartic GP

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**DATE DU FORAGE:** 31-03-2017



**DATUM:** NAD83 UTM 17

**COORDONNÉES:** 717934.3E, 5334301.2N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION / TARIÈRE (200 mm) / TUBAGE NW (88.9 mm) | 309,50 | | Surface | | | | | | |
| | | 0.00 | | Neige. | 1 | CF | 0 | 1 | | |
| | | 308,89 | | | | | | | | |
| 1 | | 0,61 | | TOURBE fibreuse, brune à noire, saturée, très lâche. | | | | | | |
| 2 | | | | | 2 | CF | 30 | PM | | |
| | | 307,12 | | | | | | | | |
| | | 2,38 | | (CI) ARGILE SILTEUSE, grise, cohérente, w > LP, molle. | 3 | CF | 79 | 3 | | |
| 3 | | | | | 4 | CF | 100 | 3 | MH LL LP w | |
| 4 | | | | | 5 | TS | 85 | - | | Déblais de forage |
| 5 | | | | | 6 | CF | 100 | PM | | |
| | | | | | 7 | CF | 100 | PM | | |
| 6 | | | | | 8 | TS | 100 | - | MH LL LP w | |
| 7 | | | | | 9 | CF | 100 | PM | | |
| | | 301,88 | | | | | | | | |
| | | 7,62 | | (ML) SILT ARGILEUX, gris, cohérent, w > LP, ferme. | 10 | CF | 53 | 6 | | |
| 8 | | | | | 11 | CF | 53 | 6 | MH w NP | |
| 9 | | 300,36 | | | | | | | | |
| | | | | | 12 | CF | 41 | 4 | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇

TENEUR EN EAU (%) — Wp, Wn, Wl

RÉSIS. CISAILLEMENT Cu, kPa — Nat. : + Rem. : ⊕ — 0 20 40 60 80 100

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# JOURNAL DE SONDAGE BH-17-03

**PROJET:** 1776338 - 40100 **PAGE** 2 **DE** 2

**LOCALISATION:** Malartic

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | | | |
| 10 | FORAGE PAR ROTATION CAROTTIER NQ (75.7 mm) | 9,14 | | Devenant SILT ARGILEUX, gris, cohérent, w > LP, ferme, un peu de sable fin. | 12 | CF | 41 | 4 | | | |
| | | | | | 13 | CF | 57 | PM | | | |
| | | 298,83 10,67 | | GRAVIER fin à grossier, un peu de fines non plastiques, saturé, gris, très dense. | 14 | CF | 100 | R | | UCS | |
| 11 | | 298,62 10,88 | | Massif rocheux : basalte, gris foncé à noir, faible porosité, pyrite, veines de quartz, R4, W2. | 15 | CR | 100 | 47 | | | |
| | | 297,92 11,58 | | Devenant de faible porosité à aucune porosité, excellente qualité. | | | | | | | Déblais de forage |
| 12 | | | | | 16 | CR | 100 | 88 | | | |
| 13 | | | | | | | | | | | |
| 14 | | 294,92 14,58 | | FIN DU FORAGE. | 17 | CR | 100 | 100 | | | |
| 15 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# JOURNAL DE SONDAGE BH-17-05

**PROJET:** 1776338 - 40100

**LOCALISATION:** Malartic

**CLIENT:** Canadian Malartic GP

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**DATE DU FORAGE:** 05-04-2017



**DATUM:** NAD83 UTM 17

**COORDONNÉES:** 717923E, 5334315N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATIGRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION<br>TUBAGE NW (88.9 mm) | 309,90 | | Surface | | | | | | |
| | | 309,59<br>0,31 | | Neige.<br>TOURBE fibreuse, brune-noire, saturée, très lâche. | 1 | CF | 0 | 1 | | |
| 1 | | | | | 2 | CF | 26 | PM | | |
| 2 | | 307,82<br>2,08 | | (CI) ARGILE SILTEUSE, traces de matières organiques (racines), grise, cohérente, w > LP, raide. | 3 | CF | 100 | PM | MH<br>C<br>DR<br>LL<br>LP<br>w | |
| 3 | | 306,90<br>3,00 | | Devenant sans matière organique. | 4 | TS | 98 | - | | Cu > 89.4 kPa |
| 4 | | | | | 5 | CF | 100 | 1 | | |
| | | 305,40<br>4,50 | | Devenant ferme. | 6 | CF | 100 | PM | | |
| 5 | | | | | 7 | TS | 100 | - | | Déblais de forage |
| 6 | | | | | 8 | CF | 100 | 1 | | |
| 7 | | | | | 9 | CF | 100 | PM | MH<br>C<br>K<br>DR<br>TX<br>LL<br>LP<br>w | |
| 8 | | | | | 10 | TS | 100 | - | | |
| | | | | | 11 | CF | 100 | PM | | |
| 9 | | | | | 12 | CF | 100 | PM | | |
| 10 | | 299,40 | | | 13 | CF | 100 | PM | | |
| | | 10,50 | | (ML) SILT ARGILEUX, gris, cohérent, w > LP, ferme. | 14 | CF | 62 | 9 | | |
| 11 | | | | | 15 | CF | 49 | 9 | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | |

RÉSIS. PÉNÉTRATION DYNAMIQUE ◇

TENEUR EN EAU (%) — Wp, Wn, Wl

RÉSIS. CISAILLEMENT Cu, kPa — Nat. : + Rem. : ⊕ — 0 20 40 60 80 100

Valeurs de résistance au cisaillement : 89,4 ; 43,8 ; 32,6 ; 23,8 ; 26,1 ; 26,5 ; 27,9 ; 31,2 ; 38,7

ÉCHELLE VERTICALE
1 : 75

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# JOURNAL DE SONDAGE BH-17-05

**PROJET:** 1776338 - 40100 **PAGE** 2 **DE** 2

**LOCALISATION:** Malartic

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | NUMÉRO | TYPE | % RÉCUPÉRA. | COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ ; TENEUR EN EAU (%) Wp Wn Wl ; RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | | |
| 12 | FORAGE PAR ROTATION / TUBAGE NW (88.9 mm) | 297,15 | | (ML) SILT ARGILEUX, gris, cohérent, w > LP, ferme. | 15 | CF | 49 | 9 | | | |
| | | | | | 16 | CF | 54 | 8 | | | |
| 13 | | 12,75 / 296,40 | | Devenant avec un peu de sable fin. | 17 | CF | 46 | 8 | | MH w | |
| 14 | | 13,50 / 295,65 | | SABLE SILTEUX, un peu de gravier, gris, saturé, lâche (till). | 18 | CF | 46 | 8 | | | |
| | | 14,25 / 294,90 | | GRAVIER fin à grossier, silteux, un peu de sable fin, gris et bleu, saturé, très dense. | 19 | CF | 25 | R | | | |
| 15 | | 15,00 / 294,00 | | Devenant présence de cailloux. | 20 | CR | - | - | | | |
| 16 | FORAGE PAR ROTATION / CAROTTIER NQ (75.7 mm) | 15,90 / 293,38 | | Bloc (till). | | | | | | | Déblais de forage |
| | | 16,52 / 292,84 | | Till : GRAVIER fin à grossier. | 21 | CR | 100 | 100 | | | |
| 17 | | 17,06 | | Massif rocheux : basalte, gris foncé à noir, non-poreux, veines de quartz, pyrite, R4, W2, excellente qualité. | | | | | | | |
| 18 | | | | | 22 | CR | 100 | 100 | | UCS | |
| 19 | | | | | | | | | | | |
| 20 | | 289,30 | | | 23 | CR | 100 | 95 | | | |
| | | 20,60 | | FIN DU FORAGE. | | | | | | | |
| 21 | | | | | | | | | | | |
| 22 | | | | | | | | | | | |
| 23 | | | | | | | | | | | |
| 24 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 75

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY.GPJ GENERAL.GDT 17-7-4 Ariane Touchette

# *JOURNAL DE SONDAGE PO-17-04*

**PROJET:** 1776338 - 40100

**LOCALISATION:** Malartic

**CLIENT:** Canadian Malartic GP

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**DATE DU FORAGE:** 04-04-2017

**PAGE** 1 **DE** 1

**DATUM:** NAD83 UTM 17

**COORDONNÉES:** 717934.7E, 5334309.3N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa (Nat. : + Rem. : ⊕) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION — TUBAGE HW (114.2 mm) | 309,34 / 0.00 | | Surface<br>Forage en destructif et installation d'un puits d'observation. | | | | | 0 20 40 60 80 100 | | Bentonite |
| 1 | | | | | | | | | | | |
| 2 | | | | | | | | | 43,3 | | Cu > 43.3 kPa |
| 3 | | | | | | | | | 43,8 | | Cu > 43.8 kPa |
| 4 | | | | | | | | | 27,5 | | 4.04m (2017-04-05) |
| 5 | | | | | | | | | | | |
| 6 | | | | | | | | | 16,5 | | Sable de silice no. 1 |
| 7 | | | | | | | | | 15,8 | | |
| 8 | | | | | | | | | 16,1 | | |
| 9 | | | | | | | | | | | Bentonite<br>Sable de silice |
| 10 | FORAGE PAR ROTATION — CAROTTIER HQ (96 mm) | 299,49 / 9,85 | | Massif rocheux : basalte, gris foncé à noir, non poreux, veines de quartz, pyrite, R4, W2, excellente qualité. | 1 | CR | 100 | 100 | | | Crépine CPV Dia.: 25mm Ouv.: 0.25mm Longueur: 0.93m |
| 11 | | 298,57 / 10,77 | | FIN DU FORAGE. | | | | | | | |

ÉCHELLE VERTICALE
1 : 75

**Golder Associés**

JOURNAL PAR: M. Senécal
VÉRIFIÉ PAR: S. Gougeon

GENERAL 1776338-ODYSSEY GPJ GENERAL GDT 17-7-4 Ariane Touchette

# *JOURNAL DE SONDAGE PZ-18-60R*

**PROJET:** 1776338-20200 Investigation géotechnique - Projet Odyssey

**LOCALISATION:** Malartic, Québec

**CLIENT:** CMGP

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**DATE DU FORAGE:** 2018-11-11



**DATUM:** Géodésique UTM Nad83, Zone 17

**COORDONNÉES:** 717905.8E, 5334556.29N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ (0 20 40 60 80 100) | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 308,33 | | Surface | | | | | | | Élevation du CPV: 309.19 m |
| 0 | FORAGE PAR ROTATION / TUBAGE HW (114.2 mm) | 0.00 | | TERRE VÉGÉTALE, tourbe saturée. | | | | | | | Sable de silice |
| 1 | | 306,83 | | | | | | | | | Niveau d'eau 2018-11-11 |
| 2 | | 1,50 | | (CL) ARGILE SILTEUSE, un peu de matière organique; gris-brun; varvé; cohérent, w > LP, ferme (gelée) | 1 | CF | 51 | 8 | | | Bentonite |
| 3 | | 305,28 | | | | | | | | | |
| | | 3,05 | | Devenant non gélée. | 2 | CF | 64 | 6 | | | |
| 4 | | 304,14 | | | | | | | | | Sable de silice No.1 |
| | CAROTTIER HQ (96 mm) | 4,19 | | SOCLE ROCHEUX; gris; fracturé, mauvaise qualité. | 3 | CR | 100 | 39 | | | Crépine CPV Dia.: 50mm Ouv.: 0.25mm Longueur: 1.52m |
| 5 | | | | | 4 | CR | 100 | 43 | | | |
| | | 302,38 | | | | | | | | | |
| 6 | | 5,95 | | FIN DU FORAGE. | | | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | | | | | | | |
| 9 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Brenner
VÉRIFIÉ PAR: J. Giroux

GENERAL 1776338-20200-PZ-V2.GPJ GENERAL.GDT 19-3-4 JG

# *JOURNAL DE SONDAGE PZ-18-61R*

**PROJET:** 1776338-20200 Investigation géotechnique - Projet Odyssey

**PAGE** 1 **DE** 1

**LOCALISATION:** Malartic, Québec

**CLIENT:** CMGP

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**DATE DU FORAGE:** 2018-11-12

**DATUM:** Géodésique UTM Nad83, Zone 17

**COORDONNÉES:** 717847.09E, 5334462.41N
**PLONGÉE:** -90°
**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg
**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | ÉCHANTILLONS NUMÉRO | TYPE | % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS COUPS/0.3m ou RQD (%) | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ 0 20 40 60 80 100 | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION | 308,64 | | Surface | | | | | | | Élévation du CPV: 309.57 m |
| | TUBAGE HW (114.2 mm) | 0.00 | | TERRE VÉGÉTALE, tourbe saturée. | | | | | | | Sable de silice |
| | | 307,84 | | | | | | | | | |
| 1 | | 0,80 | | (CL) ARGILE SILTEUSE, trace de matière organique; gris; varvé 2 à 4 cm; cohérent, w > LP, molle. | | | | | | | |
| 2 | | | | | 1 | CF | 100 | 2 | | | |
| 3 | | | | | 2 | CF | 67 | 3 | | | Bentonite |
| 4 | | 304,07 | | | | | | | | | |
| | | 4,57 | | (CL-ML) SILT et ARGILE; gris; varvé 2 à 3 cm; cohérent, w ~ LP, ferme. | 3 | CF | 49 | 8 | | | Niveau d'eau 2018-11-12 |
| 5 | | 302,74 | | | | | | | | | Sable de silice No.1 |
| 6 | CAROTTIER HQ (96 mm) | 5,90 | | TILL; BLOCS et CAILLOUX. | 4 | CR | 71 | - | | | |
| | | 302,64 | | SOCLE ROCHEUX; gris-vert; veines de quartz blanc; fracturé, mauvaise qualité. | | | | | | | Crépine CPV Dia.: 50mm Ouv.: 0.25mm Longueur: 1.52m |
| | | 6,00 | | | | | | | | | |
| 7 | | | | | 5 | CR | 77 | 24 | | | |
| 8 | | | | | 6 | CR | 100 | 54 | | | |
| | | 300,10 | | | | | | | | | |
| | | 8,54 | | FIN DU FORAGE. | | | | | | | |
| 9 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Brenner
VÉRIFIÉ PAR: J. Giroux

GENERAL 1776338-20200-PZ-V2.GPJ GENERAL.GDT 19-3-4 JG

# *JOURNAL DE SONDAGE PZ-18-62R*

**PROJET:** 1776338-20200 Investigation géotechnique - Projet Odyssey

**PAGE** 1 **DE** 2

**LOCALISATION:** Malartic, Québec

**CLIENT:** CMGP

**DATUM:** Géodésique UTM Nad83, Zone 17

**ENTREPRENEUR:** Succession Forage George Downing Limitée

**COORDONNÉES:** 717949.06E, 5334410.25N

**DATE DU FORAGE:** 2018-11-15

**PLONGÉE:** -90°

**MARTEAU D'ÉCHANTILLONNAGE:** 63.5 kg

**COURSE:** 760 mm

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | STRATIGRAPHIE: ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE: STRATI-GRAPHIE | STRATIGRAPHIE: DESCRIPTION | ÉCHANTILLONS: NUMÉRO | ÉCHANTILLONS: TYPE | ÉCHANTILLONS: % RÉCUPÉRA. | OBSERVATIONS ET RÉSULTATS: COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS: RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ / TENEUR EN EAU (%) Wp Wn Wl / RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ 0 20 40 60 80 100 | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | FORAGE PAR ROTATION / TUBAGE HW (114.2 mm) | 308,90 | | Surface | | | | | | | Élévation du CPV: 309.95 m |
| | | 0.00 | | TERRE VÉGÉTALE, tourbe saturée. | | | | | | | Sable de silice |
| 1 | | | | | | | | | | | |
| 2 | | 306,16 | | | | | | | | | |
| | | 2,74 | | (CI) ARGILE SILTEUSE; gris; cohérent, w > LP, molle. | 1 | CF | 100 | 4 | | | |
| 3 | | | | | | | | | | | |
| 4 | | 304,33 | | | | | | | | | Niveau d'eau 2018-11-15 |
| | | 4,57 | | Devenant très molle. | 2 | CF | 92 | 2 | | | Bentonite |
| 5 | | | | | | | | | | | |
| 6 | | 302,80 | | | | | | | | | |
| | | 6,10 | | Devenant varvé 2 cm. | 3 | CF | 100 | PM | | | |
| 7 | | | | | | | | | | | |
| 8 | | | | | 4 | CF | 100 | PM | | | |
| 9 | | 299,76 | | | 5 | CF | 15 | 10 | | | |
| | | | | *SUITE À LA PAGE 2* | | | | | | | |

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Brenner
VÉRIFIÉ PAR: J. Giroux

GENERAL 1776338-20200-PZ-V2.GPJ GENERAL.GDT 19-3-4 JG

# *JOURNAL DE SONDAGE PZ-18-62R*

**PROJET:** 1776338-20200 Investigation géotechnique - Projet Odyssey **PAGE** 2 **DE** 2

**LOCALISATION:** Malartic, Québec

| PROFONDEUR (mètres) | MÉTHODE DE FORAGE | ÉLÉV. / PROF. (mètres) | STRATIGRAPHIE | DESCRIPTION | NUMÉRO | TYPE | % RÉCUPÉRA. | COUPS/0.3m ou RQD (%) | OBSERVATIONS ET RÉSULTATS | ESSAIS DE LABORATOIRE | AMÉNAGEMENT(S) DE PUITS D'OBSERVATION ET NIVEAU(X) D'EAU SOUTERRAINE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *SUITE DE LA PAGE 1* | | | | | RÉSIS. PÉNÉTRATION DYNAMIQUE ◇ ; TENEUR EN EAU (%) Wp Wn Wl ; RÉSIS. CISAILLEMENT Cu, kPa Nat. : + Rem. : ⊕ 0 20 40 60 80 100 | | |
| 10 | FORAGE PAR ROTATION TUBAGE HW (114.2 mm) | 9,14 | | (CL-ML) SILT et ARGILE; gris; présence de cailloux; cohérent, w ~ LP, raide. | 5 | CF | 15 | 10 | | | |
| 11 | | | | | 6 | CF | 20 | 10 | | | Bentonite |
| 12 | | 296,70 12,20 | | | | | | | | | |
| | FORAGE PAR ROTATION CAROTTIER HQ (96 mm) | 296,55 12,35 | | TILL (SW) SABLE graveleux; gris-brun; non-cohérent, humide, dense. | 7 | CF | - | 48 | | | |
| 13 | | | | Devenant avec BLOCS et CAILLOUX. | 8 | CR | 70 | 29 | | | |
| 14 | | | | | 9 | CR | 29 | 0 | | | Sable de silice No.1 |
| 15 | | | | | | | | | | | Crépine CPV Dia.: 50mm Ouv.: 0.25mm Longueur: 1.52m |
| | | 293,35 15,55 | | SOCLE ROCHEUX; vert-gris; altéré, fracturé, mauvaise qualité. | 10 | CR | 100 | 64 | | | |
| 16 | | 292,84 16,06 | | FIN DU FORAGE. | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |

ÉCHELLE VERTICALE
1 : 60

**Golder Associés**

JOURNAL PAR: M. Brenner
VÉRIFIÉ PAR: J. Giroux

GENERAL 1776338-20200-PZ-V2.GPJ GENERAL.GDT 19-3-4 J.G

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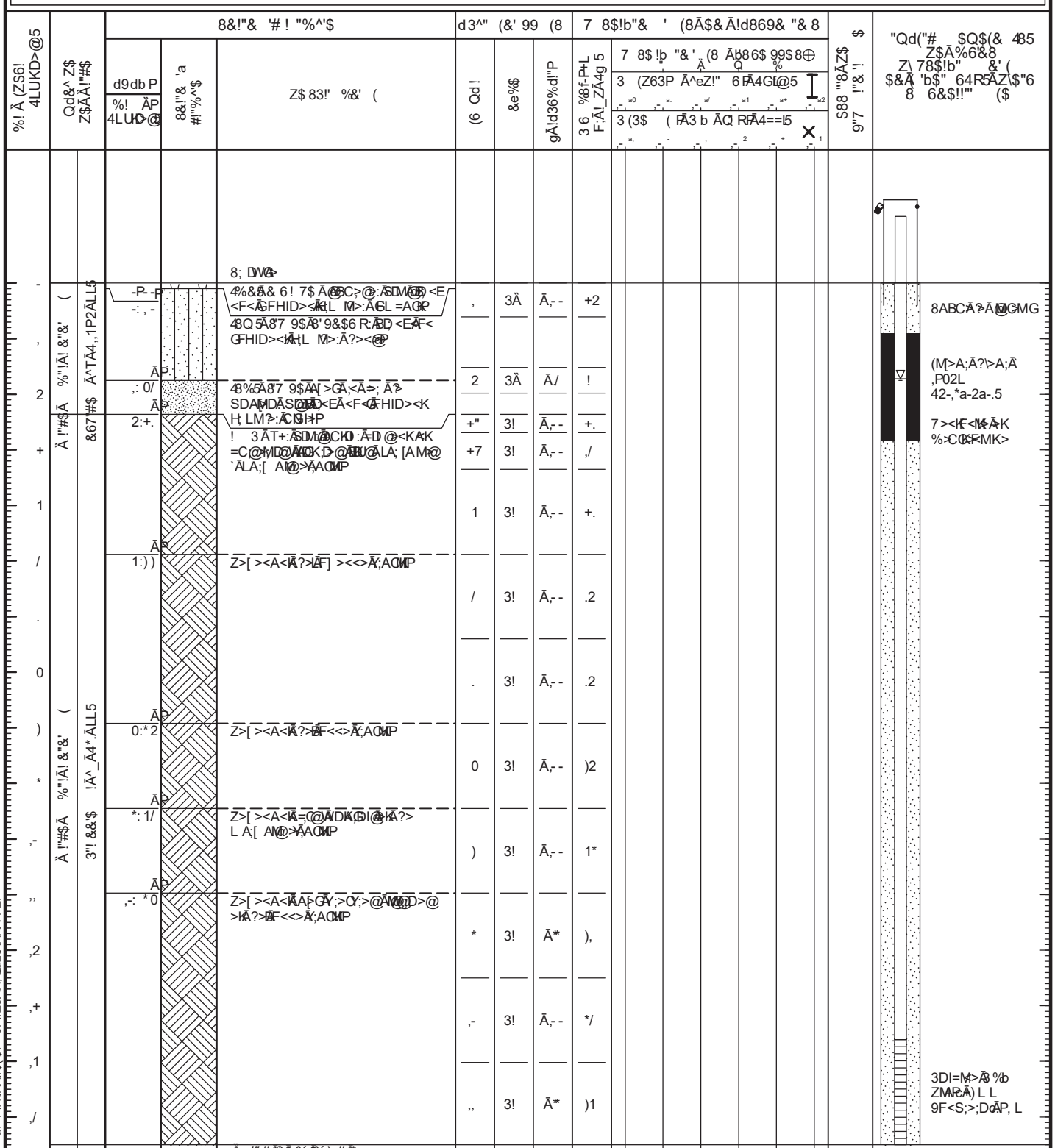


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**Golder Associés**

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**ANNEXE B**

# Résultats analytiques

**RÉSULTATS ANALYTIQUES DES ÉCHANTILLONS D'EAU SOUTERRAINE - SECTEUR ODYSSEY**

| Paramètres | Critères MELCC [1] | | Puits d'observation / Date d'échantillonnage / Numéro de dossier du labo. / Unité stratigraphique / Concentrations | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | BH11-06 | | | | BH11-07 | | | |
| | *Eau de consommation* | *RES* | 2011-11-26 | 2012-05-20 | 2012-08-31 | 2017-06-14 | 2011-11-29 | 2012-05-20 | 2012-08-31 | 2017-06-13 |
| | | | B166091 | B224197 | B248518 | B733770 | B166741 | B224197 | B248518 | B733463 |
| | | | roc | | | | sable et gravier | | | |
| **Hydrocarbures pétroliers (C10-C50) (µg/L)** | - | 2800 | < 100 | < 100 | < 100 | - | < 100 | < 100 | < 100 | - |
| **Métaux (µg/L)** | | | | | | | | | | |
| Aluminium (Al) | 100 | - | **3000** | < 30 | < 30 | - | < 30 | < 30 | < 30 | - |
| Arsenic (As) | 0,3 | 340 | < 2 | < 2 | < 1 | < 0,3 | **4** | < 2 | **2** | **0,9** |
| Baryum (Ba) | 1000 | 600 + | 40 | < 30 | < 20 | - | 90 | 80 | 70 | - |
| Bore (B) | 5000 | 28000 | < 50 | < 50 | < 50 | - | < 50 | < 50 | < 50 | - |
| Cadmium (Cd) | 5 | 1,1 + | < 1 | < 1 | < 1 | - | < 1 | < 1 | < 1 | - |
| Calcium (Ca) | - | - | 17000 | 15000 | 14000 | 13000 | 120000 | 100000 | 80000 | 34000 |
| Chrome total (Cr) | 50 | - | < 30 | < 30 | < 5 | - | < 30 | < 30 | < 5 | - |
| Cuivre (Cu) | 1000 | 7,3 + | **14** | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Fer (Fe) | - | - | 2800 | < 100 | < 100 | < 100 | 7600 | 5000 | 3800 | 160 |
| Magnésium (Mg) | - | - | 2800 | 2200 | 2100 | 2100 | 31000 | 24000 | 20000 | 12000 |
| Nickel (Ni) | 70 | 260 + | 10 | < 10 | < 10 | < 10 | < 10 | < 10 | 10 | < 10 |
| Plomb (Pb) | 10 | 34 + | 4 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Potassium (K) | - | - | 1600 | 800 | 1000 | 780 | 10000 | 9400 | 8400 | 6900 |
| Sélénium (Se) | 10 | 62 | < 1 | < 1 | < 1 | - | < 1 | < 1 | < 1 | - |
| Sodium (Na) | 200000 | - | 22000 | 6000 | 3800 | 3300 | 47000 | 41000 | 36000 | 22000 |
| Zinc (Zn) | 5000 | 67 + | 18 | < 5 | 11 | 7,4 | 11 | < 5 | < 5 | < 5 |
| **Paramètres inorganiques (mg/L)** | | | | | | | | | | |
| Alcalinité (Totale en CaCO3) pH 4.5 | - | - | 71 | 46 | 39 | 37 | 180 | 170 | 170 | 180 |
| Azote ammoniacal (N-NH3) | 0,05 | 18 ** | 0,05 | **0,07** | < 0,02 | - | **0,55** | **0,37** | **0,33** | - |
| Bicarbonates (HCO3 comme CaCO3) | - | - | - | - | - | - | - | - | - | - |
| Carbonate (CO3 comme CaCO3) | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Chlorures (Cl) | 250 | 860 | 0,27 | 0,26 | 13 | 0,6 | 19 | 15 | 13 | 1,9 |
| Cyanures disponibles (CN-) | 0,2 | 0,022 | - | - | - | - | - | - | - | - |
| Cyanures Libres**** | - | - | < 0,01 | < 0,01 | < 0,01 | 0,0034 | < 0,01 | < 0,01 | < 0,01 | 0,0043 |
| Cyanures totaux**** | - | - | < 0,003 | < 0,003 | < 0,003 | 0,003 | 0,003 | < 0,003 | < 0,003 | 0,0037 |
| Fluorure (F) | 1,5 | 4 | 0,2 | 0,1 | < 0,1 | - | 0,1 | 0,2 | 0,2 | - |
| Nitrates et Nitrites | 10 | - | 0,02 | - | < 0,02 | - | < 0,2 | - | < 0,02 | - |
| Nitrate | - | 300 | - | 0,35 | - | < 0,02 | - | 0,28 | - | < 0,02 |
| Nitrite | 1 | 0,12 *** | - | < 0,02 | - | - | - | < 0,02 | - | - |
| Phosphore total (P) | - | 1 | < 0,01 | 0,08 | < 0,01 | - | < 0,01 | 0,05 | 0,03 | - |
| Solide totaux dissous | - | - | 140 | 100 | 74 | - | 740 | 570 | 490 | - |
| Sulfates (SO4) | - | - | 14 | 10 | 190 | 11 | 330 | 220 | 190 | 11 |
| Sulfures (S=) | 0,05 | 0,0032 | < 0,02 | < 0,02 | < 0,02 | - | < 0,02 | < 0,1 | < 0,1 | - |
| **Mesures *in situ*** | | | | | | | | | | |
| pH | - | - | 6,70 | 5,64 | 6,31 | 5,92 | 7,62 | 6,65 | 7,60 | 8,56 |
| Température (°C) | - | - | 5,67 | 11,92 | 16,8 | 9,8 | 5,08 | 6,86 | 8,4 | 8,4 |
| Oxygène dissous (mg/L) | - | - | 1,56 | 4,22 | 5,87 | 1,74 | 0,00 | 0,00 | 0,82 | 0,77 |
| Potentiel d'oxydo-réduction (mV) | - | - | 17,0 | 47,2 | 98,5 | -47,2 | -254,3 | -126,3 | -165,9 | -84,7 |
| Conductivité (µS/cm) | - | - | 135 | 84 | 158,2 | 99,0 | 980 | 570 | 1060 | 304 |

**Notes:**

[1] : Critères du Guide d'intervention de la Politique de protection des sols et de réhabilitation des terrains contaminés du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MELCC, 2019)

**32** : Concentration supérieure au critère de résurgence dans les eaux de surface

**4** : Concentration supérieure au critère d'eau de consommation

\- : Non analysé / non spécifié

\+ : Critère établi pour une dureté de 50 mg/L ($CaCO_3$)

** : Critère établi pour un pH de 7,1 et une température de 18 °C (Golder, 2010)

*** : Critère établi pour une concentration de chlorures de 2800 µg/L (Golder, 2010)

**** : Depuis mars 2019, il n'y a plus de critère mentionné dans le Guide d'intervention pour les cyanures totaux et les cyanures libres.

0,05 :Critères additionels depuis mars 2019 selon le guide d'intervention du MELCC

**RÉSULTATS ANALYTIQUES DES ÉCHANTILLONS D'EAU SOUTERRAINE - SECTEUR ODYSSEY**

| Paramètres | Critères MELCC [1] | | Puits d'observation / Date d'échantillonnage / Numéro de dossier du labo. / Unité stratigraphique / Concentrations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BH11-09 | | | | | | | BH11-13 | |
| | *Eau de consommation* | *RES* | 2011-11-26 | 2012-05-20 | 2012-08-31 | 2018-07-19 | 2018-10-08 | 2019-06-10 | 2019-10-15 | 2011-11-29 | 2012-05-22 |
| | | | B166091 | B224197 | B248518 | B830145 | B845372 | B923961 | B951414 | B166741 | B224885 |
| | | | sable fin | | | | | | | roc | |
| **Hydrocarbures pétroliers (C10-C50) (µg/L)** | - | 2800 | < 100 | < 100 | < 100 | - | - | - | - | < 100 | < 100 |
| **Métaux (µg/L)** | | | | | | | | | | | |
| Aluminium (Al) | 100 | - | < 30 | < 30 | < 30 | - | - | - | - | **2300** | < 30 |
| Arsenic (As) | 0,3 | 340 | **4** | **4** | **5** | **3,7** | **5** | **4,2** | **7,7** | **5** | **4** |
| Baryum (Ba) | 1000 | 600 + | 70 | 60 | 60 | - | - | - | - | 520 | 450 |
| Bore (B) | 5000 | 28000 | < 50 | < 50 | < 50 | - | - | - | - | < 50 | < 50 |
| Cadmium (Cd) | 5 | 1,1 + | < 1 | < 1 | < 1 | - | - | - | - | < 1 | < 1 |
| Calcium (Ca) | - | - | 53000 | 60000 | 54000 | 85000 | 84000 | 82000 | 89000 | 54000 | 58000 |
| Chrome total (Cr) | 50 | - | < 30 | < 30 | < 5 | - | - | - | - | < 30 | < 30 |
| Cuivre (Cu) | 1000 | 7,3 + | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | **32** | < 3 |
| Fer (Fe) | - | - | < 100 | 200 | < 100 | 2100 | 2300 | 1100 | 1300 | 6300 | 1100 |
| Magnésium (Mg) | - | - | 25000 | 30000 | 30000 | 45000 | 46000 | 45000 | 48000 | 22000 | 18000 |
| Nickel (Ni) | 70 | 260 + | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | 20 | < 10 |
| Plomb (Pb) | 10 | 34 + | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | 2 | < 1 |
| Potassium (K) | - | - | 4200 | 4200 | 4600 | 4300 | 4500 | 4100 | 4800 | 5600 | 4700 |
| Sélénium (Se) | 10 | 62 | < 1 | < 1 | < 1 | - | - | - | - | < 1 | < 1 |
| Sodium (Na) | 200000 | - | 25000 | 21000 | 19000 | 29000 | 31000 | 32000 | 34000 | 11000 | 11000 |
| Zinc (Zn) | 5000 | 67 + | 20 | 7 | 7 | < 5 | < 5 | < 5 | < 5 | 20 | 7 |
| **Paramètres inorganiques (mg/L)** | | | | | | | | | | | |
| Alcalinité (Totale en CaCO3) pH 4.5 | - | - | 270 | 280 | 290 | 440 | 470 | 460 | 470 | 200 | 200 |
| Azote ammoniacal (N-NH3) | 0,05 | 18 ** | 0,04 | **0,17** | < 0,02 | - | - | - | - | **0,23** | **0,27** |
| Bicarbonates (HCO3 comme CaCO3) | - | - | - | - | - | 440 | 470 | 460 | 470 | - | - |
| Carbonate (CO3 comme CaCO3) | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Chlorures (Cl) | 250 | 860 | 0,19 | 0,15 | 0,11 | 1,1 | 1,3 | 1,1 | 1,1 | 0,76 | 0,72 |
| Cyanures disponibles (CN-) | 0,2 | 0,022 | - | - | - | < 0,003 | < 0,003 | < 0,003 | < 0,003 | - | - |
| Cyanures Libres**** | - | - | < 0,01 | < 0,01 | < 0,01 | - | - | - | - | < 0,01 | < 0,01 |
| Cyanures totaux**** | - | - | < 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 |
| Fluorure (F) | 1,5 | 4 | 0,2 | 0,2 | 0,2 | - | - | - | - | 0,1 | 0,4 |
| Nitrates et Nitrites | 10 | - | 0,02 | - | 0,03 | - | - | - | - | < 0,2 | - |
| Nitrate | - | 300 | - | 0,43 | - | < 0,02 | < 0,02 | < 0,02 | < 0,02 | - | 0,23 |
| Nitrite | 1 | 0,12 *** | - | < 0,02 | - | - | - | - | - | - | < 0,02 |
| Phosphore total (P) | - | 1 | < 0,01 | **53** | **13** | - | - | - | - | 0,20 | 0,12 |
| Solide totaux dissous | - | - | 320 | 300 | 190 | - | - | - | - | 290 | 270 |
| Sulfates (SO4) | - | - | 14 | 15 | 15 | 23 | 19 | 17 | 13 | 39 | 35 |
| Sulfures (S=) | 0,05 | 0,0032 | < 0,02 | < 0,1 | < 0,02 | - | - | - | - | < 0,02 | < 0,02 |
| **Mesures *in situ*** | | | | | | | | | | | |
| pH | - | - | 7,38 | 6,70 | 7,39 | 9,75 | 7,35 | 7,24 | 7,61 | 7,88 | 7,10 |
| Température (°C) | - | - | 5,77 | 7,70 | 15,0 | 10,0 | 7,6 | 9,49 | 7,63 | 4,69 | 6,54 |
| Oxygène dissous (mg/L) | - | - | 2,81 | 2,80 | 3,16 | - | - | - | - | 0,00 | 0,00 |
| Potentiel d'oxydo-réduction (mV) | - | - | -90,8 | -134,6 | -68,4 | 40,1 | -263,6 | 100,9 | < 181,6 | -240,6 | -70,4 |
| Conductivité (µS/cm) | - | - | 429 | 364 | 803 | 764 | 788 | 706 | 433 | 443 | 300 |

**Notes:**

[1] : Critères du Guide d'intervention de la Politique de protection des sols et de réhabilitation des terrains contaminés du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MELCC, 2019)

**32** : Concentration supérieure au critère de résurgence dans les eaux de surface

**4** : Concentration supérieure au critère d'eau de consommation

\- : Non analysé / non spécifié

\+ : Critère établi pour une dureté de 50 mg/L ($CaCO_3$)

** : Critère établi pour un pH de 7,1 et une température de 18 °C (Golder, 2010)

*** : Critère établi pour une concentration de chlorures de 2800 µg/L (Golder, 2010)

**** : Depuis mars 2019, il n'y a plus de critère mentionné dans le Guide d'intervention pour les cyanures totaux et les cyanures libres.

0,05 :Critères additionels depuis mars 2019 selon le guide d'intervention du MELCC

**RÉSULTATS ANALYTIQUES DES ÉCHANTILLONS D'EAU SOUTERRAINE - SECTEUR ODYSSEY**

| Paramètres | Critères MELCC [1] | | Puits d'observation / Date d'échantillonnage / Numéro de dossier du labo. / Unité stratigraphique / Concentrations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BH11-13 | | | | | | | BH11-17D | |
| | *Eau de consommation* | *RES* | 2012-09-12 | 2017-07-20 | 2017-10-27 | 2018-07-10 | 2018-10-24 | 2019-06-18 | 2019-10-09 | 2012-09-02 | 2013-07-06 |
| | | | B251172 | B743034 | B766097 | B827874 | B848813 | B926095 | B949760 | B248518 | B339920 |
| | | | | roc | | | | | | sable fin | |
| **Hydrocarbures pétroliers (C10-C50) (µg/L)** | - | 2800 | 150 | - | - | - | < 100 | - | - | < 100 | < 100 |
| **Métaux (µg/L)** | | | | | | | | | | | |
| Aluminium (Al) | 100 | - | < 30 | - | - | - | - | - | - | **220** | < 30 |
| Arsenic (As) | 0,3 | 340 | **4** | **5,5** | **5,3** | **5,4** | **5,6** | **6,5** | **7** | < 1 | < 1 |
| Baryum (Ba) | 1000 | 600 + | 440 | - | - | - | - | - | - | < 20 | < 20 |
| Bore (B) | 5000 | 28000 | < 50 | - | - | - | - | - | - | < 50 | - |
| Cadmium (Cd) | 5 | 1,1 + | < 1 | - | - | - | - | - | - | < 1 | < 1 |
| Calcium (Ca) | - | - | 53000 | 59000 | 56000 | 53000 | 52000 | 49000 | 48000 | 6000 | - |
| Chrome total (Cr) | 50 | - | < 5 | - | - | - | - | - | - | < 5 | < 5 |
| Cuivre (Cu) | 1000 | 7,3 + | < 3 | < 0,5 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | 6 |
| Fer (Fe) | - | - | 1100 | 1200 | 1100 | 1000 | 1000 | 850 | 790 | < 100 | - |
| Magnésium (Mg) | - | - | 18000 | 19000 | 16000 | 17000 | 16000 | 16000 | 17000 | 2100 | - |
| Nickel (Ni) | 70 | 260 + | < 10 | < 1 | < 10 | < 10 | < 10 | < 10 | < 10 | 10 | < 10 |
| Plomb (Pb) | 10 | 34 + | < 1 | < 0,1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Potassium (K) | - | - | 4500 | 5000 | 4500 | 4500 | 4300 | 4200 | 5000 | 1100 | - |
| Sélénium (Se) | 10 | 62 | < 1 | - | - | - | - | - | - | < 1 | < 1 |
| Sodium (Na) | 200000 | - | 9800 | 11000 | 9500 | 10000 | 9700 | 10000 | 11000 | 4800 | 1800 |
| Zinc (Zn) | 5000 | 67 + | 7 | 6,9 | < 5 | 25 | < 5 | < 5 | < 5 | 16 | 39 |
| **Paramètres inorganiques (mg/L)** | | | | | | | | | | | |
| Alcalinité (Totale en CaCO3) pH 4.5 | - | - | 200 | 190 | 210 | 210 | 220 | 200 | 200 | 18 | 12 |
| Azote ammoniacal (N-NH3) | 0,05 | 18 ** | **0,22** | - | - | - | - | - | - | **0,06** | **0,06** |
| Bicarbonates (HCO3 comme CaCO3) | - | - | - | - | 210 | 210 | 220 | 200 | 200 | - | - |
| Carbonate (CO3 comme CaCO3) | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Chlorures (Cl) | 250 | 860 | 0,59 | 0,73 | 0,72 | 0,63 | 0,72 | 1,3 | 1,5 | 0,61 | 0,47 |
| Cyanures disponibles (CN-) | 0,2 | 0,022 | - | - | < 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 | - | - |
| Cyanures Libres**** | - | - | < 0,01 | < 0,003 | - | - | - | - | - | < 0,01 | 0,02 |
| Cyanures totaux**** | - | - | 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 | 0,0031 | < 0,003 | < 0,003 | 0,021 |
| Fluorure (F) | 1,5 | 4 | 0,1 | - | - | - | - | - | - | < 0,1 | < 0,1 |
| Nitrates et Nitrites | 10 | - | - | - | - | - | - | - | - | - | 0,03 |
| Nitrate | - | 300 | < 0,02 | < 0,02 | < 0,02 | < 0,02 | < 0,02 | < 0,02 | < 0,02 | 0,04 | - |
| Nitrite | 1 | 0,12 *** | < 0,02 | - | - | - | - | - | - | < 0,02 | - |
| Phosphore total (P) | - | 1 | 0,08 | - | - | - | - | - | - | < 0,01 | < 0,01 |
| Solide totaux dissous | - | - | 290 | - | - | - | - | - | - | 57 | 5800 |
| Sulfates (SO4) | - | - | 30 | 21 | 19 | 18 | 19 | 12 | 11 | 14 | 8,6 |
| Sulfures (S=) | 0,05 | 0,0032 | < 0,02 | - | - | - | - | - | - | < 0,02 | - |
| **Mesures *in situ*** | | | | | | | | | | | |
| pH | - | - | 7,84 | 7,97 | 7,38 | 6,53 | 7,67 | 8,10 | 8,79 | 6,61 | 6,30 |
| Température (°C) | - | - | 8,9 | 8,3 | 5,8 | 9,9 | 5,4 | 7,2 | 8,6 | 7,9 | 8,7 |
| Oxygène dissous (mg/L) | - | - | 3,03 | 0,83 | - | - | - | - | - | 8,50 | 11,29 |
| Potentiel d'oxydo-réduction (mV) | - | - | -136,1 | -583,7 | -90,1 | 87,5 | -90,4 | 142,6 | -145,1 | 84,2 | -476 |
| Conductivité (µS/cm) | - | - | 770 | 561 | 289 | 18 | 260 | 369 | 625 | 112,6 | 35,0 |

**Notes:**

[1] : Critères du Guide d'intervention de la Politique de protection des sols et de réhabilitation des terrains contaminés du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MELCC, 2019)

**32** : Concentration supérieure au critère de résurgence dans les eaux de surface

**4** : Concentration supérieure au critère d'eau de consommation

\- : Non analysé / non spécifié

\+ : Critère établi pour une dureté de 50 mg/L ($CaCO_3$)

** : Critère établi pour un pH de 7,1 et une température de 18 °C (Golder, 2010)

*** : Critère établi pour une concentration de chlorures de 2800 µg/L (Golder, 2010)

**** : Depuis mars 2019, il n'y a plus de critère mentionné dans le Guide d'intervention pour les cyanures totaux et les cyanures libres.

0,05 :Critères additionels depuis mars 2019 selon le guide d'intervention du MELCC

**RÉSULTATS ANALYTIQUES DES ÉCHANTILLONS D'EAU SOUTERRAINE - SECTEUR ODYSSEY**

| Paramètres | Critères MELCC [1] | | Puits d'observation / Date d'échantillonnage / Numéro de dossier du labo. / Unité stratigraphique / Concentrations | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Eau de consommation* | *RES* | BH11-17R | | | | | | |
| | | | 2012-09-02 | 2013-07-06 | 2017-06-14 | 2017-06-14 | 2017-10-27 | 2018-07-18 | 2018-10-16 |
| | | | B248518 | B339920 | B733770 | B733770 | B766097 | B830145 | B847363 |
| | | | | | | roc | | | |
| **Hydrocarbures pétroliers (C10-C50) (µg/L)** | - | 2800 | 120 | < 100 | - | - | - | - | - |
| **Métaux (µg/L)** | | | | | | | | | |
| Aluminium (Al) | 100 | - | < 30 | < 30 | - | - | - | - | - |
| Arsenic (As) | 0,3 | 340 | **8** | **8** | **9,4** | **9,4** | **9,6** | **8,9** | **8,6** |
| Baryum (Ba) | 1000 | 600 + | 50 | 39 | - | - | - | - | - |
| Bore (B) | 5000 | 28000 | 60 | - | - | - | - | - | - |
| Cadmium (Cd) | 5 | 1,1 + | < 1 | < 1 | - | - | - | - | - |
| Calcium (Ca) | - | - | 150000 | - | 170000 | 170000 | 160000 | 160000 | 160000 |
| Chrome total (Cr) | 50 | - | < 5 | < 5 | - | - | - | - | - |
| Cuivre (Cu) | 1000 | 7,3 + | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Fer (Fe) | - | - | 400 | - | 700 | 700 | 690 | 800 | 860 |
| Magnésium (Mg) | - | - | 45000 | - | 47000 | 47000 | 42000 | 46000 | 45000 |
| Nickel (Ni) | 70 | 260 + | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Plomb (Pb) | 10 | 34 + | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Potassium (K) | - | - | 14000 | - | 13000 | 13000 | 12000 | 12000 | 13000 |
| Sélénium (Se) | 10 | 62 | < 1 | < 1 | - | - | - | - | - |
| Sodium (Na) | 200000 | - | 21000 | 22000 | 32000 | 32000 | 24000 | 27000 | 25000 |
| Zinc (Zn) | 5000 | 67 + | < 5 | < 5 | 8,2 | 8,2 | < 5 | < 5 | < 5 |
| **Paramètres inorganiques (mg/L)** | | | | | | | | | |
| Alcalinité (Totale en CaCO3) pH 4.5 | - | - | 180 | 180 | 200 | 200 | 190 | 200 | 200 |
| Azote ammoniacal (N-NH3) | 0,05 | 18 ** | 0,05 | 0,05 | - | - | - | - | - |
| Bicarbonates (HCO3 comme CaCO3) | - | - | - | - | - | 200 | 190 | 200 | 200 |
| Carbonate (CO3 comme CaCO3) | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Chlorures (Cl) | 250 | 860 | 25 | 25 | 25 | 25 | 24 | 24 | 23 |
| Cyanures disponibles (CN-) | 0,2 | 0,022 | - | - | - | < 0,003 | < 0,003 | < 0,003 | < 0,003 |
| Cyanures Libres**** | - | - | < 0,01 | < 0,01 | < 0,003 | - | - | - | - |
| Cyanures totaux**** | - | - | < 0,003 | 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 | < 0,003 |
| Fluorure (F) | 1,5 | 4 | < 0,1 | 0,1 | - | - | - | - | - |
| Nitrates et Nitrites | 10 | - | - | < 0,02 | - | - | - | - | - |
| Nitrate | - | 300 | < 0,02 | - | < 0,02 | < 0,02 | < 0,02 | < 0,02 | < 0,02 |
| Nitrite | 1 | 0,12 *** | < 0,02 | - | - | - | - | - | - |
| Phosphore total (P) | - | 1 | < 0,01 | < 0,01 | - | - | - | - | - |
| Solide totaux dissous | - | - | 860 | 6700 | - | - | - | - | - |
| Sulfates (SO4) | - | - | 420 | 410 | 330 | 330 | 420 | 430 | 470 |
| Sulfures (S=) | 0,05 | 0,0032 | < 0,02 | - | - | - | - | - | - |
| **Mesures *in situ*** | | | | | | | | | |
| pH | - | - | 7,55 | 7,80 | 7,37 | 7,37 | 6,10 | 8,85 | 8,01 |
| Température (°C) | - | - | 6,70 | 7,70 | 8,25 | 8,25 | 5,31 | 9,72 | 5,77 |
| Oxygène dissous (mg/L) | - | - | 1,55 | 7,82 | 1,72 | - | - | - | - |
| Potentiel d'oxydo-réduction (mV) | - | - | -91,7 | -509 | -52 | -52 | -60 | -83 | -154 |
| Conductivité (µS/cm) | - | - | 1688 | 1111 | 1012 | 1012 | 788 | 1031 | 506 |

**Notes:**

[1] : Critères du Guide d'intervention de la Politique de protection des sols et de réhabilitation des terrains contaminés du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MELCC, 2019)

**32** : Concentration supérieure au critère de résurgence dans les eaux de surface

**4** : Concentration supérieure au critère d'eau de consommation

\- : Non analysé / non spécifié

\+ : Critère établi pour une dureté de 50 mg/L ($CaCO_3$)

** : Critère établi pour un pH de 7,1 et une température de 18 °C (Golder, 2010)

*** : Critère établi pour une concentration de chlorures de 2800 µg/L (Golder, 2010)

**** : Depuis mars 2019, il n'y a plus de critère mentionné dans le Guide d'intervention pour les cyanures totaux et les cyanures libres.

0,05 :Critères additionels depuis mars 2019 selon le guide d'intervention du MELCC

**RÉSULTATS ANALYTIQUES DES ÉCHANTILLONS D'EAU SOUTERRAINE - SECTEUR ODYSSEY**

| Paramètres | Critères MELCC [1] | | Puits d'observation / Date d'échantillonnage / Numéro de dossier du labo. / Unité stratigraphique / Concentrations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Eau de consommation* | *RES* | BH11-17R | | PZ-13-34 | | PZ-13-36 | | PZ-18-60R | | |
| | | | 2019-06-10 | 2019-10-17 | 2013-07-06 | 2017-06-15 | 2013-07-06 | 2017-06-15 | 2018-11-21 | 2018-12-13 | 2019-10-09 |
| | | | B923961 | B951414 | B339920 | B734266 | B339920 | B734266 | B853524 | B857105 | B949760 |
| | | | roc | | roc | | sable fin | | roc | | |
| **Hydrocarbures pétroliers (C10-C50) (µg/L)** | - | 2800 | - | - | < 100 | - | < 100 | - | < 100 | < 100 | < 100 |
| **Métaux (µg/L)** | | | | | | | | | | | |
| Aluminium (Al) | 100 | - | | | < 30 | - | 66 | - | - | - | - |
| Arsenic (As) | 0,3 | 340 | **9,1** | **9** | **2** | **0,74** | **3** | **1,2** | **4,8** | **2,6** | **1,9** |
| Baryum (Ba) | 1000 | 600 + | - | - | 360 | - | 110 | - | - | - | - |
| Bore (B) | 5000 | 28000 | - | - | - | - | - | - | - | - | - |
| Cadmium (Cd) | 5 | 1,1 + | - | - | < 1 | - | < 1 | - | - | - | - |
| Calcium (Ca) | - | - | 160000 | 180000 | - | 39000 | - | 120000 | 69000 | 57000 | 120000 |
| Chrome total (Cr) | 50 | - | - | - | < 5 | - | < 5 | - | - | - | - |
| Cuivre (Cu) | 1000 | 7,3 + | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | 4,2 |
| Fer (Fe) | - | - | 1000 | 1100 | - | < 100 | - | 13000 | <100 | <100 | < 100 |
| Magnésium (Mg) | - | - | 45000 | 50000 | - | 22000 | - | 26000 | 28000 | 24000 | 47000 |
| Nickel (Ni) | 70 | 260 + | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Plomb (Pb) | 10 | 34 + | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Potassium (K) | - | - | 12000 | 12000 | - | 12000 | - | 7700 | 7600 | 6100 | 12000 |
| Sélénium (Se) | 10 | 62 | - | - | < 1 | - | < 1 | - | - | - | - |
| Sodium (Na) | 200000 | - | 29000 | 31000 | 43000 | 26000 | 18000 | 20000 | 22000 | 18000 | 15000 |
| Zinc (Zn) | 5000 | 67 + | < 5 | < 5 | 8 | < 5 | < 5 | 10 | < 5 | 5,4 | < 5 |
| **Paramètres inorganiques (mg/L)** | | | | | | | | | | | |
| Alcalinité (Totale en CaCO3) pH 4.5 | - | - | 200 | 220 | 160 | 180 | 130 | 150 | 240 | 250 | 190 |
| Azote ammoniacal (N-NH3) | 0,05 | 18 ** | - | - | **0,19** | - | **0,23** | - | - | - | - |
| Bicarbonates (HCO3 comme CaCO3) | - | - | 200 | 220 | - | - | - | - | 240 | 250 | 190 |
| Carbonate (CO3 comme CaCO3) | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Chlorures (Cl) | 250 | 860 | 23 | 21 | 12,0 | 8,2 | 24,0 | 33,0 | 6,3 | 5,6 | 0,86 |
| Cyanures disponibles (CN-) | 0,2 | 0,022 | < 0,003 | < 0,003 | - | - | - | - | < 0.003 | < 0.003 | < 0.003 |
| Cyanures Libres**** | - | - | - | - | 0,02 | < 0,003 | 0,01 | 0,0039 | - | - | - |
| Cyanures totaux**** | - | - | < 0,003 | < 0,003 | 0,015 | < 0,003 | 0,011 | 0,0036 | 0,006 | < 0.003 | < 0.003 |
| Fluorure (F) | 1,5 | 4 | - | - | 0,2 | - | < 0,1 | - | - | - | - |
| Nitrates et Nitrites | 10 | - | - | - | < 0,02 | - | - | - | - | - | - |
| Nitrate | - | 300 | < 0,02 | < 0,02 | - | < 0,02 | 0,03 | <0.02 | < 0.02 | < 0.02 | 0,14 |
| Nitrite | 1 | 0,12 *** | - | - | - | - | < 0,02 | - | - | < 0.02 | - |
| Phosphore total (P) | - | 1 | - | - | 0,08 | - | 0,06 | - | - | - | - |
| Solide totaux dissous | - | - | - | - | 6200 | - | 6300 | - | - | - | - |
| Sulfates (SO4) | - | - | 460 | 460 | 110 | 67 | 160 | 270 | 36 | 33 | 300 |
| Sulfures (S=) | 0,05 | 0,0032 | - | - | - | | - | - | - | - | - |
| **Mesures *in situ*** | | | | | | | | | | | |
| pH | - | - | 7,71 | 8,31 | 8,80 | 7,79 | 7,87 | 7,37 | 8,32 | 7,29 | 8,65 |
| Température (°C) | - | - | 8,43 | 5,82 | 8,0 | 8,5 | 6,4 | 8,4 | 0,2 | 0,23 | 13,39 |
| Oxygène dissous (mg/L) | - | - | - | - | 5,44 | 0,13 | 11,43 | 0,00 | - | 57,9 | - |
| Potentiel d'oxydo-réduction (mV) | - | - | 114 | -252 | -507 | -234 | -472 | -124 | - | 129,2 | -29,3 |
| Conductivité (µS/cm) | - | - | 1055 | 530 | 707 | 530 | 632 | 874 | 617 | 359 | 955 |

**Notes:**

[1] : Critères du Guide d'intervention de la Politique de protection des sols et de réhabilitation des terrains contaminés du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MELCC, 2019)

**32** : Concentration supérieure au critère de résurgence dans les eaux de surface

**4** : Concentration supérieure au critère d'eau de consommation

\- : Non analysé / non spécifié

\+ : Critère établi pour une dureté de 50 mg/L ($CaCO_3$)

** : Critère établi pour un pH de 7,1 et une température de 18 °C (Golder, 2010)

*** : Critère établi pour une concentration de chlorures de 2800 µg/L (Golder, 2010)

**** : Depuis mars 2019, il n'y a plus de critère mentionné dans le Guide d'intervention pour les cyanures totaux et les cyanures libres.

0,05 :Critères additionels depuis mars 2019 selon le guide d'intervention du MELCC

**RÉSULTATS ANALYTIQUES DES ÉCHANTILLONS D'EAU SOUTERRAINE - SECTEUR ODYSSEY**

| Paramètres | Critères MELCC [1] | | Puits d'observation / Date d'échantillonnage / Numéro de dossier du labo. / Unité stratigraphique / Concentrations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Eau de consommation* | *RES* | PZ-18-61R | | PZ-18-62R | | | | | PZ-19-63R | |
| | | | 2018-11-20 | 2018-12-13 | 2018-11-20 | 2018-11-20 | 2018-12-13 | 2019-06-18 | 2019-10-09 | 2019-06-15 | 2019-10-18 |
| | | | B853524 | B857105 | B853524 | B853524 (DUP 6) | B857105 | B926095 | B949760 | B925029 | B952350 |
| | | | roc | | roc | | | | | roc | |
| **Hydrocarbures pétroliers (C10-C50) (µg/L)** | - | 2800 | < 100 | < 100 | < 100 | < 100 | < 100 | - | - | < 100 | < 100 |
| **Métaux (µg/L)** | | | | | | | | | | | |
| Aluminium (Al) | 100 | - | - | - | - | - | - | - | - | - | - |
| Arsenic (As) | 0,3 | 340 | **1,6** | **0,55** | **2,1** | **2,1** | **3,1** | **17** | **3** | **8,8** | **3,7** |
| Baryum (Ba) | 1000 | 600 + | - | - | - | - | - | - | - | - | - |
| Bore (B) | 5000 | 28000 | - | - | - | - | - | - | - | - | - |
| Cadmium (Cd) | 5 | 1,1 + | - | - | - | - | - | - | - | - | - |
| Calcium (Ca) | - | - | 66000 | 64000 | 130000 | 130000 | 99000 | 82000 | 130000 | 45000 | 47000 |
| Chrome total (Cr) | 50 | - | - | - | - | - | - | - | - | - | - |
| Cuivre (Cu) | 1000 | 7,3 + | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 | < 3 |
| Fer (Fe) | - | - | 850 | 1500 | 350 | 340 | 500 | 1400 | 770 | 590 | 2100 |
| Magnésium (Mg) | - | - | 25000 | 22000 | 33000 | 32000 | 26000 | 24000 | 32000 | 23000 | 18000 |
| Nickel (Ni) | 70 | 260 + | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 | < 10 |
| Plomb (Pb) | 10 | 34 + | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Potassium (K) | - | - | 6500 | 4500 | 7800 | 7600 | 5200 | 2300 | 6000 | 12000 | 12000 |
| Sélénium (Se) | 10 | 62 | - | - | - | - | - | - | - | - | - |
| Sodium (Na) | 200000 | - | 18000 | 11000 | 15000 | 15000 | 16000 | 9900 | 18000 | 9400 | 15000 |
| Zinc (Zn) | 5000 | 67 + | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 | < 5 |
| **Paramètres inorganiques (mg/L)** | | | | | | | | | | | |
| Alcalinité (Totale en CaCO3) pH 4.5 | - | - | 240 | 270 | 190 | 190 | 230 | 300 | 230 | 230 | 200 |
| Azote ammoniacal (N-NH3) | 0,05 | 18 ** | - | - | - | - | - | - | - | - | - |
| Bicarbonates (HCO3 comme CaCO3) | - | - | 240 | 270 | 190 | 190 | 230 | 300 | 230 | 230 | 200 |
| Carbonate (CO3 comme CaCO3) | - | - | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 | < 1 |
| Chlorures (Cl) | 250 | 860 | 3,9 | 1,6 | 18 | 18 | 14 | 2,5 | 13 | 18 | 21 |
| Cyanures disponibles (CN-) | 0,2 | 0,022 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| Cyanures Libres**** | - | - | - | - | - | - | - | - | - | - | - |
| Cyanures totaux**** | - | - | 0,0031 | < 0.003 | 0,0034 | < 0.003 | 0,0068 | 0,0034 | < 0.003 | < 0.003 | 0,005 |
| Fluorure (F) | 1,5 | 4 | - | - | - | - | - | - | - | - | - |
| Nitrates et Nitrites | 10 | - | - | - | - | - | - | - | - | - | - |
| Nitrate | - | 300 | < 0.02 | < 0.02 | < 0.02 | 0,032 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 |
| Nitrite | 1 | 0,12 *** | - | < 0.02 | - | - | < 0.02 | - | - | - | - |
| Phosphore total (P) | - | 1 | - | - | - | - | - | - | - | - | - |
| Solide totaux dissous | - | - | - | - | - | - | - | - | - | - | - |
| Sulfates (SO4) | - | - | 23 | 8 | 210 | 210 | 150 | 21 | 240 | 16 | 20 |
| Sulfures (S=) | 0,05 | 0,0032 | - | - | - | - | - | - | - | - | - |
| **Mesures *in situ*** | | | | | | | | | | | |
| pH | - | - | 7,09 | 7,19 | 7,66 | 7,66 | 7,08 | 6,95 | 7,96 | 7,58 | 7,13 |
| Température (°C) | - | - | 4 | 3,8 | 4 | 4 | 3,1 | 8,69 | 6,28 | 7,88 | 7,55 |
| Oxygène dissous (mg/L) | - | - | - | 27,2 | - | - | 37,8 | - | - | - | - |
| Potentiel d'oxydo-réduction (mV) | - | - | - | -56,9 | - | - | -8,3 | 158,4 | -144,6 | 790,9 | -97,8 |
| Conductivité (µS/cm) | - | - | 408 | 347 | 638 | 638 | 428 | 474 | 858 | 481 | 479 |

**Notes:**

[1] : Critères du Guide d'intervention de la Politique de protection des sols et de réhabilitation des terrains contaminés du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MELCC, 2019)

**32** : Concentration supérieure au critère de résurgence dans les eaux de surface

**4** : Concentration supérieure au critère d'eau de consommation

\- : Non analysé / non spécifié

\+ : Critère établi pour une dureté de 50 mg/L ($CaCO_3$)

** : Critère établi pour un pH de 7,1 et une température de 18 °C (Golder, 2010)

*** : Critère établi pour une concentration de chlorures de 2800 µg/L (Golder, 2010)

**** : Depuis mars 2019, il n'y a plus de critère mentionné dans le Guide d'intervention pour les cyanures totaux et les cyanures libres.

0,05 :Critères additionels depuis mars 2019 selon le guide d'intervention du MELCC

**RÉSULTATS ANALYTIQUES DES ÉCHANTILLONS D'EAU SOUTERRAINE - SECTEUR ODYSSEY**

| Paramètres | Critères MELCC [1] | | Puits d'observation / Date d'échantillonnage / Numéro de dossier du labo. / Unité stratigraphique / Concentrations | | | | |
|---|---|---|---|---|---|---|---|
| | *Eau de consommation* | *RES* | PO-17-04 | | | | |
| | | | 2017-10-26 | 2018-07-20 | 2018-10-18 | 2019-06-19 | 2019-10-09 |
| | | | B764830 | B830582 | B847363 | B926095 | B949760 |
| | | | | | roc | | |
| **Hydrocarbures pétroliers (C10-C50) (µg/L)** | - | 2800 | - | - | - | - | - |
| **Métaux (µg/L)** | | | | | | | |
| Aluminium (Al) | 100 | - | - | - | - | - | - |
| Arsenic (As) | 0,3 | 340 | **2,7** | **0,36** | **0,35** | **0,48** | **0,42** |
| Baryum (Ba) | 1000 | 600 + | - | - | - | - | - |
| Bore (B) | 5000 | 28000 | - | - | - | - | - |
| Cadmium (Cd) | 5 | 1,1 + | - | - | - | - | - |
| Calcium (Ca) | - | - | 55000 | 57000 | 54000 | 67000 | 80000 |
| Chrome total (Cr) | 50 | - | - | - | - | - | - |
| Cuivre (Cu) | 1000 | 7,3 + | < 3 | < 3 | < 3 | < 3 | < 3 |
| Fer (Fe) | - | - | 160 | < 100 | < 100 | < 100 | < 100 |
| Magnésium (Mg) | - | - | 12000 | 12000 | 12000 | 14000 | 17000 |
| Nickel (Ni) | 70 | 260 + | < 10 | < 10 | < 10 | < 10 | < 10 |
| Plomb (Pb) | 10 | 34 + | < 1 | < 1 | < 1 | < 1 | < 1 |
| Potassium (K) | - | - | 5000 | 4200 | 4300 | 4400 | 5500 |
| Sélénium (Se) | 10 | 62 | - | - | - | - | - |
| Sodium (Na) | 200000 | - | 19000 | 16000 | 14000 | 16000 | 18000 |
| Zinc (Zn) | 5000 | 67 + | < 5 | < 5 | < 5 | < 5 | < 5 |
| **Paramètres inorganiques (mg/L)** | | | | | | | |
| Alcalinité (Totale en CaCO3) pH 4.5 | - | - | 210 | 220 | 210 | 250 | 280 |
| Azote ammoniacal (N-NH3) | 0,05 | 18 ** | - | - | - | - | - |
| Bicarbonates (HCO3 comme CaCO3) | - | - | 210 | 220 | 210 | 250 | 280 |
| Carbonate (CO3 comme CaCO3) | - | - | < 1 | < 1 | < 1 | < 1 | < 1 |
| Chlorures (Cl) | 250 | 860 | 2,4 | 0,98 | 0,89 | 0,53 | 0,51 |
| Cyanures disponibles (CN-) | 0,2 | 0,022 | < 0.003 | < 0.003 | < 0.003 | < 0.003 | < 0.003 |
| Cyanures Libres**** | - | - | - | - | - | - | - |
| Cyanures totaux**** | - | - | < 0.003 | < 0.003 | < 0.003 | 0,0032 | < 0.003 |
| Fluorure (F) | 1,5 | 4 | - | - | - | - | - |
| Nitrates et Nitrites | 10 | - | - | - | - | - | - |
| Nitrate | - | 300 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 0,041 |
| Nitrite | 1 | 0,12 *** | - | - | - | - | - |
| Phosphore total (P) | - | 1 | - | - | - | - | - |
| Solide totaux dissous | - | - | - | - | - | - | - |
| Sulfates (SO4) | - | - | 17 | 15 | 11 | 9,5 | 9,7 |
| Sulfures (S=) | 0,05 | 0,0032 | - | - | - | - | - |
| **Mesures *in situ*** | | | | | | | |
| pH | - | - | 7,8 | 8,59 | 8,31 | 7,7 | 8,78 |
| Température (°C) | - | - | 6,87 | 10,8 | 5,93 | 13,8 | 13,5 |
| Oxygène dissous (mg/L) | - | - | - | - | - | - | - |
| Potentiel d'oxydo-réduction (mV) | - | - | -85,6 | 31 | -232 | 143,4 | -129,2 |
| Conductivité (µS/cm) | - | - | 289 | 395 | 265 | 418 | 712 |

**Notes:**

[1] : Critères du Guide d'intervention de la Politique de protection des sols et de réhabilitation des terrains contaminés du ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques du Québec (MELCC, 2019)

**32** : Concentration supérieure au critère de résurgence dans les eaux de surface

**4** : Concentration supérieure au critère d'eau de consommation

\- : Non analysé / non spécifié

\+ : Critère établi pour une dureté de 50 mg/L ($CaCO_3$)

** : Critère établi pour un pH de 7,1 et une température de 18 °C (Golder, 2010)

*** : Critère établi pour une concentration de chlorures de 2800 µg/L (Golder, 2010)

**** : Depuis mars 2019, il n'y a plus de critère mentionné dans le Guide d'intervention pour les cyanures totaux et les cyanures libres.

0,05 :Critères additionels depuis mars 2019 selon le guide d'intervention du MELCC

**ANNEXE C**

# Certificats analytiques du laboratoire (Suivi 2011 à 2013, 2017,2018 et 2019)

# Suivi 2011 à 2013

Votre # du projet: 10-1221-0107
Votre # Bordereau: E836388

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2011/12/06**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B166091**
**Reçu: 2011/11/29, 11:05**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 4

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 3 | N/A | 2011/11/29 | STL SOP-00038 | MA. 315- Alc-Aci 1.0 |
| Anions (1) | 3 | N/A | 2011/12/05 | QUE SOP-00141 | MA. 300 . Ions 1.2 |
| Contenant supplementaire-archivé | 13 | N/A | 2011/11/29 | | |
| Hydrocarbures pétroliers (C10-C50) | 3 | 2011/12/02 | 2011/12/04 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 4 | 2011/12/02 | 2011/12/02 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 4 | 2011/12/01 | 2011/12/01 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Frais de gestion | 4 | N/A | 2011/11/29 | | |
| Fluorures | 3 | N/A | 2011/11/29 | STL SOP-00038 | SM 4500-F- C. |
| Métaux par ICP-MS | 4 | 2011/12/01 | 2011/12/01 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux par ICP | 3 | 2011/11/30 | 2011/12/01 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 3 | N/A | 2011/12/01 | STL SOP-00040 | MA. 300 - N 1.1 |
| Phosphore total | 3 | 2011/11/30 | 2011/11/30 | STL SOP-00006 | MA.200- Mét 1.2 |
| Sulfures (exprimés en S2-) | 3 | 2011/11/30 | 2011/11/30 | STL SOP-00005 | MA. 300-S 1.1 |
| Solides totaux dissous | 3 | 2011/12/02 | 2011/12/02 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

(1) Cette analyse a été effectuée par Maxxam - Québec

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

ARGYRO FRANGOULIS, Chargée de projets
Email: AFrangoulis@maxxam.ca
Phone# (514) 448-9001

==========

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Dossier Maxxam: B166091
Date du rapport: 2011/12/06

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| ID Maxxam | | P59787 | P59788 | P59789 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2011/11/26 | 2011/11/26 | 2011/11/26 | | |
| # Bordereau | | E836388 | E836388 | E836388 | | |
| | **Unités** | **BH-11-06-26112011** | **BH-11-09-26112011** | **BH-11-11-22112011** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | 100 | 948736 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 72 | 79 | 74 | N/A | 948736 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Dossier Maxxam: B166091
Date du rapport: 2011/12/06

Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| ID Maxxam | | | | P59787 | P59788 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | | | 2011/11/26 | 2011/11/26 | | |
| # Bordereau | | | | E836388 | E836388 | | |
| | **Unités** | | | **BH-11-06-26112011** | **BH-11-09-26112011** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Phosphore total | mg/L | | | <0.01 | <0.01 | 0.01 | 947515 |
| Aluminium (Al) | mg/L | | | 3.0 | <0.03 | 0.03 | 948137 |
| Arsenic (As) | mg/L | | | <0.002 | 0.004 | 0.002 | 948137 |
| Baryum (Ba) | mg/L | | | 0.04 | 0.07 | 0.03 | 948137 |
| Cadmium (Cd) | mg/L | | | <0.001 | <0.001 | 0.001 | 948137 |
| Chrome (Cr) | mg/L | | | <0.03 | <0.03 | 0.03 | 948137 |
| Cuivre (Cu) | mg/L | | | 0.014 | <0.003 | 0.003 | 948137 |
| Plomb (Pb) | mg/L | | | 0.004 | <0.001 | 0.001 | 948137 |
| Nickel (Ni) | mg/L | | | 0.01 | <0.01 | 0.01 | 948137 |
| Sélénium (Se) | mg/L | | | <0.001 | <0.001 | 0.001 | 948137 |
| Sodium (Na) | mg/L | | | 22 | 25 | 0.2 | 948137 |
| Zinc (Zn) | mg/L | | | 0.018 | 0.020 | 0.005 | 948137 |
| Bore (B) | mg/L | | | <0.05 | <0.05 | 0.05 | 948137 |
| Fer (Fe) | mg/L | | | 2.8 | <0.1 | 0.1 | 948137 |
| Magnésium (Mg) | mg/L | | | 2.8 | 25 | 0.2 | 948137 |
| Potassium (K) | mg/L | | | 1.6 | 4.2 | 0.2 | 948137 |
| Calcium (Ca) | mg/L | | | 17 | 53 | 0.5 | 948137 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B166091
Date du rapport: 2011/12/06

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| ID Maxxam | | P59789 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2011/11/26 | | |
| # Bordereau | | E836388 | | |
| | **Unités** | **BH-11-11-22112011** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Phosphore total | mg/L | <0.01 | 0.01 | 947515 |
| Aluminium (Al) | mg/L | 0.38 | 0.03 | 948137 |
| Arsenic (As) | mg/L | <0.002 | 0.002 | 948137 |
| Baryum (Ba) | mg/L | 0.04 | 0.03 | 948137 |
| Cadmium (Cd) | mg/L | <0.001 | 0.001 | 948137 |
| Chrome (Cr) | mg/L | <0.03 | 0.03 | 948137 |
| Cuivre (Cu) | mg/L | <0.003 | 0.003 | 948137 |
| Plomb (Pb) | mg/L | <0.001 | 0.001 | 948137 |
| Nickel (Ni) | mg/L | <0.01 | 0.01 | 948137 |
| Sélénium (Se) | mg/L | <0.001 | 0.001 | 948137 |
| Sodium (Na) | mg/L | 2.4 | 0.2 | 948137 |
| Zinc (Zn) | mg/L | 0.019 | 0.005 | 948137 |
| Bore (B) | mg/L | <0.05 | 0.05 | 948137 |
| Fer (Fe) | mg/L | 0.6 | 0.1 | 948137 |
| Magnésium (Mg) | mg/L | 2.9 | 0.2 | 948137 |
| Potassium (K) | mg/L | 1.5 | 0.2 | 948137 |
| Calcium (Ca) | mg/L | 8.1 | 0.5 | 948137 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B166091
Date du rapport: 2011/12/06

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | | P59787 | P59788 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | | 2011/11/26 | 2011/11/26 | | |
| # Bordereau | | | E836388 | E836388 | | |
| | **Unités** | | **BH-11-06-26112011** | **BH-11-09-26112011** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | | 0.05 | 0.04 | 0.02 | 948000 |
| Cyanures disponibles (CN-) | mg/L | | <0.01 | <0.01 | 0.01 | 948608 |
| Cyanures Totaux | mg/L | | <0.003 | <0.003 | 0.003 | 948212 |
| Fluorure (F) | mg/L | | 0.2 | 0.2 | 0.1 | 947254 |
| Sulfures (exprimés en S2-) | mg/L | | <0.02 | <0.02 | 0.02 | 947409 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | | 71 | 270 | 1 | 947252 |
| Carbonate (CO3 comme CaCO3) | mg/L | | <1 | <1 | 1 | 947252 |
| Chlorures (Cl) | mg/L | | 0.27 | 0.19 | 0.05 | 949183 |
| Nitrate(N) et Nitrite(N) | mg/L | | 0.02 | 0.02 | 0.02 | 949183 |
| Sulfates (SO4) | mg/L | | 14 | 14 | 0.5 | 949183 |
| Solide Dissous Totaux | mg/L | | 140 | 320 | 10 | 948834 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B166091
Date du rapport: 2011/12/06

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | P59789 | P59789 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2011/11/26 | 2011/11/26 | | |
| # Bordereau | | E836388 | E836388 | | |
| | **Unités** | **BH-11-11-22112011** | **BH-11-11-22112011 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.09 | N/A | 0.02 | 948000 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | <0.01 | 0.01 | 948608 |
| Cyanures Totaux | mg/L | <0.003 | N/A | 0.003 | 948212 |
| Fluorure (F) | mg/L | <0.1 | N/A | 0.1 | 947254 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | N/A | 0.02 | 947409 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 6 | N/A | 1 | 947252 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | N/A | 1 | 947252 |
| Chlorures (Cl) | mg/L | 2.0 | N/A | 0.05 | 949183 |
| Nitrate(N) et Nitrite(N) | mg/L | 0.13 | N/A | 0.02 | 949183 |
| Sulfates (SO4) | mg/L | 27 | N/A | 0.5 | 949183 |
| Solide Dissous Totaux | mg/L | 95 | N/A | 10 | 948834 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B166091
Date du rapport: 2011/12/06

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**


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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site:

# Rapport Assurance Qualité

Dossier Maxxam: B166091

| Lot AQ/CQ Num | Init | Type CQ | Paramètre | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 947252 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2011/11/29 | | 97 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2011/11/29 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2011/11/29 | <1 | | mg/L |
| 947254 | MR4 | Blanc fortifié | Fluorure (F) | 2011/11/29 | | 96 | % |
| | | Blanc de méthode | Fluorure (F) | 2011/11/29 | <0.1 | | mg/L |
| 947409 | LI | Blanc fortifié | Sulfures (exprimés en S2-) | 2011/11/30 | | 99 | % |
| | | Blanc de méthode | Sulfures (exprimés en S2-) | 2011/11/30 | <0.02 | | mg/L |
| 947515 | SC5 | Blanc fortifié | Phosphore total | 2011/12/01 | | 94 | % |
| | | Blanc de méthode | Phosphore total | 2011/12/01 | <0.01 | | mg/L |
| 948000 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2011/12/01 | | 105 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2011/12/01 | <0.02 | | mg/L |
| 948137 | SC5 | Blanc fortifié | Aluminium (Al) | 2011/12/01 | | 96 | % |
| | | | Arsenic (As) | 2011/12/01 | | 103 | % |
| | | | Baryum (Ba) | 2011/12/01 | | 101 | % |
| | | | Cadmium (Cd) | 2011/12/01 | | 103 | % |
| | | | Chrome (Cr) | 2011/12/01 | | 103 | % |
| | | | Cuivre (Cu) | 2011/12/01 | | 100 | % |
| | | | Plomb (Pb) | 2011/12/01 | | 107 | % |
| | | | Nickel (Ni) | 2011/12/01 | | 102 | % |
| | | | Sélénium (Se) | 2011/12/01 | | 105 | % |
| | | | Sodium (Na) | 2011/12/01 | | 106 | % |
| | | | Zinc (Zn) | 2011/12/01 | | 104 | % |
| | | | Bore (B) | 2011/12/01 | | 101 | % |
| | | | Fer (Fe) | 2011/12/01 | | 109 | % |
| | | | Magnésium (Mg) | 2011/12/01 | | 102 | % |
| | | | Potassium (K) | 2011/12/01 | | 109 | % |
| | | | Calcium (Ca) | 2011/12/01 | | 100 | % |
| | | Blanc de méthode | Aluminium (Al) | 2011/12/01 | <0.03 | | mg/L |
| | | | Arsenic (As) | 2011/12/01 | <0.002 | | mg/L |
| | | | Baryum (Ba) | 2011/12/01 | <0.03 | | mg/L |
| | | | Cadmium (Cd) | 2011/12/01 | <0.001 | | mg/L |
| | | | Chrome (Cr) | 2011/12/01 | <0.03 | | mg/L |
| | | | Cuivre (Cu) | 2011/12/01 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2011/12/01 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2011/12/01 | <0.01 | | mg/L |
| | | | Sélénium (Se) | 2011/12/01 | <0.001 | | mg/L |
| | | | Sodium (Na) | 2011/12/01 | <0.2 | | mg/L |
| | | | Zinc (Zn) | 2011/12/01 | <0.005 | | mg/L |
| | | | Bore (B) | 2011/12/01 | <0.05 | | mg/L |
| | | | Fer (Fe) | 2011/12/01 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2011/12/01 | <0.2 | | mg/L |
| | | | Potassium (K) | 2011/12/01 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2011/12/01 | <0.5 | | mg/L |
| 948212 | DB2 | ÉTALON CQ | Cyanures Totaux | 2011/12/01 | | 88 | % |
| | | Blanc fortifié | Cyanures Totaux | 2011/12/01 | | 104 | % |
| | | Blanc de méthode | Cyanures Totaux | 2011/12/01 | <0.003 | | mg/L |
| 948608 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2011/12/02 | | 95 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2011/12/02 | | 110 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2011/12/02 | <0.01 | | mg/L |
| 948736 | YW | Blanc fortifié | 1-Chlorooctadécane | 2011/12/04 | | 80 | % |
| | | Blanc fortifié DUP | 1-Chlorooctadécane | 2011/12/04 | | 71 | % |
| | | Blanc fortifié DUP 2 | 1-Chlorooctadécane | 2011/12/04 | | 67 | % |
| | | Blanc fortifié DUP 3 | 1-Chlorooctadécane | 2011/12/04 | | 71 | % |



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site:

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B166091

| Lot AQ/CQ Num Init | Type CQ | Paramètre | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|
| 948736 YW | Blanc fortifié | Hydrocarbures Pétroliers (C10-C50) | 2011/12/04 | | 80 | % |
| | Blanc fortifié DUP | Hydrocarbures Pétroliers (C10-C50) | 2011/12/04 | | 71 | % |
| | Blanc fortifié DUP 2 | Hydrocarbures Pétroliers (C10-C50) | 2011/12/04 | | 73 | % |
| | Blanc fortifié DUP 3 | Hydrocarbures Pétroliers (C10-C50) | 2011/12/04 | | 71 | % |
| | Blanc de méthode | 1-Chlorooctadécane | 2011/12/04 | | 80 | % |
| | | Hydrocarbures Pétroliers (C10-C50) | 2011/12/04 | <100 | | ug/L |
| 948834 FSI | Blanc fortifié | Solide Dissous Totaux | 2011/12/02 | | 101 | % |
| | Blanc fortifié DUP | Solide Dissous Totaux | 2011/12/02 | | 102 | % |
| | Blanc de méthode | Solide Dissous Totaux | 2011/12/02 | <10 | | mg/L |
| 949183 MCC | ÉTALON CQ | Chlorures (Cl) | 2011/12/05 | | 97 | % |
| | ÉTALON CQ DUP | Chlorures (Cl) | 2011/12/05 | | 98 | % |
| | ÉTALON CQ | Nitrate(N) et Nitrite(N) | 2011/12/05 | | 94 | % |
| | ÉTALON CQ DUP | Nitrate(N) et Nitrite(N) | 2011/12/05 | | 97 | % |
| | ÉTALON CQ | Sulfates (SO4) | 2011/12/05 | | 96 | % |
| | ÉTALON CQ DUP | Sulfates (SO4) | 2011/12/05 | | 98 | % |
| | Blanc fortifié | Nitrate(N) et Nitrite(N) | 2011/12/05 | | 96 | % |
| | Blanc fortifié DUP | Nitrate(N) et Nitrite(N) | 2011/12/05 | | 96 | % |
| | Blanc de méthode | Chlorures (Cl) | 2011/12/05 | <0.05 | | mg/L |
| | Blanc de méthode DUP | Chlorures (Cl) | 2011/12/05 | <0.05 | | mg/L |
| | Blanc de méthode | Nitrate(N) et Nitrite(N) | 2011/12/05 | <0.02 | | mg/L |
| | Blanc de méthode DUP | Nitrate(N) et Nitrite(N) | 2011/12/05 | <0.02 | | mg/L |
| | Blanc de méthode | Sulfates (SO4) | 2011/12/05 | <0.5 | | mg/L |
| | Blanc de méthode DUP | Sulfates (SO4) | 2011/12/05 | <0.5 | | mg/L |

Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B166091**

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Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

DELIA BARBUL, B.Sc., Chimiste

MARIA CHRIFI ALAOUI, B.Sc., Chimiste

MADINA HAMROUNI, B.Sc., Chimiste

MATHIEU LETOURNEAU, B.Sc., chimiste, Superviseur, Québec

NOUREDDINE CHAFIAAI, B.Sc., Chimiste

STELIANA CALESTRU, B.Sc. Chimiste



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Votre # du projet: 10-1221-0107
Votre # Bordereau: e836397

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/03/15**
**# Rapport: NM-388005**

Ce rapport a préséance sur tous les rapports précédents pour le même numéro de dossier Maxxam

## CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B166741**
**Reçu: 2011/12/01, 11:40**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 6

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 3 | N/A | 2011/12/01 | STL SOP-00038 | SM 2320B |
| Anions (1) | 3 | N/A | 2011/12/06 | QUE SOP-00141 | MA. 300 . Ions 1.2 |
| Contenant supplementaire-archivé | 15 | N/A | 2011/12/01 | | |
| Hydrocarbures pétroliers (C10-C50) | 3 | 2011/12/03 | 2011/12/06 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 6 | 2011/12/02 | 2011/12/02 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 1 | 2011/12/05 | 2011/12/05 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 5 | 2011/12/06 | 2011/12/07 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Frais de gestion | 6 | N/A | 2011/12/01 | | |
| Fluorures | 3 | N/A | 2011/12/01 | STL SOP-00038 | SM 4500-F- C. |
| Métaux par ICP-MS | 6 | 2011/12/02 | 2011/12/05 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux par ICP | 3 | 2011/12/02 | 2011/12/06 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 3 | N/A | 2011/12/02 | STL SOP-00040 | MA. 300 - N 1.1 |
| Phosphore total | 3 | 2011/12/02 | 2011/12/02 | STL SOP-00006 | MA.200- Mét 1.2 |
| Sulfures (exprimés en S2-) | 3 | 2011/12/02 | 2011/12/02 | STL SOP-00005 | MA. 300-S 1.1 |
| Solides totaux dissous | 3 | 2011/12/05 | 2011/12/05 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

(1) Cette analyse a été effectuée par Maxxam - Québec

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

ARGYRO FRANGOULIS, Chargée de projets
Email: AFrangoulis@maxxam.ca
Phone# (514) 448-9001

==========



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Votre # du projet: 10-1221-0107
Votre # Bordereau: e836397

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/03/15**
**# Rapport: NM-388005**

Ce rapport a préséance sur tous les rapports précédents pour le même numéro de dossier Maxxam

## CERTIFICAT D'ANALYSES

-2-

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Dossier Maxxam: B166741
Date du rapport: 2012/03/15

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| ID Maxxam | | P62766 | P62767 | P62768 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2011/11/29 | 2011/11/29 | 2011/11/29 | | |
| # Bordereau | | e836397 | e836397 | e836397 | | |
| | **Unités** | **BH-11-13-29112011** | **BH-11-07-29112011** | **DUP-3-29112011** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | 100 | 949061 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 77 | 77 | 78 | N/A | 949061 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B166741
Date du rapport: 2012/03/15

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| | | | | |
|---|---|---|---|---|
| ID Maxxam | | P62766 | | |
| Date d'échantillonnage | | 2011/11/29 | | |
| # Bordereau | | e836397 | | |
| | **Unités** | **BH-11-13-29112011** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Phosphore total | mg/L | 0.20 | 0.01 | 948588 |
| Aluminium (Al) | mg/L | 2.3 | 0.03 | 948904 |
| Arsenic (As) | mg/L | 0.005 | 0.002 | 948904 |
| Baryum (Ba) | mg/L | 0.52 | 0.03 | 948904 |
| Cadmium (Cd) | mg/L | <0.001 | 0.001 | 948904 |
| Chrome (Cr) | mg/L | <0.03 | 0.03 | 948904 |
| Cuivre (Cu) | mg/L | 0.032 | 0.003 | 948904 |
| Plomb (Pb) | mg/L | 0.002 | 0.001 | 948904 |
| Nickel (Ni) | mg/L | 0.02 | 0.01 | 948904 |
| Sélénium (Se) | mg/L | <0.001 | 0.001 | 948904 |
| Sodium (Na) | mg/L | 11 | 0.2 | 948904 |
| Zinc (Zn) | mg/L | 0.020 | 0.005 | 948904 |
| Bore (B) | mg/L | <0.05 | 0.05 | 948904 |
| Fer (Fe) | mg/L | 6.3 | 0.1 | 948904 |
| Magnésium (Mg) | mg/L | 22 | 0.2 | 948904 |
| Potassium (K) | mg/L | 5.6 | 0.2 | 948904 |
| Calcium (Ca) | mg/L | 54 | 0.5 | 948904 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B166741
Date du rapport: 2012/03/15

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| ID Maxxam | | P62767 | P62768 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2011/11/29 | 2011/11/29 | | |
| # Bordereau | | e836397 | e836397 | | |
| | **Unités** | **BH-11-07-29112011** | **DUP-3-29112011** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | |
| Phosphore total | mg/L | <0.01 | 0.03 | 0.01 | 948588 |
| Aluminium (Al) | mg/L | <0.03 | <0.03 | 0.03 | 948904 |
| Arsenic (As) | mg/L | 0.004 | 0.004 | 0.002 | 948904 |
| Baryum (Ba) | mg/L | 0.09 | 0.09 | 0.03 | 948904 |
| Cadmium (Cd) | mg/L | <0.001 | <0.001 | 0.001 | 948904 |
| Chrome (Cr) | mg/L | <0.03 | <0.03 | 0.03 | 948904 |
| Cuivre (Cu) | mg/L | <0.003 | <0.003 | 0.003 | 948904 |
| Plomb (Pb) | mg/L | <0.001 | <0.001 | 0.001 | 948904 |
| Nickel (Ni) | mg/L | <0.01 | <0.01 | 0.01 | 948904 |
| Sélénium (Se) | mg/L | <0.001 | <0.001 | 0.001 | 948904 |
| Sodium (Na) | mg/L | 47 | 48 | 0.2 | 948904 |
| Zinc (Zn) | mg/L | 0.011 | 0.009 | 0.005 | 948904 |
| Bore (B) | mg/L | <0.05 | <0.05 | 0.05 | 948904 |
| Fer (Fe) | mg/L | 7.6 | 7.4 | 0.1 | 948904 |
| Magnésium (Mg) | mg/L | 31 | 32 | 0.2 | 948904 |
| Potassium (K) | mg/L | 10 | 11 | 0.2 | 948904 |
| Calcium (Ca) | mg/L | 120 | 120 | 0.5 | 948904 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B166741
Date du rapport: 2012/03/15

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | | | |
|---|---|---|---|---|
| Date d'échantillonnage | | | | |
| # Bordereau | | | | |
| | **Unités** | | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Cyanures disponibles (CN-) | mg/L | | 0.01 | 948608 |
| Cyanures Totaux | mg/L | | 0.003 | 949137 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | P62766 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2011/11/29 | | |
| # Bordereau | | e836397 | | |
| | **Unités** | **BH-11-13-29112011** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.23 | 0.02 | 948718 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | 948608 |
| Cyanures Totaux | mg/L | <0.003 | 0.003 | 949876 |
| Fluorure (F) | mg/L | 0.1 | 0.1 | 948345 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | 0.02 | 948761 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 200 | 1 | 948344 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | 1 | 948344 |
| Chlorures (Cl) | mg/L | 0.76 | 0.05 | 949787 |
| Nitrate(N) et Nitrite(N) | mg/L | <0.2 | 0.2 | 949787 |
| Sulfates (SO4) | mg/L | 39 | 0.5 | 949787 |
| Solide Dissous Totaux | mg/L | 290 | 10 | 949419 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B166741
Date du rapport: 2012/03/15

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | P62766 | P62767 | P62767 | P62768 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2011/11/29 | 2011/11/29 | 2011/11/29 | 2011/11/29 | | |
| # Bordereau | | e836397 | e836397 | e836397 | e836397 | | |
| | **Unités** | **BH-11-13-29112011 Dup. de Lab.** | **BH-11-07-29112011** | **BH-11-07-29112011 Dup. de Lab.** | **DUP-3-29112011** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | N/A | 0.55 | 0.55 | 0.54 | 0.02 | 948718 |
| Cyanures disponibles (CN-) | mg/L | N/A | <0.01 | N/A | <0.01 | 0.01 | 948608 |
| Cyanures Totaux | mg/L | N/A | 0.003 | N/A | 0.003 | 0.003 | 949876 |
| Fluorure (F) | mg/L | N/A | 0.1 | N/A | 0.2 | 0.1 | 948345 |
| Sulfures (exprimés en S2-) | mg/L | N/A | <0.02 | N/A | <0.02 | 0.02 | 948761 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | N/A | 180 | N/A | 170 | 1 | 948344 |
| Carbonate (CO3 comme CaCO3) | mg/L | N/A | <1 | N/A | <1 | 1 | 948344 |
| Chlorures (Cl) | mg/L | 0.79 | 19 | N/A | 19 | 0.05 | 949787 |
| Nitrate(N) et Nitrite(N) | mg/L | <0.2 | <0.2 | N/A | <0.2 | 0.2 | 949787 |
| Sulfates (SO4) | mg/L | 39 | 330 | N/A | 330 | 0.5 | 949787 |
| Solide Dissous Totaux | mg/L | N/A | 740 | N/A | 740 | 10 | 949419 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B166741
Date du rapport: 2012/03/15

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**


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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site:

# Rapport Assurance Qualité

Dossier Maxxam: B166741

| Lot AQ/CQ Num | Init | Type CQ | Paramètre | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 948344 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2011/12/01 | | 99 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2011/12/01 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2011/12/01 | <1 | | mg/L |
| 948345 | MR4 | Blanc fortifié | Fluorure (F) | 2011/12/01 | | 100 | % |
| | | Blanc de méthode | Fluorure (F) | 2011/12/01 | <0.1 | | mg/L |
| 948588 | MCA | Blanc fortifié | Phosphore total | 2011/12/06 | | 118 | % |
| | | Blanc de méthode | Phosphore total | 2011/12/06 | <0.01 | | mg/L |
| 948608 | DB2 | Matériau de référence certifié | Cyanures disponibles (CN-) | 2011/12/02 | | 95 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2011/12/02 | | 110 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2011/12/02 | <0.01 | | mg/L |
| 948718 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2011/12/02 | | 103 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2011/12/02 | <0.02 | | mg/L |
| 948761 | CN1 | Blanc fortifié | Sulfures (exprimés en S2-) | 2011/12/02 | | 98 | % |
| | | Blanc de méthode | Sulfures (exprimés en S2-) | 2011/12/02 | <0.02 | | mg/L |
| 948904 | SC5 | Blanc fortifié | Aluminium (Al) | 2011/12/05 | | 104 | % |
| | | | Arsenic (As) | 2011/12/05 | | 98 | % |
| | | | Baryum (Ba) | 2011/12/05 | | 99 | % |
| | | | Cadmium (Cd) | 2011/12/05 | | 109 | % |
| | | | Chrome (Cr) | 2011/12/05 | | 97 | % |
| | | | Cuivre (Cu) | 2011/12/05 | | 93 | % |
| | | | Plomb (Pb) | 2011/12/05 | | 103 | % |
| | | | Nickel (Ni) | 2011/12/05 | | 98 | % |
| | | | Sélénium (Se) | 2011/12/05 | | 104 | % |
| | | | Sodium (Na) | 2011/12/05 | | 107 | % |
| | | | Zinc (Zn) | 2011/12/05 | | 107 | % |
| | | | Bore (B) | 2011/12/05 | | 86 | % |
| | | | Fer (Fe) | 2011/12/05 | | 105 | % |
| | | | Magnésium (Mg) | 2011/12/05 | | 104 | % |
| | | | Potassium (K) | 2011/12/05 | | 109 | % |
| | | | Calcium (Ca) | 2011/12/05 | | 101 | % |
| | | Blanc de méthode | Aluminium (Al) | 2011/12/05 | <0.03 | | mg/L |
| | | | Arsenic (As) | 2011/12/05 | <0.002 | | mg/L |
| | | | Baryum (Ba) | 2011/12/05 | <0.03 | | mg/L |
| | | | Cadmium (Cd) | 2011/12/05 | <0.001 | | mg/L |
| | | | Chrome (Cr) | 2011/12/05 | <0.03 | | mg/L |
| | | | Cuivre (Cu) | 2011/12/05 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2011/12/05 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2011/12/05 | <0.01 | | mg/L |
| | | | Sélénium (Se) | 2011/12/05 | <0.001 | | mg/L |
| | | | Sodium (Na) | 2011/12/05 | <0.2 | | mg/L |
| | | | Zinc (Zn) | 2011/12/05 | 0.008, LDR=0.005 | | mg/L |
| | | | Bore (B) | 2011/12/05 | <0.05 | | mg/L |
| | | | Fer (Fe) | 2011/12/05 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2011/12/05 | <0.2 | | mg/L |
| | | | Potassium (K) | 2011/12/05 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2011/12/05 | <0.5 | | mg/L |
| 949061 | AM8 | Blanc fortifié | 1-Chlorooctadécane | 2011/12/05 | | 79 | % |
| | | Blanc fortifié DUP | 1-Chlorooctadécane | 2011/12/05 | | 71 | % |
| | | Blanc fortifié DUP 2 | 1-Chlorooctadécane | 2011/12/05 | | 70 | % |
| | | Blanc fortifié DUP 3 | 1-Chlorooctadécane | 2011/12/05 | | 78 | % |
| | | Blanc fortifié | Hydrocarbures Pétroliers (C10-C50) | 2011/12/05 | | 91 | % |
| | | Blanc fortifié DUP | Hydrocarbures Pétroliers (C10-C50) | 2011/12/05 | | 83 | % |



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site:

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B166741

| Lot AQ/CQ Num | Init | Type CQ | Paramètre | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 949061 | AM8 | Blanc fortifié DUP 2 | Hydrocarbures Pétroliers (C10-C50) | 2011/12/05 | | 79 | % |
| | | Blanc fortifié DUP 3 | Hydrocarbures Pétroliers (C10-C50) | 2011/12/05 | | 87 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2011/12/05 | | 79 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2011/12/05 | 110, LDR=100 | | ug/L |
| 949137 | DB2 | Matériau de référence certifié | Cyanures Totaux | 2011/12/05 | | 84 | % |
| | | Blanc fortifié | Cyanures Totaux | 2011/12/05 | | 104 | % |
| | | Blanc de méthode | Cyanures Totaux | 2011/12/05 | <0.003 | | mg/L |
| 949419 | PL3 | Blanc fortifié | Solide Dissous Totaux | 2011/12/05 | | 99 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2011/12/05 | | 100 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2011/12/05 | <10 | | mg/L |
| 949787 | MCC | Matériau de référence certifié | Chlorures (Cl) | 2011/12/06 | | 98 | % |
| | | | Nitrate(N) et Nitrite(N) | 2011/12/06 | | 97 | % |
| | | | Sulfates (SO4) | 2011/12/06 | | 98 | % |
| | | Blanc fortifié | Nitrate(N) et Nitrite(N) | 2011/12/06 | | 95 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2011/12/06 | <0.05 | | mg/L |
| | | | Nitrate(N) et Nitrite(N) | 2011/12/06 | <0.02 | | mg/L |
| | | | Sulfates (SO4) | 2011/12/06 | <0.5 | | mg/L |
| 949876 | DB2 | Matériau de référence certifié | Cyanures Totaux | 2011/12/07 | | 96 | % |
| | | Blanc fortifié | Cyanures Totaux | 2011/12/07 | | 106 | % |
| | | Blanc de méthode | Cyanures Totaux | 2011/12/07 | <0.003 | | mg/L |

Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B166741**

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Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

CORINA TUE, B.Sc. Chimiste

DELIA BARBUL, B.Sc., Chimiste

DAVID PROVENCHER, B.Sc., Chimiste, Québec

HHRISTINA CHORBADZHIEVA, B.Sc Chimiste

MARIA CHRIFI ALAOUI, B.Sc., Chimiste

MADINA HAMROUNI, B.Sc., Chimiste



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Votre # du projet: 10-1221-0107
Votre # Bordereau: E836391

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2011/12/09**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B167045**
**Reçu: 2011/12/02, 12:45**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 1

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 1 | N/A | 2011/12/02 | STL SOP-00038 | MA. 315- Alc-Aci 1.0 |
| Anions (1) | 1 | N/A | 2011/12/06 | QUE SOP-00141 | MA. 300 . Ions 1.2 |
| Contenant supplementaire-archivé | 2 | N/A | 2011/12/02 | | |
| Hydrocarbures pétroliers (C10-C50) | 1 | 2011/12/06 | 2011/12/07 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 1 | 2011/12/08 | 2011/12/08 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 1 | 2011/12/07 | 2011/12/07 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Frais de gestion | 1 | N/A | 2011/12/02 | | |
| Fluorures | 1 | N/A | 2011/12/02 | STL SOP-00038 | SM 4500-F- C. |
| Métaux par ICP-MS | 1 | 2011/12/06 | 2011/12/06 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux par ICP | 1 | 2011/12/05 | 2011/12/06 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 1 | N/A | 2011/12/05 | STL SOP-00040 | MA. 300 - N 1.1 |
| Phosphore total | 1 | 2011/12/05 | 2011/12/05 | STL SOP-00006 | MA.200- Mét 1.2 |
| Sulfures (exprimés en S2-) | 1 | 2011/12/06 | 2011/12/06 | STL SOP-00005 | MA. 300-S 1.1 |
| Solides totaux dissous | 1 | 2011/12/05 | 2011/12/05 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

(1) Cette analyse a été effectuée par Maxxam - Québec

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

ARGYRO FRANGOULIS, Chargée de projets
Email: AFrangoulis@maxxam.ca
Phone# (514) 448-9001

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Dossier Maxxam: B167045
Date du rapport: 2011/12/09

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| ID Maxxam | | P64154 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2011/12/01 | | |
| # Bordereau | | E836391 | | |
| | **Unités** | **BH-11-21-01122011** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | 100 | 949711 |
| **Récupération des Surrogates (%)** | | | | |
| 1-Chlorooctadécane | % | 77 | N/A | 949711 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B167045
Date du rapport: 2011/12/09

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| ID Maxxam | | P64154 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2011/12/01 | | |
| # Bordereau | | E836391 | | |
| | **Unités** | **BH-11-21-01122011** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Phosphore total | mg/L | <0.01 | 0.01 | 949188 |
| Aluminium (Al) | mg/L | 0.14 | 0.03 | 949849 |
| Arsenic (As) | mg/L | <0.002 | 0.002 | 949849 |
| Baryum (Ba) | mg/L | 0.04 | 0.03 | 949849 |
| Cadmium (Cd) | mg/L | <0.001 | 0.001 | 949849 |
| Chrome (Cr) | mg/L | <0.03 | 0.03 | 949849 |
| Cuivre (Cu) | mg/L | <0.003 | 0.003 | 949849 |
| Plomb (Pb) | mg/L | <0.001 | 0.001 | 949849 |
| Nickel (Ni) | mg/L | <0.01 | 0.01 | 949849 |
| Sélénium (Se) | mg/L | <0.001 | 0.001 | 949849 |
| Sodium (Na) | mg/L | 83 | 0.2 | 949849 |
| Zinc (Zn) | mg/L | 0.023 | 0.005 | 949849 |
| Bore (B) | mg/L | <0.05 | 0.05 | 949849 |
| Fer (Fe) | mg/L | 0.2 | 0.1 | 949849 |
| Magnésium (Mg) | mg/L | 10 | 0.2 | 949849 |
| Potassium (K) | mg/L | 4.8 | 0.2 | 949849 |
| Calcium (Ca) | mg/L | 35 | 0.5 | 949849 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B167045
Date du rapport: 2011/12/09

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | P64154 | P64154 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2011/12/01 | 2011/12/01 | | |
| # Bordereau | | E836391 | E836391 | | |
| | **Unités** | **BH-11-21-01122011** | **BH-11-21-01122011 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.18 | N/A | 0.02 | 949185 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | <0.01 | 0.01 | 950739 |
| Cyanures Totaux | mg/L | <0.003 | N/A | 0.003 | 950346 |
| Fluorure (F) | mg/L | 0.1 | N/A | 0.1 | 948978 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | N/A | 0.02 | 949580 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 130 | N/A | 1 | 948977 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | N/A | 1 | 948977 |
| Chlorures (Cl) | mg/L | 11 | N/A | 0.05 | 949787 |
| Nitrate(N) et Nitrite(N) | mg/L | 0.05 | N/A | 0.02 | 949787 |
| Sulfates (SO4) | mg/L | 150 | N/A | 0.5 | 949787 |
| Solide Dissous Totaux | mg/L | 370 | N/A | 20 | 949419 |

N/A = Non applicable
LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B167045
Date du rapport: 2011/12/09

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107

Initiales du préleveur: RC

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

Dû à une présence de sédiments, l'échantillon P64154 fut décanté avant l'analyse.

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site:

# Rapport Assurance Qualité

Dossier Maxxam: B167045

| Lot AQ/CQ Num | Init | Type CQ | Paramètre | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 948977 | AL8 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2011/12/02 | | 99 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2011/12/02 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2011/12/02 | <1 | | mg/L |
| 948978 | AL8 | Blanc fortifié | Fluorure (F) | 2011/12/02 | | 96 | % |
| | | Blanc de méthode | Fluorure (F) | 2011/12/02 | <0.1 | | mg/L |
| 949185 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2011/12/05 | | 112 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2011/12/05 | <0.02 | | mg/L |
| 949188 | MCA | Blanc fortifié | Phosphore total | 2011/12/06 | | 110 | % |
| | | Blanc de méthode | Phosphore total | 2011/12/06 | <0.01 | | mg/L |
| 949419 | PL3 | Blanc fortifié | Solide Dissous Totaux | 2011/12/05 | | 99 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2011/12/05 | | 100 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2011/12/05 | <10 | | mg/L |
| 949580 | CN1 | Blanc fortifié | Sulfures (exprimés en S2-) | 2011/12/06 | | 102 | % |
| | | Blanc de méthode | Sulfures (exprimés en S2-) | 2011/12/06 | <0.02 | | mg/L |
| 949711 | AS2 | Blanc fortifié | 1-Chlorooctadécane | 2011/12/07 | | 76 | % |
| | | Blanc fortifié DUP | 1-Chlorooctadécane | 2011/12/07 | | 98 | % |
| | | Blanc fortifié | Hydrocarbures Pétroliers (C10-C50) | 2011/12/07 | | 86 | % |
| | | Blanc fortifié DUP | Hydrocarbures Pétroliers (C10-C50) | 2011/12/07 | | 105 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2011/12/07 | | 83 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2011/12/07 | <100 | | ug/L |
| 949787 | MCC | ÉTALON CQ | Chlorures (Cl) | 2011/12/06 | | 98 | % |
| | | | Nitrate(N) et Nitrite(N) | 2011/12/06 | | 97 | % |
| | | | Sulfates (SO4) | 2011/12/06 | | 98 | % |
| | | Blanc fortifié | Nitrate(N) et Nitrite(N) | 2011/12/06 | | 95 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2011/12/06 | <0.05 | | mg/L |
| | | | Nitrate(N) et Nitrite(N) | 2011/12/06 | <0.02 | | mg/L |
| | | | Sulfates (SO4) | 2011/12/06 | <0.5 | | mg/L |
| 949849 | MCA | Blanc fortifié | Aluminium (Al) | 2011/12/06 | | 95 | % |
| | | | Arsenic (As) | 2011/12/06 | | 92 | % |
| | | | Baryum (Ba) | 2011/12/06 | | 96 | % |
| | | | Cadmium (Cd) | 2011/12/06 | | 94 | % |
| | | | Chrome (Cr) | 2011/12/06 | | 93 | % |
| | | | Cuivre (Cu) | 2011/12/06 | | 88 | % |
| | | | Plomb (Pb) | 2011/12/06 | | 97 | % |
| | | | Nickel (Ni) | 2011/12/06 | | 93 | % |
| | | | Sélénium (Se) | 2011/12/06 | | 97 | % |
| | | | Sodium (Na) | 2011/12/06 | | 91 | % |
| | | | Zinc (Zn) | 2011/12/06 | | 119 | % |
| | | | Bore (B) | 2011/12/06 | | 87 | % |
| | | | Fer (Fe) | 2011/12/06 | | 93 | % |
| | | | Magnésium (Mg) | 2011/12/06 | | 92 | % |
| | | | Potassium (K) | 2011/12/06 | | 91 | % |
| | | | Calcium (Ca) | 2011/12/06 | | 95 | % |
| | | Blanc de méthode | Aluminium (Al) | 2011/12/06 | <0.03 | | mg/L |
| | | | Arsenic (As) | 2011/12/06 | <0.002 | | mg/L |
| | | | Baryum (Ba) | 2011/12/06 | <0.03 | | mg/L |
| | | | Cadmium (Cd) | 2011/12/06 | <0.001 | | mg/L |
| | | | Chrome (Cr) | 2011/12/06 | <0.03 | | mg/L |
| | | | Cuivre (Cu) | 2011/12/06 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2011/12/06 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2011/12/06 | <0.01 | | mg/L |
| | | | Sélénium (Se) | 2011/12/06 | <0.001 | | mg/L |
| | | | Sodium (Na) | 2011/12/06 | <0.2 | | mg/L |
| | | | Zinc (Zn) | 2011/12/06 | 0.006, LDR=0.005 | | mg/L |
| | | | Bore (B) | 2011/12/06 | <0.05 | | mg/L |



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site:

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B167045

| Lot AQ/CQ Num | Init | Type CQ | Paramètre | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 949849 | MCA | Blanc de méthode | Fer (Fe) | 2011/12/06 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2011/12/06 | <0.2 | | mg/L |
| | | | Potassium (K) | 2011/12/06 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2011/12/06 | <0.5 | | mg/L |
| 950346 | DB2 | ÉTALON CQ | Cyanures Totaux | 2011/12/07 | | 96 | % |
| | | Blanc fortifié | Cyanures Totaux | 2011/12/07 | | 106 | % |
| | | Blanc de méthode | Cyanures Totaux | 2011/12/07 | <0.003 | | mg/L |
| 950739 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2011/12/08 | | 90 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2011/12/08 | | 108 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2011/12/08 | <0.01 | | mg/L |

Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B167045**

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Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

DELIA BARBUL, B.Sc., Chimiste

DAVID PROVENCHER, B.Sc., Chimiste, Québec

HHRISTINA CHORBADZHIEVA, B.Sc Chimiste

MADINA HAMROUNI, B.Sc., Chimiste

NOUREDDINE CHAFIAAI, B.Sc., Chimiste

STELIANA CALESTRU, B.Sc. Chimiste



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Votre # du projet: 10-1221-0107
Adresse du site: 6002
Votre # Bordereau: E8444493

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/05/31**

Ce rapport a préséance sur tous les rapports précédents pour le même numéro de dossier Maxxam

## CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B224197**
**Reçu: 2012/05/22, 11:30**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 12

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 6 | N/A | 2012/05/23 | STL SOP-00038 | SM 2320B |
| Anions | 6 | N/A | 2012/05/28 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Contenant supplementaire-archivé | 12 | N/A | 2012/05/22 | | |
| Hydrocarbures pétroliers (C10-C50) | 6 | 2012/05/23 | 2012/05/23 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 6 | 2012/05/24 | 2012/05/24 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 6 | 2012/05/28 | 2012/05/28 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Frais de gestion | 6 | N/A | 2012/05/22 | | |
| Fluorures | 6 | N/A | 2012/05/23 | STL SOP-00038 | SM 4500-F- C. |
| Métaux par ICP-MS | 6 | 2012/05/25 | 2012/05/25 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux par ICP | 6 | 2012/05/25 | 2012/05/25 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 6 | N/A | 2012/05/28 | STL SOP-00040 | MA. 300 - N 1.1 |
| Nitrate et/ou Nitrite | 6 | N/A | 2012/05/23 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Phosphore total | 6 | 2012/05/25 | 2012/05/25 | STL SOP-00006 | MA.200- Mét 1.2 |
| Sulfures (exprimés en S2-) | 6 | 2012/05/28 | 2012/05/28 | STL SOP-00005 | MA. 300-S 1.1 |
| Solides totaux dissous | 6 | 2012/05/25 | 2012/05/25 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

LEILA SABOURI, Chargée de projets
Email: LSabouri@maxxam.ca
Phone# (514) 448-9001 Ext:4227

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Dossier Maxxam: B224197
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| Identification Maxxam | | Q98992 | Q98993 | Q98994 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/20 | 2012/05/20 | 2012/05/20 | | |
| # Bordereau | | E8444493 | E8444493 | E8444493 | | |
| | **Unités de** | **BH-11-21-20120520** | **BH-11-09-20120520** | **BH-11-07-20120520** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | 100 | 1007557 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 85 | 77 | 81 | N/A | 1007557 |

N/A = Non Applicable
LDR = Limite de détection rapportée

| Identification Maxxam | | Q99039 | Q99040 | Q99041 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/20 | 2012/05/21 | 2012/05/21 | | |
| # Bordereau | | E8444493 | E8444493 | E8444493 | | |
| | **Unités de** | **BH-11-06-20120520** | **BH-11-11-20120521** | **DUP-1-20120521** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | 100 | 1007557 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 72 | 82 | 81 | N/A | 1007557 |

N/A = Non Applicable
LDR = Limite de détection rapportée


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Dossier Maxxam: B224197
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | Q98992 | Q98993 | Q98994 | Q99039 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/20 | 2012/05/20 | 2012/05/20 | 2012/05/20 | | |
| # Bordereau | | E8444493 | E8444493 | E8444493 | E8444493 | | |
| | **Unités de** | **BH-11-21-20120520** | **BH-11-09-20120520** | **BH-11-07-20120520** | **BH-11-06-20120520** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Phosphore total | mg/L | 0.36 | 53 | 0.05 | 0.08 | 0.01 | 1008746 |

LDR = Limite de détection rapportée

| Identification Maxxam | | Q99040 | Q99041 | Q99327 | Q99329 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/21 | 2012/05/21 | 2012/05/20 | 2012/05/20 | | |
| # Bordereau | | E8444493 | E8444493 | E8444493 | E8444493 | | |
| | **Unités de** | **BH-11-11-20120521** | **DUP-1-20120521** | **BH-11-21-20120520 DISSOUS** | **BH-11-09-20120520 DISSOUS** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Phosphore total | mg/L | 0.02 | 0.03 | N/A | N/A | 0.01 | 1008746 |
| Aluminium (Al) | mg/L | N/A | N/A | 0.04 | <0.03 | 0.03 | 1008681 |
| Arsenic (As) | mg/L | N/A | N/A | <0.002 | 0.004 | 0.002 | 1008681 |
| Baryum (Ba) | mg/L | N/A | N/A | <0.03 | 0.06 | 0.03 | 1008681 |
| Cadmium (Cd) | mg/L | N/A | N/A | <0.001 | <0.001 | 0.001 | 1008681 |
| Chrome (Cr) | mg/L | N/A | N/A | <0.03 | <0.03 | 0.03 | 1008681 |
| Cuivre (Cu) | mg/L | N/A | N/A | <0.003 | <0.003 | 0.003 | 1008681 |
| Plomb (Pb) | mg/L | N/A | N/A | <0.001 | <0.001 | 0.001 | 1008681 |
| Nickel (Ni) | mg/L | N/A | N/A | <0.01 | <0.01 | 0.01 | 1008681 |
| Sélénium (Se) | mg/L | N/A | N/A | <0.001 | <0.001 | 0.001 | 1008681 |
| Sodium (Na) | mg/L | N/A | N/A | 37 | 21 | 0.2 | 1008681 |
| Zinc (Zn) | mg/L | N/A | N/A | 0.011 | 0.007 | 0.005 | 1008681 |
| Bore (B) | mg/L | N/A | N/A | <0.05 | <0.05 | 0.05 | 1008681 |
| Fer (Fe) | mg/L | N/A | N/A | <0.1 | 0.2 | 0.1 | 1008681 |
| Magnésium (Mg) | mg/L | N/A | N/A | 15 | 30 | 0.2 | 1008681 |
| Potassium (K) | mg/L | N/A | N/A | 5.6 | 4.2 | 0.2 | 1008681 |
| Calcium (Ca) | mg/L | N/A | N/A | 54 | 60 | 0.5 | 1008681 |

N/A = Non Applicable
LDR = Limite de détection rapportée


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Dossier Maxxam: B224197
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | Q99330 | Q99331 | Q99332 | Q99333 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/20 | 2012/05/20 | 2012/05/21 | 2012/05/21 | | |
| # Bordereau | | E8444493 | E8444493 | E8444493 | E8444493 | | |
| | **Unités de** | **BH-11-07-20120520 DISSOUS** | **BH-11-06-20120520 DISSOUS** | **BH-11-11-20120521 DISSOUS** | **DUP-1-20120521 DISSOUS** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Aluminium (Al) | mg/L | <0.03 | <0.03 | 0.21 | 0.21 | 0.03 | 1008681 |
| Arsenic (As) | mg/L | <0.002 | <0.002 | <0.002 | <0.002 | 0.002 | 1008681 |
| Baryum (Ba) | mg/L | 0.08 | <0.03 | <0.03 | <0.03 | 0.03 | 1008681 |
| Cadmium (Cd) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1008681 |
| Chrome (Cr) | mg/L | <0.03 | <0.03 | <0.03 | <0.03 | 0.03 | 1008681 |
| Cuivre (Cu) | mg/L | <0.003 | <0.003 | 0.004 | <0.003 | 0.003 | 1008681 |
| Plomb (Pb) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1008681 |
| Nickel (Ni) | mg/L | <0.01 | <0.01 | 0.01 | 0.01 | 0.01 | 1008681 |
| Sélénium (Se) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1008681 |
| Sodium (Na) | mg/L | 41 | 6.0 | 3.0 | 2.9 | 0.2 | 1008681 |
| Zinc (Zn) | mg/L | <0.005 | <0.005 | 0.015 | 0.007 | 0.005 | 1008681 |
| Bore (B) | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 1008681 |
| Fer (Fe) | mg/L | 5.0 | <0.1 | 1.7 | 1.8 | 0.1 | 1008681 |
| Magnésium (Mg) | mg/L | 24 | 2.2 | 2.1 | 2.1 | 0.2 | 1008681 |
| Potassium (K) | mg/L | 9.4 | 0.8 | 1.4 | 1.3 | 0.2 | 1008681 |
| Calcium (Ca) | mg/L | 100 | 15 | 7.1 | 7.0 | 0.5 | 1008681 |

LDR = Limite de détection rapportée


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Dossier Maxxam: B224197
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | Q99333 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/21 | | |
| # Bordereau | | E8444493 | | |
| | **Unités de** | **DUP-1-20120521 DISSOUS Dup. de Lab.** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Aluminium (Al) | mg/L | 0.21 | 0.03 | 1008681 |
| Arsenic (As) | mg/L | <0.002 | 0.002 | 1008681 |
| Baryum (Ba) | mg/L | <0.03 | 0.03 | 1008681 |
| Cadmium (Cd) | mg/L | <0.001 | 0.001 | 1008681 |
| Chrome (Cr) | mg/L | <0.03 | 0.03 | 1008681 |
| Cuivre (Cu) | mg/L | <0.003 | 0.003 | 1008681 |
| Plomb (Pb) | mg/L | <0.001 | 0.001 | 1008681 |
| Nickel (Ni) | mg/L | 0.01 | 0.01 | 1008681 |
| Sélénium (Se) | mg/L | <0.001 | 0.001 | 1008681 |
| Sodium (Na) | mg/L | 2.9 | 0.2 | 1008681 |
| Zinc (Zn) | mg/L | 0.008 | 0.005 | 1008681 |
| Bore (B) | mg/L | <0.05 | 0.05 | 1008681 |
| Fer (Fe) | mg/L | 1.8 | 0.1 | 1008681 |
| Magnésium (Mg) | mg/L | 2.2 | 0.2 | 1008681 |
| Potassium (K) | mg/L | 1.3 | 0.2 | 1008681 |
| Calcium (Ca) | mg/L | 6.7 | 0.5 | 1008681 |

LDR = Limite de détection rapportée



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Dossier Maxxam: B224197
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | Q98992 | | Q98993 | | Q98994 | | |
|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/20 | | 2012/05/20 | | 2012/05/20 | | |
| # Bordereau | | E8444493 | | E8444493 | | E8444493 | | |
| | **Unités de** | **BH-11-21-20120520** | **LDR** | **BH-11-09-20120520** | **LDR** | **BH-11-07-20120520** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.14 | 0.02 | 0.17 | 0.02 | 0.37 | 0.02 | 1009295 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | <0.01 | 0.01 | <0.01 | 0.01 | 1008083 |
| Cyanures Totaux | mg/L | <0.003 | 0.003 | <0.003 | 0.003 | <0.003 | 0.003 | 1009377 |
| Fluorure (F) | mg/L | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 1007645 |
| Nitrates (N-NO3-) | mg/L | 0.57 | 0.02 | 0.43 | 0.02 | 0.28 | 0.02 | 1007442 |
| Nitrites (N-NO2-) | mg/L | <0.02 | 0.02 | <0.02 | 0.02 | <0.02 | 0.02 | 1007442 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | 0.02 | <0.1 | 0.1 | <0.1 | 0.1 | 1009332 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 180 | 1 | 280 | 1 | 170 | 1 | 1007640 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | 1 | <1 | 1 | <1 | 1 | 1007640 |
| Chlorures (Cl) | mg/L | 2.8 | 0.05 | 0.15 | 0.05 | 15 | 0.05 | 1009344 |
| Sulfates (SO4) | mg/L | 66 | 0.5 | 15 | 0.5 | 220 | 1 | 1009344 |
| Solide Dissous Totaux | mg/L | 320 | 10 | 300 | 10 | 570 | 10 | 1008861 |

LDR = Limite de détection rapportée

| Identification Maxxam | | Q98994 | | Q99039 | Q99039 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/20 | | 2012/05/20 | 2012/05/20 | | |
| # Bordereau | | E8444493 | | E8444493 | E8444493 | | |
| | **Unités de** | **BH-11-07-20120520 Dup. de Lab.** | **LDR** | **BH-11-06-20120520** | **BH-11-06-20120520 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | N/A | 0.02 | 0.07 | N/A | 0.02 | 1009295 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | <0.01 | N/A | 0.01 | 1008083 |
| Cyanures Totaux | mg/L | N/A | 0.003 | <0.003 | <0.003 | 0.003 | 1009377 |
| Fluorure (F) | mg/L | N/A | 0.1 | 0.1 | N/A | 0.1 | 1007645 |
| Nitrates (N-NO3-) | mg/L | N/A | 0.02 | 0.35 | N/A | 0.02 | 1007442 |
| Nitrites (N-NO2-) | mg/L | N/A | 0.02 | <0.02 | N/A | 0.02 | 1007442 |
| Sulfures (exprimés en S2-) | mg/L | N/A | 0.1 | <0.02 | N/A | 0.02 | 1009332 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | N/A | 1 | 46 | N/A | 1 | 1007640 |
| Carbonate (CO3 comme CaCO3) | mg/L | N/A | 1 | <1 | N/A | 1 | 1007640 |
| Chlorures (Cl) | mg/L | N/A | 0.05 | 0.26 | N/A | 0.05 | 1009344 |
| Sulfates (SO4) | mg/L | N/A | 1 | 10 | N/A | 0.5 | 1009344 |
| Solide Dissous Totaux | mg/L | N/A | 10 | 100 | N/A | 10 | 1008861 |

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Dossier Maxxam: B224197
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | Q99040 | Q99041 | Q99041 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/21 | 2012/05/21 | 2012/05/21 | | |
| # Bordereau | | E8444493 | E8444493 | E8444493 | | |
| | **Unités de** | **BH-11-11-20120521** | **DUP-1-20120521** | **DUP-1-20120521 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.12 | 0.12 | 0.12 | 0.02 | 1009295 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | <0.01 | N/A | 0.01 | 1008083 |
| Cyanures Totaux | mg/L | <0.003 | <0.003 | N/A | 0.003 | 1009377 |
| Fluorure (F) | mg/L | <0.1 | <0.1 | N/A | 0.1 | 1007645 |
| Nitrates (N-NO3-) | mg/L | 0.39 | 0.41 | N/A | 0.02 | 1007442 |
| Nitrites (N-NO2-) | mg/L | 0.04 | 0.03 | N/A | 0.02 | 1007442 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | <0.02 | N/A | 0.02 | 1009332 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 13 | 13 | N/A | 1 | 1007640 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | <1 | N/A | 1 | 1007640 |
| Chlorures (Cl) | mg/L | 5.8 | 5.7 | 5.8 | 0.05 | 1009344 |
| Sulfates (SO4) | mg/L | 10 | 10 | 10 | 0.5 | 1009344 |
| Solide Dissous Totaux | mg/L | 70 | 70 | N/A | 10 | 1008861 |

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LDR = Limite de détection rapportée


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Dossier Maxxam: B224197
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

Dû à une présence de sédiments, les échantillons Q98993 et Q99039 furent décantés avant l'analyse.

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**


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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: 6002

# Rapport Assurance Qualité

Dossier Maxxam: B224197

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités de |
|---|---|---|---|---|---|---|---|
| 1007442 | AL8 | Blanc fortifié | Nitrates (N-NO3-) | 2012/05/23 | | 98 | % |
| | | | Nitrites (N-NO2-) | 2012/05/23 | | 109 | % |
| | | Blanc de méthode | Nitrates (N-NO3-) | 2012/05/23 | <0.02 | | mg/L |
| | | | Nitrites (N-NO2-) | 2012/05/23 | <0.02 | | mg/L |
| 1007557 | AM8 | Blanc fortifié | 1-Chlorooctadécane | 2012/05/23 | | 80 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/05/23 | | 99 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2012/05/23 | | 83 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/05/23 | <100 | | ug/L |
| 1007640 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/05/23 | | 98 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/05/23 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2012/05/23 | <1 | | mg/L |
| 1007645 | MR4 | Blanc fortifié | Fluorure (F) | 2012/05/23 | | 88 | % |
| | | Blanc de méthode | Fluorure (F) | 2012/05/23 | 0.1, LDR=0.1 | | mg/L |
| 1008083 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2012/05/24 | | 86 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2012/05/24 | | 104 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2012/05/24 | <0.01 | | mg/L |
| 1008681 | MCA | Blanc fortifié | Aluminium (Al) | 2012/05/25 | | 109 | % |
| | | | Arsenic (As) | 2012/05/25 | | 102 | % |
| | | | Baryum (Ba) | 2012/05/25 | | 106 | % |
| | | | Cadmium (Cd) | 2012/05/25 | | 105 | % |
| | | | Chrome (Cr) | 2012/05/25 | | 103 | % |
| | | | Cuivre (Cu) | 2012/05/25 | | 100 | % |
| | | | Plomb (Pb) | 2012/05/25 | | 107 | % |
| | | | Nickel (Ni) | 2012/05/25 | | 99 | % |
| | | | Sélénium (Se) | 2012/05/25 | | 103 | % |
| | | | Sodium (Na) | 2012/05/25 | | 105 | % |
| | | | Zinc (Zn) | 2012/05/25 | | 100 | % |
| | | | Bore (B) | 2012/05/25 | | 99 | % |
| | | | Fer (Fe) | 2012/05/25 | | 101 | % |
| | | | Magnésium (Mg) | 2012/05/25 | | 103 | % |
| | | | Potassium (K) | 2012/05/25 | | 106 | % |
| | | | Calcium (Ca) | 2012/05/25 | | 106 | % |
| | | Blanc de méthode | Aluminium (Al) | 2012/05/25 | <0.03 | | mg/L |
| | | | Arsenic (As) | 2012/05/25 | <0.002 | | mg/L |
| | | | Baryum (Ba) | 2012/05/25 | <0.03 | | mg/L |
| | | | Cadmium (Cd) | 2012/05/25 | <0.001 | | mg/L |
| | | | Chrome (Cr) | 2012/05/25 | <0.03 | | mg/L |
| | | | Cuivre (Cu) | 2012/05/25 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2012/05/25 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2012/05/25 | <0.01 | | mg/L |
| | | | Sélénium (Se) | 2012/05/25 | <0.001 | | mg/L |
| | | | Sodium (Na) | 2012/05/25 | <0.2 | | mg/L |
| | | | Zinc (Zn) | 2012/05/25 | <0.005 | | mg/L |
| | | | Bore (B) | 2012/05/25 | <0.05 | | mg/L |
| | | | Fer (Fe) | 2012/05/25 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2012/05/25 | <0.2 | | mg/L |
| | | | Potassium (K) | 2012/05/25 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2012/05/25 | <0.5 | | mg/L |
| 1008746 | JS2 | Blanc fortifié | Phosphore total | 2012/05/25 | | 103 | % |
| | | Blanc de méthode | Phosphore total | 2012/05/25 | <0.01 | | mg/L |
| 1008861 | FSI | Blanc fortifié | Solide Dissous Totaux | 2012/05/25 | | 98 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2012/05/25 | | 100 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2012/05/25 | <10 | | mg/L |
| 1009295 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2012/05/28 | | 100 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2012/05/28 | <0.02 | | mg/L |


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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: 6002

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B224197

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités de |
|---|---|---|---|---|---|---|---|
| 1009332 | AP0 | Vérification d'étalonnage | Sulfures (exprimés en S2-) | 2012/05/28 | | 106 | % |
| | | Blanc fortifié | Sulfures (exprimés en S2-) | 2012/05/28 | | 97 | % |
| | | Blanc de méthode | Sulfures (exprimés en S2-) | 2012/05/28 | <0.02 | | mg/L |
| 1009344 | AL8 | Blanc fortifié | Chlorures (Cl) | 2012/05/28 | | 102 | % |
| | | | Sulfates (SO4) | 2012/05/28 | | 105 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2012/05/28 | <0.05 | | mg/L |
| | | | Sulfates (SO4) | 2012/05/28 | <0.5 | | mg/L |
| 1009377 | DB2 | ÉTALON CQ | Cyanures Totaux | 2012/05/28 | | 85 | % |
| | | Blanc fortifié | Cyanures Totaux | 2012/05/28 | | 98 | % |
| | | Blanc de méthode | Cyanures Totaux | 2012/05/28 | <0.003 | | mg/L |

Vérification d'étalonnage: Sert à confimer que l'étalonnage est en contrôle tout au long de la séquence instrumentale.
Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée



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# Page des signatures de validation

**Dossier Maxxam: B224197**

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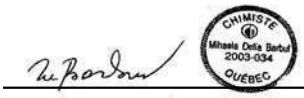
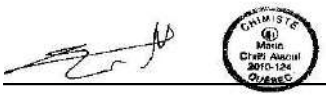
Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:




DELIA BARBUL, B.Sc., Chimiste

KATHIE QUEVILLON, B.Sc., Chimiste




MARIA CHRIFI ALAOUI, B.Sc., Chimiste

MICHEL POULIN, B.Sc., Chimiste

==========

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Votre # du projet: 10-1221-0107
Adresse du site: 6002
Votre # Bordereau: E836438, E-836438

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/05/31**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B224885**
**Reçu: 2012/05/24, 11:15**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 1

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 1 | N/A | 2012/05/25 | STL SOP-00038 | SM 2320B |
| Anions | 1 | N/A | 2012/05/24 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Contenant supplementaire-archivé | 2 | N/A | 2012/05/24 | | |
| Hydrocarbures pétroliers (C10-C50) | 1 | 2012/05/25 | 2012/05/26 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 1 | 2012/05/30 | 2012/05/30 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 1 | 2012/05/30 | 2012/05/31 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Fluorures | 1 | N/A | 2012/05/30 | STL SOP-00038 | SM 4500-F- C. |
| Métaux par ICP-MS | 1 | 2012/05/29 | 2012/05/29 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux par ICP | 1 | 2012/05/29 | 2012/05/29 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 1 | N/A | 2012/05/28 | STL SOP-00040 | MA. 300 - N 1.1 |
| Nitrate et/ou Nitrite | 1 | N/A | 2012/05/24 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Phosphore total | 1 | 2012/05/29 | 2012/05/29 | STL SOP-00006 | MA.200- Mét 1.2 |
| Sulfures (exprimés en S2-) | 1 | 2012/05/30 | 2012/05/30 | STL SOP-00005 | MA. 300-S 1.1 |
| Solides totaux dissous | 1 | 2012/05/29 | 2012/05/29 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

LEILA SABOURI, Chargée de projets
Email: LSabouri@maxxam.ca
Phone# (514) 448-9001 Ext:4227

==========

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Dossier Maxxam: B224885
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| | | | | |
|---|---|---|---|---|
| Identification Maxxam | | R01944 | | |
| Date d'échantillonnage | | 2012/05/22 | | |
| # Bordereau | | E-836438 | | |
| | **Unités de** | **BH-11-13-22052012** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | 100 | 1008711 |
| **Récupération des Surrogates (%)** | | | | |
| 1-Chlorooctadécane | % | 68 | N/A | 1008711 |

N/A = Non Applicable
LDR = Limite de détection rapportée


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Dossier Maxxam: B224885
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | R01944 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/22 | | |
| # Bordereau | | E-836438 | | |
| | **Unités de** | **BH-11-13-22052012** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Phosphore total | mg/L | 0.12 | 0.01 | 1009811 |
| Aluminium (Al) | mg/L | <0.03 | 0.03 | 1009747 |
| Arsenic (As) | mg/L | 0.004 | 0.002 | 1009747 |
| Baryum (Ba) | mg/L | 0.45 | 0.03 | 1009747 |
| Cadmium (Cd) | mg/L | <0.001 | 0.001 | 1009747 |
| Chrome (Cr) | mg/L | <0.03 | 0.03 | 1009747 |
| Cuivre (Cu) | mg/L | <0.003 | 0.003 | 1009747 |
| Plomb (Pb) | mg/L | <0.001 | 0.001 | 1009747 |
| Nickel (Ni) | mg/L | <0.01 | 0.01 | 1009747 |
| Sélénium (Se) | mg/L | <0.001 | 0.001 | 1009747 |
| Sodium (Na) | mg/L | 11 | 0.2 | 1009747 |
| Zinc (Zn) | mg/L | 0.007 | 0.005 | 1009747 |
| Bore (B) | mg/L | <0.05 | 0.05 | 1009747 |
| Fer (Fe) | mg/L | 1.1 | 0.1 | 1009747 |
| Magnésium (Mg) | mg/L | 18 | 0.2 | 1009747 |
| Potassium (K) | mg/L | 4.7 | 0.2 | 1009747 |
| Calcium (Ca) | mg/L | 58 | 0.5 | 1009747 |

LDR = Limite de détection rapportée



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Dossier Maxxam: B224885
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | R01944 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2012/05/22 | | |
| # Bordereau | | E-836438 | | |
| | **Unités de** | **BH-11-13-22052012** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.27 | 0.02 | 1009427 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | 1010423 |
| Cyanures Totaux | mg/L | <0.003 | 0.003 | 1010664 |
| Fluorure (F) | mg/L | 0.4 | 0.1 | 1010650 |
| Nitrates (N-NO3-) | mg/L | 0.23 | 0.02 | 1008494 |
| Nitrites (N-NO2-) | mg/L | <0.02 | 0.02 | 1008494 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | 0.02 | 1010333 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 200 | 1 | 1008869 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | 1 | 1008869 |
| Chlorures (Cl) | mg/L | 0.72 | 0.05 | 1008502 |
| Sulfates (SO4) | mg/L | 35 | 0.5 | 1008502 |
| Solide Dissous Totaux | mg/L | 270 | 10 | 1009963 |

LDR = Limite de détection rapportée


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Dossier Maxxam: B224885
Date du rapport: 2012/05/31

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: 6002

# Rapport Assurance Qualité

Dossier Maxxam: B224885

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités de |
|---|---|---|---|---|---|---|---|
| 1008494 | AL8 | Blanc fortifié | Nitrates (N-NO3-) | 2012/05/24 | | 98 | % |
| | | | Nitrites (N-NO2-) | 2012/05/24 | | 109 | % |
| | | Blanc de méthode | Nitrates (N-NO3-) | 2012/05/24 | <0.02 | | mg/L |
| | | | Nitrites (N-NO2-) | 2012/05/24 | <0.02 | | mg/L |
| 1008502 | AL8 | Blanc fortifié | Chlorures (Cl) | 2012/05/24 | | 104 | % |
| | | | Sulfates (SO4) | 2012/05/24 | | 105 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2012/05/24 | 0.16, LDR=0.05 | | mg/L |
| | | | Sulfates (SO4) | 2012/05/24 | <0.5 | | mg/L |
| 1008711 | YW | Blanc fortifié | 1-Chlorooctadécane | 2012/05/26 | | 61 | % |
| | | Blanc fortifié DUP | 1-Chlorooctadécane | 2012/05/26 | | 63 | % |
| | | Blanc fortifié DUP 2 | 1-Chlorooctadécane | 2012/05/26 | | 66 | % |
| | | Blanc fortifié | Hydrocarbures Pétroliers (C10-C50) | 2012/05/26 | | 81 | % |
| | | Blanc fortifié DUP | Hydrocarbures Pétroliers (C10-C50) | 2012/05/26 | | 91 | % |
| | | Blanc fortifié DUP 2 | Hydrocarbures Pétroliers (C10-C50) | 2012/05/26 | | 89 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2012/05/26 | | 75 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/05/26 | <100 | | ug/L |
| 1008869 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/05/25 | | 99 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/05/25 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2012/05/25 | <1 | | mg/L |
| 1009427 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2012/05/28 | | 106 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2012/05/28 | 0.06, LDR=0.02 | | mg/L |
| 1009747 | SD5 | ÉTALON CQ | Aluminium (Al) | 2012/05/29 | | 103 | % |
| | | | Arsenic (As) | 2012/05/29 | | 101 | % |
| | | | Baryum (Ba) | 2012/05/29 | | 100 | % |
| | | | Cadmium (Cd) | 2012/05/29 | | 98 | % |
| | | | Chrome (Cr) | 2012/05/29 | | 102 | % |
| | | | Cuivre (Cu) | 2012/05/29 | | 100 | % |
| | | | Plomb (Pb) | 2012/05/29 | | 103 | % |
| | | | Nickel (Ni) | 2012/05/29 | | 101 | % |
| | | | Sélénium (Se) | 2012/05/29 | | 101 | % |
| | | | Zinc (Zn) | 2012/05/29 | | 99 | % |
| | | | Bore (B) | 2012/05/29 | | 101 | % |
| | | | Fer (Fe) | 2012/05/29 | | 104 | % |
| | | Blanc fortifié | Aluminium (Al) | 2012/05/29 | | 99 | % |
| | | | Arsenic (As) | 2012/05/29 | | 99 | % |
| | | | Baryum (Ba) | 2012/05/29 | | 99 | % |
| | | | Cadmium (Cd) | 2012/05/29 | | 100 | % |
| | | | Chrome (Cr) | 2012/05/29 | | 101 | % |
| | | | Cuivre (Cu) | 2012/05/29 | | 97 | % |
| | | | Plomb (Pb) | 2012/05/29 | | 100 | % |
| | | | Nickel (Ni) | 2012/05/29 | | 100 | % |
| | | | Sélénium (Se) | 2012/05/29 | | 100 | % |
| | | | Sodium (Na) | 2012/05/29 | | 98 | % |
| | | | Zinc (Zn) | 2012/05/29 | | 98 | % |
| | | | Bore (B) | 2012/05/29 | | 103 | % |
| | | | Fer (Fe) | 2012/05/29 | | 98 | % |
| | | | Magnésium (Mg) | 2012/05/29 | | 99 | % |
| | | | Potassium (K) | 2012/05/29 | | 100 | % |
| | | | Calcium (Ca) | 2012/05/29 | | 99 | % |
| | | Blanc de méthode | Aluminium (Al) | 2012/05/29 | <0.03 | | mg/L |
| | | | Arsenic (As) | 2012/05/29 | <0.002 | | mg/L |
| | | | Baryum (Ba) | 2012/05/29 | <0.03 | | mg/L |
| | | | Cadmium (Cd) | 2012/05/29 | <0.001 | | mg/L |



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: 6002

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B224885

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | Unités de |
|---|---|---|---|---|---|---|---|
| 1009747 | SD5 | Blanc de méthode | Chrome (Cr) | 2012/05/29 | <0.03 | | mg/L |
| | | | Cuivre (Cu) | 2012/05/29 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2012/05/29 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2012/05/29 | <0.01 | | mg/L |
| | | | Sélénium (Se) | 2012/05/29 | <0.001 | | mg/L |
| | | | Sodium (Na) | 2012/05/29 | 0.6, LDR=0.2 | | mg/L |
| | | | Zinc (Zn) | 2012/05/29 | <0.005 | | mg/L |
| | | | Bore (B) | 2012/05/29 | <0.05 | | mg/L |
| | | | Fer (Fe) | 2012/05/29 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2012/05/29 | <0.2 | | mg/L |
| | | | Potassium (K) | 2012/05/29 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2012/05/29 | <0.5 | | mg/L |
| 1009811 | JS2 | Blanc fortifié | Phosphore total | 2012/05/29 | | 103 | % |
| | | Blanc de méthode | Phosphore total | 2012/05/29 | <0.01 | | mg/L |
| 1009963 | FSI | Blanc fortifié | Solide Dissous Totaux | 2012/05/29 | | 99 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2012/05/29 | | 99 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2012/05/29 | <10 | | mg/L |
| 1010333 | AP0 | Vérification d'étalonnage | Sulfures (exprimés en S2-) | 2012/05/30 | | 101 | % |
| | | Blanc fortifié | Sulfures (exprimés en S2-) | 2012/05/30 | | 100 | % |
| | | Blanc de méthode | Sulfures (exprimés en S2-) | 2012/05/30 | <0.02 | | mg/L |
| 1010423 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2012/05/30 | | 85 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2012/05/30 | | 100 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2012/05/30 | <0.01 | | mg/L |
| 1010650 | MR4 | Blanc fortifié | Fluorure (F) | 2012/05/30 | | 96 | % |
| | | Blanc de méthode | Fluorure (F) | 2012/05/30 | <0.1 | | mg/L |
| 1010664 | DB2 | ÉTALON CQ | Cyanures Totaux | 2012/05/31 | | 86 | % |
| | | Blanc fortifié | Cyanures Totaux | 2012/05/31 | | 98 | % |
| | | Blanc de méthode | Cyanures Totaux | 2012/05/31 | <0.003 | | mg/L |

Vérification d'étalonnage: Sert à confimer que l'étalonnage est en contrôle tout au long de la séquence instrumentale.
Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée



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# Page des signatures de validation

**Dossier Maxxam: B224885**

---

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

CHIMISTE Corina Maria Florea Tue 2007-006 QUÉBEC

CORINA TUE, B.Sc. Chimiste

CHIMISTE Mihaela Delia Barbul 2003-034 QUÉBEC

DELIA BARBUL, B.Sc., Chimiste

CHIMISTE Faouzi Sarsi 2005-093 QUÉBEC

FAOUZI SARSI, B. Sc. Chimiste

CHIMISTE Maria Chrifi Alaoui 2010-124 Québec

MARIA CHRIFI ALAOUI, B.Sc., Chimiste

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Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Votre # Bordereau: 8113604, 81136-04-01

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/09/11**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B248518**
**Reçu: 2012/09/04, 10:40**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 7

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 7 | N/A | 2012/09/06 | STL SOP-00038 | SM 2320B |
| Anions | 2 | N/A | 2012/09/04 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Anions | 5 | N/A | 2012/09/08 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Contenant supplementaire-archivé | 13 | N/A | 2012/09/04 | | |
| Hydrocarbures pétroliers (C10-C50) | 6 | 2012/09/04 | 2012/09/05 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 6 | 2012/09/10 | 2012/09/11 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures disponibles | 1 | 2012/09/11 | 2012/09/11 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 7 | 2012/09/07 | 2012/09/07 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Frais de gestion | 6 | N/A | 2012/09/04 | | |
| Fluorures | 7 | N/A | 2012/09/06 | STL SOP-00038 | SM 4500-F- C. |
| Métaux | 7 | 2012/09/07 | 2012/09/07 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux extractibles totaux | 7 | 2012/09/07 | 2012/09/07 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 7 | N/A | 2012/09/05 | STL SOP-00040 | MA. 300 - N 1.1 |
| Nitrate et/ou Nitrite | 2 | N/A | 2012/09/04 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Phosphore total | 7 | 2012/09/07 | 2012/09/07 | STL SOP-00006 | MA.200- Mét 1.2 |
| Sulfures (exprimés en S2-) | 7 | 2012/09/07 | 2012/09/07 | STL SOP-00005 | MA. 300-S 1.1 |
| Solides totaux dissous | 7 | 2012/09/07 | 2012/09/07 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

* Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Leila Sabouri, Chargée de projets
Email: LSabouri@maxxam.ca
Phone# (514) 448-9001 Ext:4227

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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| Identification Maxxam | | S12991 | S12993 | S12994 | S12995 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | 2012/08/31 | 2012/08/31 | 2012/08/31 | | |
| # Bordereau | | 81136-04-01 | 81136-04-01 | 81136-04-01 | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-09-20120831** | **BH-11-06-20120831** | **BH-11-07-20120831** | **DUP-1-20120831** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | <100 | 100 | 1051931 |
| **Récupération des Surrogates (%)** | | | | | | | |
| 1-Chlorooctadécane | % | 75 | 95 | 91 | 81 | N/A | 1051931 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | S12996 | S12997 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/02 | 2012/09/02 | | |
| # Bordereau | | 81136-04-01 | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-17D-20120902** | **BH-11-17R-20120902** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | 120 | 100 | 1051931 |
| **Récupération des Surrogates (%)** | | | | | |
| 1-Chlorooctadécane | % | 73 | 87 | N/A | 1051931 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité



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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | S12991 | S12991 | S12992 | S12993 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | 2012/08/31 | 2012/08/31 | 2012/08/31 | | |
| # Bordereau | | 81136-04-01 | 81136-04-01 | 81136-04-01 | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-09-20120831** | **BH-11-09-20120831 Dup. de Lab.** | **BH-11-11-20120831** | **BH-11-06-20120831** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Aluminium (Al) | mg/L | <0.03 | <0.03 | 0.50 | <0.03 | 0.03 | 1053421 |
| Arsenic (As) | mg/L | 0.005 | 0.005 | 0.001 | <0.001 | 0.001 | 1053421 |
| Baryum (Ba) | mg/L | 0.06 | 0.07 | 0.02 | <0.02 | 0.02 | 1053421 |
| Cadmium (Cd) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1053421 |
| Chrome (Cr) | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | 0.005 | 1053421 |
| Cuivre (Cu) | mg/L | <0.003 | <0.003 | 0.003 | <0.003 | 0.003 | 1053421 |
| Plomb (Pb) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1053421 |
| Nickel (Ni) | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | 0.01 | 1053421 |
| Sélénium (Se) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1053421 |
| Sodium (Na) | mg/L | 19 | 20 | 3.3 | 3.8 | 0.2 | 1053421 |
| Zinc (Zn) | mg/L | 0.007 | 0.013 | 0.040 | 0.011 | 0.005 | 1053421 |
| Bore (B) | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | 0.05 | 1053421 |
| Fer (Fe) | mg/L | <0.1 | <0.1 | 4.0 | <0.1 | 0.1 | 1053421 |
| Magnésium (Mg) | mg/L | 30 | 30 | 1.7 | 2.1 | 0.2 | 1053421 |
| Potassium (K) | mg/L | 4.6 | 4.7 | 1.5 | 1.0 | 0.2 | 1053421 |
| Calcium (Ca) | mg/L | 54 | 55 | 4.5 | 14 | 0.5 | 1053421 |

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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | S12994 | S12995 | S12996 | S12997 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | 2012/08/31 | 2012/09/02 | 2012/09/02 | | |
| # Bordereau | | 81136-04-01 | 81136-04-01 | 81136-04-01 | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-07-20120831** | **DUP-1-20120831** | **BH-11-17D-20120902** | **BH-11-17R-20120902** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Aluminium (Al) | mg/L | <0.03 | 0.49 | 0.22 | <0.03 | 0.03 | 1053421 |
| Arsenic (As) | mg/L | 0.002 | 0.001 | <0.001 | 0.008 | 0.001 | 1053421 |
| Baryum (Ba) | mg/L | 0.07 | 0.02 | <0.02 | 0.05 | 0.02 | 1053421 |
| Cadmium (Cd) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1053421 |
| Chrome (Cr) | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | 0.005 | 1053421 |
| Cuivre (Cu) | mg/L | <0.003 | <0.003 | <0.003 | <0.003 | 0.003 | 1053421 |
| Plomb (Pb) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1053421 |
| Nickel (Ni) | mg/L | 0.01 | <0.01 | 0.01 | <0.01 | 0.01 | 1053421 |
| Sélénium (Se) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1053421 |
| Sodium (Na) | mg/L | 36 | 3.3 | 4.8 | 21 | 0.2 | 1053421 |
| Zinc (Zn) | mg/L | <0.005 | 0.016 | 0.016 | <0.005 | 0.005 | 1053421 |
| Bore (B) | mg/L | <0.05 | <0.05 | <0.05 | 0.06 | 0.05 | 1053421 |
| Fer (Fe) | mg/L | 3.8 | 4.0 | <0.1 | 0.4 | 0.1 | 1053421 |
| Magnésium (Mg) | mg/L | 20 | 1.6 | 2.1 | 45 | 0.2 | 1053421 |
| Potassium (K) | mg/L | 8.4 | 1.5 | 1.1 | 14 | 0.2 | 1053421 |
| Calcium (Ca) | mg/L | 80 | 4.3 | 6.0 | 150 | 0.5 | 1053421 |

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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | S12991 | S12992 | S12993 | S12994 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | 2012/08/31 | 2012/08/31 | 2012/08/31 | | |
| # Bordereau | | 81136-04-01 | 81136-04-01 | 81136-04-01 | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-09-20120831** | **BH-11-11-20120831** | **BH-11-06-20120831** | **BH-11-07-20120831** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Phosphore total | mg/L | 13 | <0.01 | <0.01 | 0.03 | 0.01 | 1053464 |

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Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | S12995 | S12996 | S12997 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | 2012/09/02 | 2012/09/02 | | |
| # Bordereau | | 81136-04-01 | 81136-04-01 | 81136-04-01 | | |
| | **UNITÉS** | **DUP-1-20120831** | **BH-11-17D-20120902** | **BH-11-17R-20120902** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | |
| Phosphore total | mg/L | <0.01 | <0.01 | <0.01 | 0.01 | 1053464 |

LDR = Limite de détection rapportée
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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | S12991 | S12991 | | S12992 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | 2012/08/31 | | 2012/08/31 | | |
| # Bordereau | | 81136-04-01 | 81136-04-01 | | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-09-20120831** | **BH-11-09-20120831 Dup. de Lab.** | **Lot CQ** | **BH-11-11-20120831** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | <0.02 | N/A | 1051995 | 0.13 | 0.02 | 1051995 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | <0.01 | 1054783 | <0.01 | 0.01 | 1054365 |
| Cyanures Totaux | mg/L | <0.003 | N/A | 1053324 | <0.003 | 0.003 | 1053603 |
| Fluorure (F) | mg/L | 0.2 | N/A | 1052025 | <0.1 | 0.1 | 1052025 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | N/A | 1053394 | <0.02 | 0.02 | 1053394 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 290 | N/A | 1052023 | 13 | 1 | 1052023 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | N/A | 1052023 | <1 | 1 | 1052023 |
| Chlorures (Cl) | mg/L | 0.11 | N/A | 1053405 | 2.3 | 0.05 | 1053405 |
| Nitrate(N) et Nitrite(N) | mg/L | 0.03 | N/A | 1053405 | <0.02 | 0.02 | 1053405 |
| Sulfates (SO4) | mg/L | 15 | N/A | 1053405 | 9.7 | 0.5 | 1053405 |
| Solide Dissous Totaux | mg/L | 190 | N/A | 1053719 | 100 | 10 | 1053719 |

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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | S12992 | | S12993 | | S12994 | | |
|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | | 2012/08/31 | | 2012/08/31 | | |
| # Bordereau | | 81136-04-01 | | 81136-04-01 | | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-11-20120831 Dup. de Lab.** | **Lot CQ** | **BH-11-06-20120831** | **LDR** | **BH-11-07-20120831** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | N/A | 1051995 | <0.02 | 0.02 | 0.33 | 0.02 | 1051995 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 1054365 | <0.01 | 0.01 | <0.01 | 0.01 | 1054365 |
| Cyanures Totaux | mg/L | N/A | 1053603 | <0.003 | 0.003 | <0.003 | 0.003 | 1053324 |
| Fluorure (F) | mg/L | N/A | 1052025 | <0.1 | 0.1 | 0.2 | 0.1 | 1052025 |
| Sulfures (exprimés en S2-) | mg/L | N/A | 1053394 | <0.02 | 0.02 | <0.1 | 0.1 | 1053394 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | N/A | 1052023 | 39 | 1 | 170 | 1 | 1052023 |
| Carbonate (CO3 comme CaCO3) | mg/L | N/A | 1052023 | <1 | 1 | <1 | 1 | 1052023 |
| Chlorures (Cl) | mg/L | 2.3 | 1053405 | 13 | 0.05 | 13 | 0.05 | 1053405 |
| Nitrate(N) et Nitrite(N) | mg/L | <0.02 | 1053405 | <0.02 | 0.02 | <0.02 | 0.02 | 1053405 |
| Sulfates (SO4) | mg/L | 9.6 | 1053405 | 190 | 0.5 | 190 | 0.5 | 1053405 |
| Solide Dissous Totaux | mg/L | N/A | 1053719 | 74 | 10 | 490 | 10 | 1053719 |

N/A = Non Applicable
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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | S12995 | | S12996 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/08/31 | | 2012/09/02 | | |
| # Bordereau | | 81136-04-01 | | 81136-04-01 | | |
| | **UNITÉS** | **DUP-1-20120831** | **Lot CQ** | **BH-11-17D-20120902** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.13 | 1051995 | 0.06 | 0.02 | 1051995 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 1054365 | <0.01 | 0.01 | 1054365 |
| Cyanures Totaux | mg/L | 0.003 | 1053324 | <0.003 | 0.003 | 1053324 |
| Fluorure (F) | mg/L | <0.1 | 1052025 | <0.1 | 0.1 | 1052025 |
| Nitrates (N-NO3-) | mg/L | N/A | N/A | 0.04 | 0.02 | 1052038 |
| Nitrites (N-NO2-) | mg/L | N/A | N/A | <0.02 | 0.02 | 1052038 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | 1053394 | <0.02 | 0.02 | 1053394 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 11 | 1052023 | 18 | 1 | 1052023 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | 1052023 | <1 | 1 | 1052023 |
| Chlorures (Cl) | mg/L | 1.8 | 1053405 | 0.61 | 0.05 | 1052042 |
| Nitrate(N) et Nitrite(N) | mg/L | <0.02 | 1053405 | N/A | 0.02 | N/A |
| Sulfates (SO4) | mg/L | 8.1 | 1053405 | 14 | 0.5 | 1052042 |
| Solide Dissous Totaux | mg/L | 78 | 1053719 | 57 | 10 | 1053719 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | S12997 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/02 | | |
| # Bordereau | | 81136-04-01 | | |
| | **UNITÉS** | **BH-11-17R-20120902** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.05 | 0.02 | 1051995 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | 1054365 |
| Cyanures Totaux | mg/L | <0.003 | 0.003 | 1053324 |
| Fluorure (F) | mg/L | <0.1 | 0.1 | 1052025 |
| Nitrates (N-NO3-) | mg/L | <0.02 | 0.02 | 1052038 |
| Nitrites (N-NO2-) | mg/L | <0.02 | 0.02 | 1052038 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | 0.02 | 1053394 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 180 | 1 | 1052023 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | 1 | 1052023 |
| Chlorures (Cl) | mg/L | 25 | 0.05 | 1052042 |
| Sulfates (SO4) | mg/L | 420 | 3 | 1052042 |
| Solide Dissous Totaux | mg/L | 860 | 10 | 1053719 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B248518
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON excepté pour
Cyanures disponibles: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: S12995
Cyanures totaux: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: S12995

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

Dû à une présence de sédiments, l'échantillon S12991 fut décanté avant l'analyse.

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: EAU SOUTERRAINE 6002

# Rapport Assurance Qualité

Dossier Maxxam: B248518

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1051931 | MCF | Blanc fortifié | 1-Chlorooctadécane | 2012/09/05 | | 75 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/09/05 | | 87 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2012/09/05 | | 82 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/09/05 | <100 | | ug/L |
| 1051995 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2012/09/05 | | 96 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2012/09/05 | <0.02 | | mg/L |
| 1052023 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/09/06 | | 95 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/09/06 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2012/09/06 | <1 | | mg/L |
| 1052025 | MR4 | Blanc fortifié | Fluorure (F) | 2012/09/06 | | 104 | % |
| | | Blanc de méthode | Fluorure (F) | 2012/09/06 | <0.1 | | mg/L |
| 1052038 | AL8 | Blanc fortifié | Nitrates (N-NO3-) | 2012/09/04 | | 109 | % |
| | | | Nitrites (N-NO2-) | 2012/09/04 | | 104 | % |
| | | Blanc de méthode | Nitrates (N-NO3-) | 2012/09/04 | <0.02 | | mg/L |
| | | | Nitrites (N-NO2-) | 2012/09/04 | <0.02 | | mg/L |
| 1052042 | AL8 | Blanc fortifié | Chlorures (Cl) | 2012/09/04 | | 103 | % |
| | | | Sulfates (SO4) | 2012/09/04 | | 104 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2012/09/04 | <0.05 | | mg/L |
| | | | Sulfates (SO4) | 2012/09/04 | <0.5 | | mg/L |
| 1053324 | DB2 | ÉTALON CQ | Cyanures Totaux | 2012/09/07 | | 88 | % |
| | | Blanc fortifié | Cyanures Totaux | 2012/09/07 | | 96 | % |
| | | Blanc de méthode | Cyanures Totaux | 2012/09/10 | <0.003 | | mg/L |
| 1053394 | AH2 | Vérification d'étalonnage | Sulfures (exprimés en S2-) | 2012/09/07 | | 97 | % |
| | | Blanc fortifié | Sulfures (exprimés en S2-) | 2012/09/07 | | 99 | % |
| | | Blanc de méthode | Sulfures (exprimés en S2-) | 2012/09/07 | <0.02 | | mg/L |
| 1053405 | AL8 | Blanc fortifié | Chlorures (Cl) | 2012/09/08 | | 99 | % |
| | | | Nitrate(N) et Nitrite(N) | 2012/09/08 | | 102 | % |
| | | | Sulfates (SO4) | 2012/09/08 | | 103 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2012/09/08 | <0.05 | | mg/L |
| | | | Nitrate(N) et Nitrite(N) | 2012/09/08 | <0.02 | | mg/L |
| | | | Sulfates (SO4) | 2012/09/08 | <0.5 | | mg/L |
| 1053421 | SD5 | ÉTALON CQ | Aluminium (Al) | 2012/09/07 | | 100 | % |
| | | | Arsenic (As) | 2012/09/07 | | 98 | % |
| | | | Baryum (Ba) | 2012/09/07 | | 99 | % |
| | | | Cadmium (Cd) | 2012/09/07 | | 92 | % |
| | | | Chrome (Cr) | 2012/09/07 | | 99 | % |
| | | | Cuivre (Cu) | 2012/09/07 | | 96 | % |
| | | | Plomb (Pb) | 2012/09/07 | | 101 | % |
| | | | Nickel (Ni) | 2012/09/07 | | 96 | % |
| | | | Sélénium (Se) | 2012/09/07 | | 98 | % |
| | | | Zinc (Zn) | 2012/09/07 | | 98 | % |
| | | | Bore (B) | 2012/09/07 | | 94 | % |
| | | | Fer (Fe) | 2012/09/07 | | 101 | % |
| | | Blanc fortifié | Aluminium (Al) | 2012/09/07 | | 102 | % |
| | | | Arsenic (As) | 2012/09/07 | | 100 | % |
| | | | Baryum (Ba) | 2012/09/07 | | 98 | % |
| | | | Cadmium (Cd) | 2012/09/07 | | 99 | % |
| | | | Chrome (Cr) | 2012/09/07 | | 104 | % |
| | | | Cuivre (Cu) | 2012/09/07 | | 99 | % |
| | | | Plomb (Pb) | 2012/09/07 | | 98 | % |
| | | | Nickel (Ni) | 2012/09/07 | | 99 | % |
| | | | Sélénium (Se) | 2012/09/07 | | 99 | % |
| | | | Sodium (Na) | 2012/09/07 | | 101 | % |
| | | | Zinc (Zn) | 2012/09/07 | | 99 | % |



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: EAU SOUTERRAINE 6002

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B248518

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1053421 | SD5 | Blanc fortifié | Bore (B) | 2012/09/07 | | 94 | % |
| | | | Fer (Fe) | 2012/09/07 | | 98 | % |
| | | | Magnésium (Mg) | 2012/09/07 | | 101 | % |
| | | | Potassium (K) | 2012/09/07 | | 102 | % |
| | | | Calcium (Ca) | 2012/09/07 | | 99 | % |
| | | Blanc de méthode | Aluminium (Al) | 2012/09/07 | <0.03 | | mg/L |
| | | | Arsenic (As) | 2012/09/07 | <0.001 | | mg/L |
| | | | Baryum (Ba) | 2012/09/07 | <0.02 | | mg/L |
| | | | Cadmium (Cd) | 2012/09/07 | <0.001 | | mg/L |
| | | | Chrome (Cr) | 2012/09/07 | <0.005 | | mg/L |
| | | | Cuivre (Cu) | 2012/09/07 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2012/09/07 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2012/09/07 | <0.01 | | mg/L |
| | | | Sélénium (Se) | 2012/09/07 | <0.001 | | mg/L |
| | | | Sodium (Na) | 2012/09/07 | <0.2 | | mg/L |
| | | | Zinc (Zn) | 2012/09/07 | <0.005 | | mg/L |
| | | | Bore (B) | 2012/09/07 | <0.05 | | mg/L |
| | | | Fer (Fe) | 2012/09/07 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2012/09/07 | <0.2 | | mg/L |
| | | | Potassium (K) | 2012/09/07 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2012/09/07 | <0.5 | | mg/L |
| 1053464 | KQ | Blanc fortifié | Phosphore total | 2012/09/07 | | 87 | % |
| | | Blanc de méthode | Phosphore total | 2012/09/07 | <0.01 | | mg/L |
| 1053603 | DB2 | ÉTALON CQ | Cyanures Totaux | 2012/09/07 | | 88 | % |
| | | Blanc fortifié | Cyanures Totaux | 2012/09/07 | | 96 | % |
| | | Blanc de méthode | Cyanures Totaux | 2012/09/07 | <0.003 | | mg/L |
| 1053719 | FSI | Blanc fortifié | Solide Dissous Totaux | 2012/09/07 | | 100 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2012/09/07 | | 102 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2012/09/07 | <10 | | mg/L |
| 1054365 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2012/09/11 | | 87 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2012/09/11 | | 98 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2012/09/11 | <0.01 | | mg/L |
| 1054783 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2012/09/11 | | 87 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2012/09/11 | | 94 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2012/09/11 | <0.01 | | mg/L |

Vérification d'étalonnage: Sert à confimer que l'étalonnage est en contrôle tout au long de la séquence instrumentale.
Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B248518**

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Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

Corina Tue, B.Sc. Chimiste

Delia Barbul, B.Sc., Chimiste

Kathie Quevillon, B.Sc., Chimiste

Madina Hamrouni, B.Sc., Chimiste

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Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les "signataires" requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.


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Votre # du projet: 12-1221-0028
Adresse du site: 4000
Votre # Bordereau: 8113607, 81136-07-01

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/09/11**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B248573**
**Reçu: 2012/09/04, 10:40**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 4

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 4 | N/A | 2012/09/04 | STL SOP-00038 | SM 2320B |
| Anions | 4 | N/A | 2012/09/08 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Contenant supplementaire-archivé | 4 | N/A | 2012/09/04 | | |
| Cyanures disponibles | 4 | 2012/09/10 | 2012/09/11 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 4 | 2012/09/07 | 2012/09/07 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Conductivité | 3 | N/A | 2012/09/04 | STL SOP-00038 | SM 2510 |
| Conductivité | 1 | N/A | 2012/09/05 | STL SOP-00038 | SM 2510 |
| Frais de gestion | 4 | N/A | 2012/09/04 | | |
| Métaux | 4 | 2012/09/07 | 2012/09/07 | STL SOP-00006 | MA.200- Mét 1.2 |

* Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Leila Sabouri, Chargée de projets
Email: LSabouri@maxxam.ca
Phone# (514) 448-9001 Ext:4227

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Dossier Maxxam: B248573
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 12-1221-0028
Adresse du site: 4000
Initiales du préleveur: NA

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | S13203 | S13204 | S13205 | S13206 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/02 | 2012/09/02 | 2012/09/02 | 2012/09/02 | | |
| # Bordereau | | 81136-07-01 | 81136-07-01 | 81136-07-01 | 81136-07-01 | | |
| | **UNITÉS** | **PZ-12-30R-20120902** | **PZ-12-31R-20120902** | **PZ-12-32D-20120902** | **DUP-1-20120902** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Arsenic (As) | mg/L | <0.001 | <0.001 | 0.005 | <0.001 | 0.001 | 1053421 |
| Cuivre (Cu) | mg/L | <0.003 | <0.003 | <0.003 | <0.003 | 0.003 | 1053421 |
| Plomb (Pb) | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | 1053421 |
| Nickel (Ni) | mg/L | <0.01 | 0.02 | <0.01 | <0.01 | 0.01 | 1053421 |
| Sodium (Na) | mg/L | 30 | 30 | 52 | 31 | 0.2 | 1053421 |
| Zinc (Zn) | mg/L | <0.005 | <0.005 | 0.006 | 0.008 | 0.005 | 1053421 |
| Fer (Fe) | mg/L | 0.5 | 0.4 | 12 | 0.6 | 0.1 | 1053421 |
| Magnésium (Mg) | mg/L | 28 | 16 | 29 | 28 | 0.2 | 1053421 |
| Potassium (K) | mg/L | 8.3 | 8.1 | 30 | 8.5 | 0.2 | 1053421 |
| Calcium (Ca) | mg/L | 140 | 130 | 120 | 140 | 0.5 | 1053421 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité



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Dossier Maxxam: B248573
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 12-1221-0028
Adresse du site: 4000
Initiales du préleveur: NA

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | S13203 | | | S13204 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/02 | | | 2012/09/02 | | |
| # Bordereau | | 81136-07-01 | | | 81136-07-01 | | |
| | **UNITÉS** | **PZ-12-30R-20120902** | **LDR** | **Lot CQ** | **PZ-12-31R-20120902** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Conductivité | mS/cm | 0.95 | 0.001 | 1052056 | 0.90 | 0.001 | 1052056 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | 1054365 | <0.01 | 0.01 | 1054365 |
| Cyanures Totaux | mg/L | 0.003 | 0.003 | 1053603 | 0.007 | 0.003 | 1053324 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 310 | 1 | 1052054 | 140 | 1 | 1052054 |
| Sulfates (SO4) | mg/L | 180 | 0.5 | 1053405 | 320 | 1 | 1053405 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | S13204 | S13205 | S13205 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/02 | 2012/09/02 | 2012/09/02 | | |
| # Bordereau | | 81136-07-01 | 81136-07-01 | 81136-07-01 | | |
| | **UNITÉS** | **PZ-12-31R-20120902 Dup. de Lab.** | **PZ-12-32D-20120902** | **PZ-12-32D-20120902 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | |
| Conductivité | mS/cm | N/A | 1.1 | N/A | 0.001 | 1052056 |
| Cyanures disponibles (CN-) | mg/L | N/A | <0.01 | N/A | 0.01 | 1054365 |
| Cyanures Totaux | mg/L | N/A | 0.011 | 0.012 | 0.003 | 1053324 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | N/A | 270 | N/A | 1 | 1052054 |
| Sulfates (SO4) | mg/L | 320 | 260 | N/A | 1 | 1053405 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B248573
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 12-1221-0028
Adresse du site: 4000
Initiales du préleveur: NA

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | S13206 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/02 | | |
| # Bordereau | | 81136-07-01 | | |
| | **UNITÉS** | **DUP-1-20120902** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Conductivité | mS/cm | 0.94 | 0.001 | 1052056 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | 1054365 |
| Cyanures Totaux | mg/L | <0.003 | 0.003 | 1053324 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 320 | 1 | 1052054 |
| Sulfates (SO4) | mg/L | 190 | 0.5 | 1053405 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tél. : (514) 448-9001 Télécopieur : (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)
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Dossier Maxxam: B248573
Date du rapport: 2012/09/11

GOLDER ASSOCIES LTEE
Votre # du projet: 12-1221-0028
Adresse du site: 4000
Initiales du préleveur: NA

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON excepté pour
Cyanures disponibles: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: S13203, S13204, S13205
Cyanures totaux: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: S13203, S13204, S13205

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 12-1221-0028
P.O. #:
Adresse du site: 4000

# Rapport Assurance Qualité

Dossier Maxxam: B248573

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1052054 | AL8 | Blanc de méthode | Bicarbonates (HCO3 comme CaCO3) | 2012/09/04 | <1 | | mg/L |
| 1052056 | AL8 | Blanc fortifié | Conductivité | 2012/09/04 | | 103 | % |
| | | Blanc de méthode | Conductivité | 2012/09/04 | <0.001 | | mS/cm |
| 1053324 | DB2 | ÉTALON CQ | Cyanures Totaux | 2012/09/07 | | 88 | % |
| | | Blanc fortifié | Cyanures Totaux | 2012/09/07 | | 96 | % |
| | | Blanc de méthode | Cyanures Totaux | 2012/09/10 | <0.003 | | mg/L |
| 1053405 | AL8 | Blanc fortifié | Sulfates (SO4) | 2012/09/08 | | 103 | % |
| | | Blanc de méthode | Sulfates (SO4) | 2012/09/08 | <0.5 | | mg/L |
| 1053421 | SD5 | ÉTALON CQ | Arsenic (As) | 2012/09/07 | | 98 | % |
| | | | Cuivre (Cu) | 2012/09/07 | | 96 | % |
| | | | Plomb (Pb) | 2012/09/07 | | 101 | % |
| | | | Nickel (Ni) | 2012/09/07 | | 96 | % |
| | | | Zinc (Zn) | 2012/09/07 | | 98 | % |
| | | | Fer (Fe) | 2012/09/07 | | 101 | % |
| | | Blanc fortifié | Arsenic (As) | 2012/09/07 | | 100 | % |
| | | | Cuivre (Cu) | 2012/09/07 | | 99 | % |
| | | | Plomb (Pb) | 2012/09/07 | | 98 | % |
| | | | Nickel (Ni) | 2012/09/07 | | 99 | % |
| | | | Sodium (Na) | 2012/09/07 | | 101 | % |
| | | | Zinc (Zn) | 2012/09/07 | | 99 | % |
| | | | Fer (Fe) | 2012/09/07 | | 98 | % |
| | | | Magnésium (Mg) | 2012/09/07 | | 101 | % |
| | | | Potassium (K) | 2012/09/07 | | 102 | % |
| | | | Calcium (Ca) | 2012/09/07 | | 99 | % |
| | | Blanc de méthode | Arsenic (As) | 2012/09/07 | <0.001 | | mg/L |
| | | | Cuivre (Cu) | 2012/09/07 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2012/09/07 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2012/09/07 | <0.01 | | mg/L |
| | | | Sodium (Na) | 2012/09/07 | <0.2 | | mg/L |
| | | | Zinc (Zn) | 2012/09/07 | <0.005 | | mg/L |
| | | | Fer (Fe) | 2012/09/07 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2012/09/07 | <0.2 | | mg/L |
| | | | Potassium (K) | 2012/09/07 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2012/09/07 | <0.5 | | mg/L |
| 1053603 | DB2 | ÉTALON CQ | Cyanures Totaux | 2012/09/07 | | 88 | % |
| | | Blanc fortifié | Cyanures Totaux | 2012/09/07 | | 96 | % |
| | | Blanc de méthode | Cyanures Totaux | 2012/09/07 | <0.003 | | mg/L |
| 1054365 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2012/09/11 | | 87 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2012/09/11 | | 98 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2012/09/11 | <0.01 | | mg/L |

Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B248573**

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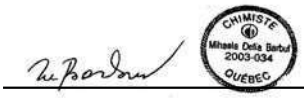
Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:




Delia Barbul, B.Sc., Chimiste

Kathie Quevillon, B.Sc., Chimiste

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Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Votre # Bordereau: 8113609, 81136-09-02

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/09/14**
**# Rapport: NM-415091**

Ce rapport a préséance sur tous les rapports précédents pour le même numéro de dossier Maxxam

## CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B248988**
**Reçu: 2012/09/05, 11:10**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 1

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Contenant supplementaire-archivé | 1 | N/A | 2012/09/05 | | |
| Hydrocarbures pétroliers (C10-C50) | 1 | 2012/09/06 | 2012/09/10 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Frais de gestion | 1 | N/A | 2012/09/05 | | |

* Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Leila Sabouri, Chargée de projets
Email: LSabouri@maxxam.ca
Phone# (514) 448-9001 Ext:4227

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Dossier Maxxam: B248988
Date du rapport: 2012/09/14

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| | | | | |
|---|---|---|---|---|
| Identification Maxxam | | S14612 | | |
| Date d'échantillonnage | | 2012/09/04 | | |
| # Bordereau | | 81136-09-02 | | |
| | **UNITÉS** | **BH-11-11-20120904** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | <100 | 100 | 1052783 |
| **Récupération des Surrogates (%)** | | | | |
| 1-Chlorooctadécane | % | 87 | N/A | 1052783 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B248988
Date du rapport: 2012/09/14

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: EAU SOUTERRAINE 6002
Initiales du préleveur: NA

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**


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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: EAU SOUTERRAINE 6002

## Rapport Assurance Qualité

Dossier Maxxam: B248988

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1052783 | AM8 | Blanc fortifié | 1-Chlorooctadécane | 2012/09/10 | | 109 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/09/10 | | 107 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2012/09/10 | | 97 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/09/10 | 120, LDR=100 | | ug/L |

Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B248988**

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Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

Michel Poulin, B.Sc., Chimiste

==========

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Votre # du projet: 10-1221-0107
Adresse du site: 6002
Votre # Bordereau: E836441, E-836441

**Attention: Veronique Blais**
GOLDER ASSOCIES LTEE
QUÉBEC
1170, Boul. Lebourgneuf
Bureau 200
Québec, PQ
CANADA G2K 2E3

**Date du rapport: 2012/09/20**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B251172**
**Reçu: 2012/09/13, 11:30**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 2

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 2 | N/A | 2012/09/18 | STL SOP-00038 | SM 2320B |
| Anions | 1 | N/A | 2012/09/14 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Anions | 1 | N/A | 2012/09/19 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Contenant supplementaire-archivé | 2 | N/A | 2012/09/13 | | |
| Hydrocarbures pétroliers (C10-C50) | 2 | 2012/09/14 | 2012/09/15 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 2 | 2012/09/17 | 2012/09/17 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Cyanures totaux | 2 | 2012/09/20 | 2012/09/20 | STL SOP-00035 | MA. 300 - CN 1.1 |
| Fluorures | 2 | N/A | 2012/09/18 | STL SOP-00038 | SM 4500-F- C. |
| FILTRATION | 1 | N/A | 2012/09/13 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux | 2 | 2012/09/17 | 2012/09/17 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux extractibles totaux | 2 | 2012/09/18 | 2012/09/19 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 2 | N/A | 2012/09/18 | STL SOP-00040 | MA. 300 - N 1.1 |
| Nitrate et/ou Nitrite | 2 | N/A | 2012/09/14 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Phosphore total | 2 | 2012/09/18 | 2012/09/18 | STL SOP-00006 | MA.200- Mét 1.2 |
| Sulfures (exprimés en S2-) | 2 | 2012/09/17 | 2012/09/17 | STL SOP-00005 | MA. 300-S 1.1 |
| Solides totaux dissous | 2 | 2012/09/17 | 2012/09/17 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

* Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Leila Sabouri, Chargée de projets
Email: LSabouri@maxxam.ca
Phone# (514) 448-9001 Ext:4227

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Dossier Maxxam: B251172
Date du rapport: 2012/09/20

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| Identification Maxxam | | S25154 | S25155 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/12 | 2012/09/12 | | |
| # Bordereau | | E-836441 | E-836441 | | |
| | **UNITÉS** | **BH-11-13-20120912** | **BH-11-21-20120912** | **LDR** | **Lot CQ** |
| **HYDRO. PÉTROLIERS TOTAUX** | | | | | |
| Hydrocarbures Pétroliers (C10-C50) | ug/L | 150 | 110 | 100 | 1056532 |
| **Récupération des Surrogates (%)** | | | | | |
| 1-Chlorooctadécane | % | 74 | 78 | N/A | 1056532 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B251172
Date du rapport: 2012/09/20

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## MÉTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | S25154 | S25155 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/12 | 2012/09/12 | | |
| # Bordereau | | E-836441 | E-836441 | | |
| | **UNITÉS** | **BH-11-13-20120912** | **BH-11-21-20120912** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | |
| Aluminium (Al) | mg/L | <0.03 | 0.11 | 0.03 | 1057042 |
| Arsenic (As) | mg/L | 0.004 | 0.001 | 0.001 | 1057042 |
| Baryum (Ba) | mg/L | 0.44 | <0.02 | 0.02 | 1057042 |
| Cadmium (Cd) | mg/L | <0.001 | <0.001 | 0.001 | 1057042 |
| Chrome (Cr) | mg/L | <0.005 | <0.005 | 0.005 | 1057042 |
| Cuivre (Cu) | mg/L | <0.003 | <0.003 | 0.003 | 1057042 |
| Plomb (Pb) | mg/L | <0.001 | <0.001 | 0.001 | 1057042 |
| Nickel (Ni) | mg/L | <0.01 | <0.01 | 0.01 | 1057042 |
| Sélénium (Se) | mg/L | <0.001 | <0.001 | 0.001 | 1057042 |
| Sodium (Na) | mg/L | 9.8 | 17 | 0.2 | 1057042 |
| Zinc (Zn) | mg/L | 0.007 | 0.007 | 0.005 | 1057042 |
| Bore (B) | mg/L | <0.05 | <0.05 | 0.05 | 1057042 |
| Fer (Fe) | mg/L | 1.1 | <0.1 | 0.1 | 1057042 |
| Magnésium (Mg) | mg/L | 18 | 16 | 0.2 | 1057042 |
| Potassium (K) | mg/L | 4.5 | 5.0 | 0.2 | 1057042 |
| Calcium (Ca) | mg/L | 53 | 50 | 0.5 | 1057042 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B251172
Date du rapport: 2012/09/20

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | S25154 | S25155 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/12 | 2012/09/12 | | |
| # Bordereau | | E-836441 | E-836441 | | |
| | **UNITÉS** | **BH-11-13-20120912** | **BH-11-21-20120912** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | |
| Phosphore total | mg/L | 0.08 | 0.33 | 0.01 | 1057525 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tél. : (514) 448-9001 Télécopieur : (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)
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Dossier Maxxam: B251172
Date du rapport: 2012/09/20

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | S25154 | S25154 | | S25155 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/12 | 2012/09/12 | | 2012/09/12 | | |
| # Bordereau | | E-836441 | E-836441 | | E-836441 | | |
| | **UNITÉS** | **BH-11-13-20120912** | **BH-11-13-20120912 Dup. de Lab.** | **Lot CQ** | **BH-11-21-20120912** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.22 | 0.22 | 1057133 | 0.07 | 0.02 | 1057133 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | N/A | 1057246 | <0.01 | 0.01 | 1057116 |
| Cyanures Totaux | mg/L | 0.003 | N/A | 1058816 | <0.003 | 0.003 | 1058816 |
| Fluorure (F) | mg/L | 0.1 | N/A | 1056897 | 0.1 | 0.1 | 1056897 |
| Nitrates (N-NO3-) | mg/L | <0.02 | <0.02 | 1056274 | 0.30 | 0.02 | 1056274 |
| Nitrites (N-NO2-) | mg/L | <0.02 | <0.02 | 1056274 | <0.02 | 0.02 | 1056274 |
| Sulfures (exprimés en S2-) | mg/L | <0.02 | N/A | 1056931 | <0.02 | 0.02 | 1056931 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 200 | N/A | 1056468 | 190 | 1 | 1056468 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | N/A | 1056468 | <1 | 1 | 1056468 |
| Chlorures (Cl) | mg/L | 0.59 | N/A | 1057682 | 2.0 | 0.05 | 1056281 |
| Sulfates (SO4) | mg/L | 30 | N/A | 1057682 | 51 | 0.5 | 1056281 |
| Solide Dissous Totaux | mg/L | 290 | N/A | 1057199 | 300 | 10 | 1057199 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | S25155 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2012/09/12 | | |
| # Bordereau | | E-836441 | | |
| | **UNITÉS** | **BH-11-21-20120912 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Cyanures Totaux | mg/L | <0.003 | 0.003 | 1058816 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité



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Dossier Maxxam: B251172
Date du rapport: 2012/09/20

GOLDER ASSOCIES LTEE
Votre # du projet: 10-1221-0107
Adresse du site: 6002
Initiales du préleveur: RC

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**MÉTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

L'échantillon S25155 a été filtré en laboratoire avant l'analyse des métaux.

**MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux objets soumis à l'essai.**


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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: 6002

## Rapport Assurance Qualité

Dossier Maxxam: B251172

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1056274 | OZP | Blanc fortifié | Nitrates (N-NO3-) | 2012/09/14 | | 103 | % |
| | | | Nitrites (N-NO2-) | 2012/09/14 | | 101 | % |
| | | Blanc de méthode | Nitrates (N-NO3-) | 2012/09/14 | <0.02 | | mg/L |
| | | | Nitrites (N-NO2-) | 2012/09/14 | <0.02 | | mg/L |
| 1056281 | OZP | Blanc fortifié | Chlorures (Cl) | 2012/09/14 | | 99 | % |
| | | | Sulfates (SO4) | 2012/09/14 | | 102 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2012/09/14 | <0.05 | | mg/L |
| | | | Sulfates (SO4) | 2012/09/14 | <0.5 | | mg/L |
| 1056468 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/09/18 | | 99 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2012/09/18 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2012/09/18 | <1 | | mg/L |
| 1056532 | NC1 | Blanc fortifié | 1-Chlorooctadécane | 2012/09/15 | | 89 | % |
| | | Blanc fortifié DUP | 1-Chlorooctadécane | 2012/09/15 | | 81 | % |
| | | Blanc fortifié | Hydrocarbures Pétroliers (C10-C50) | 2012/09/15 | | 104 | % |
| | | Blanc fortifié DUP | Hydrocarbures Pétroliers (C10-C50) | 2012/09/15 | | 96 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2012/09/15 | | 76 | % |
| | | | Hydrocarbures Pétroliers (C10-C50) | 2012/09/15 | 100, LDR=100 | | ug/L |
| 1056897 | MR4 | Blanc fortifié | Fluorure (F) | 2012/09/18 | | 92 | % |
| | | Blanc de méthode | Fluorure (F) | 2012/09/18 | <0.1 | | mg/L |
| 1056931 | MPC | Vérification d'étalonnage | Sulfures (exprimés en S2-) | 2012/09/17 | | 110 | % |
| | | Blanc fortifié | Sulfures (exprimés en S2-) | 2012/09/17 | | 102 | % |
| | | Blanc de méthode | Sulfures (exprimés en S2-) | 2012/09/17 | <0.02 | | mg/L |
| 1057042 | MCA | ÉTALON CQ | Aluminium (Al) | 2012/09/17 | | 98 | % |
| | | | Arsenic (As) | 2012/09/17 | | 96 | % |
| | | | Baryum (Ba) | 2012/09/17 | | 97 | % |
| | | | Cadmium (Cd) | 2012/09/17 | | 96 | % |
| | | | Chrome (Cr) | 2012/09/17 | | 96 | % |
| | | | Cuivre (Cu) | 2012/09/17 | | 95 | % |
| | | | Plomb (Pb) | 2012/09/17 | | 97 | % |
| | | | Nickel (Ni) | 2012/09/17 | | 94 | % |
| | | | Sélénium (Se) | 2012/09/17 | | 93 | % |
| | | | Zinc (Zn) | 2012/09/17 | | 101 | % |
| | | | Bore (B) | 2012/09/17 | | 94 | % |
| | | | Fer (Fe) | 2012/09/17 | | 99 | % |
| | | Blanc fortifié | Aluminium (Al) | 2012/09/17 | | 101 | % |
| | | | Arsenic (As) | 2012/09/17 | | 97 | % |
| | | | Baryum (Ba) | 2012/09/17 | | 96 | % |
| | | | Cadmium (Cd) | 2012/09/17 | | 99 | % |
| | | | Chrome (Cr) | 2012/09/17 | | 100 | % |
| | | | Cuivre (Cu) | 2012/09/17 | | 96 | % |
| | | | Plomb (Pb) | 2012/09/17 | | 98 | % |
| | | | Nickel (Ni) | 2012/09/17 | | 99 | % |
| | | | Sélénium (Se) | 2012/09/17 | | 84 | % |
| | | | Sodium (Na) | 2012/09/17 | | 100 | % |
| | | | Zinc (Zn) | 2012/09/17 | | 101 | % |
| | | | Bore (B) | 2012/09/17 | | 92 | % |
| | | | Fer (Fe) | 2012/09/17 | | 96 | % |
| | | | Magnésium (Mg) | 2012/09/17 | | 99 | % |
| | | | Potassium (K) | 2012/09/17 | | 98 | % |
| | | | Calcium (Ca) | 2012/09/17 | | 96 | % |
| | | Blanc de méthode | Aluminium (Al) | 2012/09/17 | <0.03 | | mg/L |
| | | | Arsenic (As) | 2012/09/17 | <0.001 | | mg/L |
| | | | Baryum (Ba) | 2012/09/17 | <0.02 | | mg/L |
| | | | Cadmium (Cd) | 2012/09/17 | <0.001 | | mg/L |



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GOLDER ASSOCIES LTEE
Attention: Veronique Blais
Votre # du projet: 10-1221-0107
P.O. #:
Adresse du site: 6002

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B251172

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1057042 | MCA | Blanc de méthode | Chrome (Cr) | 2012/09/17 | <0.005 | | mg/L |
| | | | Cuivre (Cu) | 2012/09/17 | <0.003 | | mg/L |
| | | | Plomb (Pb) | 2012/09/17 | <0.001 | | mg/L |
| | | | Nickel (Ni) | 2012/09/17 | <0.01 | | mg/L |
| | | | Sélénium (Se) | 2012/09/17 | <0.001 | | mg/L |
| | | | Sodium (Na) | 2012/09/17 | <0.2 | | mg/L |
| | | | Zinc (Zn) | 2012/09/17 | <0.005 | | mg/L |
| | | | Bore (B) | 2012/09/17 | <0.05 | | mg/L |
| | | | Fer (Fe) | 2012/09/17 | <0.1 | | mg/L |
| | | | Magnésium (Mg) | 2012/09/17 | <0.2 | | mg/L |
| | | | Potassium (K) | 2012/09/17 | <0.2 | | mg/L |
| | | | Calcium (Ca) | 2012/09/17 | <0.5 | | mg/L |
| 1057116 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2012/09/17 | | 83 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2012/09/17 | | 94 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2012/09/17 | <0.01 | | mg/L |
| 1057133 | FS | Blanc fortifié | Azote ammoniacal (N-NH3) | 2012/09/18 | | 102 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2012/09/18 | <0.02 | | mg/L |
| 1057199 | FSI | Blanc fortifié | Solide Dissous Totaux | 2012/09/17 | | 96 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2012/09/17 | | 102 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2012/09/17 | <10 | | mg/L |
| 1057246 | DB2 | ÉTALON CQ | Cyanures disponibles (CN-) | 2012/09/17 | | 83 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2012/09/17 | | 96 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2012/09/17 | <0.01 | | mg/L |
| 1057525 | JS2 | Blanc fortifié | Phosphore total | 2012/09/18 | | 90 | % |
| | | Blanc de méthode | Phosphore total | 2012/09/18 | <0.01 | | mg/L |
| 1057682 | AL8 | Blanc fortifié | Chlorures (Cl) | 2012/09/19 | | 98 | % |
| | | | Sulfates (SO4) | 2012/09/19 | | 101 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2012/09/19 | <0.05 | | mg/L |
| | | | Sulfates (SO4) | 2012/09/19 | <0.5 | | mg/L |
| 1058816 | DB2 | ÉTALON CQ | Cyanures Totaux | 2012/09/20 | | 88 | % |
| | | Blanc fortifié | Cyanures Totaux | 2012/09/20 | | 102 | % |
| | | Blanc de méthode | Cyanures Totaux | 2012/09/20 | <0.003 | | mg/L |

Vérification d'étalonnage: Sert à confimer que l'étalonnage est en contrôle tout au long de la séquence instrumentale.
Matériau de référence certifié: Matériau dont une ou plusieurs valeurs des propriétés sont certifiées par une procédure techniquement valide, délivré par un organisme de certification et accompagné d'un certificat. Sert à évaluer l'exactitude d'une méthode analytique.
Blanc fortifié: Blanc auquel a été ajouté une quantité connue d'un ou de plusieurs composés chimiques d'intérêts. Sert à évaluer la récupération des composés d'intérêts.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B251172**

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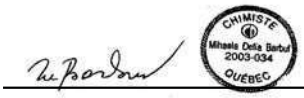
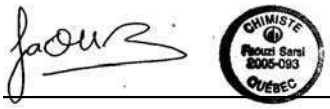
Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:




Delia Barbul, B.Sc., Chimiste

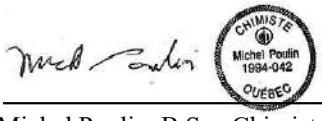



Faouzi Sarsi, B. Sc. Chimiste

Kathie Quevillon, B.Sc., Chimiste

Maria Chrifi Alaoui, B.Sc., Chimiste

Madina Hamrouni, B.Sc., Chimiste




Michel Poulin, B.Sc., Chimiste



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Votre # du projet: 13-1221-0020
No. de site: 3012
Votre # Bordereau: E858626, E-858626

**Attention: Alexandre Boutin**
GOLDER ASSOCIES LTEE
Montreal
9200, boul. l'Acadie
bureau 10
Montréal, PQ
Canada H4N 2T2

**Date du rapport: 2013/07/17**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B339920**
**Reçu: 2013/07/10, 11:10**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 8

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 8 | N/A | 2013/07/15 | STL SOP-00038 | SM 2320B |
| Anions | 1 | N/A | 2013/07/11 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Anions | 7 | N/A | 2013/07/16 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Hydrocarbures pétroliers (C10-C50) | 8 | 2013/07/12 | 2013/07/15 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 8 | 2013/07/12 | 2013/07/12 | STL SOP-00035 | MA. 300 - CN 1.2 |
| Cyanures totaux | 8 | 2013/07/15 | 2013/07/15 | STL SOP-00035 | MA. 300 - CN 1.2 |
| Fluorures | 7 | N/A | 2013/07/15 | STL SOP-00038 | SM 4500-F- C. |
| Fluorures | 1 | N/A | 2013/07/16 | STL SOP-00038 | SM 4500-F- C. |
| Métaux dissous par ICP-MS | 8 | 2013/07/12 | 2013/07/12 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux extractibles totaux par ICP | 8 | 2013/07/12 | 2013/07/13 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 8 | N/A | 2013/07/16 | STL SOP-00040 | MA. 300 - N 1.1 |
| Nitrate et/ou Nitrite | 1 | N/A | 2013/07/11 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Solides totaux dissous | 8 | 2013/07/12 | 2013/07/12 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

Matrice: EAU
Nombre d'échantillons reçus: 1

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Hydrocarbures pétroliers (C10-C50) | 1 | 2013/07/12 | 2013/07/15 | STL SOP-00173 | MA.400 - Hyd 1.1 |

* Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.



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Votre # du projet: 13-1221-0020
No. de site: 3012
Votre # Bordereau: E858626, E-858626

**Attention: Alexandre Boutin**
GOLDER ASSOCIES LTEE
Montreal
9200, boul. l'Acadie
bureau 10
Montréal, PQ
Canada H4N 2T2

**Date du rapport: 2013/07/17**

## CERTIFICAT D'ANALYSES



clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Dominique Pelletier, B. Sc., chimiste, Chargée de projets
Email: DPelletier@maxxam.ca
Phone# (514) 448-9001 Ext:4281

==========

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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| Identification Maxxam | | V08554 | V08555 | V08556 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/06 | 2013/07/06 | 2013/07/06 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **PZ13-34-20130706** | **BH11-17R-20130706** | **BH11-17D-20130706** | **LDR** | **Lot CQ** |
| **HYDROCARBURES PÉTROLIERS** | | | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | 100 | 1175919 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 73 | 76 | 74 | N/A | 1175919 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | V08557 | V08558 | V08559 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/07 | 2013/07/07 | 2013/07/07 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **PZ12-30R-20130707** | **PZ12-31R-20130707** | **PZ12-32D-20130707** | **LDR** | **Lot CQ** |
| **HYDROCARBURES PÉTROLIERS** | | | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | 180 | <100 | <100 | 100 | 1175919 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 75 | 72 | 69 | N/A | 1175919 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | V08560 | V08561 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/06 | 2013/07/08 | | |
| # Bordereau | | E-858626 | E-858626 | | |
| | **UNITÉS** | **DUP-1-20130706** | **PZ13-36-20130708** | **LDR** | **Lot CQ** |
| **HYDROCARBURES PÉTROLIERS** | | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | <100 | <100 | 100 | 1175919 |
| **Récupération des Surrogates (%)** | | | | | |
| 1-Chlorooctadécane | % | 77 | 74 | N/A | 1175919 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité



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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| Identification Maxxam | | V08554 | V08555 | V08556 | V08557 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/06 | 2013/07/06 | 2013/07/06 | 2013/07/07 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **PZ13-34-20130706** | **BH11-17R-20130706** | **BH11-17D-20130706** | **PZ12-30R-20130707** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Aluminium (Al) | ug/L | <30 | <30 | <30 | <30 | 30 | 1176064 |
| Antimoine (Sb) | ug/L | <3 | <3 | <3 | <3 | 3 | 1176064 |
| Argent (Ag) | ug/L | <0.3 | <0.3 | <0.3 | <0.3 | 0.3 | 1176064 |
| Arsenic (As) | ug/L | 2 | 8 | <1 | <1 | 1 | 1176064 |
| Baryum (Ba) | ug/L | 360 | 39 | <20 | 27 | 20 | 1176064 |
| Cadmium (Cd) | ug/L | <1 | <1 | <1 | <1 | 1 | 1176064 |
| Chrome (Cr) | ug/L | <5 | <5 | <5 | <5 | 5 | 1176064 |
| Cobalt (Co) | ug/L | <20 | <20 | <20 | <20 | 20 | 1176064 |
| Cuivre (Cu) | ug/L | <3 | <3 | 6 | <3 | 3 | 1176064 |
| Manganèse (Mn) | ug/L | 35 | 170 | 25 | 150 | 3 | 1176064 |
| Molybdène (Mo) | ug/L | <10 | <10 | <10 | 11 | 10 | 1176064 |
| Nickel (Ni) | ug/L | <10 | <10 | <10 | <10 | 10 | 1176064 |
| Plomb (Pb) | ug/L | <1 | <1 | <1 | <1 | 1 | 1176064 |
| Sélénium (Se) | ug/L | <1 | <1 | <1 | <1 | 1 | 1176064 |
| Sodium (Na) | ug/L | 43000 | 22000 | 1800 | 23000 | 200 | 1176064 |
| Zinc (Zn) | ug/L | 8 | <5 | 39 | 6 | 5 | 1176064 |

LDR = Limite de détection rapportée
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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| Identification Maxxam | | V08558 | V08559 | V08559 | V08560 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/07 | 2013/07/07 | 2013/07/07 | 2013/07/06 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **PZ12-31R-20130707** | **PZ12-32D-20130707** | **PZ12-32D-20130707 Dup. de Lab.** | **DUP-1-20130706** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Aluminium (Al) | ug/L | <30 | <30 | <30 | <30 | 30 | 1176064 |
| Antimoine (Sb) | ug/L | <3 | <3 | <3 | <3 | 3 | 1176064 |
| Argent (Ag) | ug/L | <0.3 | <0.3 | <0.3 | <0.3 | 0.3 | 1176064 |
| Arsenic (As) | ug/L | <1 | <1 | <1 | <1 | 1 | 1176064 |
| Baryum (Ba) | ug/L | 59 | 200 | 200 | <20 | 20 | 1176064 |
| Cadmium (Cd) | ug/L | <1 | <1 | <1 | <1 | 1 | 1176064 |
| Chrome (Cr) | ug/L | <5 | <5 | <5 | <5 | 5 | 1176064 |
| Cobalt (Co) | ug/L | <20 | <20 | <20 | <20 | 20 | 1176064 |
| Cuivre (Cu) | ug/L | <3 | <3 | <3 | 6 | 3 | 1176064 |
| Manganèse (Mn) | ug/L | 2000 | 1500 | 1500 | 24 | 3 | 1176064 |
| Molybdène (Mo) | ug/L | <10 | <10 | <10 | <10 | 10 | 1176064 |
| Nickel (Ni) | ug/L | 16 | <10 | <10 | <10 | 10 | 1176064 |
| Plomb (Pb) | ug/L | <1 | <1 | <1 | <1 | 1 | 1176064 |
| Sélénium (Se) | ug/L | <1 | <1 | <1 | <1 | 1 | 1176064 |
| Sodium (Na) | ug/L | 35000 | 36000 | 36000 | 1800 | 200 | 1176064 |
| Zinc (Zn) | ug/L | <5 | <5 | 7 | 13 | 5 | 1176064 |

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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| Identification Maxxam | | V08561 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/08 | | |
| # Bordereau | | E-858626 | | |
| | **UNITÉS** | **PZ13-36-20130708** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Aluminium (Al) | ug/L | 66 | 30 | 1176064 |
| Antimoine (Sb) | ug/L | <3 | 3 | 1176064 |
| Argent (Ag) | ug/L | <0.3 | 0.3 | 1176064 |
| Arsenic (As) | ug/L | 3 | 1 | 1176064 |
| Baryum (Ba) | ug/L | 110 | 20 | 1176064 |
| Cadmium (Cd) | ug/L | <1 | 1 | 1176064 |
| Chrome (Cr) | ug/L | <5 | 5 | 1176064 |
| Cobalt (Co) | ug/L | <20 | 20 | 1176064 |
| Cuivre (Cu) | ug/L | <3 | 3 | 1176064 |
| Manganèse (Mn) | ug/L | 1400 | 3 | 1176064 |
| Molybdène (Mo) | ug/L | 13 | 10 | 1176064 |
| Nickel (Ni) | ug/L | <10 | 10 | 1176064 |
| Plomb (Pb) | ug/L | <1 | 1 | 1176064 |
| Sélénium (Se) | ug/L | <1 | 1 | 1176064 |
| Sodium (Na) | ug/L | 18000 | 200 | 1176064 |
| Zinc (Zn) | ug/L | <5 | 5 | 1176064 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Dossier Maxxam: B339920
Date du rapport: 2013/07/17

Initiales du préleveur: SC

## MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | V08554 | V08555 | V08556 | V08557 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/06 | 2013/07/06 | 2013/07/06 | 2013/07/07 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **PZ13-34-20130706** | **BH11-17R-20130706** | **BH11-17D-20130706** | **PZ12-30R-20130707** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Phosphore total | mg/L | 0.08 | <0.01 | <0.01 | 0.18 | 0.01 | 1175903 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | V08558 | V08559 | V08560 | V08561 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/07 | 2013/07/07 | 2013/07/06 | 2013/07/08 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **PZ12-31R-20130707** | **PZ12-32D-20130707** | **DUP-1-20130706** | **PZ13-36-20130708** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Phosphore total | mg/L | 0.01 | 0.33 | <0.01 | 0.06 | 0.01 | 1175903 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | V08561 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/08 | | |
| # Bordereau | | E-858626 | | |
| | **UNITÉS** | **PZ13-36-20130708 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Phosphore total | mg/L | 0.06 | 0.01 | 1175903 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité



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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | V08554 | V08554 | V08555 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/06 | 2013/07/06 | 2013/07/06 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **PZ13-34-20130706** | **PZ13-34-20130706 Dup. de Lab.** | **BH11-17R-20130706** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.19 | N/A | 0.05 | 0.02 | 1176855 |
| Cyanures disponibles (CN-) | mg/L | 0.02 | N/A | <0.01 | 0.01 | 1175857 |
| Cyanures Totaux | mg/L | 0.015 | N/A | 0.003 | 0.003 | 1176759 |
| Fluorure (F) | mg/L | 0.2 | N/A | 0.1 | 0.1 | 1175958 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 160 | N/A | 180 | 1 | 1175953 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | N/A | <1 | 1 | 1175953 |
| Chlorures (Cl) | mg/L | 12 | 12 | 25 | 0.05 | 1176977 |
| Nitrate(N) et Nitrite(N) | mg/L | <0.02 | <0.02 | <0.02 | 0.02 | 1176977 |
| Sulfates (SO4) | mg/L | 110 | 110 | 410 | 0.5 | 1176977 |
| Solide Dissous Totaux | mg/L | 6200 | N/A | 6700 | 10 | 1176159 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | V08556 | V08557 | V08558 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/06 | 2013/07/07 | 2013/07/07 | | |
| # Bordereau | | E-858626 | E-858626 | E-858626 | | |
| | **UNITÉS** | **BH11-17D-20130706** | **PZ12-30R-20130707** | **PZ12-31R-20130707** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.06 | 0.09 | 1.2 | 0.02 | 1176855 |
| Cyanures disponibles (CN-) | mg/L | 0.02 | <0.01 | 0.02 | 0.01 | 1175857 |
| Cyanures Totaux | mg/L | 0.021 | <0.003 | 0.022 | 0.003 | 1176759 |
| Fluorure (F) | mg/L | <0.1 | <0.1 | <0.1 | 0.1 | 1175958 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 12 | 310 | 140 | 1 | 1175953 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | <1 | <1 | 1 | 1175953 |
| Chlorures (Cl) | mg/L | 0.47 | 18 | 17 | 0.05 | 1176977 |
| Nitrate(N) et Nitrite(N) | mg/L | 0.03 | 0.04 | <0.02 | 0.02 | 1176977 |
| Sulfates (SO4) | mg/L | 8.6 | 140 | 320 | 0.5 | 1176977 |
| Solide Dissous Totaux | mg/L | 5800 | 6400 | 6500 | 10 | 1176159 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité



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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | V08559 | | V08560 | | V08561 | | |
|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/07 | | 2013/07/06 | | 2013/07/08 | | |
| # Bordereau | | E-858626 | | E-858626 | | E-858626 | | |
| | **UNITÉS** | **PZ12-32D-20130707** | **LDR** | **DUP-1-20130706** | **Lot CQ** | **PZ13-36-20130708** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.37 | 0.02 | 0.03 | 1176855 | 0.23 | 0.02 | 1176855 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | 0.01 | <0.01 | 1175857 | 0.01 | 0.01 | 1175857 |
| Cyanures Totaux | mg/L | 0.004 | 0.003 | <0.003 | 1176759 | 0.011 | 0.003 | 1176759 |
| Fluorure (F) | mg/L | <0.1 | 0.1 | <0.1 | 1175958 | <0.1 | 0.1 | 1175958 |
| Nitrates (N-NO3-) | mg/L | N/A | N/A | N/A | N/A | 0.03 | 0.02 | 1175112 |
| Nitrites (N-NO2-) | mg/L | N/A | N/A | N/A | N/A | <0.02 | 0.02 | 1175112 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 240 | 1 | 12 | 1175953 | 130 | 1 | 1175953 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | 1 | <1 | 1175953 | <1 | 1 | 1175953 |
| Chlorures (Cl) | mg/L | 31 | 0.05 | 0.47 | 1176977 | 24 | 0.05 | 1175748 |
| Nitrate(N) et Nitrite(N) | mg/L | <0.02 | 0.02 | 0.05 | 1176977 | N/A | 0.02 | N/A |
| Sulfates (SO4) | mg/L | 230 | 0.5 | 8.9 | 1176977 | 160 | 0.5 | 1175748 |
| Solide Dissous Totaux | mg/L | 6100 | 30 | 5800 | 1176159 | 6300 | 10 | 1176159 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité

| Identification Maxxam | | V08561 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/08 | | |
| # Bordereau | | E-858626 | | |
| | **UNITÉS** | **PZ13-36-20130708 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Cyanures Totaux | mg/L | 0.013 | 0.003 | 1176759 |
| Solide Dissous Totaux | mg/L | 6400 | 10 | 1176159 |

LDR = Limite de détection rapportée
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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

## HYDROCARBURES PAR GCFID (EAU)

| Identification Maxxam | | V08562 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/08 | | |
| # Bordereau | | E-858626 | | |
| | **UNITÉS** | **BLANC TERRAIN-20130708** | **LDR** | **Lot CQ** |
| **HYDROCARBURES PÉTROLIERS** | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | <100 | 100 | 1175919 |
| **Récupération des Surrogates (%)** | | | | |
| 1-Chlorooctadécane | % | 71 | N/A | 1175919 |

N/A = Non Applicable
LDR = Limite de détection rapportée
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Dossier Maxxam: B339920
Date du rapport: 2013/07/17

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020

Initiales du préleveur: SC

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON excepté pour
Métaux extractibles totaux par ICP: Arrivé sans agent de conservation. L'agent de conservation fut ajouté à l'arrivée au laboratoire.: V08554, V08555, V08556, V08557, V08558, V08559, V08560, V08561

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**MÉTAUX DISSOUS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**HYDROCARBURES PAR GCFID (EAU)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**



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GOLDER ASSOCIES LTEE
Attention: Alexandre Boutin
Votre # du projet: 13-1221-0020
P.O. #:
Adresse du site:

# Rapport Assurance Qualité

Dossier Maxxam: B339920

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1175112 | AL8 | Blanc fortifié | Nitrates (N-NO3-) | 2013/07/11 | | 95 | % |
| | | | Nitrites (N-NO2-) | 2013/07/11 | | 98 | % |
| | | Blanc de méthode | Nitrates (N-NO3-) | 2013/07/11 | <0.02 | | mg/L |
| | | | Nitrites (N-NO2-) | 2013/07/11 | <0.02 | | mg/L |
| 1175748 | AL8 | Blanc fortifié | Chlorures (Cl) | 2013/07/11 | | 96 | % |
| | | | Sulfates (SO4) | 2013/07/11 | | 101 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2013/07/11 | <0.05 | | mg/L |
| | | | Sulfates (SO4) | 2013/07/11 | <0.5 | | mg/L |
| 1175857 | DB2 | MRC | Cyanures disponibles (CN-) | 2013/07/12 | | 84 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2013/07/12 | | 106 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2013/07/12 | <0.01 | | mg/L |
| 1175903 | JS2 | Blanc fortifié | Phosphore total | 2013/07/12 | | 88 | % |
| | | Blanc de méthode | Phosphore total | 2013/07/12 | <0.01 | | mg/L |
| 1175919 | DJ2 | Blanc fortifié | 1-Chlorooctadécane | 2013/07/15 | | 80 | % |
| | | Blanc fortifié DUP | 1-Chlorooctadécane | 2013/07/15 | | 81 | % |
| | | Blanc fortifié | Hydrocarbures pétroliers (C10-C50) | 2013/07/15 | | 87 | % |
| | | Blanc fortifié DUP | Hydrocarbures pétroliers (C10-C50) | 2013/07/15 | | 88 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2013/07/15 | | 78 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2013/07/15 | <100 | | ug/L |
| 1175953 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2013/07/15 | | 90 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2013/07/15 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2013/07/15 | <1 | | mg/L |
| 1175958 | MR4 | Blanc fortifié | Fluorure (F) | 2013/07/15 | | 96 | % |
| | | Blanc de méthode | Fluorure (F) | 2013/07/15 | <0.1 | | mg/L |
| 1176064 | JS2 | Blanc fortifié | Aluminium (Al) | 2013/07/12 | | 97 | % |
| | | | Antimoine (Sb) | 2013/07/12 | | 103 | % |
| | | | Argent (Ag) | 2013/07/12 | | 104 | % |
| | | | Arsenic (As) | 2013/07/12 | | 99 | % |
| | | | Baryum (Ba) | 2013/07/12 | | 99 | % |
| | | | Cadmium (Cd) | 2013/07/12 | | 99 | % |
| | | | Chrome (Cr) | 2013/07/12 | | 96 | % |
| | | | Cobalt (Co) | 2013/07/12 | | 95 | % |
| | | | Cuivre (Cu) | 2013/07/12 | | 93 | % |
| | | | Manganèse (Mn) | 2013/07/12 | | 101 | % |
| | | | Molybdène (Mo) | 2013/07/12 | | 100 | % |
| | | | Nickel (Ni) | 2013/07/12 | | 96 | % |
| | | | Plomb (Pb) | 2013/07/12 | | 99 | % |
| | | | Sélénium (Se) | 2013/07/12 | | 96 | % |
| | | | Sodium (Na) | 2013/07/12 | | 99 | % |
| | | | Zinc (Zn) | 2013/07/12 | | 94 | % |
| | | Blanc de méthode | Aluminium (Al) | 2013/07/12 | <30 | | ug/L |
| | | | Antimoine (Sb) | 2013/07/12 | <3 | | ug/L |
| | | | Argent (Ag) | 2013/07/12 | <0.3 | | ug/L |
| | | | Arsenic (As) | 2013/07/12 | <1 | | ug/L |
| | | | Baryum (Ba) | 2013/07/12 | <20 | | ug/L |
| | | | Cadmium (Cd) | 2013/07/12 | <1 | | ug/L |
| | | | Chrome (Cr) | 2013/07/12 | <5 | | ug/L |
| | | | Cobalt (Co) | 2013/07/12 | <20 | | ug/L |
| | | | Cuivre (Cu) | 2013/07/12 | <3 | | ug/L |
| | | | Manganèse (Mn) | 2013/07/12 | <3 | | ug/L |
| | | | Molybdène (Mo) | 2013/07/12 | <10 | | ug/L |
| | | | Nickel (Ni) | 2013/07/12 | <10 | | ug/L |
| | | | Plomb (Pb) | 2013/07/12 | <1 | | ug/L |
| | | | Sélénium (Se) | 2013/07/12 | <1 | | ug/L |
| | | | Sodium (Na) | 2013/07/12 | <200 | | ug/L |



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GOLDER ASSOCIES LTEE
Attention: Alexandre Boutin
Votre # du projet: 13-1221-0020
P.O. #:
Adresse du site:

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B339920

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1176064 | JS2 | Blanc de méthode | Zinc (Zn) | 2013/07/12 | <5 | | ug/L |
| 1176159 | FSI | Blanc fortifié | Solide Dissous Totaux | 2013/07/12 | | 101 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2013/07/12 | | 101 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2013/07/12 | <10 | | mg/L |
| 1176759 | DB2 | MRC | Cyanures Totaux | 2013/07/15 | | 91 | % |
| | | Blanc fortifié | Cyanures Totaux | 2013/07/15 | | 108 | % |
| | | Blanc de méthode | Cyanures Totaux | 2013/07/15 | <0.003 | | mg/L |
| 1176855 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2013/07/16 | | 103 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2013/07/16 | 0.02, LDR=0.02 | | mg/L |
| 1176977 | AL8 | Blanc fortifié | Chlorures (Cl) | 2013/07/15 | | 96 | % |
| | | | Nitrate(N) et Nitrite(N) | 2013/07/15 | | 98 | % |
| | | | Sulfates (SO4) | 2013/07/15 | | 101 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2013/07/16 | <0.05 | | mg/L |
| | | | Nitrate(N) et Nitrite(N) | 2013/07/16 | <0.02 | | mg/L |
| | | | Sulfates (SO4) | 2013/07/16 | <0.5 | | mg/L |

MRC: Un échantillon de concentration connue préparé dans des conditions rigoureuses par un organisme externe. Utilisé pour vérifier la justesse de la méthode.
Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B339920**

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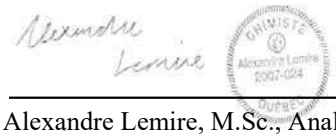
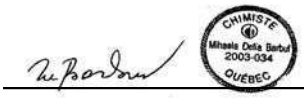
Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:




Alexandre Lemire, M.Sc., Analyste 2

Corina Tue, B.Sc. Chimiste




Delia Barbul, B.Sc., Chimiste

Maria Chrifi Alaoui, B.Sc., Chimiste

Madina Hamrouni, B.Sc., Chimiste

Ramona Dascal



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Votre # du projet: 13-1221-0020
Adresse du site: 13-1221-0020/3012
Votre # Bordereau: e824070, e-824070

**Attention: Alexandre Boutin**
GOLDER ASSOCIES LTEE
Montreal
9200, boul. l'Acadie
bureau 10
Montréal, PQ
Canada H4N 2T2

**Date du rapport: 2013/07/25**

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B342305**
**Reçu: 2013/07/18, 11:30**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 1

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5) | 1 | N/A | 2013/07/22 | STL SOP-00038 | SM 2320B |
| Anions | 1 | N/A | 2013/07/19 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Hydrocarbures pétroliers (C10-C50) | 1 | 2013/07/19 | 2013/07/23 | STL SOP-00173 | MA.400 - Hyd 1.1 |
| Cyanures disponibles | 1 | 2013/07/22 | 2013/07/23 | STL SOP-00035 | MA. 300 - CN 1.2 |
| Cyanures totaux | 1 | 2013/07/22 | 2013/07/24 | STL SOP-00035 | MA. 300 - CN 1.2 |
| Fluorures | 1 | N/A | 2013/07/22 | STL SOP-00038 | SM 4500-F- C. |
| Métaux dissous par ICP-MS | 1 | 2013/07/22 | 2013/07/22 | STL SOP-00006 | MA.200- Mét 1.2 |
| Métaux extractibles totaux par ICP | 1 | 2013/07/23 | 2013/07/23 | STL SOP-00006 | MA.200- Mét 1.2 |
| Azote ammoniacal | 1 | N/A | 2013/07/23 | STL SOP-00040 | MA. 300 - N 1.1 |
| Nitrate et/ou Nitrite | 1 | N/A | 2013/07/19 | STL SOP-00014 | MA. 300 - Ions 1.3 |
| Solides totaux dissous | 1 | 2013/07/23 | 2013/07/23 | STL SOP-00050 | MA. 103 - S.T. 1.0 |

* Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets

Dominique Pelletier, B. Sc., chimiste, Chargée de projets
Email: DPelletier@maxxam.ca
Phone# (514) 448-9001 Ext:4281

==========

Ce rapport à été produit et distribué en utilisant une procédure automatisée sécuritaire.
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Dossier Maxxam: B342305
Date du rapport: 2013/07/25

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020
Adresse du site: 13-1221-0020/3012
Initiales du préleveur: SBB

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| | | | | |
|---|---|---|---|---|
| Identification Maxxam | | V18948 | | |
| Date d'échantillonnage | | 2013/07/16 | | |
| # Bordereau | | e-824070 | | |
| | **UNITÉS** | **PZ13-35-20130716** | **LDR** | **Lot CQ** |
| **HYDROCARBURES PÉTROLIERS** | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | <100 | 100 | 1179534 |
| **Récupération des Surrogates (%)** | | | | |
| 1-Chlorooctadécane | % | 75 | N/A | 1179534 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B342305
Date du rapport: 2013/07/25

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020
Adresse du site: 13-1221-0020/3012
Initiales du préleveur: SBB

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| Identification Maxxam | | V18948 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/16 | | |
| # Bordereau | | e-824070 | | |
| | **UNITÉS** | **PZ13-35-20130716/FILTERED** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Aluminium (Al) | ug/L | <30 | 30 | 1180113 |
| Antimoine (Sb) | ug/L | <3 | 3 | 1180113 |
| Argent (Ag) | ug/L | <0.3 | 0.3 | 1180113 |
| Arsenic (As) | ug/L | 11 | 1 | 1180113 |
| Baryum (Ba) | ug/L | 40 | 20 | 1180113 |
| Cadmium (Cd) | ug/L | <1 | 1 | 1180113 |
| Chrome (Cr) | ug/L | <5 | 5 | 1180113 |
| Cobalt (Co) | ug/L | <20 | 20 | 1180113 |
| Cuivre (Cu) | ug/L | <3 | 3 | 1180113 |
| Manganèse (Mn) | ug/L | 260 | 3 | 1180113 |
| Molybdène (Mo) | ug/L | <10 | 10 | 1180113 |
| Nickel (Ni) | ug/L | <10 | 10 | 1180113 |
| Plomb (Pb) | ug/L | <1 | 1 | 1180113 |
| Sélénium (Se) | ug/L | <1 | 1 | 1180113 |
| Sodium (Na) | ug/L | 12000 | 200 | 1180113 |
| Zinc (Zn) | ug/L | <5 | 5 | 1180113 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B342305
Date du rapport: 2013/07/25

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020
Adresse du site: 13-1221-0020/3012
Initiales du préleveur: SBB

## MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)

| Identification Maxxam | | V18948 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/16 | | |
| # Bordereau | | e-824070 | | |
| | **UNITÉS** | **PZ13-35-20130716** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | |
| Phosphore total | mg/L | 0.02 | 0.01 | 1180631 |

LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B342305
Date du rapport: 2013/07/25

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020
Adresse du site: 13-1221-0020/3012
Initiales du préleveur: SBB

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| Identification Maxxam | | V18948 | V18948 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2013/07/16 | 2013/07/16 | | |
| # Bordereau | | e-824070 | e-824070 | | |
| | **UNITÉS** | **PZ13-35-20130716** | **PZ13-35-20130716 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | |
| Azote ammoniacal (N-NH3) | mg/L | 0.06 | 0.07 | 0.02 | 1180352 |
| Cyanures disponibles (CN-) | mg/L | <0.01 | N/A | 0.01 | 1180328 |
| Cyanures Totaux | mg/L | <0.003 | N/A | 0.003 | 1180257 |
| Fluorure (F) | mg/L | 0.2 | N/A | 0.1 | 1179457 |
| Nitrates (N-NO3-) | mg/L | 0.18 | N/A | 0.02 | 1179145 |
| Nitrites (N-NO2-) | mg/L | <0.02 | N/A | 0.02 | 1179145 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 210 | N/A | 1 | 1179455 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1 | N/A | 1 | 1179455 |
| Chlorures (Cl) | mg/L | 0.84 | N/A | 0.05 | 1179186 |
| Sulfates (SO4) | mg/L | 10 | N/A | 0.5 | 1179186 |
| Solide Dissous Totaux | mg/L | 230 | N/A | 10 | 1180798 |

N/A = Non Applicable
LDR = Limite de détection rapportée
Lot CQ = Lot Contrôle Qualité


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Dossier Maxxam: B342305
Date du rapport: 2013/07/25

GOLDER ASSOCIES LTEE
Votre # du projet: 13-1221-0020
Adresse du site: 13-1221-0020/3012
Initiales du préleveur: SBB

**REMARQUES GÉNÉRALES**

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats ont été corrigés pour le blanc de méthode.

**MÉTAUX DISSOUS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**MÉTAUX EXTRACTIBLES TOTAUX (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**


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GOLDER ASSOCIES LTEE
Attention: Alexandre Boutin
Votre # du projet: 13-1221-0020
P.O. #:
Adresse du site: 13-1221-0020/3012

# Rapport Assurance Qualité

Dossier Maxxam: B342305

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1179145 | AL8 | Blanc fortifié | Nitrates (N-NO3-) | 2013/07/19 | | 100 | % |
| | | | Nitrites (N-NO2-) | 2013/07/19 | | 94 | % |
| | | Blanc de méthode | Nitrates (N-NO3-) | 2013/07/19 | <0.02 | | mg/L |
| | | | Nitrites (N-NO2-) | 2013/07/19 | <0.02 | | mg/L |
| 1179186 | AL8 | Blanc fortifié | Chlorures (Cl) | 2013/07/19 | | 95 | % |
| | | | Sulfates (SO4) | 2013/07/19 | | 96 | % |
| | | Blanc de méthode | Chlorures (Cl) | 2013/07/19 | <0.05 | | mg/L |
| | | | Sulfates (SO4) | 2013/07/19 | <0.5 | | mg/L |
| 1179455 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2013/07/22 | | 88 | % |
| | | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2013/07/22 | <1 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2013/07/22 | <1 | | mg/L |
| 1179457 | MR4 | Blanc fortifié | Fluorure (F) | 2013/07/22 | | 112 | % |
| | | Blanc de méthode | Fluorure (F) | 2013/07/22 | <0.1 | | mg/L |
| 1179534 | CG2 | Blanc fortifié | 1-Chlorooctadécane | 2013/07/23 | | 93 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2013/07/23 | | 106 | % |
| | | Blanc de méthode | 1-Chlorooctadécane | 2013/07/23 | | 83 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2013/07/23 | 140, LDR=100 | | ug/L |
| 1180113 | JS2 | Blanc fortifié | Aluminium (Al) | 2013/07/22 | | 99 | % |
| | | | Antimoine (Sb) | 2013/07/22 | | 104 | % |
| | | | Argent (Ag) | 2013/07/22 | | 95 | % |
| | | | Arsenic (As) | 2013/07/22 | | 103 | % |
| | | | Baryum (Ba) | 2013/07/22 | | 100 | % |
| | | | Cadmium (Cd) | 2013/07/22 | | 102 | % |
| | | | Chrome (Cr) | 2013/07/22 | | 96 | % |
| | | | Cobalt (Co) | 2013/07/22 | | 98 | % |
| | | | Cuivre (Cu) | 2013/07/22 | | 102 | % |
| | | | Manganèse (Mn) | 2013/07/22 | | 106 | % |
| | | | Molybdène (Mo) | 2013/07/22 | | 104 | % |
| | | | Nickel (Ni) | 2013/07/22 | | 100 | % |
| | | | Plomb (Pb) | 2013/07/22 | | 100 | % |
| | | | Sélénium (Se) | 2013/07/22 | | 100 | % |
| | | | Sodium (Na) | 2013/07/22 | | 98 | % |
| | | | Zinc (Zn) | 2013/07/22 | | 104 | % |
| | | Blanc de méthode | Aluminium (Al) | 2013/07/22 | <30 | | ug/L |
| | | | Antimoine (Sb) | 2013/07/22 | <3 | | ug/L |
| | | | Argent (Ag) | 2013/07/22 | <0.3 | | ug/L |
| | | | Arsenic (As) | 2013/07/22 | <1 | | ug/L |
| | | | Baryum (Ba) | 2013/07/22 | <20 | | ug/L |
| | | | Cadmium (Cd) | 2013/07/22 | <1 | | ug/L |
| | | | Chrome (Cr) | 2013/07/22 | <5 | | ug/L |
| | | | Cobalt (Co) | 2013/07/22 | <20 | | ug/L |
| | | | Cuivre (Cu) | 2013/07/22 | <3 | | ug/L |
| | | | Manganèse (Mn) | 2013/07/22 | <3 | | ug/L |
| | | | Molybdène (Mo) | 2013/07/22 | <10 | | ug/L |
| | | | Nickel (Ni) | 2013/07/22 | <10 | | ug/L |
| | | | Plomb (Pb) | 2013/07/22 | <1 | | ug/L |
| | | | Sélénium (Se) | 2013/07/22 | <1 | | ug/L |
| | | | Sodium (Na) | 2013/07/22 | <200 | | ug/L |
| | | | Zinc (Zn) | 2013/07/22 | <5 | | ug/L |
| 1180257 | DB2 | MRC | Cyanures Totaux | 2013/07/24 | | 94 | % |
| | | Blanc fortifié | Cyanures Totaux | 2013/07/24 | | 106 | % |
| | | Blanc de méthode | Cyanures Totaux | 2013/07/24 | <0.003 | | mg/L |
| 1180328 | DB2 | MRC | Cyanures disponibles (CN-) | 2013/07/23 | | 89 | % |
| | | Blanc fortifié | Cyanures disponibles (CN-) | 2013/07/23 | | 102 | % |
| | | Blanc de méthode | Cyanures disponibles (CN-) | 2013/07/23 | <0.01 | | mg/L |



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GOLDER ASSOCIES LTEE
Attention: Alexandre Boutin
Votre # du projet: 13-1221-0020
P.O. #:
Adresse du site: 13-1221-0020/3012

## Rapport Assurance Qualité (Suite)

Dossier Maxxam: B342305

| Lot Num | Lot Init | Type CQ | Groupe | Date Analysé aaaa/mm/jj | Valeur | Réc | UNITÉS |
|---|---|---|---|---|---|---|---|
| 1180352 | DKH | Blanc fortifié | Azote ammoniacal (N-NH3) | 2013/07/23 | | 103 | % |
| | | Blanc de méthode | Azote ammoniacal (N-NH3) | 2013/07/23 | <0.02 | | mg/L |
| 1180631 | MCA | Blanc fortifié | Phosphore total | 2013/07/23 | | 84 | % |
| | | Blanc de méthode | Phosphore total | 2013/07/23 | <0.01 | | mg/L |
| 1180798 | FSI | Blanc fortifié | Solide Dissous Totaux | 2013/07/23 | | 99 | % |
| | | Blanc fortifié DUP | Solide Dissous Totaux | 2013/07/23 | | 100 | % |
| | | Blanc de méthode | Solide Dissous Totaux | 2013/07/23 | <10 | | mg/L |

MRC: Un échantillon de concentration connue préparé dans des conditions rigoureuses par un organisme externe. Utilisé pour vérifier la justesse de la méthode.
Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.
Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.
Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.
LDR = Limite de détection rapportée
Réc = Récupération



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# Page des signatures de validation

**Dossier Maxxam: B342305**

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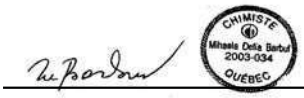
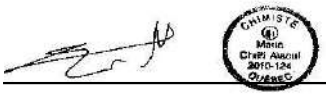
Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:



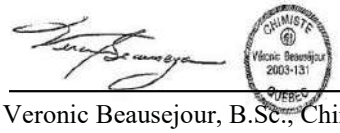

Delia Barbul, B.Sc., Chimiste




Maria Chrifi Alaoui, B.Sc., Chimiste

Madina Hamrouni, B.Sc., Chimiste

Noureddine Chafiaai, B.Sc., Chimiste




Veronic Beausejour, B.Sc., Chimiste, Superviseur

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Suivi 2017

Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-01-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/10/30**
# Rapport: R2330710
Version: 2 - Révisé

# CERTIFICAT D'ANALYSE – RÉVISÉ

**# DE DOSSIER MAXXAM: B730545**
**Reçu: 2017/06/02, 11:00**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 5

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence Primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5)*** | 4 | N/A | 2017/06/05 | STL SOP-00038 | SM 22 2320-B m |
| Anions* | 2 | N/A | 2017/06/03 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Anions* | 2 | N/A | 2017/06/05 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Benzène, toluène, éthylbenzène, xylène* | 4 | N/A | 2017/06/07 | STL SOP-00145 | MA.400–COV 2.0 R4 m |
| Benzène, toluène, éthylbenzène, xylène* | 1 | N/A | 2017/06/08 | STL SOP-00145 | MA.400–COV 2.0 R4 m |
| Hydrocarbures pétroliers (C10-C50)* | 4 | 2017/06/07 | 2017/06/07 | STL SOP-00173 | MA.400–HYD. 1.1 R3 m |
| Cyanures disponibles* | 4 | 2017/06/07 | 2017/06/07 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Cyanures totaux* | 4 | 2017/06/07 | 2017/06/09 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Métaux dissous par ICP-MS* | 4 | N/A | 2017/06/06 | STL SOP-00006 | MA.200–Mét. 1.2 R5 m |
| Nitrate et/ou Nitrite* | 2 | N/A | 2017/06/03 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Nitrate et/ou Nitrite* | 2 | N/A | 2017/06/05 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |

**Remarques:**

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.



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Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-01-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/10/30**
# Rapport: R2330710
Version: 2 - Révisé

# CERTIFICAT D'ANALYSE – RÉVISÉ

**# DE DOSSIER MAXXAM: B730545**
**Reçu: 2017/06/02, 11:00**

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDELCC.
*** Cette analyse ne fait pas partie du programme d'accréditation du MDDELCC.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Maria Manarolis, Chargée de projets
Courriel: MManarolis@maxxam.ca
Téléphone (514)448-9001 Ext:6236

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Dossier Maxxam: B730545
Date du rapport: 2017/10/30

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| ID Maxxam | | EA9513 | EA9514 | EA9515 | EA9516 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/01 12:30 | 2017/06/01 12:30 | 2017/06/01 12:30 | 2017/06/01 12:30 | | |
| # Bordereau | | 159528-01-01 | 159528-01-01 | 159528-01-01 | 159528-01-01 | | |
| | **Unités** | **PZ-11-09R-20170601** | **PZ-11-01R-20170601** | **PZ-11-02R-20170601** | **PZ-11-05R-20170601** | **LDR** | **Lot CQ** |
| **HYDROCARBURES PÉTROLIERS** | | | | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | <100 | 100 | 1786736 |
| **Récupération des Surrogates (%)** | | | | | | | |
| 1-Chlorooctadécane | % | 76 | 70 | 77 | 72 | N/A | 1786736 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable



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Dossier Maxxam: B730545
Date du rapport: 2017/10/30

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## BTEX PAR GC/MS (EAU SOUTERRAINE)

| ID Maxxam | | EA9513 | EA9514 | EA9515 | EA9516 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/01 12:30 | 2017/06/01 12:30 | 2017/06/01 12:30 | 2017/06/01 12:30 | | |
| # Bordereau | | 159528-01-01 | 159528-01-01 | 159528-01-01 | 159528-01-01 | | |
| | Unités | PZ-11-09R-20170601 | PZ-11-01R-20170601 | PZ-11-02R-20170601 | PZ-11-05R-20170601 | LDR | Lot CQ |
| **VOLATILS** | | | | | | | |
| Benzène | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | 1786711 |
| Toluène | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | 1786711 |
| Éthylbenzène | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | 1786711 |
| Xylènes (o,m,p) | ug/L | <0.40 | <0.40 | <0.40 | <0.40 | 0.40 | 1786711 |
| **Récupération des Surrogates (%)** | | | | | | | |
| 4-Bromofluorobenzène | % | 98 | 93 | 94 | 86 | N/A | 1786711 |
| D4-1,2-Dichloroéthane | % | 97 | 127 | 127 | 127 | N/A | 1786711 |
| D8-Toluène | % | 100 | 102 | 101 | 94 | N/A | 1786711 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable

| ID Maxxam | | EA9517 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/01 12:30 | | |
| # Bordereau | | 159528-01-01 | | |
| | Unités | BLANC DE TRASPORT 16MA25-6710 | LDR | Lot CQ |
| **VOLATILS** | | | | |
| Benzène | ug/L | <0.20 | 0.20 | 1786711 |
| Toluène | ug/L | <0.10 | 0.10 | 1786711 |
| Éthylbenzène | ug/L | <0.10 | 0.10 | 1786711 |
| Xylènes (o,m,p) | ug/L | <0.40 | 0.40 | 1786711 |
| **Récupération des Surrogates (%)** | | | | |
| 4-Bromofluorobenzène | % | 92 | N/A | 1786711 |
| D4-1,2-Dichloroéthane | % | 128 | N/A | 1786711 |
| D8-Toluène | % | 102 | N/A | 1786711 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable



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Dossier Maxxam: B730545
Date du rapport: 2017/10/30

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| ID Maxxam | | EA9513 | EA9514 | | EA9515 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/01 12:30 | 2017/06/01 12:30 | | 2017/06/01 12:30 | | |
| # Bordereau | | 159528-01-01 | 159528-01-01 | | 159528-01-01 | | |
| | Unités | PZ-11-09R-20170601 | PZ-11-01R-20170601 | LDR | PZ-11-02R-20170601 | LDR | Lot CQ |
| **MÉTAUX** | | | | | | | |
| Arsenic (As) | ug/L | <0.30 | <0.30 | 0.30 | <0.30 | 0.30 | 1785631 |
| Calcium (Ca) | ug/L | 60000 | 130000 | 500 | 290000 | 5000 | 1785631 |
| Cuivre (Cu) | ug/L | 4.6 | 84 | 3.0 | 18 | 3.0 | 1785631 |
| Fer (Fe) | ug/L | <100 | <100 | 100 | <100 | 100 | 1785631 |
| Magnésium (Mg) | ug/L | 8700 | 12000 | 200 | 22000 | 200 | 1785631 |
| Nickel (Ni) | ug/L | 31 | 640 | 10 | 540 | 10 | 1785631 |
| Plomb (Pb) | ug/L | <1.0 | <1.0 | 1.0 | 1.1 | 1.0 | 1785631 |
| Potassium (K) | ug/L | 3700 | 7800 | 200 | 19000 | 200 | 1785631 |
| Sodium (Na) | ug/L | 4100 | 12000 | 200 | 10000 | 200 | 1785631 |
| Zinc (Zn) | ug/L | 18 | 190 | 5.0 | 170 | 5.0 | 1785631 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | EA9516 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/01 12:30 | | |
| # Bordereau | | 159528-01-01 | | |
| | Unités | PZ-11-05R-20170601 | LDR | Lot CQ |
| **MÉTAUX** | | | | |
| Arsenic (As) | ug/L | 0.41 | 0.30 | 1785631 |
| Calcium (Ca) | ug/L | 200000 | 500 | 1785631 |
| Cuivre (Cu) | ug/L | 120 | 3.0 | 1785631 |
| Fer (Fe) | ug/L | <100 | 100 | 1785631 |
| Magnésium (Mg) | ug/L | 21000 | 200 | 1785631 |
| Nickel (Ni) | ug/L | 610 | 10 | 1785631 |
| Plomb (Pb) | ug/L | 2.7 | 1.0 | 1785631 |
| Potassium (K) | ug/L | 18000 | 200 | 1785631 |
| Sodium (Na) | ug/L | 35000 | 200 | 1785631 |
| Zinc (Zn) | ug/L | 170 | 5.0 | 1785631 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B730545
Date du rapport: 2017/10/30

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | EA9513 | EA9514 | | EA9515 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/01 12:30 | 2017/06/01 12:30 | | 2017/06/01 12:30 | | |
| # Bordereau | | 159528-01-01 | 159528-01-01 | | 159528-01-01 | | |
| | **Unités** | **PZ-11-09R-20170601** | **PZ-11-01R-20170601** | **LDR** | **PZ-11-02R-20170601** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | <0.0030 | 0.0030 | <0.0030 | 0.0030 | 1786740 |
| Cyanures Totaux | mg/L | <0.0030 | <0.0030 | 0.0030 | <0.0030 | 0.0030 | 1786739 |
| Nitrates (N-NO3-) | mg/L | 2.4 | 1.1 | 0.020 | 2.2 | 0.020 | 1785340 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 86 | 3.8 | 1.0 | <1.0 | 1.0 | 1785913 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 86 | 3.8 | 1.0 | <1.0 | 1.0 | 1785913 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | <1.0 | 1.0 | 1785913 |
| Chlorures (Cl) | mg/L | 6.6 | 19 | 0.050 | 9.0 | 0.50 | 1785348 |
| Sulfates (SO4) | mg/L | 87 | 350 | 0.50 | 770 | 5.0 | 1785348 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | EA9516 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/01 12:30 | | |
| # Bordereau | | 159528-01-01 | | |
| | **Unités** | **PZ-11-05R-20170601** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | 0.0030 | 1786740 |
| Cyanures Totaux | mg/L | 0.0035 | 0.0030 | 1786739 |
| Nitrates (N-NO3-) | mg/L | 5.8 | 0.020 | 1785340 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | <1.0 | 1.0 | 1785913 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | <1.0 | 1.0 | 1785913 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | 1.0 | 1785913 |
| Chlorures (Cl) | mg/L | 14 | 0.50 | 1785348 |
| Sulfates (SO4) | mg/L | 630 | 5.0 | 1785348 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B730545
Date du rapport: 2017/10/30

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## REMARQUES GÉNÉRALES

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats n'ont pas été corrigés pour le blanc de méthode.

**BTEX PAR GC/MS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

Veuillez noter que les échantillons sont analysés par Headspace GC/MS.

**MÉTAUX DISSOUS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**



889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B730545
Date du rapport: 2017/10/30

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 1785340 | FS | Blanc fortifié | Nitrates (N-NO3-) | 2017/06/02 | | 102 | % |
| 1785340 | FS | Blanc de méthode | Nitrates (N-NO3-) | 2017/06/02 | <0.020 | | mg/L |
| 1785348 | FS | Blanc fortifié | Chlorures (Cl) | 2017/06/02 | | 104 | % |
| | | | Sulfates (SO4) | 2017/06/02 | | 102 | % |
| 1785348 | FS | Blanc de méthode | Chlorures (Cl) | 2017/06/02 | <0.050 | | mg/L |
| | | | Sulfates (SO4) | 2017/06/02 | <0.50 | | mg/L |
| 1785631 | EMA | Blanc fortifié | Arsenic (As) | 2017/06/06 | | 102 | % |
| | | | Calcium (Ca) | 2017/06/06 | | 102 | % |
| | | | Cuivre (Cu) | 2017/06/06 | | 94 | % |
| | | | Fer (Fe) | 2017/06/06 | | 98 | % |
| | | | Magnésium (Mg) | 2017/06/06 | | 96 | % |
| | | | Nickel (Ni) | 2017/06/06 | | 92 | % |
| | | | Plomb (Pb) | 2017/06/06 | | 100 | % |
| | | | Potassium (K) | 2017/06/06 | | 98 | % |
| | | | Sodium (Na) | 2017/06/06 | | 95 | % |
| | | | Zinc (Zn) | 2017/06/06 | | 95 | % |
| 1785631 | EMA | Blanc de méthode | Arsenic (As) | 2017/06/06 | <0.30 | | ug/L |
| | | | Calcium (Ca) | 2017/06/06 | <500 | | ug/L |
| | | | Cuivre (Cu) | 2017/06/06 | <3.0 | | ug/L |
| | | | Fer (Fe) | 2017/06/06 | <100 | | ug/L |
| | | | Magnésium (Mg) | 2017/06/06 | <200 | | ug/L |
| | | | Nickel (Ni) | 2017/06/06 | <10 | | ug/L |
| | | | Plomb (Pb) | 2017/06/06 | <1.0 | | ug/L |
| | | | Potassium (K) | 2017/06/06 | <200 | | ug/L |
| | | | Sodium (Na) | 2017/06/06 | <200 | | ug/L |
| | | | Zinc (Zn) | 2017/06/06 | <5.0 | | ug/L |
| 1785913 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/05 | | 109 | % |
| 1785913 | MR4 | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/05 | <1.0 | | mg/L |
| | | | Bicarbonates (HCO3 comme CaCO3) | 2017/06/05 | <1.0 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2017/06/05 | <1.0 | | mg/L |
| 1786711 | ABE | Blanc fortifié | 4-Bromofluorobenzène | 2017/06/07 | | 94 | % |
| | | | D4-1,2-Dichloroéthane | 2017/06/07 | | 127 | % |
| | | | D8-Toluène | 2017/06/07 | | 101 | % |
| | | | Benzène | 2017/06/07 | | 107 | % |
| | | | Toluène | 2017/06/07 | | 101 | % |
| | | | Éthylbenzène | 2017/06/07 | | 100 | % |
| | | | Xylènes (o,m,p) | 2017/06/07 | | 97 | % |
| 1786711 | ABE | Blanc de méthode | 4-Bromofluorobenzène | 2017/06/07 | | 93 | % |
| | | | D4-1,2-Dichloroéthane | 2017/06/07 | | 128 | % |
| | | | D8-Toluène | 2017/06/07 | | 102 | % |
| | | | Benzène | 2017/06/07 | <0.20 | | ug/L |
| | | | Toluène | 2017/06/07 | <0.10 | | ug/L |
| | | | Éthylbenzène | 2017/06/07 | <0.10 | | ug/L |
| | | | Xylènes (o,m,p) | 2017/06/07 | <0.40 | | ug/L |
| 1786736 | CG2 | Blanc fortifié | 1-Chlorooctadécane | 2017/06/07 | | 87 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/07 | | 96 | % |
| 1786736 | CG2 | Blanc fortifié DUP | 1-Chlorooctadécane | 2017/06/07 | | 89 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/07 | | 95 | % |
| 1786736 | CG2 | Blanc fortifié DUP 2 | 1-Chlorooctadécane | 2017/06/07 | | 89 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/07 | | 96 | % |
| 1786736 | CG2 | Blanc de méthode | 1-Chlorooctadécane | 2017/06/07 | | 78 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/07 | <100 | | ug/L |



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Dossier Maxxam: B730545
Date du rapport: 2017/10/30

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ (SUITE)

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 1786739 | MR4 | Blanc fortifié | Cyanures Totaux | 2017/06/09 | | 94 | % |
| 1786739 | MR4 | Blanc de méthode | Cyanures Totaux | 2017/06/09 | <0.0030 | | mg/L |
| 1786740 | MH1 | Blanc fortifié | Cyanures disponibles (CN-) | 2017/06/07 | | 92 | % |
| 1786740 | MH1 | Blanc de méthode | Cyanures disponibles (CN-) | 2017/06/07 | <0.0030 | | mg/L |

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.

Réc = Récupération



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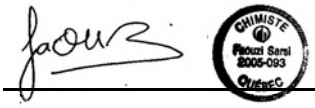
## PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:




Faouzi Sarsi, B. Sc. Chimiste

Julie Lacroix-Labonte

Miryam Assayag, B.Sc. Chimiste

Noureddine Chafiaai, B.Sc., Chimiste

Veronic Beausejour, B.Sc., Chimiste, Superviseur

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.



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Maxxam Analytics International Corporation o/a Maxxam Analytics
889, Montée de Liesse, Saint-Laurent, Québec Canada H4T 1P5 Tel:(514) 448-9001 Ligne sans frais:(877) 462-9926 x Fax:(514) 448-9199 www.maxxam.ca

# Bordereau de Transmission d'Échantillons



| ADRESSE DE FACTURATION: | | Information Rapport | | Information Projet | | À l'usage du laboratoire seulement | |
|---|---|---|---|---|---|---|---|
| Compagnie | #610 GOLDER ASSOCIES LTEE | Compagnie | #886 GOLDER ASSOCIÉS LTEE. | N° de cotation | B60829 | # dossier Maxxam | # Commande: |
| Attention de | COMPTES PAYABLES | Attention de | Cynthia Carrier/Youri Brochu | N° de commande | | | 159528 |
| Adresse | 7250, rue du Mile End 3e étage | Adresse | 7250, rue du Mile End 3e étage | N° de projet | 15-25739-2200 | Bordereau de Transmission d'Échantillons | Chargé(e) de Projets |
| | Montréal QC H2R 3A4 | | Montréal QC H2R 3A4 | Nom du projet | | | |
| Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | # de site | | C#159528-01-01 | Merla Manerolis |
| Courriel | AP_CustomerService@golder.com | Courriel | Cynthia_Carrier@golder.com | Échantillonneur | M. Senécal | | |

**Critères et Réglements:** ☐ Potable ☐ RDS ☐ RMD ☐ REMR ☐ Autre (spécifier) — Essai de pompage: ☐ 2an (Art. 6,1&8.2) ☐ 48h (Art. 6-2) ☐ 72h (Art. 6,1&8.2) — Règ. Pâtes & Papiers (Art.104) ☐ — Règ. Pâtes & Papiers (Art.112) ☐ — Règ. CUM: ☐ Égout sanitaire Art.10 ☐ Égout pluvial Art.11 — Qualité Eau Potable: ☐ Municipal ☐ Non-municipalité

**Instructions spéciales:**

*Remarque: Pour les échantillons d'eau potable soumis à la réglementation - S.V.P utiliser le formulaire client rattaché à l'eau potable*

**Conserver les échantillons en milieu froid ( < 10 eC ) de l'échantillonnage à la livraison chez Maxxam**

**Délais requis**

S.V.P notifier à l'avance en cas de projet urgent

Délai Régulier ☑
*(Sera applicable si le délai de l'urgence n'est pas précisé)*
*Délai Régulier = 5 jours ouvrables pour la plupart des analyses.*
*S.V.P.Veuillez noter que le délai pour certaines analyses faites que la DBO5 et les Dioxines/Furannes est > 5 jours - Contactez votre chargé de projets pour les détails.*

Délai rapide (Si applicable à tous les échantillons)
Date Requise: Heure Requise: ☐
Veuillez noter que tout échantillon reçu après 16H00, sera considéré comme reçu le lendemain (jour ouvrable) à 8H00.

| | Étiquette codebar de l'échantillon | Identification de l'échantillon | Date d'échantillonn | Heure | Matrice | Eau potable réglementée ? ( O / N ) | métaux à filtrer au labo ? ( O / N ) | Alcalinité totale(+HCO3,CO3) | Anions (Cl, SO4 et NO3) | Cyanures totaux | Cyanures disponibles | Métaux dissous(As, Cu, Fe, Ni, Pb, Zn, Na, Mg2, K, Ca) | c10-c50 | BTEX | | | | # of Bottles | Commentaires |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SID#099512 | PZ-11-09R-20170601 | 2017-06-01 | 12h30 | S | N | N | X | X | X | X | X | X | X | | | | 9 | |
| 2 | SID#099513 | PZ-11-01R-20170601 | " | 14h20 | S | N | N | X | X | X | X | X | X | X | | | | 7 | |
| 3 | SID#099514 | PZ-11-02R-20170601 | " | 15h35 | S | N | N | X | X | X | X | X | X | X | | | | 7 | |
| 4 | SID#099515 | PZ-11-05R-20170601 | " | 16h40 | S | N | N | X | X | X | X | X | X | X | | | | 7 | |
| 5 | SID#099516 | | | | | | | | | | | | | | | | | | |
| 6 | SID#099517 | | | | | | | | | | | | | | | | | | |
| 7 | SID#099518 | | | | | | | | | | | | | | | | | | |
| 8 | SID#099519 | | | | | | | | | | | | | | | | | | |
| 9 | SID#099520 | | | | | | | | | | | | | | | | | | |
| 10 | SID#099521 | | | | | | | | | | | | | | | | | | |

B730545_COC

| * DESSAISI PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | REÇU PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | Contenants utilisés et non soumis | Réservé au laboratoire: Court Délai de ☐ | Température (°C) de Réception | Sceau légal intact sur la glacière: ☐ Oui ☐ Non |
|---|---|---|---|---|---|---|---|---|---|
| | 2017/06/01 | 22h00 | | 2017/06/02 | 11:00 | | | 4.6, 4° | |

* SAUF ACCORD CONTRAIRE PASSÉ PAR ÉCRIT, LES SERVICES COMPRIS DANS CETTE CHAÎNE DE RESPONSABILITÉS SONT SOUMIS AUX CONDITIONS GÉNÉRALES STANDARD DE MAXXAM. PAR LA SIGNATURE DE CETTE CHAÎNE DE RESPONSABILITÉS, VOUS CONFIRMEZ QUE VOUS AVEZ PRIS CONNAISSANCE DES CONDITIONS GÉNÉRALES ET QUE VOUS LES ACCEPTEZ TELLES QU'ELLES SE PRÉSENTENT AU WWW.MAXXAM.CA/TERMS.

* IL EST DE LA RESPONSABILITÉ DE LA PERSONNE RAPPORTANT L'ÉCHANTILLON DE S'ASSURER DE L'EXACTITUDE DU BORDEREAU DE TRANSMISSION. UN MANQUEMENT À CETTE PROCÉDURE PEUT SE TRADUIRE PAR UN RETARD DANS LE DÉLAI ANALYTIQUE.

Blanc: Maxxam Jaune: Client

ice-pk
driver

**Maria Manarolis**

**From:** Carrier, Cynthia <Cynthia_Carrier@golder.com>
**Sent:** Friday, June 02, 2017 12:51 PM
**To:** Maria Manarolis
**Subject:** TR: Envoi des échantillons

Bonjour Maria,

Tu recevras aujourd'hui 2 fioles de blancs de transport en provenance de la mine Malartic.

Considérez son nom comme suit: "Blanc-transport-20170601"
Analyse requise: BTEX
Délai: régulier
Considérez que l'échantillon PZ-11-09P-20170601 a 7 bouteilles envoyées et non 9.

Merci de me confirmer que vous avez reçu ces infos.
Cynthia

Cynthia Carrier (M.Sc.Géogr.) | Chargée de projet | Golder Associés Ltée
7250, rue du Mile End, 3e étage, Montréal (Québec) Canada H2R 3A4 ◄ Nous sommes déménagés!
T: +1 (514) 383 0990 | F: +1 (514) 383 5332 | C: +1 (514) 702-9023 | E: Cynthia_Carrier@golder.com | www.golder.com

La sécurité partout et avant tout

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Pensez à l'environnement avant d'imprimer ce courriel.

-----Message d'origine-----
De : Maria Manarolis [mailto:MManarolis@maxxam.ca] Envoyé : 2 juin 2017 09:26 À : Senécal, Mikaël <Mikael_Senecal@golder.com> Cc : Carrier, Cynthia <Cynthia_Carrier@golder.com> Objet : RE: Envoi des échantillons

Merci

MARIA MANAROLIS, B.Sc.,chimiste
Chargée de Projets, Division Environnement

Bureau 514 448 9001, poste 6236 / Cell. 438 777 6392 Sans frais 877 462 9926 / Télécopieur 514 448 9199
889 Montée-de-Liesse / Saint-Laurent, QC H4T 1P5

Votre # du projet: 15-25739-2200
Votre # Bordereau: C#159528-02-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/06/13**
# Rapport: R2289418
Version: 1 - Finale

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B731043**
**Reçu: 2017/06/06, 11:40**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 5

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence Primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5)*** | 4 | N/A | 2017/06/06 | STL SOP-00038 | SM 22 2320-B m |
| Anions* | 4 | N/A | 2017/06/07 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Benzène, toluène, éthylbenzène, xylène* | 4 | N/A | 2017/06/10 | STL SOP-00145 | MA.400–COV 2.0 R4 m |
| Hydrocarbures pétroliers (C10-C50)* | 3 | 2017/06/08 | 2017/06/08 | STL SOP-00173 | MA.400–HYD. 1.1 R3 m |
| Cyanures disponibles* | 4 | 2017/06/07 | 2017/06/07 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Cyanures totaux* | 4 | 2017/06/07 | 2017/06/09 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Métaux dissous par ICP-MS* | 4 | N/A | 2017/06/09 | STL SOP-00006 | MA.200–Mét. 1.2 R5 m |
| Nitrate et/ou Nitrite* | 4 | N/A | 2017/06/07 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |

**Remarques:**

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.



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Votre # du projet: 15-25739-2200
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**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
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Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/06/13**
# Rapport: R2289418
Version: 1 - Finale

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B731043**
**Reçu: 2017/06/06, 11:40**

* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDELCC.
*** Cette analyse ne fait pas partie du programme d'accréditation du MDDELCC.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Maria Manarolis, Chargée de projets
Courriel: MManarolis@maxxam.ca
Téléphone (514)448-9001 Ext:6236
==========
Ce rapport a été produit et distribué en utilisant une procédure automatisée sécuritaire.
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Dossier Maxxam: B731043
Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| ID Maxxam | | EB3054 | EB3055 | EB3056 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/05 09:10 | 2017/06/05 10:50 | 2017/06/05 10:50 | | |
| # Bordereau | | C#159528-02-01 | C#159528-02-01 | C#159528-02-01 | | |
| | **Unités** | **PZ-11-04R-20170605** | **PZ-11-03R-20170605** | **DUP1-20170605** | **LDR** | **Lot CQ** |
| **HYDROCARBURES PÉTROLIERS** | | | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | <100 | <100 | 270 | 100 | 1787462 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 77 | 75 | 73 | N/A | 1787462 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable



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Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## BTEX PAR GC/MS (EAU SOUTERRAINE)

| ID Maxxam | | EB3054 | EB3054 | EB3055 | EB3056 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/05 09:10 | 2017/06/05 09:10 | 2017/06/05 10:50 | 2017/06/05 10:50 | | |
| # Bordereau | | C#159528-02-01 | C#159528-02-01 | C#159528-02-01 | C#159528-02-01 | | |
| | **Unités** | **PZ-11-04R-20170605** | **PZ-11-04R-20170605 Dup. de Lab.** | **PZ-11-03R-20170605** | **DUP1-20170605** | **LDR** | **Lot CQ** |
| **VOLATILS** | | | | | | | |
| Benzène | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | 1787992 |
| Toluène | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | 1787992 |
| Éthylbenzène | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | 1787992 |
| Xylènes (o,m,p) | ug/L | <0.40 | <0.40 | <0.40 | <0.40 | 0.40 | 1787992 |
| **Récupération des Surrogates (%)** | | | | | | | |
| 4-Bromofluorobenzène | % | 94 | 93 | 93 | 93 | N/A | 1787992 |
| D4-1,2-Dichloroéthane | % | 114 | 117 | 114 | 119 | N/A | 1787992 |
| D8-Toluène | % | 100 | 100 | 101 | 100 | N/A | 1787992 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
N/A = Non Applicable

| ID Maxxam | | EB3057 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/05 10:50 | | |
| # Bordereau | | C#159528-02-01 | | |
| | **Unités** | **BLANC TERRAIN-20170605** | **LDR** | **Lot CQ** |
| **VOLATILS** | | | | |
| Benzène | ug/L | <0.20 | 0.20 | 1787992 |
| Toluène | ug/L | <0.10 | 0.10 | 1787992 |
| Éthylbenzène | ug/L | <0.10 | 0.10 | 1787992 |
| Xylènes (o,m,p) | ug/L | <0.40 | 0.40 | 1787992 |
| **Récupération des Surrogates (%)** | | | | |
| 4-Bromofluorobenzène | % | 93 | N/A | 1787992 |
| D4-1,2-Dichloroéthane | % | 117 | N/A | 1787992 |
| D8-Toluène | % | 101 | N/A | 1787992 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable


889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B731043
Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| ID Maxxam | | EB3054 | | EB3055 | EB3056 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/05 09:10 | | 2017/06/05 10:50 | 2017/06/05 10:50 | | |
| # Bordereau | | C#159528-02-01 | | C#159528-02-01 | C#159528-02-01 | | |
| | Unités | PZ-11-04R-20170605 | LDR | PZ-11-03R-20170605 | DUP1-20170605 | LDR | Lot CQ |
| **MÉTAUX** | | | | | | | |
| Arsenic (As) | ug/L | <0.30 | 0.30 | <0.30 | <0.30 | 0.30 | 1786659 |
| Calcium (Ca) | ug/L | 160000 | 500 | 300000 | 290000 | 5000 | 1786659 |
| Cuivre (Cu) | ug/L | 10 | 3.0 | 73 | 76 | 3.0 | 1786659 |
| Fer (Fe) | ug/L | <100 | 100 | <100 | <100 | 100 | 1786659 |
| Magnésium (Mg) | ug/L | 18000 | 200 | 42000 | 40000 | 200 | 1786659 |
| Nickel (Ni) | ug/L | 370 | 10 | 970 | 960 | 10 | 1786659 |
| Plomb (Pb) | ug/L | 120 | 1.0 | <1.0 | <1.0 | 1.0 | 1786659 |
| Potassium (K) | ug/L | 23000 | 200 | 15000 | 15000 | 200 | 1786659 |
| Sodium (Na) | ug/L | 55000 | 200 | 57000 | 55000 | 200 | 1786659 |
| Zinc (Zn) | ug/L | 63 | 5.0 | 190 | 180 | 5.0 | 1786659 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | EB3059 | | |
|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/05 13:10 | | |
| # Bordereau | | C#159528-02-01 | | |
| | Unités | PZ-09-13R-20170605 | LDR | Lot CQ |
| **MÉTAUX** | | | | |
| Arsenic (As) | ug/L | 0.37 | 0.30 | 1786659 |
| Calcium (Ca) | ug/L | 68000 | 500 | 1786659 |
| Cuivre (Cu) | ug/L | 9.2 | 3.0 | 1786659 |
| Fer (Fe) | ug/L | 3500 | 100 | 1786659 |
| Magnésium (Mg) | ug/L | 11000 | 200 | 1786659 |
| Nickel (Ni) | ug/L | 11 | 10 | 1786659 |
| Plomb (Pb) | ug/L | <1.0 | 1.0 | 1786659 |
| Potassium (K) | ug/L | 3600 | 200 | 1786659 |
| Sodium (Na) | ug/L | 17000 | 200 | 1786659 |
| Zinc (Zn) | ug/L | 10 | 5.0 | 1786659 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B731043
Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | EB3054 | | EB3055 | EB3055 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/05 09:10 | | 2017/06/05 10:50 | 2017/06/05 10:50 | | |
| # Bordereau | | C#159528-02-01 | | C#159528-02-01 | C#159528-02-01 | | |
| | **Unités** | **PZ-11-04R-20170605** | **LDR** | **PZ-11-03R-20170605** | **PZ-11-03R-20170605 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | 0.0042 | 0.0030 | 0.023 | 0.024 | 0.0030 | 1786740 |
| Cyanures Totaux | mg/L | 0.018 | 0.0030 | 0.026 | 0.027 | 0.0030 | 1786739 |
| Nitrates (N-NO3-) | mg/L | 5.3 | 0.020 | 2.9 | N/A | 0.20 | 1786605 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 23 | 1.0 | 41 | N/A | 1.0 | 1786467 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 23 | 1.0 | 41 | N/A | 1.0 | 1786467 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | 1.0 | <1.0 | N/A | 1.0 | 1786467 |
| Chlorures (Cl) | mg/L | 110 | 0.050 | 430 | N/A | 0.50 | 1786628 |
| Sulfates (SO4) | mg/L | 400 | 0.50 | 320 | N/A | 5.0 | 1786628 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
N/A = Non Applicable

| ID Maxxam | | EB3056 | | EB3059 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/05 10:50 | | 2017/06/05 13:10 | | |
| # Bordereau | | C#159528-02-01 | | C#159528-02-01 | | |
| | **Unités** | **DUP1-20170605** | **LDR** | **PZ-09-13R-20170605** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | |
| Cyanures disponibles (CN-) | mg/L | 0.023 | 0.0030 | <0.0030 | 0.0030 | 1786740 |
| Cyanures Totaux | mg/L | 0.026 | 0.0030 | <0.0030 | 0.0030 | 1786739 |
| Nitrates (N-NO3-) | mg/L | 2.9 | 0.20 | <0.020 | 0.020 | 1786605 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 40 | 1.0 | 94 | 1.0 | 1786467 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 40 | 1.0 | 94 | 1.0 | 1786467 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | 1.0 | <1.0 | 1.0 | 1786467 |
| Chlorures (Cl) | mg/L | 430 | 0.50 | 7.0 | 0.050 | 1786628 |
| Sulfates (SO4) | mg/L | 320 | 5.0 | 140 | 0.50 | 1786628 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B731043
Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## REMARQUES GÉNÉRALES

État des échantillons à l'arrivée: BON

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats n'ont pas été corrigés pour le blanc de méthode.

**BTEX PAR GC/MS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

Veuillez noter que les échantillons sont analysés par Headspace GC/MS.

**MÉTAUX DISSOUS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**



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Dossier Maxxam: B731043
Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 1786467 | FS | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/06 | | 105 | % |
| 1786467 | FS | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/06 | <1.0 | | mg/L |
| | | | Bicarbonates (HCO3 comme CaCO3) | 2017/06/06 | <1.0 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2017/06/06 | <1.0 | | mg/L |
| 1786605 | FS | Blanc fortifié | Nitrates (N-NO3-) | 2017/06/07 | | 101 | % |
| 1786605 | FS | Blanc de méthode | Nitrates (N-NO3-) | 2017/06/07 | <0.020 | | mg/L |
| 1786628 | FS | Blanc fortifié | Chlorures (Cl) | 2017/06/07 | | 102 | % |
| | | | Sulfates (SO4) | 2017/06/07 | | 101 | % |
| 1786628 | FS | Blanc de méthode | Chlorures (Cl) | 2017/06/07 | <0.050 | | mg/L |
| | | | Sulfates (SO4) | 2017/06/07 | <0.50 | | mg/L |
| 1786659 | EMA | Blanc fortifié | Arsenic (As) | 2017/06/07 | | 101 | % |
| | | | Calcium (Ca) | 2017/06/07 | | 105 | % |
| | | | Cuivre (Cu) | 2017/06/07 | | 99 | % |
| | | | Fer (Fe) | 2017/06/07 | | 101 | % |
| | | | Magnésium (Mg) | 2017/06/07 | | 103 | % |
| | | | Nickel (Ni) | 2017/06/07 | | 97 | % |
| | | | Plomb (Pb) | 2017/06/07 | | 97 | % |
| | | | Potassium (K) | 2017/06/07 | | 104 | % |
| | | | Sodium (Na) | 2017/06/07 | | 105 | % |
| | | | Zinc (Zn) | 2017/06/07 | | 96 | % |
| 1786659 | EMA | Blanc de méthode | Arsenic (As) | 2017/06/07 | <0.30 | | ug/L |
| | | | Calcium (Ca) | 2017/06/07 | <500 | | ug/L |
| | | | Cuivre (Cu) | 2017/06/07 | <3.0 | | ug/L |
| | | | Fer (Fe) | 2017/06/07 | <100 | | ug/L |
| | | | Magnésium (Mg) | 2017/06/07 | <200 | | ug/L |
| | | | Nickel (Ni) | 2017/06/07 | <10 | | ug/L |
| | | | Plomb (Pb) | 2017/06/07 | <1.0 | | ug/L |
| | | | Potassium (K) | 2017/06/07 | <200 | | ug/L |
| | | | Sodium (Na) | 2017/06/07 | <200 | | ug/L |
| | | | Zinc (Zn) | 2017/06/07 | <5.0 | | ug/L |
| 1786739 | MR4 | Blanc fortifié | Cyanures Totaux | 2017/06/09 | | 94 | % |
| 1786739 | MR4 | Blanc de méthode | Cyanures Totaux | 2017/06/09 | <0.0030 | | mg/L |
| 1786740 | MH1 | Blanc fortifié | Cyanures disponibles (CN-) | 2017/06/07 | | 92 | % |
| 1786740 | MH1 | Blanc de méthode | Cyanures disponibles (CN-) | 2017/06/07 | <0.0030 | | mg/L |
| 1787462 | CG2 | Blanc fortifié | 1-Chlorooctadécane | 2017/06/08 | | 91 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/08 | | 100 | % |
| 1787462 | CG2 | Blanc fortifié DUP | 1-Chlorooctadécane | 2017/06/08 | | 95 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/08 | | 103 | % |
| 1787462 | CG2 | Blanc fortifié DUP 2 | 1-Chlorooctadécane | 2017/06/08 | | 88 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/08 | | 95 | % |
| 1787462 | CG2 | Blanc de méthode | 1-Chlorooctadécane | 2017/06/08 | | 98 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/08 | <100 | | ug/L |
| 1787992 | SCW | Blanc fortifié | 4-Bromofluorobenzène | 2017/06/09 | | 95 | % |
| | | | D4-1,2-Dichloroéthane | 2017/06/09 | | 120 | % |
| | | | D8-Toluène | 2017/06/09 | | 100 | % |
| | | | Benzène | 2017/06/09 | | 103 | % |
| | | | Toluène | 2017/06/09 | | 96 | % |
| | | | Éthylbenzène | 2017/06/09 | | 97 | % |
| | | | Xylènes (o,m,p) | 2017/06/09 | | 96 | % |
| 1787992 | SCW | Blanc de méthode | 4-Bromofluorobenzène | 2017/06/09 | | 93 | % |
| | | | D4-1,2-Dichloroéthane | 2017/06/09 | | 119 | % |
| | | | D8-Toluène | 2017/06/09 | | 102 | % |



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Dossier Maxxam: B731043
Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ (SUITE)

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| | | | Benzène | 2017/06/09 | <0.20 | | ug/L |
| | | | Toluène | 2017/06/09 | <0.10 | | ug/L |
| | | | Éthylbenzène | 2017/06/09 | <0.10 | | ug/L |
| | | | Xylènes (o,m,p) | 2017/06/09 | <0.40 | | ug/L |

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.

Réc = Récupération



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Dossier Maxxam: B731043
Date du rapport: 2017/06/13

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

Christian Guiang, B.Sc., Chimiste

Faouzi Sarsi, B. Sc. Chimiste

Julie Lacroix-Labonte

Olga Zlatov Polevoi

Tania Eido, B.Sc., Chimiste

Veronic Beausejour, B.Sc., Chimiste, Superviseur

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.



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Maxxam Analytics International Corporation o/a Maxxam Analytics
889, Montée de Liesse, Saint-Laurent, Quebec Canada H4T 1P5 Tel:(514) 448-9001 Ligne sans frais:(877) 462-9926 x Fax:(514) 448-6199 www.maxxam.ca

# Bordereau de Transmission d'Échantillons



| ADRESSE DE FACTURATION: | | Information Rapport | | Information Projet | | À l'usage du laboratoire seulement | |
|---|---|---|---|---|---|---|---|
| Compagnie | #610 GOLDER ASSOCIES LTEE | Compagnie | #886 GOLDER ASSOCIÉS LTEE. | N° de cotation | B60829 | # dossier Maxxam | # Commande: |
| Attention de | COMPTES PAYABLES | Attention de | Cynthia Carrier/Youri Brochu | N° de commande | | | 159528 |
| Adresse | 7250, rue du Mile End 3e étage | Adresse | 7250, rue du Mile End 3e étage | N° de projet | 15-25739-2200 | Bordereau de Transmission d'Échantillons | Chargé(e) de Projets |
| | Montréal QC H2R 3A4 | | Montréal QC H2R 3A4 | Nom du projet | | | |
| Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | Téléphone | (514) 383-0990 x Téléco (514) 383-5332 x | # de site | | C#159528-02-01 | Maria Manarolis |
| Courriel | AP_CustomerService@golder.com | Courriel | Cynthia_Carrier@golder.com | Échantillonneur | | | |

Critères et Règlements: ☐ Potable ☐ RDS ☐ RMD ☐ REIMR ☐ Autre (spécifier) — Essai de pompage: ☐ 24h (Art. 8.128.2) ☐ 48h (Art. 9.2) ☐ 72h (Art. 8.168.2) — Rég. CUM: ☐ Égout sanitaire Art.10 ☐ Égout pluvial Art.11 — Qualité Eau Potable: ☐ Rég. Pâtes & Papiers (Art.104) ☐ Rég. Pâtes & Papiers (Art.112) — ☐ Municipal ☐ Non-municipalité

Instructions spéciales:

*Remarque: Pour les échantillons d'eau potable soumis à la réglementation - S.V.P utiliser le formulaire client rattaché à l'eau potable*

**Conserver les échantillons en milieu froid ( < 10 oC ) de l'échantillonnage à la livraison chez Maxxam**

Analyses demandées

| | Étiquette code-bar de l'échantillon | Identification de l'échantillon | Date d'échantillonn | Heure | Matrice | Eau potable réglementée ? ( O / N ) | métaux à filtrer au labo ? ( O / N ) | Alcalinité totale(+HCO3,CO3) | Anions (Cl, SO4 et NO3) | Cyanures totaux | Cyanures disponibles | Métaux dissous(As, Cu, Fe, Ni, Pb, Zn, Na, Mg2, K, Ca) | c10-c50 | BTEX | | | | # et Bottles | Commentaires |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SID#099522 | PZ-11-04R-20170605 | 2017-06-05 | 9h10 | S | N | N | X | X | X | X | X | X | X | | | | 7 | métaux Filtrés |
| 2 | SID#099523 | PZ-11-03R-20170605 | " | 10h50 | S | N | N | X | X | X | X | X | X | X | | | | 7 | " " |
| 3 | SID#099524 | DUP1-20170605 | " | 10h50 | S | N | N | X | X | X | X | X | X | X | | | | 7 | " " |
| 4 | SID#099525 | BLANCTERRAIN-20170605 | " | 10h50 | S | N | N | | | | | | | X | | | | 2 | |
| 5 | SID#099526 | BLANCTRANSPORT-20170605 | " | 10h50 | S | N | N | | | | | | | X | | | | 2 | |
| 6 | SID#099527 | PZ-09-13R-20170605 | " | 13h10 | S | N | N | X | X | X | X | X | | | | | | 3 | métaux filtrés |
| 7 | SID#099528 | | | | | | | | | | | | | | | | | | |
| 8 | SID#099529 | | | | | | | | | | | | | | | | | | |
| 9 | SID#099530 | | | | | | | | | | | | | | | | | | |
| 10 | SID#099531 | | | | | | | | | | | | | | | | | | |

Délais requis

S.V.P nous aviser à l'avance en cas de projet urgent

Délai Régulier ☑
*(Sera applicable si le délai de l'urgence n'est pas précisé)*
*Délai Régulier = 5 Jours ouvrables pour la plupart des analyses.*
*S.V.P Veuillez noter que le délai pour certaines analyses telles que le DBO5 et les Dioxines/Furannes est > 5 jours - Contactez votre chargé de projets pour les détails.*

Délai rapide (Si applicable à tous les échantillons) ☐
Date Requise: _____ Heure Requise: _____
Veuillez noter que tout échantillon reçu après 15h00, sera considéré comme reçu le lendemain (jour ouvrable) à 9h00.

| * DESSAISI PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | REÇU PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | Contenants utilisés et non soumis | Réservé au laboratoire: Court Délai ☐ | Température (°C) de Réception | Sceau Intact sur la glacière |
|---|---|---|---|---|---|---|---|---|---|
| | 2017-06-05 | 20h | | 2017/06/06 | 11:40 | | ☐ | 6,5 ; 6 | ☒ Oui ☒ Non DV |

* SAUF ACCORD CONTRA... CONNAISSANCE DES CI...
* IL EST DE LA RESPONS... CHAÎNE DE RÉ... FELLES ! SURER ! ... STANDARD DE MAXXAM. PAR LA SIGNATURE DE CETTE CHAÎNE DE RESPONSABILITÉS, VOUS CONFIRMEZ QUE VOUS AVEZ PRIS ... JEMENT À CETTE PROCÉDURE PEUT SE TRADUIRE PAR UN RETARD DANS LE DÉLAI ANALYTIQUE.

Blanc: Maxxam — Jaune: Client

B731043_COC

06-Jun-17 11:40
Maria Manarolis
B731043
CL1

DRIVER

ICE: Y=S
SEAL: Y=S.

Maxxam Analytics International Corporation o/a Maxxam Analytics

Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-03-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/06/15**
# Rapport: R2290151
Version: 1 - Finale

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B731477**
**Reçu: 2017/06/07, 12:15**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 6

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence Primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5)*** | 6 | N/A | 2017/06/08 | STL SOP-00038 | SM 22 2320-B m |
| Anions* | 2 | N/A | 2017/06/08 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Anions* | 4 | N/A | 2017/06/09 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Cyanures disponibles* | 6 | 2017/06/12 | 2017/06/13 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Cyanures totaux* | 6 | 2017/06/12 | 2017/06/12 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Métaux dissous par ICP-MS* | 6 | N/A | 2017/06/10 | STL SOP-00006 | MA.200–Mét. 1.2 R5 m |
| Nitrate et/ou Nitrite* | 6 | N/A | 2017/06/09 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |

**Remarques:**

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.



889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-03-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/06/15**
# Rapport: R2290151
Version: 1 - Finale

# CERTIFICAT D'ANALYSES

**# DE DOSSIER MAXXAM: B731477**
**Reçu: 2017/06/07, 12:15**

* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDELCC.
*** Cette analyse ne fait pas partie du programme d'accréditation du MDDELCC.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Maria Manarolis, Chargée de projets
Courriel: MManarolis@maxxam.ca
Téléphone (514)448-9001 Ext:6236
==========
Ce rapport a été produit et distribué en utilisant une procédure automatisée sécuritaire.
Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.


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Dossier Maxxam: B731477
Date du rapport: 2017/06/15

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| ID Maxxam | | EB4686 | EB4687 | EB4688 | EB4689 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/06 08:45 | 2017/06/06 10:20 | 2017/06/06 11:40 | 2017/06/06 13:35 | | |
| # Bordereau | | 159528-03-01 | 159528-03-01 | 159528-03-01 | 159528-03-01 | | |
| | Unités | BH-08-15-20170606 | PZ-11-20R-20170606 | TF03-1420170606 | TF02-14-20170606 | LDR | Lot CQ |
| **MÉTAUX** | | | | | | | |
| Arsenic (As) | ug/L | <0.30 | <0.30 | <0.30 | 0.58 | 0.30 | 1787175 |
| Calcium (Ca) | ug/L | 35000 | 67000 | 7800 | 4900 | 500 | 1787175 |
| Cuivre (Cu) | ug/L | <3.0 | 4.1 | <3.0 | <3.0 | 3.0 | 1787175 |
| Fer (Fe) | ug/L | 870 | 1600 | 1900 | 890 | 100 | 1787175 |
| Magnésium (Mg) | ug/L | 2400 | 12000 | 2500 | 1100 | 200 | 1787175 |
| Nickel (Ni) | ug/L | <10 | 42 | <10 | <10 | 10 | 1787175 |
| Plomb (Pb) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | 1787175 |
| Potassium (K) | ug/L | 1800 | 3100 | 1300 | 1600 | 200 | 1787175 |
| Sodium (Na) | ug/L | 7300 | 12000 | 2700 | 2800 | 200 | 1787175 |
| Zinc (Zn) | ug/L | <5.0 | 7.7 | 9.8 | 9.5 | 5.0 | 1787175 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | EB4690 | EB4691 | | |
|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/06 14:50 | 2017/06/06 17:20 | | |
| # Bordereau | | 159528-03-01 | 159528-03-01 | | |
| | Unités | TF01-14-20170606 | PZ-10-01R-20170606 | LDR | Lot CQ |
| **MÉTAUX** | | | | | |
| Arsenic (As) | ug/L | <0.30 | 0.51 | 0.30 | 1787175 |
| Calcium (Ca) | ug/L | 23000 | 130000 | 500 | 1787175 |
| Cuivre (Cu) | ug/L | <3.0 | <3.0 | 3.0 | 1787175 |
| Fer (Fe) | ug/L | 240 | 480 | 100 | 1787175 |
| Magnésium (Mg) | ug/L | 2400 | 15000 | 200 | 1787175 |
| Nickel (Ni) | ug/L | <10 | <10 | 10 | 1787175 |
| Plomb (Pb) | ug/L | <1.0 | <1.0 | 1.0 | 1787175 |
| Potassium (K) | ug/L | 2100 | 12000 | 200 | 1787175 |
| Sodium (Na) | ug/L | 8200 | 5300 | 200 | 1787175 |
| Zinc (Zn) | ug/L | <5.0 | 26 | 5.0 | 1787175 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité


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Dossier Maxxam: B731477
Date du rapport: 2017/06/15

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | EB4686 | EB4686 | EB4687 | EB4688 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/06 08:45 | 2017/06/06 08:45 | 2017/06/06 10:20 | 2017/06/06 11:40 | | |
| # Bordereau | | 159528-03-01 | 159528-03-01 | 159528-03-01 | 159528-03-01 | | |
| | **Unités** | **BH-08-15-20170606** | **BH-08-15-20170606 Dup. de Lab.** | **PZ-11-20R-20170606** | **TF03-1420170606** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | <0.0030 | <0.0030 | <0.0030 | 0.0030 | 1788982 |
| Cyanures Totaux | mg/L | <0.0030 | <0.0030 | 0.0034 | 0.0030 | 0.0030 | 1788977 |
| Nitrates (N-NO3-) | mg/L | <0.020 | N/A | 0.46 | <0.020 | 0.020 | 1787901 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 100 | N/A | 63 | 5.8 | 1.0 | 1787269 |
| Chlorures (Cl) | mg/L | 1.3 | N/A | 19 | 7.3 | 0.050 | 1787902 |
| Sulfates (SO4) | mg/L | 8.6 | N/A | 150 | 22 | 0.50 | 1787902 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
N/A = Non Applicable

| ID Maxxam | | EB4689 | EB4690 | EB4691 | EB4691 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/06 13:35 | 2017/06/06 14:50 | 2017/06/06 17:20 | 2017/06/06 17:20 | | |
| # Bordereau | | 159528-03-01 | 159528-03-01 | 159528-03-01 | 159528-03-01 | | |
| | **Unités** | **TF02-14-20170606** | **TF01-14-20170606** | **PZ-10-01R-20170606** | **PZ-10-01R-20170606 Dup. de Lab.** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | <0.0030 | <0.0030 | N/A | 0.0030 | 1788982 |
| Cyanures Totaux | mg/L | 0.0032 | <0.0030 | 0.0030 | N/A | 0.0030 | 1788977 |
| Nitrates (N-NO3-) | mg/L | <0.020 | <0.020 | 0.12 | 0.11 | 0.020 | 1787901 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 15 | 78 | 310 | N/A | 1.0 | 1787269 |
| Chlorures (Cl) | mg/L | 0.39 | 0.30 | 3.1 | 3.1 | 0.050 | 1787902 |
| Sulfates (SO4) | mg/L | 8.2 | 8.2 | 87 | 87 | 0.50 | 1787902 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
N/A = Non Applicable


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Dossier Maxxam: B731477
Date du rapport: 2017/06/15

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## REMARQUES GÉNÉRALES

État des échantillons à l'arrivée: BON

**MÉTAUX DISSOUS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**



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Dossier Maxxam: B731477
Date du rapport: 2017/06/15

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 1787175 | EMA | Blanc fortifié | Arsenic (As) | 2017/06/10 | | 100 | % |
| | | | Calcium (Ca) | 2017/06/10 | | 99 | % |
| | | | Cuivre (Cu) | 2017/06/10 | | 96 | % |
| | | | Fer (Fe) | 2017/06/10 | | 98 | % |
| | | | Magnésium (Mg) | 2017/06/10 | | 99 | % |
| | | | Nickel (Ni) | 2017/06/10 | | 93 | % |
| | | | Plomb (Pb) | 2017/06/10 | | 96 | % |
| | | | Potassium (K) | 2017/06/10 | | 97 | % |
| | | | Sodium (Na) | 2017/06/10 | | 102 | % |
| | | | Zinc (Zn) | 2017/06/10 | | 95 | % |
| 1787175 | EMA | Blanc de méthode | Arsenic (As) | 2017/06/10 | <0.30 | | ug/L |
| | | | Calcium (Ca) | 2017/06/10 | <500 | | ug/L |
| | | | Cuivre (Cu) | 2017/06/10 | <3.0 | | ug/L |
| | | | Fer (Fe) | 2017/06/10 | <100 | | ug/L |
| | | | Magnésium (Mg) | 2017/06/10 | <200 | | ug/L |
| | | | Nickel (Ni) | 2017/06/10 | <10 | | ug/L |
| | | | Plomb (Pb) | 2017/06/10 | <1.0 | | ug/L |
| | | | Potassium (K) | 2017/06/10 | <200 | | ug/L |
| | | | Sodium (Na) | 2017/06/10 | <200 | | ug/L |
| | | | Zinc (Zn) | 2017/06/10 | <5.0 | | ug/L |
| 1787269 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/08 | | 102 | % |
| 1787269 | MR4 | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/08 | <1.0 | | mg/L |
| 1787901 | DKH | Blanc fortifié | Nitrates (N-NO3-) | 2017/06/08 | | 103 | % |
| 1787901 | DKH | Blanc de méthode | Nitrates (N-NO3-) | 2017/06/08 | <0.020 | | mg/L |
| 1787902 | DKH | Blanc fortifié | Chlorures (Cl) | 2017/06/08 | | 104 | % |
| | | | Sulfates (SO4) | 2017/06/08 | | 102 | % |
| 1787902 | DKH | Blanc de méthode | Chlorures (Cl) | 2017/06/08 | <0.050 | | mg/L |
| | | | Sulfates (SO4) | 2017/06/08 | <0.50 | | mg/L |
| 1788977 | DKH | Blanc fortifié | Cyanures Totaux | 2017/06/12 | | 100 | % |
| 1788977 | DKH | Blanc de méthode | Cyanures Totaux | 2017/06/12 | <0.0030 | | mg/L |
| 1788982 | DKH | Blanc fortifié | Cyanures disponibles (CN-) | 2017/06/13 | | 100 | % |
| 1788982 | DKH | Blanc de méthode | Cyanures disponibles (CN-) | 2017/06/13 | <0.0030 | | mg/L |

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération



889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B731477
Date du rapport: 2017/06/15

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

Dochka Koleva Hristova, B.Sc., Chimiste

Jonathan Fauvel, B.Sc, Chimiste

Veronic Beausejour, B.Sc., Chimiste, Superviseur

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.



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Maxxam Analytics International Corporation o/a Maxxam Analytics
889, Montée de Liesse, Saint-Laurent, Quebec Canada H4T 1P5 Tel:(514) 448-9001 Ligne sans frais:(877) 462-9926 x Fax:(514) 448-9199 www.maxxam.ca

# Bordereau de Transmission d'Échantillons



| ADRESSE DE FACTURATION: | | Information Rapport | | Information Projet | | À l'usage du laboratoire seulement | |
|---|---|---|---|---|---|---|---|
| Compagnie | #610 GOLDER ASSOCIES LTEE | Compagnie | #886 GOLDER ASSOCIÉS LTEE. | N° de cotation | B60829 | # dossier Maxxam | # Commande: |
| Attention de | COMPTES PAYABLES | Attention de | Cynthia Carrier/Youri Brochu | N° de commande | | | 156528 |
| Adresse | 7250, rue du Mile End 3e étage | Adresse | 7250, rue du Mile End 3e étage | N° de projet | 15-25739-2200 | Bordereau de Transmission d'Échantillons | Chargé(e) de Projets |
| | Montréal QC H2R 3A4 | | Montréal QC H2R 3A4 | Nom du projet | | C#156528-03-01 | Maria Manarolis |
| Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | Téléphone | (514) 383-0990 x Téléco (514) 383-5332 x | # de site | | | |
| Courriel | AP_CustomerService@golder.com | Courriel | Cynthia_Carrier@golder.com | Échantillonneur | M. Senecal | | |

**Critères et Règlements:** Policyc; RDS; RMD; REIMR; Autre (spécifier); Essai de pompage: 24h (Art. 8.188.2), 48h (Art. 5.2), 72h (Art. 8.188.2); Rég. CUM: Égout sanitaire Art.10, Égout pluvial Art.11; Qualité Eau Potable; Rég. Pâtes & Papiers (Art.104), Rég. Pâtes & Papiers (Art.112); Municipal, Non-municipality

**Instructions spéciales:**

*Remarque: Pour les échantillons d'eau potable soumis à la réglementation - S.V.P utiliser le formulaire client rattaché à l'eau potable*

**Conserver les échantillons en milieu froid ( < 10 oC ) de l'échantillonnage à la livraison chez Maxxam**

**Délais requis**

**S.V.P notifier à l'avance en cas de projet urgent**

**Délai Régulier**
*(Sera applicable si le délai de l'urgence n'est pas précisé)*
*Délai Régulier = 5 Jours ouvrables pour le plupart des analyses.*
*S.V.P Veuillez noter que le délai pour certaines analyses telles que la DBO5 et les Dioxines/Furannes est > 5 jours - Contactez votre chargé de projets pour les détails.*

**Délai rapide (Si applicable à tous les échantillons)**
Date Requise: _____ Heure Requise: _____
Veuillez noter que tout échantillon reçu après 16H00, sera considéré comme reçu le lendemain (jour ouvrable) à 8H00.

| | Étiquette code-bar de l'échantillon | Identification de l'échantillon | Date d'échantillonn | Heure | Matrice | Eau potable réglementée ? (O / N) | métaux à filtrer au labo ? (O / N) | Alcalinité totale(+HCO3,CO3) | Anions (Cl, SO4 et NO3) | Cyanures totaux | Cyanures disponibles | Métaux dissous(As, Cu, Fe, Ni, Pb, Zn, Na, Mg2, K, Ca) | c10-c50 | BTEX | # et Bottles | Commentaires |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SID#099532 | BH-08-15-20170606 | 2017-06-06 | 8h45 | S | N | N | X | X | X | X | X | | | 3 | Métaux Filtré sur terrain |
| 2 | SID#099533 | PZ-11-20R-20170606 | 2017-06-06 | 10h20 | S | N | N | X | X | X | X | X | | | 3 | " |
| 3 | SID#099534 | TF03-14-20170606 | " | 11h40 | S | N | N | X | X | X | X | X | | | 3 | " |
| 4 | SID#099535 | TF02-14-20170606 | " | 13h35 | S | N | N | X | X | X | X | X | | | 3 | " |
| 5 | SID#099536 | TF01-14-20170606 | " | 14h50 | S | N | N | X | X | X | X | X | | | 3 | " |
| 6 | SID#099537 | ~~TF01-14-20170606~~ | ~~"~~ | ~~"~~ | ~~S~~ | ~~N~~ | ~~N~~ | ~~X~~ | ~~X~~ | ~~X~~ | ~~X~~ | ~~X~~ | | | ~~3~~ | ~~"~~ |
| 7 | SID#099538 | PZ-10-01R-20170606 | 2017-06-06 | 17h20 | S | N | N | X | X | X | X | X | | | 3 | Métaux Filtré sur terrain |
| 8 | SID#099539 | | | | | | | | | | | | | | | |
| 9 | SID#099540 | | | | | | | | | | | | | | | |
| 10 | SID#099541 | | | | | | | | | | | | | | | |

| * DESSAISI PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | REÇU PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | Conteneurs utilisés et non soumis | Réservé au laboratoire | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2017-06-06 | 19h00 | | | | | Court Délai de ☐ | Température (°C) de Réception 10,9,8 | Scellé seal intact sur le glacière ☐ Oui ☐ Non |

* SAUF ACCORD CONTRAIRE PASSÉ PAR ÉCRIT, LES SERVICES COMPRIS DANS CETTE CHAÎNE DE RESPONSABILITÉS SONT SOUMIS AUX CONDITIONS GÉNÉRALES STANDARD DE MAXXAM. PAR LA SIGNATURE DE CETTE CHAÎNE DE TRANSMISSION, VOUS CONFIRMEZ QUE VOUS AVEZ PRIS CONNAISSANCE DES CONDITIONS GÉNÉRALES ET ACCEPTÉ LES TERMS. UN MANQUEMENT À CETTE PROCÉDURE PEUT SE TRADUIRE PAR UN RETARD DANS LE DÉLAI ANALYTIQUE.

Blanc: Maxxam Jaune: Client

07-Jun-17 12:15
Maria Manarolis
B731477
CL8

B731477_COC

COC: Yes
Seal: Yes

Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-08-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/06/19**
# Rapport: R2291321
Version: 2 - Révisé

# CERTIFICAT D'ANALYSE – RÉVISÉ

**# DE DOSSIER MAXXAM: B732107**
**Reçu: 2017/06/08, 11:35**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 7

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence Primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5)*** | 4 | N/A | 2017/06/09 | STL SOP-00038 | SM 22 2320-B m |
| Alcalinité totale (pH final 4.5)*** | 3 | N/A | 2017/06/12 | STL SOP-00038 | SM 22 2320-B m |
| Anions* | 7 | N/A | 2017/06/09 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Cyanures disponibles* | 7 | 2017/06/13 | 2017/06/13 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Cyanures totaux* | 7 | 2017/06/13 | 2017/06/14 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Métaux dissous par ICP-MS* | 7 | N/A | 2017/06/09 | STL SOP-00006 | MA.200–Mét. 1.2 R5 m |
| Nitrate et/ou Nitrite* | 7 | N/A | 2017/06/09 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |

**Remarques:**

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.

Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin d'améliorer la performance de la méthode de référence.

Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.



889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-08-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/06/19**
# Rapport: R2291321
Version: 2 - Révisé

# CERTIFICAT D'ANALYSE – RÉVISÉ

**# DE DOSSIER MAXXAM: B732107**
**Reçu: 2017/06/08, 11:35**

* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDELCC.
*** Cette analyse ne fait pas partie du programme d'accréditation du MDDELCC.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Maria Manarolis, Chargée de projets
Courriel: MManarolis@maxxam.ca
Téléphone (514)448-9001 Ext:6236
==========
Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.



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Dossier Maxxam: B732107
Date du rapport: 2017/06/19

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| ID Maxxam | | EB8064 | EB8065 | EB8066 | EB8067 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/07 09:00 | 2017/06/07 10:20 | 2017/06/07 11:45 | 2017/06/07 13:40 | | |
| # Bordereau | | 159528-08-01 | 159528-08-01 | 159528-08-01 | 159528-08-01 | | |
| | **Unités** | **PZ-11-15R-20170607** | **PZ-11-14R-20170607** | **PZ-11-13RB-20170607** | **PZ-09-01R-20170607** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Arsenic (As) | ug/L | 0.90 | 20 | 1.4 | <0.30 | 0.30 | 1788069 |
| Calcium (Ca) | ug/L | 390000 | 390000 | 340000 | 190000 | 5000 | 1788069 |
| Cuivre (Cu) | ug/L | <3.0 | <3.0 | <3.0 | <3.0 | 3.0 | 1788069 |
| Fer (Fe) | ug/L | 140000 | 53000 | 29000 | 270 | 100 | 1788069 |
| Magnésium (Mg) | ug/L | 210000 | 600000 | 250000 | 48000 | 200 | 1788069 |
| Nickel (Ni) | ug/L | <10 | <10 | <10 | <10 | 10 | 1788069 |
| Plomb (Pb) | ug/L | <1.0 | <1.0 | <1.0 | <1.0 | 1.0 | 1788069 |
| Potassium (K) | ug/L | 58000 | 120000 | 40000 | 25000 | 200 | 1788069 |
| Sodium (Na) | ug/L | 170000 | 120000 | 31000 | 30000 | 200 | 1788069 |
| Zinc (Zn) | ug/L | <5.0 | <5.0 | <5.0 | <5.0 | 5.0 | 1788069 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | EB8068 | EB8069 | | EB8070 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/07 15:10 | 2017/06/07 15:20 | | 2017/06/07 16:30 | | |
| # Bordereau | | 159528-08-01 | 159528-08-01 | | 159528-08-01 | | |
| | **Unités** | **PZ-11-17R-20170607** | **DUP2-20170607** | **LDR** | **PZ-11-22R-20170607** | **LDR** | **Lot CQ** |
| **MÉTAUX** | | | | | | | |
| Arsenic (As) | ug/L | <0.30 | <0.30 | 0.30 | <0.30 | 0.30 | 1788069 |
| Calcium (Ca) | ug/L | 170000 | 170000 | 500 | 210000 | 5000 | 1788069 |
| Cuivre (Cu) | ug/L | <3.0 | 3.5 | 3.0 | <3.0 | 3.0 | 1788069 |
| Fer (Fe) | ug/L | <100 | <100 | 100 | <100 | 100 | 1788069 |
| Magnésium (Mg) | ug/L | 83000 | 82000 | 200 | 40000 | 200 | 1788069 |
| Nickel (Ni) | ug/L | 74 | 76 | 10 | 31 | 10 | 1788069 |
| Plomb (Pb) | ug/L | <1.0 | <1.0 | 1.0 | <1.0 | 1.0 | 1788069 |
| Potassium (K) | ug/L | 24000 | 24000 | 200 | 21000 | 200 | 1788069 |
| Sodium (Na) | ug/L | 14000 | 14000 | 200 | 18000 | 200 | 1788069 |
| Zinc (Zn) | ug/L | 26 | 27 | 5.0 | <5.0 | 5.0 | 1788069 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B732107
Date du rapport: 2017/06/19

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | EB8064 | | EB8065 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/07 09:00 | | 2017/06/07 10:20 | | |
| # Bordereau | | 159528-08-01 | | 159528-08-01 | | |
| | Unités | PZ-11-15R-20170607 | Lot CQ | PZ-11-14R-20170607 | LDR | Lot CQ |
| **CONVENTIONNELS** | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | 1789415 | 0.0037 | 0.0030 | 1789415 |
| Cyanures Totaux | mg/L | 0.0054 | 1789413 | 0.019 | 0.0030 | 1789413 |
| Nitrates (N-NO3-) | mg/L | <0.020 | 1788458 | <0.020 | 0.020 | 1788458 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 340 | 1789167 | 180 | 1.0 | 1788389 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 340 | 1789167 | 180 | 1.0 | 1788389 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | 1789167 | N/A | 1.0 | N/A |
| Chlorures (Cl) | mg/L | 39 | 1788461 | 19 | 0.050 | 1788461 |
| Sulfates (SO4) | mg/L | 2000 | 1788461 | 3700 | 5.0 | 1788461 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable

| ID Maxxam | | EB8066 | | EB8067 | | EB8068 | | |
|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/07 11:45 | | 2017/06/07 13:40 | | 2017/06/07 15:10 | | |
| # Bordereau | | 159528-08-01 | | 159528-08-01 | | 159528-08-01 | | |
| | Unités | PZ-11-13RB-20170607 | Lot CQ | PZ-09-01R-20170607 | LDR | PZ-11-17R-20170607 | LDR | Lot CQ |
| **CONVENTIONNELS** | | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | 1789415 | <0.0030 | 0.0030 | <0.0030 | 0.0030 | 1789415 |
| Cyanures Totaux | mg/L | 0.0092 | 1789413 | 0.012 | 0.0030 | 0.0033 | 0.0030 | 1789413 |
| Nitrates (N-NO3-) | mg/L | <0.020 | 1788458 | 0.53 | 0.020 | <0.020 | 0.020 | 1788458 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 99 | 1789167 | 270 | 1.0 | 360 | 1.0 | 1788389 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 99 | 1789167 | 270 | 1.0 | 360 | 1.0 | 1788389 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | 1789167 | N/A | 1.0 | N/A | 1.0 | N/A |
| Chlorures (Cl) | mg/L | 1.6 | 1788461 | 9.4 | 0.050 | 1.6 | 0.050 | 1788461 |
| Sulfates (SO4) | mg/L | 1900 | 1788461 | 590 | 5.0 | 470 | 0.50 | 1788461 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable



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Dossier Maxxam: B732107
Date du rapport: 2017/06/19

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | EB8068 | EB8069 | | | EB8070 | | |
|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/07 15:10 | 2017/06/07 15:20 | | | 2017/06/07 16:30 | | |
| # Bordereau | | 159528-08-01 | 159528-08-01 | | | 159528-08-01 | | |
| | **Unités** | **PZ-11-17R-20170607 Dup. de Lab.** | **DUP2-20170607** | **LDR** | **Lot CQ** | **PZ-11-22R-20170607** | **LDR** | **Lot CQ** |
| **CONVENTIONNELS** | | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | <0.0030 | 0.0030 | 1789415 | <0.0030 | 0.0030 | 1789415 |
| Cyanures Totaux | mg/L | 0.0035 | 0.0034 | 0.0030 | 1789413 | 0.018 | 0.0030 | 1789413 |
| Nitrates (N-NO3-) | mg/L | N/A | 0.025 | 0.020 | 1788458 | 0.52 | 0.020 | 1788458 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | N/A | 360 | 1.0 | 1788389 | 91 | 1.0 | 1789167 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | N/A | 360 | 1.0 | 1788389 | 91 | 1.0 | 1789167 |
| Carbonate (CO3 comme CaCO3) | mg/L | N/A | N/A | 1.0 | N/A | <1.0 | 1.0 | 1789167 |
| Chlorures (Cl) | mg/L | N/A | 1.6 | 0.050 | 1788461 | 18 | 0.050 | 1788461 |
| Sulfates (SO4) | mg/L | N/A | 470 | 0.50 | 1788461 | 610 | 5.0 | 1788461 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
Duplicata de laboratoire
N/A = Non Applicable



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Dossier Maxxam: B732107
Date du rapport: 2017/06/19

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## REMARQUES GÉNÉRALES

Cyanures disponibles: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB8064
Cyanures totaux: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB8064
Cyanures disponibles: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB8065
Cyanures totaux: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB8065
Cyanures disponibles: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB8066
Cyanures totaux: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB8066
Version 2: ajout de CO3 2017-06-19

**MÉTAUX DISSOUS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode. Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode. Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**



889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B732107
Date du rapport: 2017/06/19

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 1788069 | EMA | Blanc fortifié | Arsenic (As) | 2017/06/09 | | 100 | % |
| | | | Calcium (Ca) | 2017/06/09 | | 98 | % |
| | | | Cuivre (Cu) | 2017/06/09 | | 89 | % |
| | | | Fer (Fe) | 2017/06/09 | | 97 | % |
| | | | Magnésium (Mg) | 2017/06/09 | | 102 | % |
| | | | Nickel (Ni) | 2017/06/09 | | 92 | % |
| | | | Plomb (Pb) | 2017/06/09 | | 93 | % |
| | | | Potassium (K) | 2017/06/09 | | 99 | % |
| | | | Sodium (Na) | 2017/06/09 | | 98 | % |
| | | | Zinc (Zn) | 2017/06/09 | | 92 | % |
| 1788069 | EMA | Blanc de méthode | Arsenic (As) | 2017/06/09 | <0.30 | | ug/L |
| | | | Calcium (Ca) | 2017/06/09 | <500 | | ug/L |
| | | | Cuivre (Cu) | 2017/06/09 | <3.0 | | ug/L |
| | | | Fer (Fe) | 2017/06/09 | <100 | | ug/L |
| | | | Magnésium (Mg) | 2017/06/09 | <200 | | ug/L |
| | | | Nickel (Ni) | 2017/06/09 | <10 | | ug/L |
| | | | Plomb (Pb) | 2017/06/09 | <1.0 | | ug/L |
| | | | Potassium (K) | 2017/06/09 | <200 | | ug/L |
| | | | Sodium (Na) | 2017/06/09 | <200 | | ug/L |
| | | | Zinc (Zn) | 2017/06/09 | <5.0 | | ug/L |
| 1788389 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/09 | | 103 | % |
| 1788389 | MR4 | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/09 | <1.0 | | mg/L |
| | | | Bicarbonates (HCO3 comme CaCO3) | 2017/06/09 | <1.0 | | mg/L |
| 1788458 | DKH | Blanc fortifié | Nitrates (N-NO3-) | 2017/06/09 | | 101 | % |
| 1788458 | DKH | Blanc de méthode | Nitrates (N-NO3-) | 2017/06/09 | <0.020 | | mg/L |
| 1788461 | DKH | Blanc fortifié | Chlorures (Cl) | 2017/06/09 | | 101 | % |
| | | | Sulfates (SO4) | 2017/06/09 | | 101 | % |
| 1788461 | DKH | Blanc de méthode | Chlorures (Cl) | 2017/06/09 | <0.050 | | mg/L |
| | | | Sulfates (SO4) | 2017/06/09 | <0.50 | | mg/L |
| 1789167 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/12 | | 104 | % |
| 1789167 | MR4 | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/12 | <1.0 | | mg/L |
| | | | Bicarbonates (HCO3 comme CaCO3) | 2017/06/12 | <1.0 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2017/06/12 | <1.0 | | mg/L |
| 1789413 | MR4 | Blanc fortifié | Cyanures Totaux | 2017/06/14 | | 101 | % |
| 1789413 | MR4 | Blanc de méthode | Cyanures Totaux | 2017/06/14 | <0.0030 | | mg/L |
| 1789415 | DKH | Blanc fortifié | Cyanures disponibles (CN-) | 2017/06/13 | | 97 | % |
| 1789415 | DKH | Blanc de méthode | Cyanures disponibles (CN-) | 2017/06/13 | <0.0030 | | mg/L |

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Réc = Récupération



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Dossier Maxxam: B732107
Date du rapport: 2017/06/19

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

Dochka Koleva Hristova, B.Sc., Chimiste

Miryam Assayag, B.Sc. Chimiste

Veronic Beausejour, B.Sc., Chimiste, Superviseur

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Maxxam Analytics International Corporation o/a Maxxam Analytics
889, Montée de Liesse, Saint-Laurent, Quebec Canada H4T 1P5 Tel:(514) 448-9001 Ligne sans frais:(877) 482-9926 x Fax:(514) 448-9199 www.maxxam.ca

# Bordereau de Transmission d'Échantillons



| ADRESSE DE FACTURATION: | | Information Rapport | | Information Projet | | À l'usage du laboratoire seulement | |
|---|---|---|---|---|---|---|---|
| Compagnie | #610 GOLDER ASSOCIES LTEE | Compagnie | #886 GOLDER ASSOCIÉS LTEE. | N° de cotation | B60829 | # dossier Maxxam | # Commande: |
| Attention de | COMPTES PAYABLES | Attention de | Cynthia Carrier/Youri Brochu | N° de commande | | | 159528 |
| Adresse | 7250, rue du Mile End 3e étage Montréal QC H2R 3A4 | Adresse | 7250, rue du Mile End 3e étage Montréal QC H2R 3A4 | N° de projet | 15-25739-2200 | Bordereau de Transmission d'Échantillons | Chargé(e) de Projete |
| Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | Nom du projet | | C#159528-08-01 | Maria Manarolis |
| Courriel | AP_CustomerService@golder.com | Courriel | Cynthia_Carrier@golder.com | # de site | | | |
| | | | | Échantillonneur | M. Senécal | | |

**Critères et Réglements**

Politique; RDS; RMD; REMR; Autre (spécifier)

Essai de pompage: 24h (Art. 6.148.2); 48h (Art. 6.2); 72h (Art. 6.148.2)

Rég. CUM: Égout sanitaire Art.10; Égout pluvial Art.11

Qualité Eau Potable: Rég. Pâtes & Papiers (Art.104); Rég. Pates & Papiers (Art.112); Municipal; Non-municipality

**Instructions spéciales**

*Remarque: Pour les échantillons d'eau potable soumis à la réglementation - S.V.P utiliser le formulaire client rattaché à l'eau potable*

**Conserver les échantillons en milieu froid ( < 10 oC ) de l'échantillonnage à la livraison chez Maxxam**

**Analyses demandées**

| | Étiquette code-barr de l'échantillon | Identification de l'échantillon | Date d'échantillonn | Heure | Matrice | Eau potable réglementée ? ( O / N ) | métaux à filtrer au labo ? ( O / N ) | Alcalinité totale(+HCO3,CO3) | Anions (Cl, SO4 et NO3) | Cyanures totaux | Cyanures disponibles | Métaux dissous(As, Cu, Fe, Ni, Pb, Zn, Na, Mg2, K, Ca) | c10-c50 | BTEX | | | | # of Settles | Commentaires |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SID#099582 | PZ-11-15R-20170607 | 2017-06-07 | 9h00 | S | N | N | X | X | X | X | X | | | | | | 3 | métaux filtré sur terrain |
| 2 | SID#099583 | PZ-11-14R-20170607 | " | 10h20 | S | N | N | X | X | X | X | X | | | | | | 3 | " |
| 3 | SID#099584 | PZ-11-13RB-20170607 | " | 11h45 | S | N | N | X | X | X | X | X | | | | | | 3 | " |
| 4 | SID#099585 | PZ-09-01R-20170607 | " | 13h40 | S | N | N | X | X | X | X | X | | | | | | 3 | " |
| 5 | SID#099586 | PZ-11-17R-20170607 | " | 15h10 | S | N | N | X | X | X | X | X | | | | | | 3 | " |
| 6 | | DUP2-20170607 | " | 15h20 | S | N | N | X | X | X | X | X | | | | | | 3 | " |
| 7 | | PZ-11-22R-20170607 | " | 16h30 | S | N | N | X | X | X | X | X | | | | | | 3 | " |
| 8 | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | | |

**Délais requis**

S.V.P notifier à l'avance en cas de projet urgent

Délai Régulier
*(Sera applicable si le délai de l'urgence n'est pas précisé)*
*Délai Régulier = 5 Jours ouvrables pour la plupart des analyses.*
*S.V.P.Veuillez noter que le délai pour certaines analyses telles que la DBO5 et les Dioxines/Furannes est > 5 jours - Contactez votre chargé de projets pour les détails.*

Délai rapide (Si applicable à tous les échantillons)
Date Requise: _____ Heure Requise: _____
Veuillez noter que tout échantillon reçu après 16H00, sera considéré comme reçu le lendemain (jour ouvrable) à 9H00.

| * DESSAISI PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | REÇU PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | Contenants utilisés et non soumis |
|---|---|---|---|---|---|---|
| | 2017-06-07 | 18h00 | Yo Nancie Denney | 2017/06/08 | 11:35 | |

**Réservé au laboratoire**

| Cour Délai de | Température (°C)de Reception | Sceau légal intact sur la glacière |
|---|---|---|
| ☐ | 6.6.4 | ☑ Oui ☐ Non 40 2017/06/08 |

Blanc: Maxxam Jaune: Client

* SAUF ACCORD CONTRAIRE PASSÉ PAR ÉCRIT, LES SERVICES COMPRIS DANS CETTE CHAÎNE DE RESPONSABILITÉS SONT SOUMIS AUX CONDITIONS GÉNÉRALES STANDARD DE MAXXAM. PAR LA SIGNATURE DE CETTE CHAÎNE DE RESPONSABILITÉS, VOUS CONFIRMEZ QUE VOUS AVEZ PRIS CONNAISSANCE DES CONDITIONS GÉNÉRALES ET QUE VOUS LES ACCEPTEZ TELLES QU'ELLES SE PRÉSENTENT AU WWW.MAXXAM.CA/TERMS

* IL EST DE LA RESPONSABILITÉ DE LA PERSONNE RAPPORTANT L'ÉCHANTILLON DE S'ASSURER DE L'EXAC[illegible] À CETTE PROCÉDURE PEUT SE TRADUIRE PAR UN RETARD DANS LE DÉLAI ANALYTIQUE.

ice-40 Driver.

B732107_COC

08-Jun-17 11:35
Maria Manarolis
B732107
CL8

Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-04-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/12/07**
# Rapport: R2341623
Version: 3 - Révisé

# CERTIFICAT D'ANALYSE – RÉVISÉ

**# DE DOSSIER MAXXAM: B732304**
**Reçu: 2017/06/09, 10:40**

Matrice: EAU SOUTERRAINE
Nombre d'échantillons reçus: 6

| Analyses | Quantité | Date de l' extraction | Date Analysé | Méthode de laboratoire | Référence Primaire |
|---|---|---|---|---|---|
| Alcalinité totale (pH final 4.5)*** | 6 | N/A | 2017/06/09 | STL SOP-00038 | SM 22 2320-B m |
| Anions* | 2 | N/A | 2017/06/09 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Anions* | 4 | N/A | 2017/06/10 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Benzène, toluène, éthylbenzène, xylène* | 3 | N/A | 2017/06/15 | STL SOP-00145 | MA.400–COV 2.0 R4 m |
| Hydrocarbures pétroliers (C10-C50)* | 3 | 2017/06/13 | 2017/06/14 | STL SOP-00173 | MA.400–HYD. 1.1 R3 m |
| Cyanures disponibles* | 6 | 2017/06/13 | 2017/06/16 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Cyanures totaux* | 6 | 2017/06/13 | 2017/06/14 | STL SOP-00035 | MA300-CN 1.2 R3 m |
| Métaux dissous par ICP-MS* | 6 | N/A | 2017/06/12 | STL SOP-00006 | MA.200–Mét. 1.2 R5 m |
| Nitrate et/ou Nitrite* | 2 | N/A | 2017/06/09 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |
| Nitrate et/ou Nitrite* | 4 | N/A | 2017/06/10 | STL SOP-00014 | MA.300–Ions 1.3 R3 m |

**Remarques:**

Les laboratoires Maxxam sont accrédités ISO/IEC 17025:2005. Sauf indication contraire, les méthodes d'analyses utilisées par Maxxam s'inspirent des méthodes de référence d'organismes provinciaux, fédéraux et américains, tel que le CCME, le MDDELCC, l'EPA et l'APHA.

Toutes les analyses présentées ont été réalisées conformément aux procédures et aux pratiques relatives à la méthodologie, à l'assurance qualité et au contrôle de la qualité généralement appliquées par les employés de Maxxam (sauf s'il en a été convenu autrement par écrit entre le client et Maxxam). Toutes les données de laboratoire rencontrent les contrôles statistiques et respectent tous les critères du CQ et les critères de performance des méthodes, sauf s'il en a été signalé autrement. Tous les blancs de méthode sont rapportés, toutefois, les données des échantillons correspondants ne sont pas corrigées pour la valeur du blanc, sauf indication contraire.

Les responsabilités de Maxxam sont restreintes au coût réel de l'analyse, sauf s'il en a été convenu autrement par écrit. Il n'existe aucune autre garantie, explicite ou implicite. Le client a fait appel à Maxxam pour l'analyse de ses échantillons conformément aux méthodes de référence mentionnées dans ce rapport. L'interprétation et l'utilisation des résultats sont sous l'entière responsabilité du client et ne font pas partie des services offerts par Maxxam, sauf si convenu autrement par écrit.

Les résultats des échantillons solides, sauf les biotes, sont rapportés en fonction de la masse sèche, sauf indication contraire. Les analyses organiques ne sont pas corrigées en fonction de la récupération, sauf pour les méthodes de dilution isotopique.
Les résultats s'appliquent seulement aux échantillons analysés.
Le présent rapport ne doit pas être reproduit, sinon dans son intégralité, sans le consentement écrit du laboratoire.
Lorsque la méthode de référence comprend un suffixe « m », cela signifie que la méthode d'analyse du laboratoire contient des modifications validées et appliquées afin



889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Votre # du projet: 15-25739-2200
Votre # Bordereau: 159528-04-01

**Attention:CYNTHIA CARRIER**

GOLDER ASSOCIES LTEE
Montreal
7250, rue du Mile End
3e étage
Montréal, QC
Canada H2R 3A4

**Date du rapport: 2017/12/07**
# Rapport: R2341623
Version: 3 - Révisé

# CERTIFICAT D'ANALYSE – RÉVISÉ

**# DE DOSSIER MAXXAM: B732304**
**Reçu: 2017/06/09, 10:40**

d'améliorer la performance de la méthode de référence.
Notez: Les données brutes sont utilisées pour le calcul du RPD (% d'écart relatif). L'arrondissement des résultats finaux peut expliquer la variation apparente.

* Maxxam détient l'accréditation pour cette analyse selon le programme du MDDELCC.
*** Cette analyse ne fait pas partie du programme d'accréditation du MDDELCC.

clé de cryptage

Veuillez adresser toute question concernant ce certificat d'analyse à votre chargé(e) de projets
Maria Manarolis, Chargée de projets
Courriel: MManarolis@maxxam.ca
Téléphone (514)448-9001 Ext:6236
==========
Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.



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Dossier Maxxam: B732304
Date du rapport: 2017/12/07

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)

| ID Maxxam | | EB9061 | EB9064 | EB9065 | | |
|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/08 08:35 | 2017/06/08 13:00 | 2017/06/08 15:25 | | |
| # Bordereau | | 159528-04-01 | 159528-04-01 | 159528-04-01 | | |
| | Unités | PZ-11-06R-20170608 | PZ-11-07R-20170608 | PZ-11-08R-20170608 | LDR | Lot CQ |
| **HYDROCARBURES PÉTROLIERS** | | | | | | |
| Hydrocarbures pétroliers (C10-C50) | ug/L | <100 | <100 | <100 | 100 | 1789761 |
| **Récupération des Surrogates (%)** | | | | | | |
| 1-Chlorooctadécane | % | 81 | 71 | 73 | N/A | 1789761 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité
N/A = Non Applicable



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Dossier Maxxam: B732304
Date du rapport: 2017/12/07

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## BTEX PAR GC/MS (EAU SOUTERRAINE)

| ID Maxxam | | EB9061 | EB9061 | EB9064 | EB9065 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/08 08:35 | 2017/06/08 08:35 | 2017/06/08 13:00 | 2017/06/08 15:25 | | |
| # Bordereau | | 159528-04-01 | 159528-04-01 | 159528-04-01 | 159528-04-01 | | |
| | **Unités** | **PZ-11-06R-20170608** | **PZ-11-06R-20170608 Dup. de Lab.** | **PZ-11-07R-20170608** | **PZ-11-08R-20170608** | **LDR** | **Lot CQ** |
| **VOLATILS** | | | | | | | |
| Benzène | ug/L | <0.20 | <0.20 | <0.20 | <0.20 | 0.20 | 1790015 |
| Toluène | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | 1790015 |
| Éthylbenzène | ug/L | <0.10 | <0.10 | <0.10 | <0.10 | 0.10 | 1790015 |
| Xylènes (o,m,p) | ug/L | <0.40 | <0.40 | <0.40 | <0.40 | 0.40 | 1790015 |
| **Récupération des Surrogates (%)** | | | | | | | |
| 4-Bromofluorobenzène | % | 107 | 106 | 109 | 107 | N/A | 1790015 |
| D4-1,2-Dichloroéthane | % | 107 | 110 | 109 | 111 | N/A | 1790015 |
| D8-Toluène | % | 94 | 95 | 93 | 94 | N/A | 1790015 |

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Duplicata de laboratoire
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Dossier Maxxam: B732304
Date du rapport: 2017/12/07

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## MÉTAUX DISSOUS (EAU SOUTERRAINE)

| ID Maxxam | | EB9061 | | EB9062 | | | EB9063 | | |
|---|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/08 08:35 | | 2017/06/08 10:00 | | | 2017/06/08 11:05 | | |
| # Bordereau | | 159528-04-01 | | 159528-04-01 | | | 159528-04-01 | | |
| | Unités | PZ-11-06R-20170608 | Lot CQ | PZ-11-16R-20170608 | LDR | Lot CQ | PZ-09-12R-20170608 | LDR | Lot CQ |
| **MÉTAUX** | | | | | | | | | |
| Arsenic (As) | ug/L | <0.30 | 1788723 | 0.54 | 0.30 | 1788719 | 0.80 | 0.30 | 1788723 |
| Calcium (Ca) | ug/L | 51000 | 1788723 | 180000 | 500 | 1788719 | 260000 | 5000 | 1788723 |
| Cuivre (Cu) | ug/L | 4.0 | 1788723 | <3.0 | 3.0 | 1788719 | <3.0 | 3.0 | 1788723 |
| Fer (Fe) | ug/L | <100 | 1788723 | 59000 | 100 | 1788719 | 130000 | 100 | 1788723 |
| Magnésium (Mg) | ug/L | 12000 | 1788723 | 38000 | 200 | 1788719 | 45000 | 200 | 1788723 |
| Nickel (Ni) | ug/L | 31 | 1788723 | <10 | 10 | 1788719 | <10 | 10 | 1788723 |
| Plomb (Pb) | ug/L | <1.0 | 1788723 | <1.0 | 1.0 | 1788719 | <1.0 | 1.0 | 1788723 |
| Potassium (K) | ug/L | 3200 | 1788723 | 4300 | 200 | 1788719 | 22000 | 200 | 1788723 |
| Sodium (Na) | ug/L | 4300 | 1788723 | 17000 | 200 | 1788719 | 500000 | 2000 | 1788723 |
| Zinc (Zn) | ug/L | <5.0 | 1788723 | <5.0 | 5.0 | 1788719 | <5.0 | 5.0 | 1788723 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | EB9064 | | EB9065 | | | EB9066 | | |
|---|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/08 13:00 | | 2017/06/08 15:25 | | | 2017/06/08 11:10 | | |
| # Bordereau | | 159528-04-01 | | 159528-04-01 | | | 159528-04-01 | | |
| | Unités | PZ-11-07R-20170608 | Lot CQ | PZ-11-08R-20170608 | LDR | Lot CQ | DUP3-20170608 | LDR | Lot CQ |
| **MÉTAUX** | | | | | | | | | |
| Arsenic (As) | ug/L | <0.30 | 1788723 | 0.40 | 0.30 | 1788719 | 0.84 | 0.30 | 1788723 |
| Calcium (Ca) | ug/L | 120000 | 1788723 | 110000 | 500 | 1788719 | 280000 | 5000 | 1788723 |
| Cuivre (Cu) | ug/L | 5.5 | 1788723 | <3.0 | 3.0 | 1788719 | <3.0 | 3.0 | 1788723 |
| Fer (Fe) | ug/L | 1200 | 1788723 | 1400 | 100 | 1788719 | 130000 | 100 | 1788723 |
| Magnésium (Mg) | ug/L | 16000 | 1788723 | 10000 | 200 | 1788719 | 45000 | 200 | 1788723 |
| Nickel (Ni) | ug/L | 120 | 1788723 | 21 | 10 | 1788719 | <10 | 10 | 1788723 |
| Plomb (Pb) | ug/L | 41 | 1788723 | <1.0 | 1.0 | 1788719 | <1.0 | 1.0 | 1788723 |
| Potassium (K) | ug/L | 8300 | 1788723 | 4700 | 200 | 1788719 | 22000 | 200 | 1788723 |
| Sodium (Na) | ug/L | 47000 | 1788723 | 21000 | 200 | 1788719 | 560000 | 2000 | 1788723 |
| Zinc (Zn) | ug/L | 17 | 1788723 | <5.0 | 5.0 | 1788719 | <5.0 | 5.0 | 1788723 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité



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Dossier Maxxam: B732304
Date du rapport: 2017/12/07

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)

| ID Maxxam | | EB9061 | EB9062 | | EB9063 | | |
|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/08 08:35 | 2017/06/08 10:00 | | 2017/06/08 11:05 | | |
| # Bordereau | | 159528-04-01 | 159528-04-01 | | 159528-04-01 | | |
| | Unités | PZ-11-06R-20170608 | PZ-11-16R-20170608 | LDR | PZ-09-12R-20170608 | LDR | Lot CQ |
| **CONVENTIONNELS** | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | <0.0030 | 0.0030 | 0.0031 | 0.0030 | 1789853 |
| Cyanures Totaux | mg/L | <0.0030 | 0.0091 | 0.0030 | 0.0035 | 0.0030 | 1789851 |
| Nitrates (N-NO3-) | mg/L | 1.0 | <0.020 | 0.020 | <0.20 | 0.20 | 1788458 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 38 | 250 | 1.0 | 160 | 1.0 | 1788389 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 38 | 250 | 1.0 | 160 | 1.0 | 1788389 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | <1.0 | 1.0 | 1788389 |
| Chlorures (Cl) | mg/L | 0.45 | 8.2 | 0.050 | 1400 | 0.50 | 1788461 |
| Sulfates (SO4) | mg/L | 130 | 340 | 0.50 | 290 | 5.0 | 1788461 |

LDR = Limite de détection rapportée
Lot CQ = Lot contrôle qualité

| ID Maxxam | | EB9064 | EB9065 | | EB9066 | EB9066 | | |
|---|---|---|---|---|---|---|---|---|
| Date d'échantillonnage | | 2017/06/08 13:00 | 2017/06/08 15:25 | | 2017/06/08 11:10 | 2017/06/08 11:10 | | |
| # Bordereau | | 159528-04-01 | 159528-04-01 | | 159528-04-01 | 159528-04-01 | | |
| | Unités | PZ-11-07R-20170608 | PZ-11-08R-20170608 | LDR | DUP3-20170608 | DUP3-20170608 Dup. de Lab. | LDR | Lot CQ |
| **CONVENTIONNELS** | | | | | | | | |
| Cyanures disponibles (CN-) | mg/L | <0.0030 | <0.0030 | 0.0030 | <0.0030 | N/A | 0.0030 | 1789853 |
| Cyanures Totaux | mg/L | <0.0030 | <0.0030 | 0.0030 | <0.0030 | N/A | 0.0030 | 1789851 |
| Nitrates (N-NO3-) | mg/L | <0.020 | 0.12 | 0.020 | <0.20 | <0.20 | 0.20 | 1788458 |
| Alcalinité Totale (en CaCO3) pH 4.5 | mg/L | 9.7 | 73 | 1.0 | 160 | 160 | 1.0 | 1788389 |
| Bicarbonates (HCO3 comme CaCO3) | mg/L | 9.7 | 73 | 1.0 | 160 | 160 | 1.0 | 1788389 |
| Carbonate (CO3 comme CaCO3) | mg/L | <1.0 | <1.0 | 1.0 | <1.0 | <1.0 | 1.0 | 1788389 |
| Chlorures (Cl) | mg/L | 140 | 41 | 0.050 | 1400 | 1400 | 0.50 | 1788461 |
| Sulfates (SO4) | mg/L | 220 | 210 | 0.50 | 290 | 290 | 5.0 | 1788461 |

LDR = Limite de détection rapportée
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N/A = Non Applicable



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Dossier Maxxam: B732304
Date du rapport: 2017/12/07

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## REMARQUES GÉNÉRALES

Cyanures disponibles: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB9063
Cyanures totaux: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB9063
Cyanures disponibles: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB9066
Cyanures totaux: Agent de conservation insuffisant, pH ajusté sur réception au laboratoire.: EB9066

**HYDROCARBURES PAR GCFID (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés pour la récupération des échantillons de contrôle de qualité (blanc fortifié et surrogates).
Veuillez noter que les résultats n'ont pas été corrigés pour le blanc de méthode.

**BTEX PAR GC/MS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont été corrigés ni pour la récupération des échantillons de contrôle qualité (blanc fortifié et blanc de méthode), ni pour les surrogates.

Veuillez noter que les échantillons sont analysés par Headspace GC/MS.

**MÉTAUX DISSOUS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**PARAMÈTRES CONVENTIONNELS (EAU SOUTERRAINE)**

Veuillez noter que les résultats n'ont pas été corrigés ni pour la récupération des échantillons de contrôle qualité, ni pour le blanc de méthode.
Les limites de détections indiquées sont multipliées par les facteurs de dilution utilisés pour l'analyse des échantillons.

**Les résultats ne se rapportent qu'aux échantillons soumis pour analyse**



889 Montée de Liesse, Ville St-Laurent, Québec, Canada H4T 1P5 Tel: (514) 448-9001 Fax: (514) 448-9199 Ligne sans frais : 1-877-4MAXXAM (462-9926)

Dossier Maxxam: B732304
Date du rapport: 2017/12/07

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 1788389 | MR4 | Blanc fortifié | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/09 | | 103 | % |
| 1788389 | MR4 | Blanc de méthode | Alcalinité Totale (en CaCO3) pH 4.5 | 2017/06/09 | <1.0 | | mg/L |
| | | | Bicarbonates (HCO3 comme CaCO3) | 2017/06/09 | <1.0 | | mg/L |
| | | | Carbonate (CO3 comme CaCO3) | 2017/06/09 | <1.0 | | mg/L |
| 1788458 | DKH | Blanc fortifié | Nitrates (N-NO3-) | 2017/06/09 | | 101 | % |
| 1788458 | DKH | Blanc de méthode | Nitrates (N-NO3-) | 2017/06/09 | <0.020 | | mg/L |
| 1788461 | DKH | Blanc fortifié | Chlorures (Cl) | 2017/06/09 | | 101 | % |
| | | | Sulfates (SO4) | 2017/06/09 | | 101 | % |
| 1788461 | DKH | Blanc de méthode | Chlorures (Cl) | 2017/06/09 | <0.050 | | mg/L |
| | | | Sulfates (SO4) | 2017/06/09 | <0.50 | | mg/L |
| 1788719 | EMA | Blanc fortifié | Arsenic (As) | 2017/06/12 | | 108 | % |
| | | | Calcium (Ca) | 2017/06/12 | | 107 | % |
| | | | Cuivre (Cu) | 2017/06/12 | | 98 | % |
| | | | Fer (Fe) | 2017/06/12 | | 106 | % |
| | | | Magnésium (Mg) | 2017/06/12 | | 106 | % |
| | | | Nickel (Ni) | 2017/06/12 | | 99 | % |
| | | | Plomb (Pb) | 2017/06/12 | | 100 | % |
| | | | Potassium (K) | 2017/06/12 | | 106 | % |
| | | | Sodium (Na) | 2017/06/12 | | 106 | % |
| | | | Zinc (Zn) | 2017/06/12 | | 102 | % |
| 1788719 | EMA | Blanc de méthode | Arsenic (As) | 2017/06/12 | <0.30 | | ug/L |
| | | | Calcium (Ca) | 2017/06/12 | <500 | | ug/L |
| | | | Cuivre (Cu) | 2017/06/12 | <3.0 | | ug/L |
| | | | Fer (Fe) | 2017/06/12 | <100 | | ug/L |
| | | | Magnésium (Mg) | 2017/06/12 | <200 | | ug/L |
| | | | Nickel (Ni) | 2017/06/12 | <10 | | ug/L |
| | | | Plomb (Pb) | 2017/06/12 | <1.0 | | ug/L |
| | | | Potassium (K) | 2017/06/12 | <200 | | ug/L |
| | | | Sodium (Na) | 2017/06/12 | <200 | | ug/L |
| | | | Zinc (Zn) | 2017/06/12 | <5.0 | | ug/L |
| 1788723 | JF1 | Blanc fortifié | Arsenic (As) | 2017/06/12 | | 107 | % |
| | | | Calcium (Ca) | 2017/06/12 | | 107 | % |
| | | | Cuivre (Cu) | 2017/06/12 | | 95 | % |
| | | | Fer (Fe) | 2017/06/12 | | 103 | % |
| | | | Magnésium (Mg) | 2017/06/12 | | 104 | % |
| | | | Nickel (Ni) | 2017/06/12 | | 99 | % |
| | | | Plomb (Pb) | 2017/06/12 | | 100 | % |
| | | | Potassium (K) | 2017/06/12 | | 105 | % |
| | | | Sodium (Na) | 2017/06/12 | | 104 | % |
| | | | Zinc (Zn) | 2017/06/12 | | 100 | % |
| 1788723 | JF1 | Blanc de méthode | Arsenic (As) | 2017/06/12 | <0.30 | | ug/L |
| | | | Calcium (Ca) | 2017/06/12 | <500 | | ug/L |
| | | | Cuivre (Cu) | 2017/06/12 | <3.0 | | ug/L |
| | | | Fer (Fe) | 2017/06/12 | <100 | | ug/L |
| | | | Magnésium (Mg) | 2017/06/12 | <200 | | ug/L |
| | | | Nickel (Ni) | 2017/06/12 | <10 | | ug/L |
| | | | Plomb (Pb) | 2017/06/12 | <1.0 | | ug/L |
| | | | Potassium (K) | 2017/06/12 | <200 | | ug/L |
| | | | Sodium (Na) | 2017/06/12 | <200 | | ug/L |
| | | | Zinc (Zn) | 2017/06/12 | <5.0 | | ug/L |
| 1789761 | MP | Blanc fortifié | 1-Chlorooctadécane | 2017/06/14 | | 92 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/14 | | 104 | % |



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Dossier Maxxam: B732304
Date du rapport: 2017/12/07

GOLDER ASSOCIES LTEE
Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

## RAPPORT ASSURANCE QUALITÉ (SUITE)

| Lot AQ/CQ | Init | Type CQ | Groupe | Date Analysé | Valeur | Réc | Unités |
|---|---|---|---|---|---|---|---|
| 1789761 | MP | Blanc fortifié DUP | 1-Chlorooctadécane | 2017/06/14 | | 84 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/14 | | 99 | % |
| 1789761 | MP | Blanc de méthode | 1-Chlorooctadécane | 2017/06/14 | | 84 | % |
| | | | Hydrocarbures pétroliers (C10-C50) | 2017/06/14 | <100 | | ug/L |
| 1789851 | DKH | Blanc fortifié | Cyanures Totaux | 2017/06/14 | | 104 | % |
| 1789851 | DKH | Blanc de méthode | Cyanures Totaux | 2017/06/14 | <0.0030 | | mg/L |
| 1789853 | MH1 | Blanc fortifié | Cyanures disponibles (CN-) | 2017/06/16 | | 97 | % |
| 1789853 | MH1 | Blanc de méthode | Cyanures disponibles (CN-) | 2017/06/16 | <0.0030 | | mg/L |
| 1790015 | FF | Blanc fortifié | 4-Bromofluorobenzène | 2017/06/14 | | 107 | % |
| | | | D4-1,2-Dichloroéthane | 2017/06/14 | | 106 | % |
| | | | D8-Toluène | 2017/06/14 | | 96 | % |
| | | | Benzène | 2017/06/14 | | 88 | % |
| | | | Toluène | 2017/06/14 | | 80 | % |
| | | | Éthylbenzène | 2017/06/14 | | 84 | % |
| | | | Xylènes (o,m,p) | 2017/06/14 | | 87 | % |
| 1790015 | FF | Blanc de méthode | 4-Bromofluorobenzène | 2017/06/14 | | 106 | % |
| | | | D4-1,2-Dichloroéthane | 2017/06/14 | | 109 | % |
| | | | D8-Toluène | 2017/06/14 | | 95 | % |
| | | | Benzène | 2017/06/14 | <0.20 | | ug/L |
| | | | Toluène | 2017/06/14 | <0.10 | | ug/L |
| | | | Éthylbenzène | 2017/06/14 | <0.10 | | ug/L |
| | | | Xylènes (o,m,p) | 2017/06/14 | <0.40 | | ug/L |

Blanc fortifié: Un blanc, d'une matrice exempte de contaminants, auquel a été ajouté une quantité connue d'analyte provenant généralement d'une deuxième source. Utilisé pour évaluer la précision de la méthode.

Blanc de méthode: Une partie aliquote de matrice pure soumise au même processus analytique que les échantillons, du prétraitement au dosage. Sert à évaluer toutes contaminations du laboratoire.

Surrogate: Composé se comportant de façon similaire aux composés analysés et ajouté à l'échantillon avant l'analyse. Sert à évaluer la qualité de l'extraction.

Réc = Récupération



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Votre # du projet: 15-25739-2200
Initiales du préleveur: MS

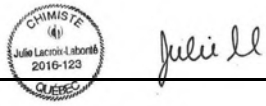
## PAGE DES SIGNATURES DE VALIDATION

Les résultats analytiques ainsi que les données de contrôle-qualité contenus dans ce rapport furent vérifiés et validés par les personnes suivantes:

Christian Guiang, B.Sc., Chimiste

Dochka Koleva Hristova, B.Sc., Chimiste

Jonathan Fauvel, B.Sc, Chimiste




Julie Lacroix-Labonte

Veronic Beausejour, B.Sc., Chimiste, Superviseur

Maxxam a mis en place des procédures qui protègent contre l'utilisation non autorisée de la signature électronique et emploie les «signataires» requis, conformément à la section 5.10.2 de la norme ISO/CEI 17025:2005(E). Veuillez vous référer à la page des signatures de validation pour obtenir les détails des validations pour chaque division.



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Maxxam Analytics International Corporation o/a Maxxam Analytics
6969, Montée de Liesse, Saint-Laurent, Quebec Canada H4T 1P5 Tel:(514) 448-9001 Ligne sans frais:(877) 462-9926 x Fax:(514) 448-9199 www.maxxam.ca

# Bordereau de Transmission d'Échantillons



| ADRESSE DE FACTURATION: | | Information Rapport | | Information Projet | | À l'usage du laboratoire seulement | |
|---|---|---|---|---|---|---|---|
| Compagnie | #610 GOLDER ASSOCIES LTEE | Compagnie | #886 GOLDER ASSOCIÉS LTEE | N° de cotation | B60829 | # dossier Maxxam | # Commande: |
| Attention de | COMPTES PAYABLES | Attention de | Cynthia Carrier/Youri Brochu | N° de commande | | | 159528 |
| Adresse | 7250, rue du Mile End 3e étage | Adresse | 7250, rue du Mile End 3e étage | N° de projet | 15-25739-2200 | Bordereau de Transmission d'Échantillons | Chargé(e) de Projets |
| | Montréal QC H2R 3A4 | | Montréal QC H2R 3A4 | Nom du projet | | C#159528-04-01 | Maria Manerolis |
| Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | Téléphone | (514) 383-0990 x Téléc (514) 383-5332 x | # de site | | | |
| Courriel | AP_CustomerService@golder.com | Courriel | Cynthia_Carrier@golder.com | Échantillonneur | M. Sénécal | | |

Critères et Règlements: ☐ Potable ☐ RDS ☒ RMD ☐ REMR ☐ Autre (spécifier) — Essai de pompage: ☐ 24h (Art. 6.1&6.2) ☐ 48h (Art. 6.2) ☐ 72h (Art. 6.1&6.2) — Rég. CUM: ☐ Égout sanitaire Art.10 ☐ Égout pluvial Art.11 — Ouvrés Eau Potable: ☐ Municipal ☐ Non-municipalité — ☐ Rég. Pâtes & Papiers (Art.104) ☐ Rég. Pâtes & Papiers (Art.112)

Instructions spéciales:

*Remarque: Pour les échantillons d'eau potable soumis à la réglementation - S.V.P utiliser le formulaire client rattaché à l'eau potable*

**Conserver les échantillons en milieu froid ( < 10 oC ) de l'échantillonnage à la livraison chez Maxxam**

Délais requis — S.V.P notifier à l'avance en cas de projet urgent

Délai Régulier (Sera appliquée si le délai de l'urgence n'est pas précisé) ☒

Délai Régulier = 5 jours ouvrables pour la plupart des analyses.
S.V.P Veuillez noter que le délai pour certaines analyses telles que le DBO5 et les Dioxines/Furannes est > 5 jours - Contactez votre chargé de projets pour les détails.

Délai rapide (Si applicable à tous les échantillons)
Date Requise: _____ Heure Requise: _____ ☐

Veuillez noter que tout échantillon reçu après 15H00, sera considéré comme reçu le lendemain (jour ouvrable) à 8H00.

| | Étiquette codebar de l'échantillon | Identification de l'échantillon | Date d'échantillonn | Heure | Matrice | Eau potable réglementée ? ( O / N ) | métaux à filtrer au labo ? ( O / N ) | Alcalinité totale(+HCO3,CO3) | Anions (Cl, SO4 et NO3) | Cyanures totaux | Cyanures disponibles | Métaux dissous(As, Cu, Fe, Ni, Pb, Zn, Na, Mg2, K, Ca) | c10-c50 | BTEX | | | # of Bottles | Commentaires |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | SID#099542 | P2-11-06R-20170608 | 2017-06-08 | 8h35 | S | N | N | X | X | X | X | X | X | X | | | 7 | métaux F/lbrs sur terrain |
| 2 | SID#099543 | P2-11-16R-20170608 | 2017-06-08 | 10h00 | S | N | N | X | X | X | X | X | | | | | 3 | 11 |
| 3 | SID#099544 | P2-09-12R-20170608 | 2017-06-08 | 11h05 | S | N | N | X | X | X | X | X | | | | | 3 | 11 |
| 4 | SID#099545 | P2-11-07R-20170608 | 2017-06-08 | 13h00 | S | N | N | X | X | X | X | X | X | X | | | 7 | 11 |
| 5 | SID#099546 | P2-11-08R-20170608 | 2017-06-08 | 15h25 | S | N | N | X | X | X | X | X | X | X | | | 7 | 11 |
| 6 | SID#099547 | | | | | | | | | | | | | | | | | |
| 7 | SID#099548 | | | | | | | | | | | | | | | | | |
| 8 | SID#099549 | | | | | | | | | | | | | | | | | |
| 9 | SID#099550 | | | | | | | | | | | | | | | | | |
| 10 | SID#099551 | | | | | | | | | | | | | | | | | |

B732304_COC

| * DESSAISI PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | REÇU PAR: (Signature) | Date: (AAAA/MM/JJ) | Heure | Contenants utilisés et non soumis | Réservé aulaboratoire: Court Délai de ☐ | Température (°C) de Réception | Sceau intact sur le glacière ☐ Oui ☒ Non |
|---|---|---|---|---|---|---|---|---|---|
| | 2017/06/08 | 18h30 | | 2017/06/09 | 10:40 | | | 0,0,1 | |

* SAUF ACCORD CONTRAIRE PASSÉ PAR ÉCRIT, LES SERVICES COMPRIS DANS CETTE CHAÎNE DE RESPONSABILITÉS SONT SOUMIS AUX CONDITIONS GÉNÉRALES STANDARD DE MAXXAM. PAR LA SIGNATURE DE CETTE CHAÎNE DE RESPONSABILITÉS, VOUS CONFIRMEZ QUE VOUS AVEZ PRIS CONNAISSANCE DES CONDITIONS GÉNÉRALES ET QUE VOUS LES ACCEPTEZ TELLES QU'ELLES SE PRÉSENTENT AU WWW.MAXXAM.CA/TERMS.

* IL EST DE LA RESPONSABILITÉ DE LA PERSONNE RAPPORTANT L'ÉCHANTILLON DE S'ASSURER DE L'EXACTITUDE DU BORDEREAU DE TRANSMISSION. UN MANQUEMENT À CETTE PROCÉDURE PEUT SE TRADUIRE PAR UN RETARD DANS LE DÉLAI ANALYTIQUE.

Blanc: Maxxam Jaune: Client

IQE: YES

**Maria Manarolis**

**From:** Carrier, Cynthia <Cynthia_Carrier@golder.com>
**Sent:** Friday, June 09, 2017 1:19 PM
**To:** Maria Manarolis
**Cc:** Senécal, Mikaël
**Subject:** RE: ASAP-confirmation- 15-25739-2200---RE: Envoi éch. Jeudi

Bonjour Maria,

Procédez aux mêmes analyses que pour les échantillons de la même journée pour lesquels tu as reçu 3 bouteilles.

Alcalinité CO3 HCO3
Anions (Cl, SO4, NO3)
Cyanures totaux
Cyanures libres (disponibles)
Métaux dissous et métalloïdes (As, Cu, Fe, Ni, Pb, Zn, Na+, Mg2+, K+, Ca2 ) (il a été filtré au chantier)

Délai régulier

Merci
Cynthia

Cynthia Carrier (M.Sc.Géogr.) | Chargée de projet | Golder Associés Ltée
7250, rue du Mile End, 3e étage, Montréal (Québec) Canada H2R 3A4 ◄ Nous sommes déménagés!
T: +1 (514) 383 0990 | F: +1 (514) 383 5332 | C: +1 (514) 702-9023 | E: Cynthia_Carrier@golder.com | www.golder.com

La sécurité partout et avant tout

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-----Message d'origine-----
De : Maria Manarolis [mailto:MManarolis@maxxam.ca] Envoyé : June-09-17 12:49 PM À : Senécal, Mikaël <Mikael_Senecal@golder.com> Cc : Carrier, Cynthia <Cynthia_Carrier@golder.com> Objet : ASAP-confirmation- 15-25739-2200---RE: Envoi éch. Jeudi

J'ai reçu un DUP-3, est-ce qu'on l'analyse?

1