AVIS GÉNÉRAL

Les documents faisant partie de l'ordre du jour ci-joint, ont force de la loi, que s'ils ont été entérinés par le Conseil municipal.

Prière de vérifier auprès de l'administration si des modifications et/ou des retraits de sujets ont été effectués.

AVIS COVID-19

Inscription obligatoire pour assister aux réunions en personnes :

Afin de soutenir les efforts en cours pour arrêter la propagation de la Covid-19, nous recommandons fortement à tous les membres du public de rester dans le confort et la sécurité de leur maison et de regarder les délibérations du conseil en direct sur la chaîne YouTube de La Nation. En raison des directives de distanciation sociale du BSEO, nous ne pouvons accueillir qu'un maximum de sept membres du public dans la salle du conseil.

Une inscription est obligatoire afin d'assister à une réunion puisque l'espace est limité. Si vous voulez réserver un siège, ou si vous avez des questions, veuillez communiquer avec la Greffière adjointe au 613-764-5444, poste 228 ou par courriel à aroy@nationmun.ca.

Vous pouvez visiter la chaîne YouTube de La Nation pour visionner les réunions.

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Corporation de la municipalité de La Nation
Ordre du jour

Information de la réunion

Numéro de réunion : 2022-07

Type : Ordinaire

Date : 4 avril 2022

Heure : 16h00

Endroit : Hôtel de ville, 958 route 500 ouest, Casselman

Président : François St-Amour, Maire

Préparé par : Aimée Roy, Greffière adjointe

Vidéo : la réunion du Conseil sera diffusée en direct sur YouTube

Sujets à l'horaire précis

16h00 : Pont Touchette

Ordre du jour

1. **Ouverture de l'assemblée**
2. **Modifications et additions à l'ordre du jour**
3. **Adoption de l'ordre du jour**
4. **Déclaration de conflit d'intérêt**
5. **Adoption des procès-verbaux des réunions précédentes**
6. **Adoption des recommandations des comités du conseil municipal**
7. **Réception des rapports mensuels des membres de l'administration**

7.1 Marc Legault, Directeur des Travaux publics

7.1.1 McIntosh Perry (16h00)
Projet de réhabilitation du Pont Touchette

7.1.2 Rapport TP-09-2022
Achat de tracteur et souffleuse de neige

7.1.3 Rapport TP-10-2022
Projet pilot, limite de vitesse Limoges

7.1.4 Rapport TP-11-2022
Fournir et livrer matériaux pour ponceau – chemin Indian Creek

7.2 Carol Ann Scott, Coordinatrice de la récréation

7.2.1 Politique sur les droits de nom par commanditaire – Complexe sportif de La Nation

7.3 Nadia Knebel, Trésorière

7.3.1 Rapport F-09-2022
Révision du budget 2022, rapport à suivre

7.3.2 Rapport F-10-2022
Règlement sur les frais et charges proposé
Règlement numéro 60-2022

7.4 Daniel R. Desforges, Gérant des Infrastructures Environnementales

7.4.1 Rapport annuel de surveillance des opérations 2021, site d'enfouissement et dépôt de déchets dangereux de Limoges

7.4.2 Rapport de surveillance des eaux souterraines et des eaux de surface du site d'enfouissement Central 2021 (EXP)

7.5 Josée Brizard, DG-Greffière

7.5.1 Jean Jacques Lacombe
Rapport annuel de 2021 du Commissaire à l'intégrité

8. Avis de motions proposées

9. Affaires découlant des réunions précédentes

10. Délégations

11. Demandes au comité de division de terrains de Prescott-Russell

12. Règlements municipaux

12.1 Règlement 60-2022
Règlement sur les frais et charges

12.2 Règlement 64-2022
Rue Trail – pour dédier le chemin Finch Cambridge Boundary

13. Approbation du rapport de variance et comptes fournisseurs

13.1 Comptes payables

14. Autres

15. Rapports mensuels divers

15.1 Bureau de santé de l'est de l'Ontario, Avis des flambées

16. Correspondance

16.1 AMO, infolettres

16.2 Ville de Port Colborne, l'année du jardin 2022

16.3 Ville de Waterloo, Code de construction

16.4 Old Fort William Cottagers' Association, Proposition de CNL pour une installation de déchets radioactifs à 1 km de la rivière des Outaouais

16.5 Police provinciale de l'Ontario, Projet de patrouille pour des communautés sûres

16.6 Village de Georgina, Sanctions gouvernementales imposées à la Russie

17. Événements à venir

17.1 Réunion de conseil ordinaire, 28 avril 2022

18. Huis clos

18.1 Procès-verbal de la session à huis clos tenue le 14 mars 2022

18.2 Richard J. Groulx, Chef pompier
Rapport F-05-2022
Résignation de pompiers

Section 239 (2) (b) des renseignements privés concernant une personne qui peut être identifiée, y compris des employés de la municipalité ou du conseil local;

19. Règlement pour confirmer les procédures du Conseil

20. Ajournement

Memorandum

March 30, 2022

McINTOSH PERRY

To: Marc Legault, Director of Public Works

Re: The Nation Municipality, Road-06-2021
Touchette Bridge Rehabilitation, Site No. 27-174
Construction Cost and Schedule Update Memo

Per the Municipalities request McIntosh Perry (MP) has prepared a summary of the construction budget and the scheduling options for the Rehabilitation of the Touchette Bridge, located on Route 650 over the South Nation River. McIntosh Perry Consulting Engineers Ltd. (MP) was retained by the Nation Municipality to complete the preliminary and detailed design for the rehabilitation.

The purpose of the bridge rehabilitation is to improve roadway safety and extend the useable service life of the structure. The scope of the rehabilitation was based on the previous inspection reports and was expected to include the following major elements:

- Replacement of deck, stringers, floor beams, and bottom bracing;
- Installation of new concrete deck;
- Repair of structural steel (fractured members, rivets);
- Abutment refacing;
- Expansion joint replacement.

The cost to complete the work noted above was expected to be $2.5M with 2.1M being provided by the federal and provincial governments. MP has completed the 90% design for the project and associated cost estimate. Based on several factors the cost estimate has increased from the original $2.5M budget. This memo summarizes the rationale behind the cost increases and the implications to the construction schedule.

1.0 CONSTRUCTION BUDGET INCREASES

1.1 Changes in Scope

At the start of the assignment, McIntosh Perry completed a field investigation and identified three potential changes from the original scope of work based on the bridge condition.

Wingwalls

The existing bridge wingwalls had significant concrete deterioration and corrosion of the exposed reinforcing steel. Based on the extent of deterioration, it was recommended that the wingwalls be reconstructed to ensure the service life extension is maximized.

Abutment Stability

During the investigation, MP noted that the bridge truss was pushing against the bridge abutment and that the bearings were no longer in their correct position. A gap between the bridge truss and abutment is required to accommodate the expansion and contraction of the bridge due to temperature changes which can be as big as 50 mm.

The lack of gap meant that the bridge abutments must have moved inward (toward water), eliminating the expansion and contraction gap. The binding of the abutment and bridge truss has caused the ballast wall to crack. A desktop review of the existing abutment design was completed to try and determine why the abutments are

moving. Modelling confirmed that the existing timber piles likely did not have enough lateral (horizontal) resistance to withstand the earth loads behind the abutments. It is likely that the earth and vehicle loads caused the abutments to rotate inward (toward water) until they wedged against the bridge truss.

To stabilize the bridge abutments, a deadman anchor system needs to be installed behind the existing abutments to withstand the earth loads and prevent abutments from moving any further.

The deadman system will consist of a sheet pile anchor system with threaded bars fixed through the abutments and secured to the sheet piles. The abutments can't be pushed back to their original position so the ballast wall will need to be rebuilt and moved further back to restore the gap between the abutment and bridge truss.

The installation of this system will be costly as it requires additional excavation behind the abutments, replacement of the ballast wall and backfill with engineered granular. An illustration of the deadman anchor system is provided in the Figure 1.

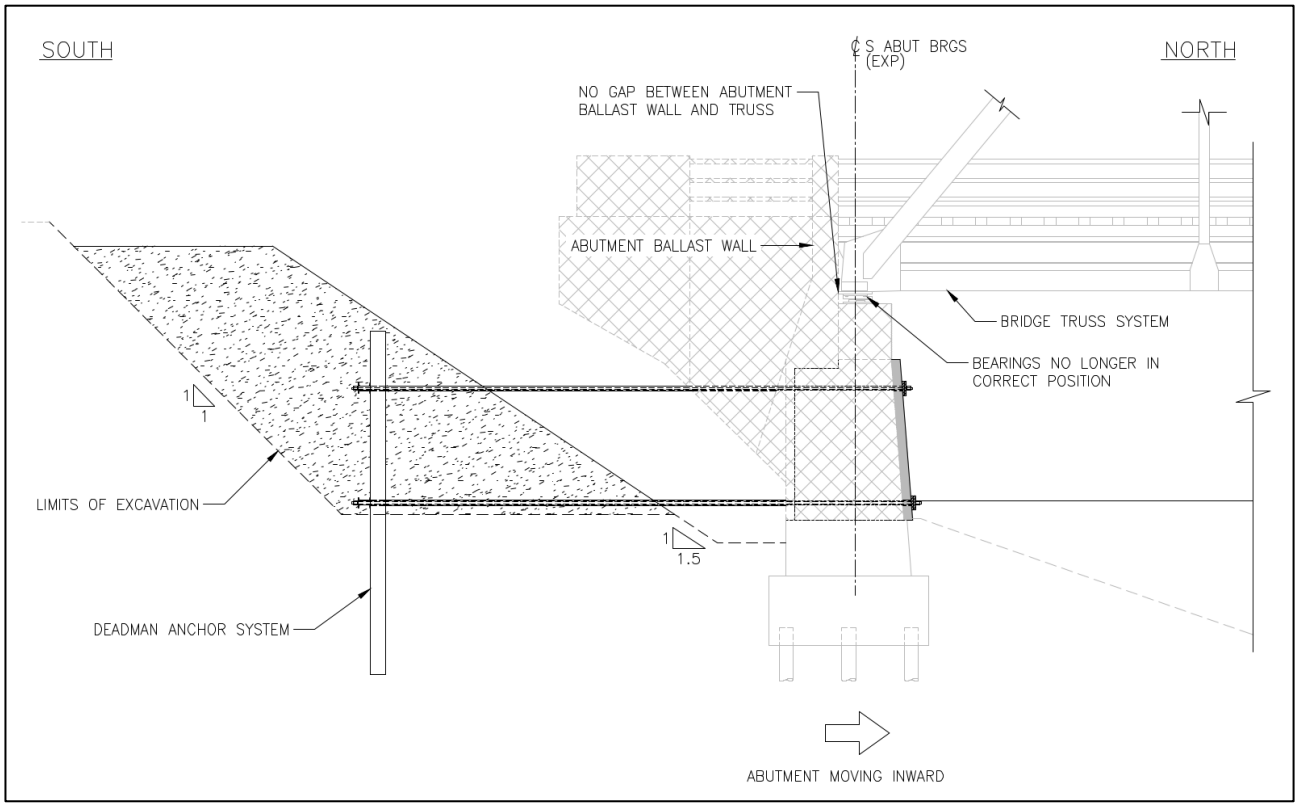


Figure 1: Sketch of Abutment Deadman Anchor System

Once stabilized the south abutment bearings will also need to be replaced as they are no longer in their correct position due to the abutment movement.

Structural Steel Condition

The existing structural steel, in select locations, was in poor condition and continues to deteriorate as the existing protective paint coating has failed. It is expected that additional corrosion may be uncovered or damaged during construction. To account for this risk, it is recommended that a $100,000 contingency be included in the budget.

1.2 Covid Impacts

Construction costs have been steadily rising over the previous two years from the economic impacts of COVID. The Ministry of Transportation (MTO) monitors the average annual change in tender item pricing per year. Their data shows that the average unit cost of structural items has increased by 10% since March 2020.

Based on this, it is expected that the original cost of the rehabilitation has increased by 10% without considering the changes in scope noted above.

1.3 Summary of Budget Changes

A summary of the additional costs from the change in scope have been summarized below:

Table 1: Additional Costs from Change in Scope

Item	Added Cost
Wingwall and Ballast Wall Replacement	$239,600
Deadman Anchor System	$264,900
Bearing Replacement	$72,000
Structural Steel Repair Contingency	$100,000
Covid Impacts (10%)	$346,900
Total	**$1,023,400**

Based on the change in scope and impacts of Covid, the total construction cost has now increased from $2.5M to $3.47 M.

2.0 CONSTRUCTION SCHEDULE

Based on above changes in scope, the amount of working days for construction has increased. It is expected that construction within a single construction season will be challenging as in-water work cannot begin until July 1st. Table 2 provides a comparison of different construction schedules for review.

Table 2: Summary of Schedule Alternatives

Alternative	Pros	Cons/Risks
Tendering Proceeds as Planned **(June 2022 to December 2022)**	• Critical work begins before any further deterioration occurs • Provides the least interruption to traffic	• An accelerated timeline may be more susceptible to delays • Cost may not be competitive due to time of tendering • Contractor availability may reduce the number of bids
Delay Tendering to January 2023 **(April 2023 to December 2023)**	• More contractors will be available to bid • Competitive bids are typically seen at this time of year	• Construction costs may continue to rise • Closure in place during spring planting season for farmers • Further deterioration may require closure of the bridge if not addressed
Provide Extension to Construction Schedule **(June 2022 to June 2023)**	• A less compressed schedule will invite more competitive bids • Unforeseen delays will have less impact on meeting the completion date • Potential to do some work from the ice	• The bridge will be closed for a longer period • Closure in place during spring planting season for farmers • Time of tendering may still impact prices

Yours truly,

Christine Shillinglaw, P.Eng.
Project Manager, Bridge Engineering
Phone: 613.714.0794
c.shillinglaw@mcintoshperry.com
MPCE File No. CCO-21-1195

Rapport pour le Conseil

Numéro du rapport: TP-09-2022

Sujet : Achat tracteur et souffleuse à neige

Préparé par : Joanne Bougie-Normand, assistante au directeur

Révisé par: Marc Legault, directeur des Travaux publics

Révisé par : Josée Brizard, directrice générale/greffière

Révisé par : Nadia Knebel, trésorière

Date de la réunion : 4 avril 2022

Contexte

L'achat d'un nouveau tracteur et souffleuse à neige est au budget 2022 pour remplacer 2005 John Deere ID 6041 et souffleuse à neige Pronovost.

Rapport

L'appel d'offres a été publié sur la plateforme numérique «Bids & Tenders» et sur notre site web municipal pendant un mois. Trois compagnies ont déposé une soumission. La soumission gagnante donne un bon prix avec la reprise du tracteur 2005 John Deere, modèle 6715 et souffleuse, modèle Pronovost p980.

Donc, je recommande d'accepter la soumission pour un Kubota 2022, modèle M6-141DTCC avec une souffleuse Normand, modèle N-98-34H. La livraison est prévue au plus tard le 31 août 2022. Cependant, la souffleuse est prévue seulement en 2023. De ce fait, nous allons garder la nôtre durant ce temps.

Soumissionnaire	Somme $	Taxe T.V.H. $	Somme globale $
Carrière & Poirier Equipment Ltd.	160 150,00	exempter	160 150,00

Considérations financières

Un montant de 160 000 $ est prévu au budget 2022 pour remplacer le 2005 John Deere ID 6041 et la souffleuse à neige.

Recommandation

«Que le Conseil accepte la recommandation présentée par le directeur des Travaux publics dans son rapport du TP-09-2022 et que la soumission pour l'achat d'un tracteur 2022 Kubota, modèle M6-141DTCC et une souffleuse à neige Normand, modèle N-98-34H soit accordée à Carrière & Poirier Equipment Ltd. pour la somme globale de 160 150 $ sans taxe et incluant la reprise du tracteur John Deere 2005 et la souffleuse Pronovost selon les spécifications au contrat Road-04-2022.»

Rapport pour le Conseil

Numéro du rapport: TP-10-2022

Sujet : Campagne sensibilisation - Limite de vitesse Limoges

Préparé par : Marc Léveillé (pour Marc Legault)

Révisé par : Josée Brizard, DG-Greffière

Date de la réunion : 4 avril 2022

Rapport

Je propose de lancer une campagne de sensibilisation dans la communauté du village de Limoges afin d'informer les résidents que les limites de vitesse seront de 40 km/h dans les rues résidentielles.

- Une douzaine d'enseignes **(Item 1)** seront installées aux entrées et sorties des rues résidentielles.
- Trois enseignes sensibilisant la population **(Item 2)** seront installées aux entrées du village de Limoges. Ces enseignes, produites par KB Média, inviteront les résidents de respecter les nouvelles limites fixées dans les rues résidentielles.

La campagne de sensibilisation sera aussi visible sur :

- Les réseaux sociaux de La Nation
- Le site web de La Nation
- Telmatik
- Dans les journaux locaux

Dans les différentes publications, nous y verrons les Items 1 et Items 2 ainsi qu'un document ''Questions/Réponses'' **(Item 3)** qui aidera les résidents à comprendre l'initiative de la municipalité de La Nation.

Recommandation

Que le Conseil municipal approuve le rapport TP-10-2022 préparé par le directeur des Travaux publics et accepte qu'une campagne de sensibilisation soient lancées à compter du 2 mai 2022.

Pièces jointes

Item 1 – Enseignes rues résidentielles

Item 2 – Enseigne aux entrées du Village (KB Média)

Item 3 – Document ''Questions/Réponses''

Appendix 2- Gateway signs

NEW SPEED LIMIT
NOUVELLE LIMITE DE VITESSE

SLOW DOWN | RALENTISSEZ

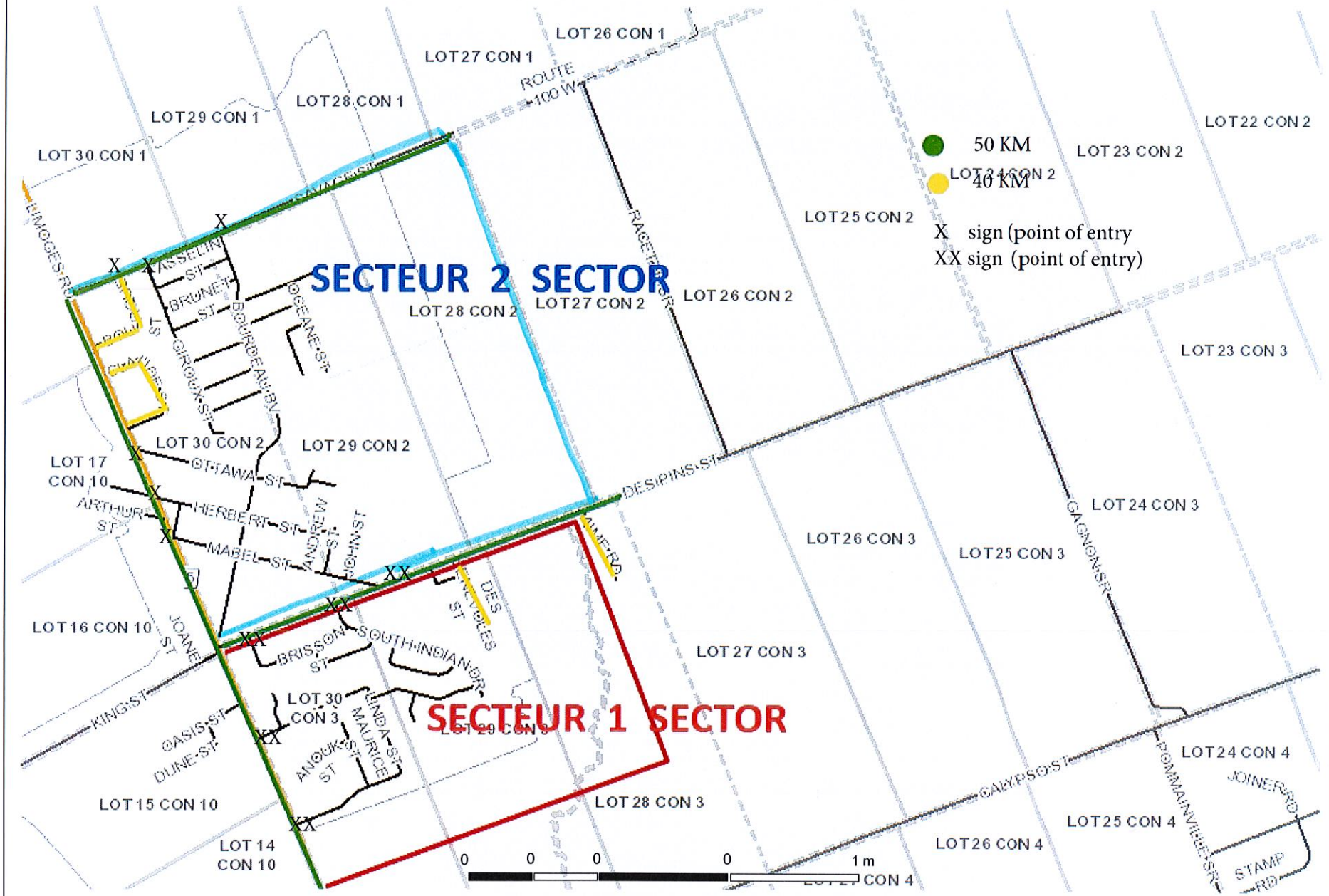
RESIDENTIAL AREAS | ZONES RÉSIDENTIELLES

40 KM/H

Réduction de la limite de vitesse dans le village de Limoges

1.	**Question:**	Pourquoi est-ce que la municipalité réduit la limite de vitesse?
	Réponse:	Au cours des dernières années, nous avons remarqué une augmentation du nombre de plaintes et d'incidents causés par l'excès de vitesse ce qui peut nuire à la sécurité de nos piétons.
2.	**Question:**	Pourquoi pas aux rues Des Pins, Savage ou au Chemin Limoges?
	Réponse:	Ces rues sont considérées comme des rues collectrices servant à canaliser la circulation vers certains secteurs du village.
3.	**Question:**	Y aura-t-il une plus grande présence policière?
	Réponse:	Oui. La municipalité demandera une plus grande présence policière afin de faire respecter la limite de vitesse.
4.	**Question:**	Quand cette mesure sera-t-elle appliquée?
	Réponse:	Nous prévoyons mettre en place une campagne de sensibilisation en Février 2022 pour aviser les résidents de la future limite de vitesse. Nous espérons implanter la nouvelle limite en mai 2022.
5.	**Question:**	Y aura-t-il des enseignes d'installées afin de promouvoir la réduction de la vitesse?
	Réponse:	Oui. De nouvelles affiches seront installées à chacune des entrées des rues collectrices
6.	**Question:**	Y aura-t-il des enseignes aux rues collectrices indiquant la modification à la limite de vitesse?
	Réponse:	Oui. De nouvelles enseignes seront installées à chacune des entrées du village de Limoges. Ces enseignes rappelleront aux automobilistes de réduire leur vitesse pour le bien de nos enfants et de nos résidents.
7.	**Question:**	Quelles rues seront soumises à une réduction de vitesse?
	Réponse:	Les limites de vitesse seront fixées à 40 km/h sur toutes les rues sauf aux rue Savage, Des Pins et le chemin Limoges. Pour ces rues, la limite restera inchangée, soit à 50 km/h, car celles-ci sont considérées comme des rues collectrices.

LIMITE DE VITESSE / SPEED LIMIT - VILLAGE LIMOGES



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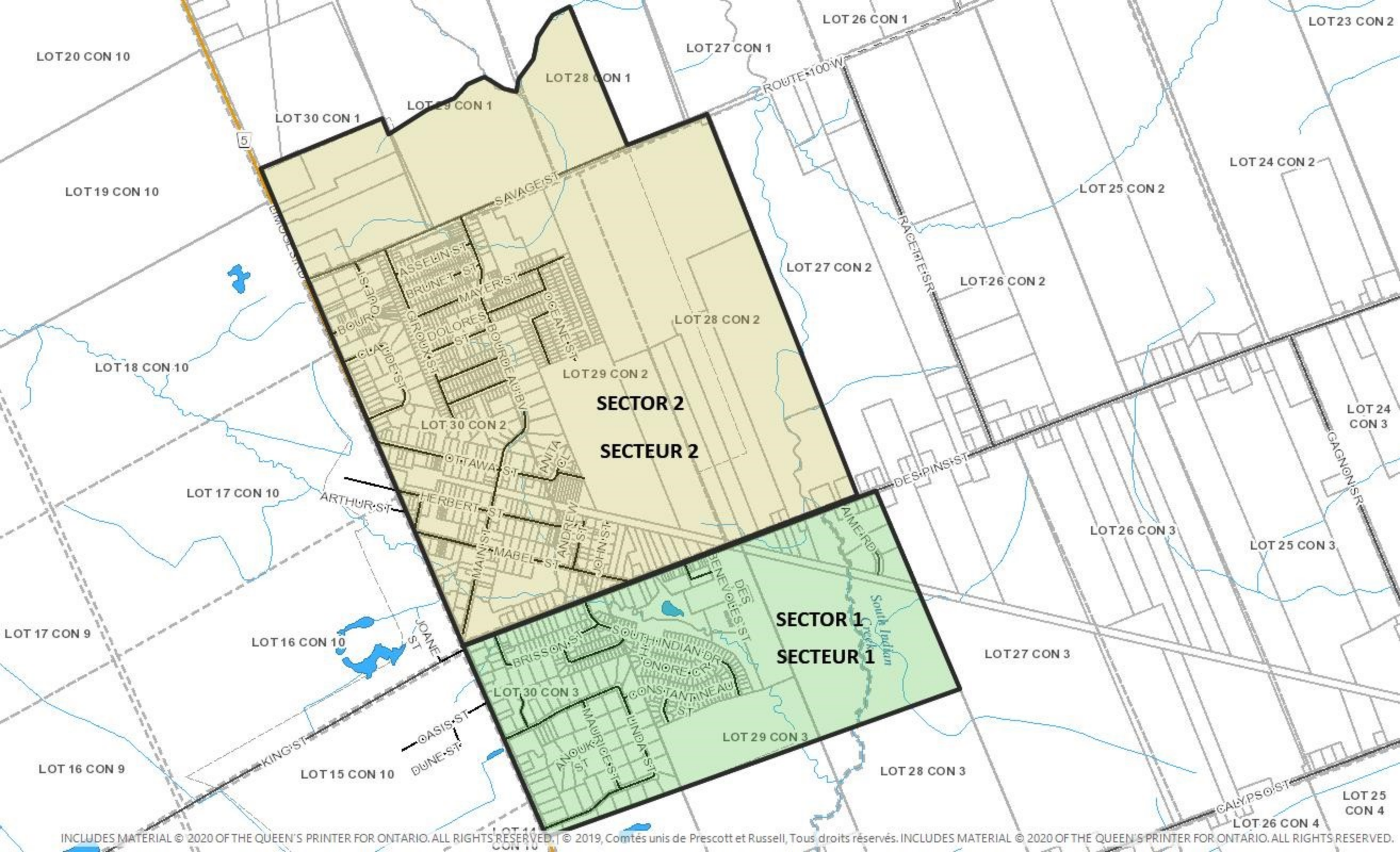

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Rapport pour le Conseil

Numéro du rapport: TP-11-2022

Sujet : Fournir et délivrer matériaux ponceau double chemin Indian Creek

Préparé par : Joanne Bougie-Normand, assistante au directeur

Révisé par : Marc Legault, directeur des Travaux publics

Révisé par : Josée Brizard, directrice générale/greffière

Date de la réunion : Le 4 avril 2022

Contexte

Soumission demandée pour les matériaux pour la construction d'un ponceau double dans le chemin Indian Creek. Ce projet est au budget 2022 et ce ponceau est sur le chemin de frontière qui est partagé avec la ville d'Ottawa. Le département des Travaux publics entreprendra et gérera le projet selon les spécifications détaillées de conception et de construction (phase 2) et les services de construction (phase 3) en vertu d'une entente signée avec la Ville d'Ottawa.

Rapport

L'appel d'offres a été publié sur la plateforme de Bids & Tenders et sur notre site web municipal. Nous avons reçu deux soumissions :

Soumissionnaire	Somme $	Taxe T.V .H. $	Somme globale $
Armtec Inc.	587 720,08	76 403,61	644 123,70

Donc, je recommande d'accepter la soumission la plus basse.

Nous réclamerons un total de 75 058,91 $ de la T.V.H. payée. Ceci apporte le coût total net de 589 064,78 pour la municipalité.

Considérations financières

La construction de ce projet est évaluée au coût de 1.6 million à partager les dépenses à 50% avec la ville d'Ottawa. Notre part au budget 2022 est de 800 000 $, compte G/L compte N-4000-8075-7500.

Recommandation

«Le Conseil accepte la recommandation présentée par le directeur des Travaux publics dans son rapport TP-11-2022 et que la soumission pour fournir et délivrer matériaux pour la construction du ponceau double soit accordée à Armtec Inc. pour la somme globale de 644 123,70$ taxe incluse suivant les spécifications au contrat Road-05-2022».

RAPPORT DU SERVICE DES FINANCES

Numéro du rapport : F-10-2022

Sujet **:** Changements Règlement 87-2018

Préparé par **:** Nadia Knebel, Trésorière

Révisé par : Josée Brizard, Directrice générale/Greffière

Date**:** le 4 avril 2022

CONTEXTE:

Le règlement 87-2018 a été mi a jour pour refléter la hausses de certains frais et charges. Les items ayant un changement proposé sont ci-dessous.

	RÈGLEMENT 87-2018	CHANGEMENT PROPOSÉ
Administration		
Affidavits, commissaire à l'assermentation	10,00 $	15,00 $
~~Enregistrement des naissances~~	~~15,00 $~~	~~0 $~~
~~Permis d'enterrement~~	~~15,00 $~~	~~0 $~~
Licence de mariage	135,00 $	140,00 $
Autres municipalités frais d'administration		
Projets d'infrastructures avec main d'œuvre partagée, équipement et gérance	10 %	2 %
Projets d'infrastructure sans partage gérance, partage de main d'œuvre et équipement	10 %	5 %
Projets d'infrastructure sans partage gérance, de main d'œuvre ou équipement	10 %	10 %
Contrôle des animaux, fourrières et élimination		
(Règlement 31-2021)*		
~~Médailles de chien, pan année~~	~~20 $~~	~~0 $~~
Permis de chenil / ***élevage de pur race, par permis***	100,00 $	100,00 $
Fourrière ***& ramassage, par chien***	50,00 $	50,00 $
Élimination ***d'animaux***	95,00 $	95,00 $
~~Maintenance quotidienne~~ ***Frais journalier de fourrière, par chien***	15,00 $	30,00 $
Planification et zonage		
Somme fixe aux fins de parc pour demande d'autorisation	900,00 $	1 750,00 $
Demande d'autorisation	600,00 $	700.00 $
Inspection sur place pour les ententes de plan de site, par visite	50,00 $	75,00 $
Conformité de zonage	30,00 $	40,00$
Travaux publics		
Poteau d'adresse 9-1-1	100,00 $	135,00 $
Permis d'entrée, par demande, non remboursable	75,00 $	125,00 $
Permis coupe de route et/ou de fossé, par demande, non remboursable plus dépôt selon le Règlement 48-2006*	75,00 $	125,00 $

	RÈGLEMENT 87-2018	CHANGEMENT PROPOSÉ
Environnement		
Collants pour les sacs de d'ordures, par étiquette (Règlement 131-2021)*	1,00 $	1,00 $
Frais de dépotoir	Règl 4-2015*	Règl 131-2021*
Recréation		
Publicité - panneaux à l'aréna St-Isidore	142,86 $ + TVH	Selon la politique en vigueur
Publicité - panneaux à la patinoire St-Albert	100,00 $ + TVH	Selon la politique en vigueur
Location de salle pour les clubs d'âge d'or	Selon l'entente	Selon la politique en vigueur
Eau & Égouts		
Compteur d'eau (***Règlement 53-2021***)* ~~(Règlement 117-2016)~~	400,00 $	450,00 $

RECOMMANDATION

Il est recommandé que le conseil approuve le règlement 60-2022 avec les changements proposés.

Nadia Knebel, CPA, CA
Trésorière

CORPORATION DE LA MUNICIPALITÉ DE LA NATION
CORPORATION OF THE NATION MUNICIPALITY

Type: Regular
Date: 7/23/2018
Résolution No.: 425-2018

Proposée par/Moved by: Marie-Noëlle Lanthier ☐ Marcel Legault ☑ Marc Laflèche ☐ Francis Brière ☐

Appuyée par/Seconded by: Marie-Noëlle Lanthier ☐ Marcel Legault ☐ Marc Laflèche ☐ Francis Brière ☑

ADOPTION DU RÈGLEMENT 87-2018

Qu'il soit résolu que le règlement N° 87-2018, pour imposer des droits et redevances pour les services municipaux et les activités fournis pour le compte de la municipalité, soit lu et adopté en 1re, 2e et 3e lecture.

ADOPTION OF BY-LAW 87-2018

Be it resolved that By-law no. 87-2018, for imposing fees and charges for municipal services and activities provided, be read and adopted in 1st, 2nd and 3rd reading.

Recorded Vote/Vote Enregistré	Yea	Nay
Francois St. Amour	⌗	⌗
Marie-Noëlle Lanthier	⌗	⌗
Marcel Legault	⌗	⌗
Marc Laflèche	⌗	⌗
Francis Brière	⌗	⌗

Cette résolution est:
This resolution is:
Adoptée/Carried ⌗
Rejetée/Defeated: ⌗
Modifiée/Amended: ⌗

DÉCLARATION D'INTÉRÊT / DISCLOSURE OF INTEREST

Nom / Name: _____, _____ a (ont) déclaré ses (leur) intérêts, ☐ laissé son (leur) siège(s) et ☐ quitté la salle du Conseil./Disclosed his (her, their) interest, ☐ vacated his (her, their) seat(s) and ☐ left Council chambers.

Greffière
Clerk

CORPORATION OF THE NATION MUNICIPALITY

BY-LAW NO. 87-2018

BEING a By-Law for imposing fees and charges for municipal services and activities provided or done by or on the municipality's behalf.

WHEREAS, Part XII, Section 391 (1) of the Municipal Act, 2001 as amended, provides for municipalities to pass by-laws imposing fees and charges on any class of persons,

a) for services or activities provided or done by or on its behalf;
b) for costs payable by it for services or activities provided by or done by or on behalf of any other municipality or local board;
c) for the use of property including property under its control.

AND WHEREAS, Section 69, (1), (2), (3) of the Planning Act, R.S.O. 1990 as amended, provides for municipalities to establish a tariff of fees for the processing of applications made in respect of planning matters.

AND WHEREAS, Section 42(1) of the Planning Act, R.S.O. 1990 as amended states that as a condition of development or redevelopment of land, the council of a local municipality may, by by-law applicable to the whole municipality or to any defined area or areas thereof, require that land in an amount not exceeding, in the case of land proposed for development or redevelopment for commercial or industrial purposes, 2 per cent and in all other cases 5 per cent of the land be conveyed to the municipality for park or other public recreational purposes.

THEREFORE, the Council of the Corporation of The Nation Municipality enacts as follows:

1) Definitions

1.1 **"By-Law"** includes a resolution for the purpose of a local board.

1.2 **"Local Board"** includes any prescribed body performing a public function and a school board but, for the purpose of passing by-laws imposing fees and charges under Part XII of the Municipal Act, 2001, does not include a school board or hospital board.

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2) That fees and charges be imposed for certain services and activities as shown in the attached Schedule "A" attached to and forming part of this By-Law.

3) The fees and charges shall be invoiced to the person and shall be payable within 30 days of the date of the invoice. Interest at the rate of 1.25% per month shall be charged after the due date. The fees and charges imposed by the municipality on a person constitute a debt of the person to the municipality.

4) 4.1 The Treasurer is empowered to add any overdue fees and charges imposed by the municipality to the tax roll for any real property of the person responsible for paying the fees and charges and these shall be collected in like manner as municipal taxes.

4.2 In the case of fees and charges imposed for the supply of a public utility, the overdue amount shall be added to the tax roll for the property to which the public utility was supplied.

4.3 The Treasurer is empowered to impose fees and charges for capital costs related to sewage and water services or activities on persons not receiving an immediate benefit from the services or activities but who will receive a benefit at some point in time.

5) This By-Law repeals By-Laws No. 1-2012, 52-2013, 57-2014, 108-2016 and comes into force on the day of its passing.

READ A FIRST, SECOND AND THIRD TIME AND PASSED IN OPEN COUNCIL THIS 23RD DAY OF JULY, 2018.

Francois St. Amour, Mayor

Josée Brizard, Clerk

SEAL

By-Law 87-2018 Annexe « A »

DEPARTMENT /DÉPARTEMENT	SERVICE	AMOUNT OF FEE/FRAIS
Administration	Affidavits, Commissioner for takings oaths Affidavits, commissaire à l'assermentation	$10.00
	Birth Registration Enregistrement des naissances	$15.00
	Burial permit Permis d'enterrement	$15.00
	Change/cancel postdated chèque on file Changement ou annulation d'un chèque postdate Withdraw hold payment of file Retirer un chèque postdaté ou de placer un chèque en attente	$5.00
	Fax Transmittal Transmission de fax	$2.00
	Freedom of Information access to record request Demande de document sous la liberté d'accès à l'information	5 $ par demande aussi le règlement 823 sur le MFIPPA spécifie 7.50 $ par 15 minutes pour le temps de recherche
	Map of the Municipality Carte de la municipalité	As Per Cost +10 % Admin
	Marriage license Permis de mariage	135.00 $ By-Law / Reglement 180-2016 *
	Municipal Tax Sale Fee Vente d'impôt municipal	By-Law / Reglement 103-2015 *
	NSF cheque Chèque <<fonds insuffisant>>	$20.00
	Photocopies colour Photocopies en couleur	$ 0.25/sheet/feuille B+W /N+B (8 1/2 X 11 - X 14) $ 0.35/sheet/par feuille color/couleur (8 1/2 X 11 - X 14) $ 0.50/sheet/par feuille (11 X 17)
	Records Search Recherche de dossiers	30.00 $ per hour/par heure
	Registered mail Le courrier recommandé	20.00 $ per/par envoie
	Rental of Council Chambers Location de la chambre du Conseil	As per Small hall recreation policy
	Reprint/Copy of Tax/Utility bill receipt etc Copie d'un reçu d'impôt ou des services publics etc	$15.00
	Tax certificate Certificat d'impôt	$60.00
	Various Services Invoices Factures de services divers	10% Administration fee based on total cost of service before taxe Frais d'administration de 10 % sur le coût de base du service avant la taxe
Building Construction	Building compliance Conformité du bâtiment	$85.00
	Building permits (Fees) Permis de construction (Frais)	By -Law/ Règlement 87-2012 *
	Outdoor wood burning appliance Poêle à bois extérieur	By -Law/ Règlement 37-2004 *
	Swimming pools & enclosures Piscines et enclos	By -Law/ Règlement 80-2005 *
Animal Control Impound and Disposal Contrôle des animaux fourrières et élimination	Dog tags Médailles de chien	Dog tag/ Médaille de chien 20 $ per year By-Law / Règlement 14-2018 *
	Kennel license Permis de chenil	Kennel / Permit de chenil 100 $ By-Law / Règlement 14-2018 *
	Impound Fourrière	Impound / Fourrière 50 $ By-Law / Règlement 135-2015 *
	Disposal Élimination	Disposal / Élimination 95 $ By-Law / Règlement 139-2015 *
	Daily maintenance Maintenance quotidienne	Daily maintenance/ Maintenance quotidienne 15 $/day By-Law / Règlement 139-2015 *

By-Law 87-2018 Annexe « A »

DEPARTMENT /DÉPARTEMENT	SERVICE	AMOUNT OF FEE/FRAIS
By-Law Enforcement **Département des règlements**	Business Licenses Permis d'entreprise	By-Law /Règlement 50-2005 *
	Fences Clôtures	By-Law / Règlement 45-2014 *
	Fire permits, fire call charges Permis de feu et frais d'appel d'incendie	By-Law / Règlement 84-2004 *
	Lodging Houses Maisons d'hébergement	By-Law / Règlement 31-2004 *
	Lottery Licenses Permis de loterie	By-Law / Règlement 50-2002 *
	Property standards compliance report Rapport de conformité aux normes de propriété	By-Law / Règlement 133-1998 *
	Property standard services charges Frais de service des normes foncières	By-Law / Règlement 133-1998 *
	Refreshment Vehicles & Transient Traders Véhicules de rafraîchissement et commerçants itinérants	By-Law / Règlement 89-2010 *
	Signs Enseignes	By-Law / Règlement 22-2018 *
Drainage	Tile Drainage Inspections Inspections de drainage souterrain	$100.00
Fenceviewers **Arbitres de clôtures**	Fenceviewers Arbitres de clôtures	$100.00 per fenceviewer per visit + mileage 100,00 $ par visite d'arbitre de clôture plus le kilométrage
Fire **Incendie**	Fire confirmation report Rapport de confirmation d'incendie	By-Law / Règlement 148-2015 *
	Fire Hydrant / Borne fontaine	By-Law / Règlement 86-2018 *
Planning and Zoning **Planification et zonage**	Cash in Lieu of Parkland Flat fee for consent application Somme fixe aux fins de parc pour demande d'autorisation	$900.00
	Commercial/Industrial Site Plan Control Contrôle du Plan du site commercial ou industriel	Cash in lieu of parkland 2% of land value or convey 2% of gross land area Argent comptant au lieu d'un parc, 2 % de valeur des terres ou de transmettre 2 % de la superficie brute
	Consent Applications Demande d'autorisation	$600.00
	Development charge Frais de développement	By-Law / Règlement 93-2015 *
	Minor variance/permission Dérogation mineure/permission	$500.00
	Official Plan Amendment Modification du plan officiel	$1,500.00
	Onsite inspection for site plan agreements Inspection sur place pour les ententes de plan du site	50.00 $ per visit/par visite
	Part Lot Control Contrôle des partis de lots	200.00 $ per application maximum of 3 lots/par demande avec un maximum de 3 lots
	Residential Site Plan Control Contrôle du Plan du site résidentiel	Cash in lieu of parkland 5 % or land value or convey 5 % of gross land area Argent comptant au lieu d'un parc 5 % de valeur des terres ou de transmettre 5 % de la superficie brute
	Residential Sudivision Lotissement résidentiel	Cash in lieu of parkland 5 % or land value or convey 5 % of gross land area Argent comptant au lieu d'un parc 5 % de valeur des terres ou de transmettre 5 % de la superficie brute
	Road Closure Application Demande de fermeture de chemins	$5,000.00 with unused balance refundable and invoicing balance if over-spent 5,000.00 $ avec solde inutilité remboursable et facturation du montant excédant de dépense
	Site Plan Agreement Entente du plan du site	$500.00 non-refundable administration fee + deposit of $2000.00 with unused balance refundable 500,00 $ frais d'administration non remboursable plus de dépôt de 2000.00 $ avec solde inutilisé remboursable

By-Law 87-2018 Annexe « A »

DEPARTMENT /DÉPARTEMENT	SERVICE	AMOUNT OF FEE/FRAIS
	Subdivision Agreement Entente de lotissement	$2,500.00
	Zoning Compliance Conformité de zonage	$30.00
	Zoning By-Law Amendement Modification du règlement de zonage	$1,500.00
Public Works **Travaux publics**	9-1-1 Address Posts Poteau d'adresse 9-1-1	$100.00
	Entranceway permit Permis d'entrée	$75.00 non-refundable application fee/par demande non remboursable
	Road Cut, Ditch Cut Permit Permis coupe de route et/ou de fossé	$75.00 non-refundable application fee + security deposit per By-Law 48-2006 / par demande non remboursable plus dépôt selon le règlement 48-2006*
Environment **Environnement**	Garbage Bag Tags Collants pour les sacs de poubelles	1 $ per tag/ 1 $ par étiquette By-Law / Règlement 4-2015 *
	Garbage and recycling pick-up rates Frais de collecte poubelles et recyclage	Per yearly assessment by-Law selon le règlement d'évaluation annuel
	Tipping Fees Frais de dépotoir	By-Law / Règlement 4-2015 *
Recréation	Advertising Billboard St. Isidore Arena & St. Albert Rink (4 x 8) Publicité sur les panneaux à l'aréna St-Isidore et la patinoire à St-Albert (4x8)	St Isidore Arena- $142.86 + HST St Albert Rink- $100.00 + HST Aréna St-Isidore 142,86 $ +TVH Patinoire à St-Albert 100,00 $+TVH Policy
	Hall Rental Location de salle	Policy
	Ice Rental Location de glace à l'aréna	Amended policy
	Senior Citizens Hall Lease Location de salle pour les clubs d'âge d'or	Per lease agreement Selon l'entente
Water and Sewer **Eaux et égouts**	Connection Permit (Application two at once) Permis de connexion (demandes deux à fois)	$100.00 per service / 100.00$ par service $150.00 for two service / 150.00$ pour deux service By-Law / Règlement 49-2002 *
	Limoges Water Usage Usage d'eau Limoges	According to yearly assessment By-Law Selon l'évaluation dans le règlement annuel
	St Isidore Water and Sewers Usage Usage d'eau et d'égouts St Isidore	According to yearly assessment By-Law Selon l'évaluation dans le règlement annuel
	St Albert Sewer Usage Usage égout St-Albert Fournier Sewer Usage Usage égout Fournier St-Bernadin Sewer Usage Usage égout St- Bernadin Limoges Sewer Usage égout Limoges	According to yearly assessment By-Law Selon l'évaluation dans le règlement annuel
	Water Final Meter Reading Lecture finale du compteur d'eau	45.00 $ By-Law / Règlement 117-2016 *
Water **Eaux**	Disconnecting charge Charge de déconnexion	50.00 $ By-Law / Règlement 117-2016 *
	Reconnecting charge Charge de reconnexion	75.00 $ By-Law / Règlement 117-2016 *
	Water Meter Compteur d'eau	400.00 $ By-Law 117-2016 *

* As it may be amended from time to time

CORPORATION OF THE NATION MUNICIPALITY

BY-LAW NO. 60-2022

BEING a By-Law for imposing fees and charges for municipal services and activities provided or done by or on the municipality's behalf.

WHEREAS, Part XII, Section 391 (1) of the Municipal Act, 2001 as amended, provides for municipalities to pass by-laws imposing fees and charges on any class of persons,

a) for services or activities provided or done by or on its behalf;
b) for costs payable by it for services or activities provided by or done by or on behalf of any other municipality or local board;
c) for the use of property including property under its control.

AND WHEREAS, Section 391 (2) of said Act provides that a fee or charge imposed under subsection (1) for capital costs related to sewage or water services or activities may be imposed on persons not receiving an immediate benefit from the services or activities but who will receive a benefit at some later point in time.

AND WHEREAS, Section 69, (1), (2), (3) of the Planning Act, R.S.O. 1990 as amended, provides for municipalities to establish a tariff of fees for the processing of applications made in respect of planning matters.

AND WHEREAS, Section 42(1) of the Planning Act, R.S.O. 1990 as amended states that as a condition of development or redevelopment of land, the council of a local municipality may, by by-law applicable to the whole municipality or to any defined area or areas thereof, require that land in an amount not exceeding, in the case of land proposed for development or redevelopment for commercial or industrial purposes, 2 per cent and in all other cases 5 per cent of the land be conveyed to the municipality for park or other public recreational purposes.

THEREFORE, the Council of the Corporation of The Nation Municipality enacts as follows:

1) Definitions

1.1 **"By-Law"** includes a resolution for the purpose of a local board.

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4.3 The Treasurer is empowered to impose fees and charges for capital costs related to sewage and water services or activities on persons not receiving an immediate benefit from the services or activities but who will receive a benefit at some point in time.

5) That By-Law No. 87-2018 be hereby rescinded

6) That this by-law shall come into force on the day of its passing.

READ A FIRST, SECOND AND THIRD TIME AND PASSED IN OPEN COUNCIL THIS 4th DAY OF APRIL, 2022.

_____ _____

Francois St. Amour, Mayor **Josée Brizard, Clerk**

SEAL

By-Law 60-2022 - Annexe “A”

Administration

Affidavits, commissaire à l’assermentation	15,00 $
Changement ou annulation d’un chèque postdaté, retirer un chèque postdaté ou placer un chèque en attente	5,00 $
Transmission de télécopie	2,00 $
Demande de document sous la liberté d’accès à l’information, par demande	5,00 $
Aussi le règlement sur le MFIPPA spécifie pour le temps de recherche, par 15 minutes	7,50 $
Carte de la municipalité	Coût + 10 % administration
Licence de mariage	140,00 $
Vente d’impôt municipal (Règlement 103-2013)*	
Chèque (insuffisance de fonds)	20,00 $
Photocopie, par page, noir & blanc (8 ½ x 11- x 14)	0,25 $
Photocopie, par page, couleur (8 ½ x 11 – X 14)	0,35 $
Photocopie, par page (11 x 17)	0,50 $
Recherche de dossiers, par heure	30,00 $
Courrier recommandé, par envoi	20,00 $
Location de la chambre du Conseil – selon la politique de location de petites salles de la récréation	
Réimpression / copie d’un reçu d’impôt ou des services publics, etc	15,00$
Certificat d’impôt	60,00$
Factures de services divers- frais d’administration de 10% sur le coût de base du service avant la taxe	

Autres municipalités frais d’administration

Projets d’infrastructures avec main d’œuvre partagée, équipement et gérance	2%
Projets d’infrastructure sans partage gérance, partage de main d’œuvre et équipement	5%
Projets d’infrastructure sans partage gérance, de main d’œuvre ou équipement	10%

Construction

Certificat de conformité du bâtiment	85,00$
Permis de construction (Frais)	Règlement 87-2012*
Poêle à bois extérieur	Règlement 37-2004*
Piscines et enclos	Règlement 80-2005*

Contrôle des animaux, fourrières et élimination

(Règlement 31-2021)*

Permis de chenil / élevage de pur race, par permis	100,00$
Fourrière & ramassage, par chien	50,00$

Élimination d’animaux	95,00$
Frais journalier de fourrière, par chien	30,00$

Département des règlements

Permis d’entreprises	Règlement 50-2005*
Clôtures	Règlement 45-2014*
Permis de feu et frais d’appel d’incendie	Règlement 84-2004*
Maison d’hébergement	Règlement 31-2004*
Permis de loterie	Règlement 50-2002*
Rapport de conformité aux normes de propriété	Règlement 133-1998*
Frais de service des normes foncières	Règlement 133-1998*
Véhicules de rafraîchissement et commerçants itinérants	Règlement 89-2010*
Enseignes	Règlement 22-2018*

Drainage

Inspections de drainage souterrain	100,00$

Arbitres de clôtures

Arbitres de clôtures – par visite d’arbitre plus le kilométrage	100,00$

Incendie

Rapport de confirmation d’incendie	Règlement 148-2015*
Borne fontaine	Règlement 86-2018*

Planification et zonage

Somme fixe aux fins de parc pour demande d’autorisation	1 750,00$
Contrôle du plan du site commercial ou industriel, argent comptant au lieu d’un parc, 2% de valeur des terres ou de transmettre 2% de la superficie brute	
Contrôle du Plan du site résidentiel, argent comptant au lieu d’un parc, 5% de valeur des terres ou de transmettre 5% de la superficie brute	
Lotissement résidentiel, argent comptant au lieu d’un parc, 5% de valeur des terres ou de transmettre 5% de la superficie brute	
Demande d’autorisation	700.00$
Frais de développement	Règlement 93-2015*
Dérogation mineure/permission	500,00$
Modification du plan officiel	1 500,00$
Inspection sur place pour les ententes de plan de site, par visite	75,00$
Contrôle des partis de lots - par demande avec un maximum de 3 lots	200,00$
Demande de fermeture de chemins avec solde inutilisé remboursable et facturation du montant excédent de dépense	5 000,00$
Entente du plan de site, frais d’administration non remboursable 500,00$ plus un dépôt de 2 000,00 avec solde inutilisé remboursable	
Entente de lotissement	2 500,00$
Conformité de zonage	40,00$

Modification du règlement de zonage	1 500,00$

Travaux publics

Poteau d'adresse 9-1-1	135,00$
Permis d'entrée, par demande, non remboursable	125,00$
Permis coupe de route et/ou de fossé, par demande, non remboursable plus dépôt selon le Règlement 48-2006*	125,00$

Environment

Collants pour les sacs de d'ordures, par étiquette (Règlement 131-2021)*	1,00$
Frais de collecte d'ordures et de recyclage	Règlement d'évaluation annuel
Frais de dépotoir	Règlement 131-2021*

Recréation

Publicité - panneaux à l'aréna St-Isidore	Selon la politique en vigueur
Publicité - panneaux à la patinoire St-Albert	Selon la politique en vigueur
Location de salle	Selon la politique en vigueur
Location de la glace à l'aréna	Selon la politique en vigueur
Location de salle pour les clubs d'âge d'or	Selon la politique en vigueur

Eau & Égouts

Permis de connexion (Règlement 49-2002)*

a) Par service	100,00$
b) Pour deux services sur le même cadastre	150,00$
Consommation d'eau Limoges	Selon règlement annuel en vigueur
Consommation d'eau St Isidore	Selon règlement annuel en vigueur
Utilisation des égouts Fournier, Limoges St-Albert, St-Bernardin, St-Isidore	Selon règlement annuel vigueur
Déconnexion (Règlement 53-2021)*	45,00$
Reconnexion	75,00$
Compteur d'eau (Règlement 53-2021)*	450,00$

LIMOGES LANDFILL SITE AND HOUSEHOLD HAZARDOUS WASTE DEPOT

2021 – ANNUAL OPERATIONS MONITORING REPORT

Corporation of
The Nation Municipality
958 Route 500 West
Casselman, ON, K0A 1M0

Date submitted: March, 2022

Prepared by:
Part A – The Nation Municipality
Part B – EXP Services Inc.

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EXECUTIVE SUMMARY

The Nation Municipality owns and operates the Limoges landfill site on Lot 23, Concession 3, within the former Township of Cambridge in the United Counties of Prescott and Russell (**Figure 1, 1A**). During the year 2000, the Township submitted a revised operations plan, a groundwater and surface water monitoring program, and a contingency plan to the Ministry to amend their Certificate of Approval which was approved in May 2001 when the municipality was issued a revised Environmental Compliance Approval (Certificate of Approval # A471104). In 2016, the municipality sought the authority to build a Household Hazardous Waste depot at the Limoges landfill site in order to enhance services to its residents. An amended Environmental Compliance Approval was issued in March 26, 2018, for the operation of a Household Hazardous Waste depot which opened in June 2018.

The landfill site and HHW depot provides disposal services to The Nation Municipality residents only and accepts residential, municipal and industrial non-hazardous solid dry waste at the landfill site and residential Household Hazardous Waste at the depot. The landfill site also started to promote a recycling program in 2015 which contains but is not limited to scrap metal, white goods, tires, wood waste (branches), yard waste, paper, cardboard, Styrofoam, recyclable plastics, Waste of Electronics and Electrical Equipment (WEEE), clothing and household batteries. This program was further enhanced in 2016 with the addition of farm plastic, in 2017 with a proper WEEE container from Green for Life (GFL) through Ontario Electronic Stewardship (OES) and in 2018 with the opening of a Household Hazardous Waste Depot.

This 2021 annual report was prepared to satisfy condition 7.6 of the amended Environmental Compliance Approval (ECA) (formally Certificate of Approval) No A471104, dated March 26, 2018, for a waste disposal site and HHW depot. Condition 7.6 specifies the information that must be presented in the annual report and requires the report to be submitted to the Ministry of Environment, Conservation and Parks (MECP) District Manager by March 31st of each year for the previous year's operation.

During 2021, a volume of **3518 m3** of waste and cover material was deposited and buried at the site leaving a remaining capacity of approximately **68 759 m3**. The STANTEC Operation Development and Closure report (30 April 2000) documents the development of the landfill over an area of 5 hectares (3 ha. for future waste and 2 ha. for existing waste) within a total site area of 16.68 hectares. **Figure 1 and 2** shows the development of the remaining capacity. During 2021, the municipality continued placing waste in Phase 2. The west side slope of Phase 1 still requires some final cover placement which will be addressed once equipment is in place at the end of Row 1, Lift 2, Phase 2 at the end of 2022.

The majority of cover material is being excavated from the site itself while preparations are being made for Lift 2, Phase 2. In addition, all excavation waste material from the Public Works department and local contractors which consist of sand, earth, pebbles, rocks, etc. is being used as cover material enabling the landfill to be self-sufficient for the reporting year. We started our plan to bring soil to our site through an external contractor who excavated a commercial land. We had the soil analyzed to be within the standards of our ECA and follow the regulations of the Solid Waste Associate regards cover materials. We need to continue our plan to import more cover material for future use in the upcoming years.

The Limoges Landfill Site has seen an average use in 2021 as house demolitions have been diverted to the South Plantagenet landfill site, since 2016, in order to preserve the life of the

Limoges site due to the limited amount of space left. That initiative to enhance the life of the landfill site since the abolition of house demolition, the remaining years is now estimated to be **20 years** ending in **2042**. As the agreement with Green for Life (GFL) in Moose Creek has been extended till 2021 the landfill should not revert to being a wet waste site in the future. If this option is entertained, a new study would be required to verify the feasibility and viability of such a project.

In order to meet closure and post-closure financial commitments, it has been calculated that the Limoges Landfill site would only have an estimated lifetime of **10 years** ending in **2032** if curbside waste was sent proportionally to all municipal landfill sites. If the municipality reverts to this waste management system in lieu of using the GFL Landfill site, it is strongly recommended that all curbside waste from the former Township of Cambridge be sent to the South Plantagenet Landfill site, which has an appreciable amount of space available in lieu of the Limoges Landfill site.

The municipality's blue box recycling program, started in 1995, successfully diverted **1010.30** tonnes of material from disposal during 2021 (**Table 6**). A new recycling program was started at the Limoges landfill site on January 1st 2015, enhanced in 2016 with the inclusion of farm plastics. The recycling of farm plastic cease in 2020 due of lack of quantity and travel cost. We have effectively diverted a volume of **1359.72** m3 (approx. weight **439.68 tonnes**) (**Table 8**) towards recycling facilities at no cost to the municipality. Diversion programs at the landfill form an important part of the municipality's waste diversion strategy which was continued and augmented in 2021 with the Household Hazardous Waste depot which effectively diverted **21.28 tonnes**. Initiatives outlined in the municipality's Waste Recycling Strategy (which will be reviewed when the provincial recycling strategy will be in place in 2023-2025) will be further investigated to increase the diversion rate. The municipality's segregation of products at the landfills and its blue box recycling program provided a diversion of **25%** by weight and **42%** by volume in 2021 which is below the provincial target of 60% by weight but on average with the previous years.

Construction, demolition and commercial waste arriving in rental boxes and bins have been banned from the landfill in 2016 and this practice was continued in 2021. Also, major residential destruction has been diverted to the South Plantagenet landfill site in order to extend the life of the Limoges landfill site. Small contractor's C&D waste are still being accepted at the site in a limited fashion. All these initiatives have thus diverted a substantial amount of waste and greatly improved the service life expectancy of the landfill site **by a factor of 100%** from the estimates given in 2014.

1.0 Introduction

The Nation Municipality was formed through the amalgamation of four surrounding municipalities in January 1998. As part of that process, The Nation Municipality (**Figure 1, 1A**) assumed ownership of the Limoges landfill located on Lot 29 Concession 3 of the former Township of Cambridge, United Counties of Prescott and Russell.

The landfill site and HHW depot are operated under the amended Environmental Compliance Approval (formally Certificate of Approval) No. A471104 and have a total site area of 16.68 hectares and an approved footprint of 5 hectares. The landfill site provides disposal services to the former Township of Cambridge residents only and accepts residential, municipal and industrial non-hazardous solid dry waste at the landfill site and residential HHW at the depot. The landfill site also started to promote a recycling program in 2015 which contains but is not limited to scrap metal, white goods, tires, wood waste (branches), yard waste, paper, cardboard, Styrofoam, recyclable plastics, Waste of Electronics and Electrical Equipment (WEEE), clothing and household batteries. This was further enhanced with the addition of farm plastics in 2016 but we cease the operations in 2020 due to the cost and the fact that the quantity collected was not sufficient for the sorting center. In March 2018, approval was given by the ministry to construct a Household Hazardous Waste depot on the landfill site which was operational in June of the same year.

The site is located in a rural area and is surrounded by bush. There are several residences along the south side of Concession 3 road that are within 500 metres of the waste footprint. The closest residence is approximately 150 metres directly south of the waste footprint. The second closest residence is located to the west of the footprint at a distance of approximately 200 metres.

The landfill site area is generally 418 metre wide E-W by 398 metres long N-S, as shown in **Figure 2**. Most of the site is situated on flat land with less than a 1 metre difference in elevation between north and south ends (elev. 70 – 71 masl), except for the east side where an escarpment (8 metres high) forms the west bank of the South Indian Creek floodplain. South Indian Creek flows northward through the site (at elevation of 62 m) on an alignment that parallels the east property limit but is offset some 50 to 100 metres within the property limit

Surface drainage within the landfill is internal due to permeable surficial material which consists of fine grey sand with sorted non-calcareous fine sand and parent material. The upper layer of sand and silt is approximately 6 to 8 metres thick and overlies roughly 40 to 50 metres of stiff grey silty clay. The top of the silty clay is between elevation 61 and 62 metres (approximately the same as the creek bottom elevation).

2.0 Purpose of Annual Report

This annual report was prepared to satisfy Condition 7.6 of the amended Environmental Compliance Approval (ECA) (formally Certificate of Approval) No. A471104, dated March 26, 2018 for a waste disposal site. Condition 7.7 specifies the information that must be presented in the annual report and requires the report to be submitted to the Ministry of Environment, Conservation and Parks (MECP) District Manager by March 31 of each year for the previous year's operations.

3.0 Summary of site conditions

3.1 Guidelines for Operations (as per ECA)

The amended Environmental Compliance Approval (Certificate of Approval) No A471104 dated March 26, 2018 for the landfill site allows for the use and operation of a 16.68 hectares landfill with an approved waste footprint of 5.0 hectares. The Environmental Compliance Approval (Certificate of Approval) contains 7 sections with a total of 68 conditions which are reproduced in **Appendix B**.

Notice 1 of the Environmental Compliance Approval (Certificate of Approval) was issued on October 3 2005. The Notice revoked condition 4.5b, while Conditions 3.5, 3.7 and 4.13 were revoked and replaced (from former ECA conditions). **Appendix B**

Notice 2 of the Environmental Compliance Approval (Certificate of Approval) was issued on May 3, 2007. The Notice revoked and replaced Condition 4.13 (from former ECA conditions). **Appendix B**

Notice 3 of the Environmental Compliance Approval (Certificate of Approval) was issued on October 16, 2008. The Notice added Condition 3.8 (from former ECA conditions). **Appendix B**

Notice 4 of the Environmental Compliance Approval (Certificate of Approval) was requested to accommodate the construction of a new sewage pumping station in the south east corner of the landfill property. The pumping station was constructed during 2009. A chain link fence provides security and restricts access to the pumping station. Operations at the pumping station do not interfere with traffic flow to the landfill. **Appendix B**

An amended Environmental Compliance Approval (Certificate of Approval) was requested and issued March 26, 2018 in order to construct a Household Hazardous Waste depot near the entrance of the landfill site. The depot construction started in 2017 and was operational in June 2018. **Appendix B**

The conditions that can have an impact on the physical operations at the site are reviewed below to ensure that the site operates in compliances with the Environmental Compliance Approval. All other conditions which are considered administrative in nature were not reviewed and are reproduced in Appendix B for reference purposes. **Appendix B**

Part 2 – General Operations

Approved Service Area

Condition 2.1: The service area from which waste may be received shall be limited to generators within the Corporation of The Nation Municipality

Discussion: The site custodians are on duty when the site is open. The site custodians request that each user provide their driver's license and state the origin of waste to ensure that waste is from within the municipality.

Signage and Security

Condition 2.2: a. The Site shall be maintained in a secure manner, so that unauthorized person cannot enter the Site, and;

b. The Owner shall maintain perimeter fencing consisting of 1.15 metre "post and wire" farm fence around the entire Site boundary, with "No Trespassing" signs posted at 30 metre intervals around the perimeter.

Discussion: Custodians locks the gate when site is closed to ensure unauthorized persons cannot enter the Site. Perimeter fencing and signage surrounds only part of the landfill site. Signage was installed at the hazardous depot and additional signage need to be replace or installed to follow our plans and we will ensure that site has proper signage by the end of 2022 and all fencing repaired by 2023.

Condition 2.3: Access to the Site shall be via Concession Road No. 3, as shown in Figure 3, Item 1 of Schedule "A". Any changes to the main Site entrance or exit shall be submitted to the District Manager for prior approval. Other service entrances may be established for access by Owner, staff of contractors, or for contingency or emergency use, provided that they are secured from entry when not in use.

Discussion: There is only one practical entrance to the Site.

Condition 2.4: During non-operating hours, the Landfill entrance and exit gates shall be locked or otherwise secured against access by unauthorized persons.

Discussion: Custodians locks the gate when the Site is closed to ensure that no authorized entry occurs. On limited occasions, municipal personnel will leave the gate open for ease of entry in order to haul multiple loads covering material with a municipal employee on site to ensure that the landfill has no unauthorized entries.

Condition 2.5: A sign shall be posted in a prominent location at the Site entrance clearly stating:

a. the Owner's name;

b. the Approval number;

c. the hours of operation for receipt and transfer of waste; and

d. 24-hour telephone number to call to reach the Owner in the event of an emergency or complaint.

Discussion: We have replaced the structure that holds the proper sign at the entrance gate and encompasses all the related information as per **photo 1** of this report.

Nuisance Control

Condition 2.6: The Owner shall operate and maintain the Site in a manner which ensures the health and safety of all persons and the protection of the environment through active prevention of any possible environmental adverse effects, including but not limited to odours, dust, litter, vectors, vermin, rodents and noise

Discussion: Custodians have appropriate training in health and safety and are also in possession of multiple provincial pesticide licences to ensure all above requirements and firm control of vermin/rodents. Custodians inspect landfill site regularly to ensure that there is no environmental adverse effects.

Condition 2.7: If at any time problems such as odours, dust, litter, noise, vectors, vermin, rodents or other nuisances are generated at the Site, the Owner shall take appropriate, immediate remedial action to eliminate the problem.

Discussion: Site is inspected every opened day to ensure that no such actions will be required.

Condition 2.8: The Owner shall take all practical steps to prevent the escape of litter from the Site. Periodic pick-up of litter at the Site along the access road in the vicinity of the Site shall be carried out as required, or every two (2) weeks at a minimum. Private property adjacent to the Site shall be inspected weekly and litter shall be collected if necessary, with permission for access from the property owner. Litter fencing shall be erected around the working are of the landfill.

Discussion: During 2021, a litter fence was not needed. Clean-up procedures are ongoing and have managed to keep the Landfill site clean and surrounding area free of litter.

Condition 2.9: If it is determined by the District Manager that noise, dust, odour, litter, traffic, vector or vermin associated with the operation of the Site must be reduced or otherwise controlled to prevent adverse impacts, the Owner shall implement reasonable contingency measure as agreed to by the Owner and the District Manager.

Discussion: During 2021, this condition did not require immediate action by the Custodians due to ongoing cleanup procedures.

Public complaints procedure

Condition 2.10: The Owner shall establish a public complaints procedure that includes:

a. Posting and maintain a copy of the Site complaints procedures at the Site office and the municipal office of the Corporation of the Nation Municipality;

b. Ensuring that all residences and commercial establishments within 500 m of the Site are informed of the complaints procedures;

c. Designating a person to receive any complaints and to respond within ten (10) working days with a written notice of action; and

d. Recording the name and address of each complainant, and the date, time and nature of the complaint.

Discussion: A complaint procedure was established in 2001. There were no complaints made by users, residents or neighbours about landfill operations in 2021.

Condition 2.11: If at any time, the Owner receives complaints regarding the operation of the Site, the Owner shall respond to these complaints according to the following procedure:

a. The Owner shall record each complaint on a formal complaint form entered in a sequentially numbered log book or an electronic file;

b. The Owner shall initiate appropriate action in accordance with the public complaints procedure required under Condition 2.10;

c. The Owner shall forward a formal reply to the complainant; and

d. The Owner shall notify the District Manager, in writing, of the complaint and the resolution within 15 business days of the complaint occurring.

Discussion: There were no complaints made by users, residents and neighbours about landfill operations in 2021.

Part 3 - Landfill design and development

Condition 3.1: Any significant design optimization or modification from approved designs for the Landfill not otherwise requiring an amendment to this Approval shall be submitted to the Director for approval at least 60 days prior to its implementation along with an explanation of the reasons.

Discussion: There were no changes or modification to the approved designs in 2021

Condition 3.2: a. Waste may only be disposed of within the Limit of Fill as described in Figure 6, Item 1 of Schedule “A”; and

b. The boundaries of the Limit of Fill shall be marked using proper surveying techniques and maintained so as to be visible throughout the year.

Discussion: A survey was conducted in 2018 by municipal personnel to ensure that all stakes were properly aligned and visible throughout the year. All waste was disposed within the Limit of Fill. We have replaced some stakes on the garbage limits on the South side due to excavating work around the waste contour. A new survey was also conducted in 2020 by municipal personnel for the construction of a path that goes around the waste line.

Condition 3.3: The maximum amount of waste, daily cover, intermediate cover and final cover placed within the Limit of Fill shall not exceed the final contours shown in Figure 6, Item 1 of Schedule "A".

Discussion: Appropriate cover was used in 2021 in order to cover all waste. All waste was placed within the final contours of the Landfill.

Condition 3.4: Final cover shall be applied progressively, as weather conditions permit, as each part of the Landfill reaches its final grades. The design of the final cover shall comply with the specifications contained in Item 1 of Schedule "A". Vegetation of completed final cover using drought-resistant, low-nutrient requirement grass and legume blends which regenerate annually shall occur within one month of its placement and final grading, or as soon as weather permits.

Discussion: During 2004, the municipality shaped the historical waste that was deposited outside of the expansion foot print as shown in Figure 6 and applied final cover. Final cover will be ready to be applied along the West and South side slopes of Lift 1 Phase 2 in 2021 but was not completed due to shortage of time and equipment.

Condition: 3.5: The Buffer around areas where new waste placement is taking place shall not be less than 75 meters. Along the northern boundary where waste has already been placed, a 25 meter buffer shall be maintained.

Discussion: During 2004, the municipality reshaped the waste placed outside the footprint to maintain a 30 m buffer along the north side and applied final cover. The buffer around the waste remains as shown in **Figure 2.**

Condition 3.6: The Buffer shall not be used for waste disposal but may be used for receiving and recording waste arrivals, monitoring surface water management and the operation of other approved ancillary waste management facilities, all in accordance with Schedule "A". All parts of the Buffer, other than roadways, parking areas and structures, shall be maintained with a healthy vegetative cover or other appropriate surface treatment which will minimize erosion.

Discussion: During 2021, cover material was stockpiled on some part of the buffer areas for future use.

Condition 3.7: The sanitary sewage pumping station within the Buffer, near the property's south east corner, shall be operated in accordance with its OWRA approval and shall not interfere with the Landfill operations.

Discussion: The sanitary sewage pumping station was constructed in 2009 and operates as per its own ECA. No complications or interferences with the landfill operations have been reported.

Part 4 – Landfill Operations

Hours of operation

Conditions 4.1: a. The Landfill operating hours shall be 8:30 a.m. to 5:00 p.m. Monday to Saturday. The Landfill shall be closed on Sundays and statutory holidays.

b. The Owner may provide more limited hours of operation provided that they are correctly posted at the Site gate and that suitable public notice is given of any changes.

c. During days when the Landfill is open, activity other than waste disposal may occur up to two hours prior to opening and/or up to two hours after closing. Equipment maintenance and administrative functions may occur at any time.

d. Upon reasonable notification of the District Manager, contingency actions may proceed outside of the normal hours of operation.

e. Emergency response may occur at any time, as required.

Discussion: During 2021, the operating hours for the Landfill were 08:00 to 12:00, Thursdays, Fridays and Saturdays.

Condition: 4.2: No waste shall be received for disposal at the Landfill except during the operating hours and under the supervision of the attendant(s).

Discussion: The site custodians supervise the activities at the landfill during operating hours. Otherwise the gate at the site entrance is locked to prevent access to the site during non-operating hours or is supervised to ensure no unauthorized entry.

Approved Waste

Condition 4.3: Only solid non-hazardous waste shall be disposed of in the Landfill.

Discussion: Part of custodians' duties is to supervise the acceptance of waste at the Landfill. Throughout the year, a strict observance of this Condition was applied which minimized entry of restricted waste.

Waste Placement and Cover

Condition 4.4: Waste shall be deposited in a manner that minimizes the area of exposed waste at the Landfill working face and shall be compacted before cover material is applied in accordance with the requirements of this Approval.

Discussion: Working face area of the Landfill site is limited in size and is strictly controlled by the Custodians.

Condition 4.5: Cover material shall be applied as follows:

a. i. Between June 1 and August 31, cover material consisting of a minimum of 0.15 m thickness of soil shall be applied once a week; and

ii. Between September 1 and May 31, cover material consisting of a minimum of 0.15 m thickness of soil shall be applied once every three weeks; and

b. The Owner shall increase the frequency of cover material application if it is determined by the District Manager or by the Owner that the frequency outlined in 4.5 a. does not provide adequate control. Alternative cover material must be approved by the Director prior to its use.

Discussion: An inspection by the MECP in the summer of 2013 found that cover thickness and application frequency was insufficient at the landfill. This was addressed and adequate cover material was verified by the MECP during a subsequent visit on August 29, 2013. Thickness of cover has been maintained in 2021 and exceeded in some areas.

Condition 4.6: In landfilling areas where waste placement is below the final approved contours and landfilling is to be suspended for one (1) month or more, an interim cover consisting of a minimum of 0.30 m thickness of soil and/or a mixture of composted leaves and wood chips and/or landfill fines shall be applied.

Discussion: Working face of Landfill site is maintained as small as possible to ensure that all waste is covered by required covering thickness as per **photo 11**.

Condition 4.7: Where existing cover material has eroded such that waste is exposed, the cover material shall be promptly replaced.

Discussion: During 2004, the waste pile was reshaped and interim cover was applied on the north, west and south sides of the 2 ha footprint. During 2009, some waste was placed along the western edge of the historical waste to fill an area where waste had settled and created a depression.

Prohibitions

Condition 4.8: The burning of waste at the Landfill is prohibited.

Discussion: The site custodians do not allow waste to be burned.

Condition 4.9: Scavenging at the Landfill is prohibited, except at the designated re-use area and under the supervision of the attendant.

Discussion: The site custodians are responsible for enforcing the rules of operations at the landfill site. A re-use area has been created and is accessed by residents under the supervision of the site custodians.

Condition 4.10: No water obtained from surface water or from a well-constructed on the Site shall be used for drinking purposes without prior approval from the District Manager. Any other water supply system that obtains water from a well or surface water source on the Site shall be clearly marked to indicate that the water is not potable.

Discussion: There are no potable water wells on the landfill property.

Training

Condition 4.11: The Owner shall ensure that all Landfill personnel receive initial and ongoing training with respect to the following:

a. the Approval and conditions attached to the Approval,

b. relevant waste management regulations and legislation;

c. environmental concerns related to the waste being handled at the Landfill;

d. occupational health and safety concerns pertaining to the waste being handled at the Landfill;

e. firefighting protocol; and

f. emergency and contingency measures for the prevention of off-site impact

Discussion: Custodians have proper qualifications regarding all conditions listed above including a Solid Waste Association of North America (SWANA) certification, relevant pesticides licences, extensive firefighting protocols, elaborate Health and Safety qualifications and experience in diverse inspection protocols.

Closure

Condition 4.12: At the earlier of two (2) years prior to the anticipated date of closure, or when the Landfill has reached 90% of its final approved capacity, the Owner shall submit a complete plan for the closure, long term maintenance, long term monitoring and after use of the Site to the Director. The plan shall be developed in consultation with the public. The plan shall include, but not be limited to, the following:

a. plans for fencing and access control;

b. details of any additional cover required;

c. details of any vegetative cover required;

d. post-closure land use plans, including any further grading, filling or landscaping and the need for any structures;

e. the need for any municipal or provincial approvals that would be required to implement the proposed closure plan and the schedule for obtaining such approvals;

f. plans for the continued maintenance, operation and monitoring of the storm water management system, and landfill gas collection/destruction system (if implemented);

g. plans for the continued monitoring of the Landfill gas, surface water, groundwater and leachate;

h. updated contingency plans to mitigate potential impacts from Landfill gas, leachate and storm water; and

i. details of post-closure ownership of the Site.

Discussion: Assuming that there are no significant changes in the service area or waste generation rates, and that curbside collection waste continues being deposited at the Green for Life landfill site in Moose Creek, we estimate that the municipality has approximately **27** years of remaining capacity at the landfill.

Condition 4.13: The Owner shall continue to be responsible for the operations, maintenance and monitoring of the Landfill until such time as the Owner can demonstrate to the Director that the leachate and gas being produced at the Landfill would not cause an exceedance of the PWQO, ODWS, RUP and/or all other relevant statutes and policies respecting groundwater, surface water and air as may be applicable at the time.

Discussion: The municipality will continue its monitoring programs with EXP Services Inc. in 2022.

Part 5 – Monitoring

Condition 5.1: The Owner shall monitor groundwater, surface water and leachate in accordance with the monitoring plan described in the report listed as Item 2, Schedule "A" of this Approval. The Owner may amend the monitoring plan from time-to-time with the prior written consent of the District Manager.

Discussion: During 2021, Nation municipal personnel conducted the groundwater and surface water monitoring programs.

Condition 5.2: All monitoring wells which form part of any monitoring program shall be properly capped, locked and protected from damage. Any groundwater monitoring wells that are damaged shall be repaired, replaced forthwith or properly abandoned in accordance with Ontario Regulation 903 – R.R.O.

1990, Wells, amended to Ontario Regulation 128/03, made under the OWRA.

Discussion: All monitoring wells have been maintained by municipal personnel in 2021. Damaged wells have been identified and are in the process of being fixed.

Condition 5.3: In the event that the results of the monitoring programs are such that an off-site exceedance of the criteria set by the RUP, the ODWS and/or the PWQO has occurred as a result of the operation of the Landfill, the Owner shall notify the District Manager as soon as reasonably possible and specify the following:

a. details of the off-site exceedance, confirmatory monitoring requirements and the potential off-site impacts to surface water and groundwater users;

b. the extent and timing of contingency measures to be implemented;

c. modifications, if any, which should be made to the monitoring program; and

d. other mitigation measures, if any, which may be necessary to reduce or prevent off-site impacts.

Discussion: During 2021, EXP Services was responsible for completing the groundwater and surface water monitoring programs and Part B of this report addresses the above requirements.

Condition 5.4: The Owner shall establish, maintain, and regularly update, a Trigger Mechanism and Contingency Plan for groundwater and surface water to provide adequate warning in order to mitigate any significant leachate impact from the Landfill.

Discussion: During 2021, EXP Services Inc. conducted the groundwater and surface water monitoring programs.

Part 6 - HHW operations

Hours of operations

Condition 6.1: Waste may be received at the HHW Depot each Saturday from 8:00 am to 12:00 pm from May to October.

Discussion: All waste was received on Saturdays between 08:00 am to 12:00 pm from May to October.

Condition 6.2: Waste may be stored, categorized and transferred out of the HHW Depot on Monday to Saturday from 8:00 am to 5:00 pm.

Discussion: All waste was removed within time frames specified as per bills of lading from Drain-All Ltd. which are kept at the municipal offices.

Approved waste types and processes

Condition 6.3: The Owner shall only accept household hazardous waste limited to Ontario Waste Classes 145, 146, 147, 148, 212, 213, 221, 242, 252, 261, 263 and 331 and waste electrical and electronic equipment, generated from residential sources, at the HHW Depot.

Discussion: All waste classes were properly followed as per receipts from HHW removal contractors (Drain-All Ltd.). All receipts are kept at municipal offices.

Condition 6.4: The following waste shall not be accepted at the HHW Depot:

a. compressed gas cylinders other than residential propane and fire extinguishers;

b. waste from commercial generators;

c. radioactive;

d. explosives;

e. ammunition;

f. asbestos containing material; and

g. biomedical waste.

Discussion: No restricted waste was accepted at the HHW Depot in 2019.

Condition 6.5: Prior to being accepted at the HHW Depot, all incoming waste shall be inspected by trained personnel and shall only be accepted if it meets the requirements of Condition 6.3.

Discussion: Custodian on duty inspects all waste coming to the depot.

Condition 6.6: In the event that unacceptable waste is received at the HHW Depot, the Owner shall:

a. refuse receipt of the unacceptable waste and return the waste to the generator if safe to do so; or

b. if return of the waste is not feasible, the Owner shall isolate the unacceptable waste and remove it from the HHW Depot within seventy-two (72) hours, in accordance with Regulation 347; and

c. the Owner shall review the incident and take appropriate steps to prevent future receipt of unacceptable waste.

Discussion: No such incidents occurred since opening the newly built HHW depot in 2021.

Condition 6.7: The Owner shall ensure that the waste management activities undertaken at this HHW Depot are limited to the temporary storage and transfer of waste approved under Condition 6.3.

Discussion: Condition listed above was strictly adhered to and HHW waste was removed before achieving full capacity.

Condition 6.8: All waste received at the HHW Depot shall be removed from the HHW Depot under an approved Waste Management System, as defined under Regulation 347, and taken to a Ministry approved waste disposal site within ninety (90) days of receipt.

Discussion: Waste is removed at approximately every three months to ensure that full capacity is never reach. Sub-contractor (Drain-All) handles all waste generated as per bills of lading kept in municipal offices.

Approved quantity

Condition 6.9: The Owner shall ensure that the maximum amount of waste stored at the HHW Depot does not exceed the following:

a. 18 drums of liquid hazardous waste;

b. 6 drums of lab packed hazardous waste;

c. 350 kilograms of solid hazardous waste; and

d. 5000 kilograms of Waste electrical and electronic equipment.

Discussion: Depot never exceeded amount listed in Condition 6.9 and staff ensures that waste is removed before achieving full capacity.

Condition 6.10: In the event that waste cannot be removed from the HHW Depot and the total storage capacity as approved in Condition 6.9 is reached, the Owner:

a. must cease accepting additional waste to ensure the total approved storage capacity does not exceed the maximum amount approved by this Approval:

c. submit to the District Manager for approval, a schedule for removing the stored waste, within five (5) days of reaching the storage capacity; and

d. remove stored waste in accordance with the schedule required in Condition 6.10 b.

Discussion: Custodians ensure that waste is removed prior to achieving full capacity thus giving continuous services to residents.

Condition 6.11: Waste shall be stored and handled in accordance with Item 9 of Schedule "A".

Discussion: Custodians have been properly trained to ensure that all HHW waste is properly handled.

Inspections

Condition 6.12: a. On each operating day, the Owner shall ensure that a visual inspection is carried out by trained personnel of the storage, processing and loading/unloading areas and the security features of the HHW Depot. The inspection shall ensure that all equipment and facilities are in good working order, operated in a manner that will not negatively impact the environment, that waste storage, unloading and loading areas are orderly and that security features are in good working order.

b. On a monthly basis, the Owner shall ensure that an inspection of emergency response equipment is completed by trained personnel.

c. Any deficiencies that might negatively impact the environment detected during the above inspections shall be promptly corrected.

Discussion: A register, which is kept at the HHW Depot, has been created to ensure that an inspection is carried out at the facility and equipment every Saturday when depot is open. No deficiencies have been noted in 2021.

Emergency Response

Condition 6.13: The Owner shall take immediate measures to clean-up all spills, related discharges and process upsets of wastes which result from the operation of the HHW Depot.

Discussion: Emergency equipment is kept at the HHW Depot in the event of discharges or upsets of wastes. No such events occurred since opening in 2021.

Condition 6.14 All spills and upsets shall be immediately reported to the Ministry's Spills Action Centre at 416-325-3000 or 1-800-268-6060 and shall be recorded in a written log or an electronic file format, as to the nature of the spill or upset, and the action taken for clean-up, correction and prevention of future occurrences.

Discussion: No such actions were required since opening in 2018. Staffs are properly trained to ensure Condition 6.14 is strictly followed.

Condition 6.15: a. The Owner shall maintain an Emergency Preparedness and Response Plan for the HHW Depot. The Plan shall include, but not necessarily be limited to:

i. emergency response procedures to be undertaken in the event of a spill or process upset, including specific clean up methods for each individual waste;

ii. a list of contingency equipment and spill clean-up materials, including names and telephone numbers of waste management companies available for emergency response; and

iii. a notification protocol with names and telephone numbers of persons to be contacted, including Owner's personnel, the Ministry's Spills Action Centre, the local Fire Department and the local Municipality.

b. A copy of the Emergency Preparedness and Response Plan shall be kept at the HHW Depot, in a central location available to all staff at all times;

c. The Owner shall ensure that the contingency equipment and materials outlined in the Emergency Preparedness and Response Plan are immediately available on the HHW Depot at all times, in a good state of repair, and fully operational; and

d. The Owner shall ensure that all operating personnel are fully trained in the use of the contingency equipment and materials outlined in the Emergency Preparedness and Response Plan, and in the procedures to be employed in the event of an emergency.

Discussion: An Emergency Preparedness and Response Plan is available at the Head Office, the HHW Depot and meets all listed requirements. Equipment is in a good working order and staffs are properly trained for all emergency situations.

Training

Condition 6.16: a. The Owner shall ensure that HHW Depot personnel are trained, and receive annual refresher training, on the operation and management of the HHW Depot, in accordance with the specific job requirements of each individual, including but not limited to:

i. an outline of the responsibilities of the HHW Depot personnel;

ii. personnel training protocols;

iii. any environmental concerns pertaining to the wastes accepted at the HHW Depot;

iv. occupational health and safety concerns pertaining to the wastes received;

v. proper receiving and recording procedures (including recording procedures of wastes which are refused;

vi. proper storage, handling, sorting and shipping procedures;

vii. operation of equipment and procedures to be followed in the event of a process upset or an emergency situation;

viii. recording procedures as required by this Approval;

ix. inspection procedures, as required by this Approval; and

x. procedures for recording and responding to public complaints;

b. The Owner shall ensure that HHW Depot personnel who oversee operations at the HHW Depot are trained, and receive annual refresher training in:

i. relevant waste management legislation, including but not limit to Regulation 347; and

ii. terms, condition and operating requirements of this Approval.

Discussion: All personnel are trained according to conditions listed above and participate actively in all decisions making to ensure that all requirements are met.

Closure plan

Condition 6.17: a. The Owner must submit to the District Manager, a written closure plan for the HHW Depot three (3) months prior to closure of the HHW Depot. This plan must include, as a minimum, a description of the work that will be done to facilitate closure of the HHW Depot and a schedule for completion of that work; and

b. Within ten (10) days after closure of the HHW Depot, the Owner must notify the Director and District Manager, in writing, that the HHW Depot has been closed.

Discussion: HHW Depot is planned to stay open until closure of the Landfill site and beyond. It is not planned to be closed within the foreseeable future.

Part 7 - Record Keeping and Reporting

Condition 7.1: a. The Owner shall record the following information with respect to all wastes received at the Landfill:

i. hauler name, or "residential" if delivered by individual residents;

ii. waste category; and

iii. date received.

b. The name and vehicle license shall be recorded for any load rejected for disposal in the Landfill along with the reason for rejection.

Discussion: A register, which is kept at the HHW Depot, has been created which meets all conditions listed above. Custodians have been trained to ensure accuracy.

Condition 7.2: The Owner shall maintain, in written or electronic format, daily records which shall include the following information:

a. date of record;

b. types and quantities of waste received that day;

c. quantities and destination of waste shipped from the HHW Depot that day;

d. quantities of waste stored on HHW Depot at the end of each operating day; and

e. any spills or upsets which occurred that day

f. any refusal or acceptance of unacceptable waste at the HHW Depot as described in Condition 6.6.

Discussion: A register, kept at the HHW Depot, is on hand which meets all conditions listed above which must filled out every day the Depot is open by custodians.

Condition 7.3: The Owner shall keep a record of the HHW Depot inspections required by Condition 6.12 which includes as a minimum:

a. the date and time of the inspections;

b. the results of the inspection; and

c. the signature of the trained personnel.

Discussion: An inspection register, kept at the HHW Depot, is filled out at the beginning of each opened day to ensure that requirements listed in Condition 7.3 are met.

Condition 7.4: The Owner shall maintain a written record of employee training required by Conditions 4.11 and 6.16 which includes at a minimum:

a. date of training;

b. name and signature of person who has been trained; and

c. description of the training provided.

Discussion: All training records are included on custodians personal files kept at the municipal office. These meet requirements of Condition 7.4.

Condition 7.5: An Annual Report on the development, operation and monitoring of the Site shall be submitted by the Owner to the District Manager. The frequency of the report may be reduced with prior written permission of the District Manager, and provided that the Owner demonstrates to the District Manager that the Site operations and monitoring results have become routine and consistent. Notwithstanding any approved change in reporting frequency, the District Manager may, at any time, require the Owner to return to annual submission of the report if there is reasonable evidence to conclude that the Site operations or monitoring results are no longer routine or consistent.

Discussion: An Annual Report will be required for 2022.

Condition 7.6: Each Annual Report shall be submitted no later than March 31 of the calendar year following the calendar year being reported upon.

Discussion: This Annual Report has been submitted within the proper timeframe.

Condition 7.7: The Annual Report shall, as a minimum, include the following elements:

a. Executive Summary

i. a summary of findings, conclusion and recommendations;

b. Landfill Operations

i. a Site plan of the landfilling area showing: the current and final extent of the Limit of Fill with contours and cross-sections; and any changes to the Site Layout;

ii. a report on the Landfill capacity used during the reporting period and the remaining capacity;

iii. a report on the types and volumes of waste diverted from the Landfill by transfer from the Site;

iv. a report on any variances from Item 1 in Schedule “A”;

v. a summary of complaints regarding Site operations and the Owner’s response;

c. Waste Diversion

i. a detailed monthly summary of the type and quantity of waste diverted for recycling;

d. HHW Depot

i. a detailed monthly summary of the type and quantity of all wastes received;

ii. a detailed monthly summary of the type and quantity of all waste transferred from the HHW Depot and the destination;

iii. any changes to the emergency response plan and the Design and Operations Report that have been approved by the Director since the last annual report;

e. Environmental Quality Monitoring

i. Site plan only if there has been any changes to the monitoring network;

ii. an analysis and interpretation of gas, surface water and groundwater monitoring data;

iii. an assessment of surface water quality at the Site boundaries with respect to PWQO;

iv. an assessment of the adequacy of the natural attenuation of leachate and gas generated by the Landfill;

v. an assessment of the physical condition of the groundwater monitoring well installations and discussion on the extent of the contaminant plume(s) resulting from Landfill leachate supported by a plume map;

f. Recommendations

i. recommendations respecting any proposed changes to gas, surface water or groundwater monitoring programs or any repairs required to the monitoring well network;

ii. recommendations respecting any proposed changes to the operation of the Landfill or HHW Depot; and

iii. recommendations on the requirement for any remedial works or contingency actions based on the monitoring results or Site operations.

g. Conclusions

i. any environmental or operational problems that could negatively impact the environment, encountered during the operation of the Site and any mitigate action taken; and

ii. an assessment as to whether or not the Owner is operating in compliance with the Conditions of this Approval.

Discussion: This Annual Operations and Monitoring report provides all the information required by this condition.

Condition 7.8: In the event that the results of the monitoring programs are such that trigger mechanisms outlined in the Trigger Mechanism and Contingency Plan of any other off-site exceedance of the RUP, ODWS or PWQO can reasonably be predicted to occur, the Owner shall include in the annual report:

a. the details of any such predicted exceedance, including the assumptions upon which the prediction is based;

b. a discussion of the modifications, if any, to intended operations which would be necessary to prevent the predicted off-site exceedance;

c. a discussion of the modifications, if any, which should be made to the monitoring program; and

d. a discussion of other mitigation measures or contingency actions, if any, which may be necessary to prevent off-site impact.

Discussion: During 2021, EXP Services Inc. was responsible for completing the groundwater and surface water monitoring programs. Part B of this report addresses the above requirement.

3.2 Waste deposited during 2021

Figure 3 and **Figure 3A** show the waste contours, as measured on January 26th, 2021, in relation to the design contours approved in the Environmental Compliance Approval (Certificate of Approval). We calculate that **2655 m3** of waste and cover material has been deposited at the site during 2020. The waste has been deposited within Lift 1 of Phase 2, extending the current waste pile to the eastern perimeter of Phase 2. All waste in 2021 was placed within the approved footprint. A small area on the west side of Lift 1, Phase 2, deposited in 2014 is still outside the footprint, but this will be corrected when Row 1, Lift 2, Phase 2 will reach western side limits at the end of 2020. The 2021 volume is average to the previous 5 years. This has been achieved by banning all commercial roll-off bins from the landfill, diverting major destruction waste to South Plantagenet Landfill (SPL) since 2017, and promoting a free recycling program available to all residents at the Landfill site.

The municipality began depositing waste in Phase 2 in 2013, which continued into 2020. As identified in the Operation, Development and Closure Report in 2000, the following activities were required prior to development of Phase 2, and were performed during 2013 and mostly finished in 2018:

1. Clear bush and strip organics from area within Phase 2 – this process has been completed in 2018 and all of Phase 2 area is ready to receive future waste.

2. Fill in areas with elevation below 68.0m so that waste is not placed in water (area near existing toe of waste – this was completed prior to waste placement in 2013.

3. Excavate excess soil beneath future waste in Phase 2 to elevation 69.0 meters and stockpile for use as daily or interim cover – excess soil is being excavated during Phase 2 preparation, but exact base elevation is unknown since surface was not surveyed prior to waste placement, although Phase 2 base along the west limit matches Phase 1 and has been used as a guide.

4. Construct diversion ditch along the south limit and discharge to South Indian Creek – this will be done in 2021 once footprint extends further east at the end of Lift 1 Phase 2.

5. Construct a 1 meter high berm along the west toe of the future waste to provide a physical barrier to restrict placement any further west – this should be completed by 2020 as Lift 1 is reaching capacity.

6. Extend the all-weather access road constructed in Phase 1 to active face of Phase 2 – this was completed in order to access Phase 2 area.

7. Shape and place final cover over west and north side slopes to Lift 1 Phase 2– west side still require some minor reshaping prior to final cover application which was planned for 2020 but was not completed. The work should be completed in the coming years.

All of 2021 waste was placed within the approved footprint; some waste side slopes from 2014 still exceed design contours on the west slopes, as shown in **Figure 4**. This slope

has to be shaped before final cover can be applied to Lift 1 Phase 2. This should be done in the near future in order to start final covering procedures.

3.3 Remaining site capacity and site life

The STANTEC Operation, Development and Closure Report identified the remaining capacity of the landfill to be 207,000 cubic metres in 1994 (including 33,000 m3 of final cover). This capacity will be developed to the contours and cross sections shown in Figure 3 within an area of 3.0 ha (does not include historical waste in a 2 ha footprint). The waste will be deposited in 6 lifts with each lift having a thickness of 2.5 metres and allow for progressive closure.

Table 1 provides the capacity of each lift. Each lift will be developed in rows with each row being approximately 10 metres wide and 150 meters long (Lift 1 only). As Lift 2 is developed, the row length will decrease due to the 4H:1V side slope. The volumes shown in the last column include waste, daily, intermediate and final cover requirements as per STANTEC Operations, Development and Closure report.

Table 1 – Lift Capacity

LIFT #	# OF ROWS	ROW WIDTH METRES N-S	ROW LENGTH METRES E-W	WASTE VOL CUBIC METRES
1	Phase 1 – 5 rows Phase 2 -15 rows	10 10	70 150	 66,583
2	Phase 1 – 4 rows Phase 2 – 13 rows	10 10	60 130	51,083
3	Phase 3 – 16 rows	10	110	37,583
4	Phase 3 – 14 rows	10	90	26,083
5	Phase 3 – 12 rows	10	70	16,583
6	Phase 3 – 10 rows	10	50	9,083
TOTAL	89			207,000

Table 2 identifies the sequence of waste filling, as shown in **Figure 2** and the staging of development in **Figure 4**.

Table 2 – Lift development

Location	Elev. metres	Comments
Phase 1	69 – 72.5	Place waste within each row from east to west and advance each lift from north to south
Phase 1	72.5 – 75	Place waste within each row from east to west and advance each lift from north to south
Phase 2	69 – 72.5	Place waste within each row from north to south and advance each lift from west to east
Phase 2	72.5 – 75	Place waste within each row from north to south and advance each lift from west to east
Phase 3	75 – 77.5	Place waste within each row from east to west and advance each lift from north to south
Phase 3	77.5 – 80	Place waste within each row from east to west and advance each lift from north to south
Phase 3	80 – 82.5	Place waste within each row from east to west and advance each lift from north to south
Phase 3	82.5 – 83.25	Place waste within each row from east to west and advance each lift from north to south
Phase 3	83.25 – 84	Final cover is 750 mm thick (600 soil and 150 mm organic)

Remaining capacity

Based on the January 2021 survey, we calculate the remaining waste volume within the 3 ha footprint to be approximately **69 759 m3**. This volume already discounts an allowance of 33,000 m3 for final cover and 22,500 m3 for historical waste (2ha footprint).

Remaining service life

Table 3 presents the population and waste generation projections for the former Township of Cambridge (the service area) and compares the waste projections to the actual measurements to date. As the 2011 Census data was not broken down to consider the former municipalities, the former Township of Cambridge is taken to represent 67% of The Nation municipality population (based on latest electoral list 2014). Population projections from past annual monitoring reports were based on 1994 population increasing at a rate of 2.65% per year. The 2011 census shows the growth for The Nation municipality for the period of 2006-2011 to be 1.043%/year, which is much lower than the past projections. Therefore, population projections from 2006 and beyond were revised and based on an annual geometric growth rate of 1.043%/year.

Since the bottom of Phase 2 was not surveyed prior to waste placement, the base elevation was assumed to be the average between the design base elevation (69m) and the last surface generated by survey for that area.

The Nation municipality sent **2574.46 tonnes** (for entire Nation municipality including former Caledonia, St-Isidore and South Plantagenet areas) of residential waste to the Green for Life (GFL) landfill site in Moose Creek in 2021.

Table 3 presents the population and waste quantity projections, using a per capita waste generation rate of 0.79m3/cap/year and a 1.29m3/cap/year as per prior STANTEC reports. This data will need to be reconfirmed if landfill site reverts to wet waste. If disposal operations continue as is, and taken into account that major house destructions will be diverted to alternate destinations, the remaining service life of the landfill is conservatively calculated, when comparing volume measured at the landfill site with tipping fee slips, to be **20 years** (ending in **2042**).

In order to meet closure and post-closure financial commitments, it has been calculated that the Limoges Landfill site would only have an estimated lifetime of **10 years** ending in **2032** if curbside waste was sent proportionally to all municipal landfill sites. As the former Township of Cambridge contains approximately 67% of the municipality's population, if curbside waste was sent to the Limoges Landfill site, an extra **1724.88 tonnes (3449.76 m3)** would be added which gives a total amount of **6967 m3** per year. If the municipality reverts to this waste management system in lieu of using the Green for Life (GFL) landfill site, it is strongly recommended that all curbside waste from the former Township of Cambridge be sent to the South Plantagenet Landfill site in order to maintain the lifetime of the Limoges Landfill site at **20 years**.

Construction, demolition waste (C&D) and commercial waste have been strongly curtailed with the banning of all roll-off boxes, dumpsters, compactor trucks and tractor trailer units in order to extend the life of the landfill in 2015 which has been continued in 2021. Also, in 2017 all major residential destruction has been diverted to the South Plantagenet landfill site in order to extend the life of the Limoges Landfill site. A recycling program has been started with high degree of success in 2015, which was continued in 2021, permitting approximately **1359.72 m3** to be diverted from the landfill as per **Table 8**.

Table 3 – Population and waste projections

Year	Design Population (Notes 1,2 &3)	Design waste (m3/yr) (Note 4)	Actual waste	Remaining capacity (m3)
2000	6599	6599	17250	
2001	7949	749	3280	
2002	8020	8020	1970	
2003	8091	8091	926	
2004	8163	8163	3666	145245
2005	8235	8235	1780	143175
2006	8309	8309	2580	140625
2007	8395	8395	4578	136030
2008	8483	8483	5330	130675
2009	8571	8571	12080	123880
2010	8661	8661	6580	117408
2011	8751	8751	7740	109560
2012	8842	8842	5675	103840
2013	8934	8934	6980	99350
2014	9028	9028	7850	91500
2015	9122	7182	2603	88897
2016	9217	7257	3047	85850
2017	9313	7333	3540	82310

2018	9410	7409	3654	78656
2019	9508	7487	3724	74932
2020	9607	7565	2655	72277
2021	9708	7644	3518	68759
2022	9809	7723		
2023	9911	7804		
2024	10015	7885		
2025	10119	7967		
2026	10225	8051		
2027	10331	8135		

Note 1: Population prior to 2001 from 1994 municipal assessment for Cambridge Township
Note 2: Population from 2001-2006 based on 0.888% growth from 2001-2006 census for entire Nation Municipality
Note 3: Population 2006 onward base on 1.043% growth from 2006-2011 Census for Entire Nation Municipality
Note 4: Assumes a design waste generation of 1m3/cap/year for past years. Starting in 2015, use a rate of 0.791m3/cap/year for future projections – does not account for waste exported to GFL landfill site

3.4 Summary of landfill operations during 2021

In 2001, the municipality signed a ten-year agreement with a private landfill contractor, Green for Life (GFL) landfill near Moose Creek. In 2011, the municipality renegotiated the agreement with GFL, extending it until 2021. With recycling being transferred to producers in 2023, the municipality decided to extend the GFL contract for another two years, which will bring all contracts to the same date, May 2023.

In 2013, the municipality signed an agreement with Recycle Action, based in Hawkesbury, for the disposal of all residential recyclable materials. The agreement was extended in 2018 for three years which ended in 2021. A further two year extension was signed in 2021 which will bring it to the transition date of the Blue Box program. Throughout 2021, the municipality disposed of residential waste at the GFL landfill, most recyclable materials at Recycle Action and only placed construction, demolition and dry waste at the Limoges landfill.

The waste is covered less frequently during the winter season (biweekly) than during the summer period (weekly). Given that the municipality accepts only dry waste at this location, construction waste and application of final cover does not create undesirable impacts such as odours. The exposed waste does create some minor inconveniences with wind-blown liter. Should wind-blown litter becomes a problem in the future, the municipality is ready to install a litter fence and/or enhanced clean-up procedures.

A total of **2231** users (residents and public works) visited the Limoges landfill site in 2021 based on review of tipping fee receipts.

Table 4 provides an assessment of the condition of the facilities located at the landfill site and identifies the work required in 2022 to upgrade deficient items.

Table 4 – Condition of facilities

Description of item	Condition in 2021	Work to be done in 2022
Gate and signs	The signs and gate are in good condition (photo 1& 2)	None
Access road & traffic	Recently graded – Good condition (photo 2)	None
Surface drainage	Acceptable (photo 13 & 14)	Ensure pools of water are properly drained
Security & fences	Good condition, hunting and fake cameras added in 2018	Small repair on East side beside the entrance
Traffic/disposal signs	Good disposal signs	Better traffic signs are necessary to bring speed limit under control.
Traffic ability on cover	Acceptable (photo 13 & 14)	Ensure grade is level
Soil cover thickness and compaction	Cover applied weekly is sufficient. Compaction is somewhat under par.	Ensure proper compaction of waste with proper equipment in 2021
Waste side slopes	Some waste on west side exceeds footprint and final contours	Reshaped waste to be done before final cover of West side Lift 1 Phase 2 at the end 2022
Recycling	Blue box programs started in 1995. Recycling programs started at landfills in 2015 (photo 3)	Larger bins should be considered as recycling is overflowing
Burn area	Not allowed	None
Tire stockpile	Acceptable, pile was below limit quantity, total of **1731** tires removed (photo 8)	Continue collection tires. Number of tires to be restricted to less than 3000
Metal stockpile	Scrap metal is collected by AIM Recycling. A total of **289 tonnes** was removed (photo 7)	Continue with existing metal program.
Paper, cardboard, Styrofoam and recyclable plastics bin	Good condition. Data is not available since recycling truck come and empty containers every two weeks.(photo 3)	A bigger bin should be considered as overflow is stored outside bin and exposed to weather
Farm Plastic bin	Program has been cease in 2020.	None
Waste electronic, electrical equipment (WEEE)	Good condition. A total of **5.47 tonnes** was diverted from the landfill (photo 3)	ECA has been amended to include WEEE in 2018 as per MOECC inspection report dated 13 Jul 2016

Clothing recycling	Good condition. No data available for 2021 (photo 6)	Data should be collected to give accurate numbers
Re-use area	Good condition. No data available for 2021	Data should be collected to give accurate numbers. A shelter for re-use material should be considered.
Mulch area	Good, a total of **93 tonnes** was diverted from the landfill (photo 9)	Continue with program
Branches	Good, a total of **21 tonnes** was diverted from the landfill, awaiting disposal (photo 10)	Branches was chipped in 2021. (photo 15)
Visual appearance of site	Good (photo 13 & 14)	Continue weekly cleanup
Wind-blown litter	Good	Continue weekly cleanup
Vegetation	Good	None
Waste types	Residential and commercial	Custodian to maintain a daily record of the number of users and waste types
CFC handling	Only accept tagged appliances	Continue with program, consider providing service at cost to all residents

3.5 Proposed changes to landfill operations for 2022

In addition to the improvements listed in **Table 4**, the following activities are recommended for 2022;

- Waste placed in Lift 1, Phase 2 in 2014 exceeding approved footprint and final contours and should also be reshaped. This is slated to be done in 2019 as Lift 1 Phase 2 West is ready for final cover;

- Provide further information to The Nation Municipality residents about availability of all recycle facilities at the landfill and HHW Depot;

- Cover material will be lacking when Lift 1, Phase 2 is complete in approximately 2022. Consideration should be given to importing all waste material from municipal projects to the landfill to be stockpiled as cover material for future use.

- A shelter should be considered to keep all reusable waste protected from elements and in good condition for re-use by residents.

- A shelter for the custodian should be considered for health and safety issues regarding the different weather climate in our area.

- Improve record keeping so that the volume of soil material imported for cover can be monitored and reported

- The municipality should inquire for removal of CFCs at cost for all residents

3.6 Costs

Costs for 2020 operations are for the entire municipality as show below in **Table 5**. A full calculation of waste management operations has been introduce in 2016 in order to present a true reflection of all costs and revenues. This was done in order to facilitate reporting and auditing purposes. Full revenue calculation has been started in 2018 with proper billing to all municipal departments for services rendered.

Table 5 – Costs and Revenues

Description	Year 2021	Year 2020	Year 2019	Year 2018	Year 2017
Costs					
Waste collection	$336294	$358986	$308510	$300055	$283603
Waste collection Spring Clean up	$12118	$14196	$9939	n/a	n/a
GFL landfill	$177280	$187087	$155009	$153461	$147058
Waste disposal (landfill sites)	$260126	$106208	$349765	$327707	$278981
Engineering and monitoring	$40488	$25147	$39660	$59458	$36070
Blue box collection	$239503	$259840	$224086	$218264	$204722
Blue box recycling	$139440	$130979	$58236	$54316	$56771
HHW day	no HHW	no HHW	no HHW	$76422	no HHW
HHW Depot (Limoges)	$7688	$7536	$3429	$2924	no Depot
HHW Depot (Fournier)	$3587	$1699	$989	no Depot	no Depot
Total cost	**$1216524**	**$1091678**	**$1149623**	**$1192607**	**$1007205**
Revenues					
HHW day	no HHW	no HHW	no HHW	$40569	no HHW
HHW Depot (Limoges)	$1872	$1081	$659	$1779	no Depot
HHW Depot (Fournier)	$1014	$974	$163	no Depot	no Depot
Scrap metal revenue	$10199	$2229	$3974	$11799	$6315
Ontario Tire Stewardship	no revenue	no revenue	$476	$3438	$1529

Green tag sales	$7678	$8477	$8425	$6436	$6274
Blue Box sale revenue	$0	$240	$428	$326	$205
Waste Diversion Ontario	$130861	$122607	$128627	$123329	$110119
Tipping fees & taxes	$71573	$54163	$74463	$68961	$59040
Taxpayer funding waste collection	$529011	$522150	$517682	$511797	$504600
Taxpayer funding recycle collection	$377567	$373770	$371973	$366168	$364318
Total revenues	**$1213866**	**$1085691**	**$1106870**	**$1134602**	**$1052400**
Net costs	**$(2658)**	**$5987**	**($42753)**	**$58005**	**($45195)**

n/a – Not available

4.0 Hydrogeological monitoring: Impacts of operations

A Hydrogeological and surface water monitoring report for the Limoges Landfill site was completed by EXP Services Inc. for 2020 and is presented in Part B of this report.

5.0 Waste diversion initiatives

5.1 Waste reduction targets

The municipality's waste diversion programs consist of the following:

-Promotes backyard composting to divert organic material such as kitchen waste and yard waste.
-Operates a curbside single stream multi-material blue box program.
-Segregates the following material at the landfill:
- -scrap metal
- -CFC
- -natural wood products (branches)
- -yard waste
- -tires
- -paper, cardboard
- -plastics with recyclable sign
- -Styrofoam
- -clothing
- -Electronic and electric equipment
- -household batteries (through Call 2 Recycle)
- -farm plastic (used for hay bales)
- -re-use area

-A Household Hazardous Waste Depot which is open May to October every Saturday from 08:00 am to 12:00 pm.

The provincial government through the Waste Diversion Act (2002) establishes programs for the diversion of designated waste through various Stewardship programs (programs now exist for blue box material, tires, waste electronic and electrical equipment, and certain hazardous waste types). In 2004, the MECP discussion paper encouraged municipalities to implement waste diversion programs with a target of achieving 60% diversion (including residential, C&D, ICI) by 2008. As discussed in **Section 5.2**, the diversion rate for The Nation Municipality is presently at **25%** by weight and **42%** by volume which is average with previous years. These existing programs are interpreted to be below the provincial target but its diversion rate is on par with most municipalities. This has been achieved with an aggressive recycling strategy at the landfill sites which began in 2015, maintained in 2021, and with a HHW Depot which was opened in 2018. These initiatives should be further enhanced with the diversion of all reusable items (under proper shelter), clean wood construction products (for chipping) in the near future and also more accurate data from landfill sites.

5.2 Waste diversion/recycling programs

5.2.1 Recycling program

During 1997, the municipality established a procedure for the handling of metal goods/equipment containing CFC's that enter the landfill. Metal goods containing CFC's such as refrigerators, coolers, air conditioners, freezers, heat pumps and other similar objects must be tagged by an authorized technician before being accepted at the landfill. No CFC-containing equipment was collected at the landfill in 2021.

The municipality blue box recycling program that was started during 1995 successfully diverted **1010.30** tonnes of material from disposal during 2021 (**Table 6)**. This is above the **956.95** tonnes in 2019 and average with the past 5 years. It has been determined that the lower than expected recycling of print paper due to downturn in the newspaper medium is the major culprit for the lower number in recyclable material. **Table 6** identifies the type and total quantity of recyclable material collected by the blue box program for the entire Nation municipality.

The municipality's recyclables in blue boxes are collected Mike's Waste Disposal and hauled to Recycle Action's sorting facility in Hawkesbury to be processed.

Table 6 – Blue box recycling program

Month	2021 Recycling Tonnages							
	10.2%	5.05%	5.05%	3.5%	1.2%	55.9%	19.1%	
	mixed glass	P.E.T.	col. Plastic	Steel cans	Alum cans	news paper	cardboard & boxboard	total tonnes
January	10.55	5.22	5.22	3.62	1.24	57.81	19.75	103.41
February	7.71	3.82	3.82	2.64	0.91	42.24	14.43	75.56
March	9.04	4.47	4.47	3.10	1.06	49.53	16.92	88.60

April	9.12	4.51	4.51	3.13	1.07	49.96	17.17	89.37
May	7.78	3.85	3.85	2.67	0.92	42.65	14.57	76.30
June	9.91	4.91	4.91	3.40	1.17	54.32	18.56	97.18
July	7.63	3.78	3.78	2.62	0.90	41.82	14.29	74.81
August	7.35	3.64	3.64	2.52	0.86	40.29	13.77	72.07
September	7.40	3.66	3.66	2.54	0.87	40.53	13.85	72.50
October	9.22	4.56	4.56	3.16	1.08	50.51	17.26	90.35
November	9.69	4.80	4.80	3.33	1.14	53.12	18.15	95.03
December	7.66	3.79	3.79	2.63	0.90	41.99	14.35	75.12
Total 2021	**103.05**	**51.02**	**51.02**	**35.36**	**12.12**	**564.76**	**192.97**	**1010.30**
Total 2020	**97.61**	**48.33**	**48.33**	**33.49**	**11.48**	**534.94**	**182.78**	**956.95**
Total 2019	**91.85**	**45.47**	**45.47**	**31.52**	**10.81**	**503.36**	**171.99**	**899.47**

The results of the 2021 waste diversion programs are summarized in **Table 7** for the entire municipality. We observe that the waste diversion programs in 2020 achieved a diversion of **25%** (by weight) and **42%** (by volume). The diversion rate is lower than the provincial target of 60% (by weight) but a significant improvement from previous years and shows clear progression since 2015. The amount of segregated materials for 2021 reported in **Table 7** accounts for all diversion initiatives at all landfill sites

The landfill sites waste diversion initiatives successfully diverted **439.68 tonnes** of recyclable material from the site (**Table 7**) (**Table 8**) with a recycling program located at the landfill which is collected by the following agencies:

-paper, cardboard, plastics, Styrofoam, WEEE, farm plastic - Recycle Action
-clothing - the Canadian Diabetes Association
-tires - Trillium Tire
-scrap metal - AIM (Cohen & Cohen)
-household batteries - Call 2 Recycle
-wood products (branches) – pending decision
-yard waste – will be reused as cover material
-re-use area – residents
-WEEE – OES
-HHW – Drain-All Ltd.

Table 7 – Waste diversion initiatives

Description	2021 by weight (tons)	2021 (m3)	2020 by weight (tons)	2020 (m3)	2019 by weight (tons)	2019 (m3)	2018 by weight (tons)	2018 (m3)
Blue box recycling program (note 1)	1010	5050	957	4180	899	4495	836	4180
Segregation (note 2)	731	2582	652	1826	750	1699	878	2648

Household hazardous waste (note 3)	29	29	24	24	17	17	53	53
Subtotal waste diverted	**1770**	**7661**	**1633**	**6030**	**1683**	**6211**	**1767**	**6881**
Household waste (landfill) (note 4)	2635	5269	2108	4215	3217	6434	2908	5816
Household waste (Lafleche)	2574	5148	2513	5026	2380	4760	2217	4434
Total waste stream**	**6979**	**18078**	**6254**	**15271**	**7280**	**17405**	**6892**	**17131**
Waste diversion***	25%	42%	26%	39%	24%	36%	25%	40%

**Total waste stream = waste diverted + total waste landfilled
***Waste diversion % = waste diverted / total waste stream
Note 1: Based on a conversion of 0.2 tonnes/m3
Note 2: see Table 6 of SPL landfill, Table 8 of Limoges landfill. Difference between is 2015 and 2016 is due to inclusion of slag in calculations
Note 3: Based on density of 1Kg/L for liquids, 2 Kg/L for solids.
Note 4: Total waste landfilled at each of the 3 landfills within The Nation Municipality, assume 20% of volume is cover material and conversion of 0.5 tonnes / m3

5.2.2 Waste recycling strategy

The municipality, in partnership with Waste Diversion Ontario, developed a Waste Recycling Strategy (WRS) in 2009 to increase waste reuse, reduction and diversion. The WRS was reviewed and updated in 2011 based on the results of implemented initiatives within the first two years. In 2015, the municipality, in partnership with Recycle Action, further enhanced this strategy and started a recycling program at all landfill sites. This strategy has met with success and public support especially at Limoges landfill which serves a more urban area. This strategy has been maintained in 2019 and has been further increased with the construction of two (2) Hazardous Household Waste depots at both main landfill sites. The construction of a shelter for two (2) reuse areas, the recycling of all clean wood products and initiatives to install recycling bins in all post offices and major mailboxes in the municipality were planned for 2020 - 2021 but have not been completed. The project is still ongoing.

Short-term recommendations in the WRS include reuse, reduction and diversion initiatives, such as increasing expenditure on promotion and education to support diversion programs, assessing collection operations to optimize them in the short term, determining the feasibility of a full user-pay system for garbage collection, the creation of a reuse area at the landfill sites and an environmental web page in order to promote a recycling strategy.

These initiatives will be further evaluated and incorporated into the municipality's waste diversion program over the short, medium and long term planning periods. The strategy should have been reviewed and revised in 2018 but has been put on hold in order to further evaluate the consequences of Provincial Legislative Bill 151 and its future implementation for 2023 - 2025.

5.2.3 Segregation of products at the landfill

As per **Table 8**, the municipality segregates the following products:

Table 8 – Waste diversion initiatives – Limoges landfill site only

Description	2021 by weight (tonnes)	2021 (m3)
Tires (note 1)	15.7	518.10
Scrap metal (note 3)	289.17 (84.78 re-use)	572.00
Paper, cardboard, Styrofoam and recyclable plastics (note 2)	No data collected	No data collected
Plastic from farms (note 2)	0.00	0.00
Waste of electronic electric equipment (WEEE)	No data available	No data available
Clothing	No data collected	No data collected
Yard waste (note 3)	93.13	186.25
Wood products (branches) (note 3)	20.40	40.81
Re-use area	No data collected	No data collected
Household Hazardous Waste	21.28	42.56
Total	**439.68**	**1359.72**

Note 1: tires assume 20lb per passenger/light truck &100lb for all larger tires. Assumes average conversion of 33 m3/t
Note 2: based on a conversion of 200 kg/m3
Note 3: based on waste conversion of 500 Kg/m3
Note 4: based on 16.3 kg per box sent

Tipping fee records indicated that a total of **2231** residents, contractors, Public Works municipal workers frequented the landfill site in 2021. This data does not take into account users who only brought recyclables or HHW waste.

6.0 Household Hazardous Waste Depot

6.1 Introduction

The Nation Municipality owns and operates the Limoges Household Hazardous Waste Depot (photo 12 - 13) as per amended ECA A471104, which opened in June 2018. The depot provides disposal services to The Nation Municipality residents and only accepts household hazardous waste as per ECA included in appendix B. The depot is located near the entrance of the landfill site but outside the waste footprint and buffer zones as per figure 5. A total of **619 residents** used the facility in 2021.

6.2 Household Hazardous Waste received and transferred

Table 9 provides details on all household hazardous waste received and that was transferred to Drain-All Ltd. for their disposal and recycling as per registry and movement document manifest held at the municipal offices. This table was created from movement document manifest created by Drain-All Ltd. on day of shipments for Limoges landfill only.

Table 9 – Household Hazardous Waste received and transferred

		May 26th, 2021	June 29th, 2021	Sept 9th, 2021	Nov 10th, 2021
Hazardous Waste	**Code**	**Quantity**	**Quantity**	**Quantity**	**Quantity**
Aerosols, flammable	331I	50 kg	98 kg	99 kg	94 kg
Propane	331I	61 kg			178 kg
Fire Extinguisher	331R				
Flammable liquid N.O.S. (adhesives)	263I	88 kg	254 kg	266 kg	641 kg
Flammable liquid N.O.S. (gasoline)	221I			205 L	50 L
Glycol	212L	195 kg		209 kg	108 kg
Oil	252L	1025 L	1230 L	1230 L	1640 L
Oil filters	252L				95 kg
Corrosive liquid, toxic, N.O.S. (sodium hydroxide)	148C	200 L	100 L	100 L	200 L
Corrosive liquid, toxic, N.O.S. (sulphuric acid)	148C				
Corrosive Liquid N.O.S. (ammonia)	148C				
Nitrates Inorganic N.O.S. (fertilizer)	148I	91 kg	84 kg	84 kg	223 kg
Oxidizing solid N.O.S. (nitrates)	147I				
Pesticide, Liquid, Toxic, N.O.S. (malathion)	242A			81 kg	84 kg
Environmentally hazardous substance N.O.S. fluorescent tubes)	146T	35 kg	10 kg	70 kg	35 kg

Environmentally hazardous substance solid N.O.S. (bulbs)	146T		35 kg		83 kg
Medicine (Pharmaceuticals)	261A				14 kg
Paint related material (lab packed)	145	1855 kg	1056 kg	2024 kg	1698 kg
Paint related material (skid)	145	3621 kg	370 kg	405 kg	385 kg
Solid Hazardous Material (empty containers)		99 kg	102 kg	114 kg	176 kg
Solid Non Hazardous (Rags)					15 kg
Solid Non Hazardous (Toner)					15 kg
		7320 kg	**3339 kg**	**4887 kg**	**5734 kg**

1 liter = 1 kg

The Limoges HHW Deport diverted a total amount of **21 280 kg**. In addition, the South Plantagenet Household Hazardous Waste depot transferred at total of **7838 kg**. This brings the total for the entire municipality at **29 118 kg**.

7.0 Other issues

7.1 Planning for waste disposal

At the current fill rate, the landfill has approximately **20 years** of remaining service life, depending whether the GFL landfill site in Moose Creek is continually used for disposal of residential waste.

The municipality should consider importing fill and cover material for future use at the landfill. At present progression, there is only a maximum of 4 years of local cover material for disposal (unexcavated). Head of The Nation Municipality's Public Works has been made aware of the situation and has directed that all Public Works waste material, when feasibly possible, be brought to the Limoges landfill site to be used as cover material in the future.

7.2 Ministry inspections and correspondence

The Ministry of Environment, Conservation and Parks (MECP) conducted an inspection of the site on 12th July 2016. The corresponding MECP Inspection Report identified the following issue that should be corrected:

-By no later than October 28, 2016 the Municipality is requested to submit an application to amend their current ECA to include the acceptance of WEEE waste at the Site.

-Email sent by MECP inspector dated August 4, 2016 gave an extension to deadline given from October 28, 2016 to April 28, 2017.

-Amendment ECA A471104, dated March 28, 2018 includes a Household Hazardous Waste depot/storage and WEEE waste which was approved by the Ministry of Environment, Conservation and Parks (MECP) and is included in Appendix B.

7.3 Incident reports

There were no incident report recorded at the South Plantagenet landfill site. No waste has been left at the entrance since the installation of a fake camera and signage at the front gate.

7.4 Review of complaints

The municipality did not receive any public complaints regarding the Limoges landfill site in 2021.

8.0 Recommendations

The following recommendations are made to improve operations in 2022. These recommendations are additional to the EXP Services Inc. comments made in the accompanying report.

1. Continue with annual groundwater, surface water monitoring.
2. Implement the activities listed in **Section 3.5** of this report.
3. Continue to divert residential waste to the GFL landfill to minimize contaminant loading on groundwater and potential impacts to South Indian Creek.
4. The municipality should continue with their existing waste reduction initiatives (blue box collection, recycling at the landfill, HHW depot) and develop strategies for the future.
5. Begin recording approximate volumes of sand or other material used for daily and interim cover at the landfill.
6. Implement recommendations of the Waste Recycling Study to improve the capture of blue box materials.
7. Some reshaping is required for 2014 waste that was placed outside of approved contours and footprint within Phase 2.
8. Continue placing waste within Lift 1 Phase 2 to extend the waste pile towards the eastern limit of the approved footprint. Commence final covering of western and southern limits of Lift 1 Phase 2.
9. Continue education and training of custodian.

9.0 Limitation and use of report

In the preparation of this report, The Nation Municipality provides the benefit of its professional judgement based on its varied and multi-trained staff with generally accepted professional standards for this type of project.

The assessment of environmental conditions and possible hazards at this site has been made using the results of physical measurements and chemicals analyses of liquids from limited number of monitoring locations. The site conditions between sampling locations have been inferred based on conditions observed at the surface water and effluent sampling locations. Conditions may vary from these sampled locations.

This report was prepared for the exclusive use of the Ministry of Environment, Conservation and Parks (MECP) for the purpose of annual operations, monitoring and reporting at the subject property.
The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, The Nation Municipality should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

10.0 Closure

Sign-off sheet

This Document entitled **LIMOGES LANDFILL SITE AND HAZARDOUS WASTE DEPOT 2021 – Annual Operations Monitoring Report** was prepared by the Corporation of The Nation Municipality. The material in it reflects The Nation Municipality's best judgement in light of the information gathered throughout the reporting year. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of said third parties. The Nation Municipality accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this reports.

We trust this report satisfies your current needs. If you have any questions regarding this report, please contact the undersigned.

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2021 Limoges Landfill Groundwater and Surface Water Monitoring Report

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Type of Document:
Draft

Project Number:
OTT-00235901-A0

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Executive Summary

EXP Services (EXP) was retained by The Nation Municipality to prepare the 2021 annual monitoring report for the Limoges Landfill Site. The Limoges Landfill is located approximately 1 km southeast of the Village of Limoges, on the north side of Calypso Street (Concession Road 3), approximately 0.8 km east of Limoges Rd. (Regional Road 5), in The Nation Municipality of Ontario. The landfill site is located on Part of Lot 29, Concession 3, in the Geographic Township of Cambridge. The landfill site has been in operation since approximately 2000. It has a total area of approximately 16.7 ha, with a waste footprint of approximately 5 ha. The site is located in an area of variable terrain ranging from thin veneers of organic deposits to areas of clay and silt. Groundwater is identified within the overburden material and flows in a north-easterly direction.

Based on the results of the 2021 groundwater and surface water monitoring program at Limoges Landfill, the following conclusions are provided:

- The groundwater and surface water monitoring program included the collection of surface water from eight surface water monitoring locations (SW1 to SW8) in May, July and October, and the monitoring and sampling of two well nests consisting of five monitoring wells (P4-1, P4-2, G11-1A, G11-B and G11-C) and P9-1 in October.
- The groundwater flow direction is northeasterly towards the South Indian Creek.
- The current trigger for groundwater is the Reasonable Use Limit, as defined by MECP Policy B-7. These limits define the allowable impact to groundwater quality at the property boundary. Based on the groundwater results collected, the landfill site is in compliance since there area no B-7 exceedances.
- Phosphorus was consistently measured above PWQO for all surface water sampling locations during the year. Therefore, since the upstream background location SW8 had consistent phosphorus concentrations, phosphorus is not considered to be leachate indicator parameters for this site. The remaining exceedances were sporadic and do not indicate leachate impact. There were no exceedances of the surface water trigger concentrations in 2021.
- Based on a review of the landfill gas monitoring summary, elevated methane levels were not measured and/or were being generated at the landfill site. The landfill gas monitoring will continue in 2022.

1.0 Introduction

1.1. Background

EXP Services (EXP), was retained by The Nation Municipality to prepare the 2021 monitoring report for the Limoges Landfill Site in The Nation Municipality in Ontario. The landfill site is owned and operated by The Nation Municipality and is located on the north side of Calypso Street (Concession Road 3), approximately 0.8 km east of Limoges Rd. (Regional Road 5), approximately 1 km southeast of the Village of Limoges (Figure 1, Appendix B). The landfill site has been in operation since approximately 2000. It has a total area of approximately 16.7 ha, with a waste footprint of approximately 5 ha, as shown on the Site Plan (Figure 2).

The Limoges Landfill operates under Provisional Certificate of Approval #A471104 (C of A) was issued by the Ontario Ministry of the Environment, Conservation, and Parks (MECP) in May 2001 (Appendix "A").

1.2. Objective

The current monitoring and sampling program was conducted to adhere to the requirements in the May 1, 2001 C of A. This report fulfills the requirement of Section 8.3. (c) and 8.3 (d) (i) of the attached C of A (Appendix A).

1.3. Scope of Work

The work undertaken for the 2021 program covered by this report includes the following.

Completed by The Nation Municipality

- The measurement of groundwater elevations, during the fall sampling event, from all available monitoring wells.
- The collection of groundwater samples, during the fall, from the monitoring well network and the submission of the samples to an analytical laboratory for detailed geochemical analysis. Field measurements were taken for general water characteristics prior to sample collection.
- The collection of surface water samples, during the spring, summer and autumn, from pre-determined surface water sampling locations and the submission of the samples to an analytical laboratory for geochemical analysis. Field measurements were taken for general water characteristics.

Completed by EXP

- An interpretation of the geochemical data to determine the present characteristics and extent of the leachate contaminant plume in the groundwater flow system. An assessment of the impact to groundwater quality at the property boundary with respect to the MECP Reasonable Use criteria, Policy B-7.
- The interpretation of surface water quality impact in terms of the Provincial Water Quality Objectives (PWQO) and Surface Water Monitoring Trigger Mechanism for Waste Disposal Sites.
- Preparation of an annual monitoring report based on field and laboratory results.

2.0 Site Description

2.1. Site Location

The Limoges Landfill is located approximately 1 km southeast of the Village of Limoges, on the north side of Calypso St. (Concession Road 3), approximately 0.8 km east of Limoges Rd. (Regional Road 5), in The Nation Municipality (Figure 1, Appendix B). The landfill site is located on Part of Lot 29, Concession 3, in the Geographic Township of Cambridge. The site is accessible via Calypso St., with the frontage to the roadway fenced and the access gate locked with a steel cable. The landfill site has been in operation since approximately 2000. It has a total area of approximately 16.7 ha, with a waste footprint of approximately 5-ha as shown on the Site Plan (Figure 2).

2.2. Certificate of Approval

The Limoges Landfill site operates under Provisional Certificate of Approval No. A471104 that was originally dated June 24, 1980.

- The C of A was amended on May 1, 2001 to include several conditions regarding the use and operation of the Site that were not included originally.
- Based on comments from the MOE in September 2003, the groundwater monitoring program was reduced to the fall sampling event for wells P4-1, P4-2, P9-1, G10-1, G10-2 and G10-3.
- The C of A was amended on October 3, 2005 to include conditions regarding buffer areas, fencing on the perimeter of the Site, as well as cover material requirements.
- The C of A was amended on May 3, 2007 to issued to revoke and replace previous conditions regarding cover material requirements.
- The C of A was amended on October 8, 2008 to include a condition regarding the Site's sewage pumping station located within the landfill buffer zone.
- The C of A was amended on June 24, 2010 to modify documents listed under Schedule A.

The C of A specifies that the site can receive residential, municipal, and industrial non-hazardous solid dry waste.

An inspection report was completed by the local MECP district officer on July 12, 2016 and the only immediate action required was for the Municipality to submit for an application to amend their current ECA to include the acceptance of Waste of Electronics and Electrical Equipment (WEEE) at the Site.

The following changed have been made to the original surface water sampling program:

- On April 13, 2012 Golder and Associates, on behalf of the Municipality, submitted to the Ministry a letter requesting approval to discontinue storm event surface water sampling at the Site. In a memo dated August 1, 2012 Mr. Dana Cruikshank, Surface Water Specialist with the Ministry, agreed that the storm sampling can be removed from the surface water monitoring program.
- On April 17, 2013 the Municipality submitted to the Ministry an e-mail requesting approval to modify the surface water monitoring program at the Site. In a letter dated July 24, 2013 the District Manager granted approval to the Municipality to remove beryllium, lead, molybdenum, silver, thallium, tin, zinc, and titanium from the list of surface water parameters analyzed.
- No other changes since 2013.

2.3. Previous Studies

Previous site investigations were performed by McNeely Engineering Consultants Ltd. (McNeely), StanCon Groundwater Engineering Ltd. (StanCon), Beatty Franz and Associates Ltd. (Beatty Franz) and Golder Associates as summarized below:

Date	Consultant Involved	Investigation
1992	McNeely Engineering Consultants Ltd.	*Site Development and Operations Plan*
1992	StanCon Groundwater Engineering Ltd.	*Hydrogeological Study*: Overburden boreholes P2, P3, P4, P5, P6, P7 drilled; each completed with two monitoring wells; groundwater and surface water sampling
1998	Beatty Franz and Associates Ltd.	*Hydrogeological Assessment*: Overburden boreholes P8, P9 drilled; completed with one and two monitoring wells, respectively; groundwater and surface water sampling
1999	Golder Associates Ltd.	*Groundwater and Surface Water Monitoring*
2000	Golder Associates Ltd.	*Hydrogeological Investigation and Groundwater and Surface Water Monitoring:* Installation of new background monitoring well; groundwater and surface water sampling; development of surface water and groundwater trigger mechanisms
2001	Golder Associates Ltd.	*Groundwater and Surface Water Monitoring* Groundwater and surface water sampling, development of contingency plans
2002 to 2016	Golder Associates Ltd.	*Groundwater and Surface Water Monitoring*
2017 to 2020	EXP Services Inc.	*Groundwater and Surface Water Monitoring*

2.4. Topography and Drainage

The site grades from a relative topographic high of 75.50 metres (above sea level) to a low of approximately 63.50 m (above sea level) along the South Indian Creek to the east. It is noted that the elevations are higher within central portions of the landfill (fill pile) due to landfill mounding.

Surface water is present at two locations on the landfill site. There is a drainage ditch at the north end of the site and the South Indian Creek is located along the eastern portion of the site. Water in the drainage ditch flows approximately west to east, while the South Indian Creek flows south to the north across the site. The surface water sampling locations are shown on Figure 2, except for SW8 which is shown on Figure 1 in Appendix B.

2.5. Geology

Based on the results of previous investigations completed by others, the overburden geological units identified on the site include an upper sand unit, ranging in thickness between 1.2 to 5.2 m, underlain by a sandy silt/silty sand/silt unit, ranging in thickness between 2.3 to 5.6 m. A basal silty clay unit was identified beneath the sandy silt/silty sand/silt unit to the depths of the site boreholes. It should be noted that this silty clay unit is known to extend to depths of 30 to 50 mbgs in the area.

For ease of comparison with previous annual monitoring reports prepared by others, EXP will maintain the existing overburden unit groupings. As such, the upper sand and underlying sandy silt/silty sand/silt layers will continue to be referred to as the shallow granular deposit, while the silty clay layer will continue to be referred to as the deeper silty clay deposit.

3.0 Landfill Monitoring Network

3.1. Previous Programs

A groundwater and surface water monitoring network consisting of monitoring wells and surface water monitoring stations was initially established in 1991 and then expanded in subsequent years with the latest wells installed in 2011 to establish a true background well. The location of the monitoring wells and surface water stations is presented in Figure 2, Appendix B.

Water level measurements and groundwater and surface water samples have been collected from these locations in previous years by others. The Nation Municipality staff have been measuring water levels and collecting groundwater and surface water samples in 2017 and then providing the data to EXP for interpretation and reporting. The annual monitoring program has occurred every year since 1998.

3.2. Monitoring Well Placement

The monitoring well network consists of 18 monitoring wells at the landfill. Six of these wells (P4-1, P4-2, P9, G11-01A, G11-01B, and G11-01C) are being monitored. The remaining twelve wells are no longer part of the monitoring program.

Of the six well listed above, five of the wells are placed together to form a number of two well nests, in order to establish vertical groundwater gradients and to determine differences in groundwater chemistry with depth. Of the wells listed above, those with similar numbering (ex. P4-1 and P4-2) form a well nest with the wells being in the same location but screened at different depths. The well nests were installed to screen the different groundwater regimes. The well network is listed below in Table 5.1 and shown on Figure 2, Appendix B.

It should be noted that the site has historically been used as a snow dump, with snow stockpiled within 20 m of monitoring well P-4.

3.3. Surface Water Locations

The surface water sampling locations consist of eight surface water locations meant to monitor potential downgradient and upgradient impacts. Surface water sampling locations SW1, SW2, SW3, and SW8 are located along the South Indian Creek, while surface water location SW4, SW5, and SW6 are within the north ditch. Surface water location SW7 is an intermittent groundwater seep along the bank of the South Indian Creek. The surface water locations are shown on Figure 2 in Appendix B.

4.0 Methodology

4.1. Groundwater

4.1.1. Groundwater Monitoring Program

The current groundwater monitoring program was approved by the MECP in 2004. The 2021 groundwater monitoring program consisted of one monitoring session carried out on October 27, 2021 by the Nation Staff. The sampling session included 6 monitoring wells in the vicinity of the Limoges Landfill. The locations of monitoring wells are illustrated on Figure 2 Appendix B.

During the fall sampling event, the following tasks were completed: groundwater level measurements and groundwater samples collected from monitoring wells P4-1, P4-2, P9-1, G11-01A, G11-01B, and G11-01C.

These wells continue to be used to monitor landfill gas. The depth to groundwater was measured using a manual water tape, relative to the top of well casing. These measurements were used to determine the groundwater elevation (above sea level).

The following sections describe the monitoring program conducted by The Nation Staff in 2019, the groundwater analytical results obtained, and an assessment of the site impact on groundwater quality in terms of compliance with provincial policy and guidelines.

4.1.2. Groundwater Sampling Protocols

Standard field techniques were used during the sampling activities. The wells were purged of a minimum three well volumes of water or until dry, prior to sample collection, to ensure collection of a representative groundwater sample. Dedicated HDPE tubing with an attached foot valve was used to purge and sample the wells. While purging the wells, field readings of pH, conductivity, ORP, DO, turbidity and temperature were measured using a multimeter (Horiba U-52). All field staff used disposable vinyl gloves during the sampling program to minimize cross-contamination.

All samples were retrieved and placed in laboratory-prepared bottles. Groundwater was filtered using a 45 µm filter attached to the HDPE tubing to minimize the amount of sediment introduced into the sample bottles for metals analysis and dissolved reactive phosphorus (DRP). All samples were subsequently delivered to Caduceon Environmental Laboratories in Ottawa, Ontario, under chain of custody protocols.

All groundwater samples collected, including one field duplicate (for QA/QC purposes), were analyzed for the following parameters: metals, total dissolved solids (TDS), alkalinity, bromide, sulphate, ortho-phosphate, chloride, nitrite, nitrate, dissolved organic carbon (DOC), phenols, total phosphorus, total kjeldahl nitrogen (TKN), chemical oxygen demand (COD) and ammonia.

4.1.3. Groundwater Sampling Guidelines

The results of the groundwater quality analyses for 2021, along with historical analytical results are summarized in tables (Appendix B). The analytical results were compared to the Ontario Drinking Water Standards (ODWS), as well as Guideline B-7 Reasonable Use Limits to assess the compliance of the landfill.

4.2. Surface Water

4.2.1. Surface Water Sampling Protocols

The 2021 surface water monitoring program consisted of three monitoring session carried out on May 19, July 28, and October 26, 2021. Each sampling session included the sampling of surface water from eight surface water locations in the vicinity of the Limoges Landfill. The locations of the surface water monitoring are illustrated on Figure 2, with the exception of SW8 which is shown on Figure 1.

The eight (8) surface water locations are located to address downgradient vs upgradient impacts. Surface water sampling locations SW1, SW2, SW3, and SW8 are located along the South Indian Creek, while surface water locations SW4, SW5, and SW6 are within the north ditch. Surface water location SW7 is an intermittent groundwater seep along the bank of the South Indian Creek. SW1 and SW2 are upgradient of the landfill, the remaining surface water stations are adjacent to or downgradient of the landfill.

Field readings of pH, conductivity, ORP, DO, turbidity and temperature were measured using a multimeter (Horiba U-52) at the time of sampling collection. The stream and flow conditions were noted at each sample location during the time of sampling.

The surface water samples are collected by inserting a sampling jar below the top of the surface water, while minimizing the amount of sediment that enters the bottle. Surface water was filtered using a 0.2 µm filter, in order to minimize the amount of sediment entering the sample bottle for aluminum analysis. The Nation Municipality staff used fresh vinyl gloves at each sampling location, in order to minimize the potential for cross-contamination. As a general rule, surface water locations that display less than 5 cm of water are not sampled and are considered dry (to minimize collection of sediment and thus produce erroneous results). Samples were submitted to Caduceon Environmental Laboratories for analysis.

All surface water samples collected, including one field duplicate (for QA/QC purposes), were analyzed for the following parameters: metals, dissolved aluminum, TDS, alkalinity, sulphate, ortho-phosphate, chloride, nitrite, nitrate, bromide, DOC, phenols, Total phosphorus, COD, biological oxygen demand (BOD), and ammonia.

4.2.2. Surface Water Guidelines

The surface water analytical results were compared to Provincial Water Quality Objectives (PWQO) and guidelines in *Interim Guidance Document – Surface Water Monitoring Trigger Mechanism for Waste Disposal Sites, revised March 1998.* These guidelines were developed on a three-tiered “trigger” mechanism, which prescribes an increasingly detailed monitoring program should a decrease in surface water quality be attributed to landfilling operations. The process can ultimately lead to the design and implementation of a contingency plan to actively address surface water quality problems.

Tier I is considered an annual routine monitoring program which includes analysis of conservative tracer and site-specific PWQO parameters as well as a sampling frequency of three to four times annually. This level is considered an “Alert” level for surface water impact.

The Tier II guidelines are initiated should downstream concentrations significantly exceed background levels. The Tier II Trigger is considered a “Confirmation” level. This plan consists of an extended parameter list and increased sampling frequency, both of which are to be established on a site-specific basis with input from the MECP. Should an unacceptable reduction in surface water quality be confirmed through the Tier II monitoring plan, a Tier III contingency plan is to be initiated along with a compliance monitoring program.

4.3. Landfill Gas

Under Ontario Regulation 232/98, specified methane concentration limits include:

- Less than 1.0% methane gas in an on-site building, or its foundation;
- Less than 2.5% methane gas in the subsurface at the property boundary; and,
- Less than 0.05% percent methane (i.e. not present) in a building, or its foundation, which is located off-site.

Monitoring of landfill gas migration is not normally required where the assessment shows there is no significant potential for methane to migrate below land surface to adjacent or to the off-site properties, or into buildings or enclosures on-site or off-site. Nevertheless, The Nation Municipality attempted to monitor the landfill gas from the on-site wells in October 2021 in concert with the groundwater monitoring program. However, the landfill gas monitor was not working properly and therefore, no readings were collected. The landfill gas monitoring will continue in 2022.

5.0 Ground Water Results

5.1. Groundwater Elevations

All recorded groundwater levels for 2021 are shown below in Table 5.1.

Table 5.1: Groundwater Elevations (2021)

Well number	Top of Casing Elevation (mASL)	Well Depth (m)	Water Level	Water Elevation
			October 26, 2021	
P4-1	70.47	7.62	5.78	64.69
P4-2	70.18	5.26	5.14	65.04
P9-1	70.45	9.00	6.12	64.33
G11-1A	70.88	10.50	2.45	68.43
G11-1B	70.93	7.00	2.56	68.37
G11-1C	70.86	3.00	2.51	68.35

Note:
ASL = Above Sea Level
"--" = Not measured
a Water level could not be measured but a water sample could be collected.

A groundwater flow diagram was constructed based on measured groundwater elevations from October 26, 2021 (Figure 2, Appendix B). Based on the interpreted groundwater elevations from the measured wells, groundwater flow continues to display a northeast groundwater flow pattern. The general groundwater flow suggests that groundwater flows towards the South Indian Creek to the northeast of the site.

The flow pattern under the landfill footprint cannot be accurately determined at this time given that there are no wells within the landfill footprint. There is the potential for some mounding within the landfill footprint, which may slightly affect localized flow patterns but not considered to alter the regional groundwater flow.

5.2. Hydraulic gradients

Horizontal hydraulic gradients were estimated for the groundwater flow components identified in the overburden aquifer based on the October 26, 2021 groundwater elevations.

The horizontal hydraulic gradient, between monitoring wells G11-01 and P4, is calculated using the following equation:

$$i = \Delta h / \Delta s$$

Where: i = horizontal hydraulic gradient;
Δh (m) = groundwater elevation difference; and,
Δs (m) = separation distance.

The horizontal hydraulic gradient across the footprint of the landfill, during the fall, was estimated to be 0.013. This value is of the same order of magnitude as the horizontal hydraulic gradients calculated previously by others.

5.3. Hydraulic Conductivity

No new estimates of horizontal hydraulic conductivity were undertaken for the 2021 monitoring report. During previous investigations undertaken by others, estimates of horizontal hydraulic conductivity were obtained based on grain size distributions from soil samples from selected wells, as well as single well response tests (SWRT) undertaken on each monitoring well in the network. Based on these SWRT, the geometric mean horizontal hydraulic conductivity for the upper granular deposit is 9.0×10^{-5} cm/s, while the geometric mean for the lower granular deposit is 6.9×10^{-5} cm/s.

5.4. Groundwater Velocity

Average linear groundwater velocity (v), is calculated using Darcy's equation:

$$v = -Ki/n$$

Where: v = average linear groundwater velocity in units of length per time;
K = horizontal hydraulic conductivity in units of length per time;
i = dimensionless horizontal hydraulic gradient in direction of groundwater flow; and,
n = dimensionless formation porosity.

The following data was used to estimate the average linear groundwater flow velocity: a horizontal gradient of 0.013 between G11-01 and P4, the geometric mean horizontal hydraulic conductivity of 6.9×10^{-5} cm/s for the deeper granular deposits, and 9.0×10^{-5} cm/s for the shallow granular deposit, and an average porosity of 35 percent for the granular deposit. Typical porosity values can range from 25 to 50 percent for silts and sands (Freeze and Cherry, 1979). Using these data, the groundwater velocity is calculated to be approximately 0.7 to 0.9 m/yr.

5.5. Vertical Gradients

In addition to measuring the horizontal groundwater flow at the subject site, vertical hydraulic gradients between the shallow and deeper well pairs were interpreted at the site to identify the flow characteristics of the groundwater at the site. Based on the current vertical gradient within G11, located upgradient of the landfill, there is a minimal downward gradient. The vertical gradient at P4 was downward.

6.0 Groundwater Quality

Analytical results for the current sampling program are summarized in Appendix B. To interpret the groundwater chemistry, the analytical results were compared against the Ontario Drinking Water Standards as a general guide. This was used to assess whether the parameters, which are not governed by the Reasonable Use B-7 guideline (i.e. within the property boundary) were deemed to be elevated and could help in establishing leachate migration. The analytical results from the groundwater samples collected from downgradient wells were compared against source zone wells to assess whether the conditions improved or worsened when moving downgradient. However, it is understood that MECP Guideline B-7 is the governing regulation for groundwater compliance issues of the site based on the C of A.

6.1. Well Classification

6.1.1. Background Wells

The impact of the landfill activities on groundwater quality is evaluated by comparing the chemistry of the water downgradient of the site to the upgradient / background groundwater chemistry. An appropriate background well is used to determine the Reasonable Use Limit (RUL) criteria for the shallow and deep groundwater aquifers at the site.

As described in detail in previous monitoring reports prepared by others, the original background wells (P6-1 and P6-2) located upgradient from the active landfill were determined to be impacted with chloride and TDS resulting from road salting activities. As such, in 2000, three new background monitoring wells were installed in borehole G10-00 location. The wells, identified as G10-1, G10-2 and G10-3, were installed and screened in each of the three characteristic overburden strata. Monitoring well G10-1 was installed in the basal silty clay unit; G10-2 was installed in the mid-level silty sand unit; and, G10-3 was installed in upper sand unit. These wells were used to represent background groundwater conditions until wells G10-2 and G10-3 were destroyed by excavation equipment.

Subsequently, three new wells were installed at a location approximately 25 m directly west of the landfill, and upgradient, from a groundwater flow direction perspective. The new wells, labelled G11-01A, G11-01B and G11-01C, replaced the previously used background monitoring wells (G10-1, G10-2 and G10-3), and were installed in the three characteristic overburden strata, with G11-01A screened in the basal silty clay unit; G11-01B screened in the mid-level silty sand unit; and, G11-01C screened in the upper sand unit.

Initial samples from these newly installed background wells (G11) were determined to contain sediment, which resulted in elevated concentrations of several parameters including alkalinity, COD, DOC, total phosphorus and boron. As such, the data from the first two years of monitoring were excluded when determining the true background water quality range.

6.1.2. Representative Source Zone Wells

The leachate chemistry is best defined by groundwater collected from monitoring wells installed within the fill area of the landfill. However, there are no monitoring wells located within the landfill footprint since the landfill is still operational. Therefore, the leachate chemistry is best defined by groundwater collected from P4-1 and P4-2, since they are located immediately adjacent and downgradient of the landfill (within 3 m of the actual waste footprint).

Based on the previous groundwater quality data (collected by others), monitoring wells P4-1, P4-2 and P8-2 were considered to be impacted by landfill leachate. Monitoring wells P2-1, P2-2, P3-1, P7-1 and P8-1 have shown minor leachate impacts. All remaining monitoring wells have not, historically, shown elevated

concentrations of the key indicator parameters and therefore have been interpreted not to be impacted by landfill leachate.

6.1.3. Downgradient Groundwater Quality

Based on the measured groundwater levels, the interpreted groundwater flow direction is primarily towards the north/northeast. The groundwater quality at monitoring well P9-1 is representative of the downgradient groundwater quality.

6.2. Groundwater RUL

The permissible magnitude of groundwater impact is defined by the Ontario Ministry of the Environment *Reasonable Use Policy, B-7*. This policy establishes maximum allowable concentrations of various parameters at the downgradient site boundary. These maximum concentrations for given parameters are based on the background concentration of a specific compound in the aquifer, the nature of the parameter (whether it has an applicable health or aesthetic criteria) and the present or potential future use of the downgradient groundwater resources. Unless there is specific evidence to the contrary, the assumed downgradient groundwater use is normally considered to be drinking water, which is the case for this site.

For evaluation purposes, the Reasonable Use Limit (RUL) for leachate indicator parameters is generally calculated for both shallow and deeper groundwater regimes since the chemistry of these background groundwater regimes could be different. These parameters have either a health-related Maximum Acceptable Concentration (MAC), an Interim health related Maximum Acceptable Concentration (IMAC) or an Aesthetic Objective (AO) in the Ontario Drinking Water Standards.

RUL concentrations are calculated using the following relationship:

$$Cm = Cb + X(Cr-Cb)$$

The **Cb** term is the background concentration of the particular contaminant in the groundwater before it has been affected by human activity. This allows consideration to be given to the amount of increase in contaminant level. The **Cr** term is the ODWS criteria. The **X** term is a constant that reduces the contamination to a level that is considered by the Ministry to have only a negligible effect on the use of the water. For drinking water **X** is 0.5 for non-health related parameters or 0.25 for health-related parameters.

Based on the monitoring well analytical data, location, and groundwater levels, the G11-01 well nest was selected as a background well. The corresponding reasonable use parameters were calculated by Golder Associates in the 2016 Limoges Landfill report. The calculated Reasonable Use Limits concentrations for the indicator parameters were, based on the maximum background groundwater quality data which was obtained during monitoring programs from monitors G10-2 and G10-3 from 2000 to 2010, and G11-01B and G11-01C in 2013 to 2015. It is EXP's opinion that the background data between 2013-2015 provides sufficient background data used in the RUL calculation. Additional data is no longer incorporated into the RUL calculation to minimize the impacts to the RUL criteria based on changes in flow patterns, which could increase background concentrations.

Table 6.2: Reasonable Use Limits (RUL)

Parameter	ODWS[3] (mg/L)	Background Range (mg/L)		RUL (mg/L)	
		Shallow Granular Deposits[1]	Deeper Silty Clay Deposits[2]	Shallow Granular Deposits	Deeper Silty Clay Deposits
Ammonia	--	<0.02 – 0.37[(5)]	0.03 – 0.80	---	---
Alkalinity	--	36 – 170	55 – 250	---	---
Chloride	250	<1 – 5	2 – 77	128	133
Sulphate	500	6 – 29	<1 – 55	265	278
Strontium	--	0.027 – 0.09	0.041 – 0.11	---	---
Manganese	0.05	<0.002 – 0.09	<0.005 – 0.32	0.09	0.32
Boron	5	<0.005 – 0.02	<0.005 – 0.19	1.27	1.39
Hardness	--	19 – 120	53 – 117	---	---
Iron	0.3	<0.01 – 1.72	<0.01 – 10.5	1.72	10.5
TDS	500	70 – 256	108 – 504	378	504
DOC	5	0.9 – 4.7[(4)]	1.1 – 6.1[(4)]	4.85	6.1
Phosphorus (Dissolved Reactive)	--	<0.01 – 0.57	0.04 – 0.63	---	---
Total Phosphorus	--	<0.05 – 15[(6)]	<0.05 – 15.8	---	---
Sodium	200	6.8 – 69	52 - 130	---	---
Nitrate	--	<0.2 - <0.050	<0.050 - <0.10	---	---
Barium	--	0.0096 – 0.059	0.016 – 0.047	---	---

Note:

Shade – suitable leachate indicator parameters for the assessment of the reasonable use limits

mg/L – milligrams per Litre

ODWS – Ontario Drinking Water Standards (2006)

1. Historic background data obtained from monitors G10-2 and G10-3 from 2000 to 2010, and G11-01B and G11-01C in 2013 to 2016
2. Historic background data obtained from monitor G10-1 from 2000 to 2010, and G11-01A in 2013 to 2015
3. ODWS values presented relate specifically to parameters for which an Aesthetic Objective, Maximum Acceptable Concentration (MAC) or interim maximum acceptable concentration (IMAC) has been established.
4. Excludes G10-2 and G10-3 data from 2004
5. Excludes G11-01B data from 2014 (in addition to all 2011 and 2012 data)
6. Excludes G11-01B and G11-01C data from 2014 and 2015 (in addition to all 2011 and 2012 data)

As shown in the table above, all parameters sampled were assessed against the reasonable use limits for discussion purposes. However, based on our professional experience and landfill trends, the best indicators for leachate impact at the site are boron, chloride, sulphate, sodium and TDS. Iron and

manganese are not considered optimal indicator parameters since they are earth metals and are naturally occurring in the soils.

Having established the RUL for the above-noted parameters (Table 6.2) in the groundwater regimes. These parameters were chosen since they are considered common leachate parameters and generally provide a good indication.

6.3. Groundwater Results

The 2021 groundwater analytical results are presented in Tables 1 and 2 in Appendix C. The historical groundwater analytical results are presented in Appendix D, and Certificates of Analysis are enclosed in Appendix E. The results are compared to ODWS as well as the calculated RUL's for the trigger parameters (Table 1, Appendix C). As requested by the MECP surface water reviewer in 2014, the groundwater results for P4-1 and P4-2 are also compared to the PWQO (Table 2, Appendix C). Table 6.3 below is a summary of the groundwater exceedances.

Table 6.3: Groundwater Exceedances (2021)

ID	Fall 2021		
	RUL Exceedances	**ODWS Exceedances**	**PWQO Exceedances**
P4-1 (On-Site, deeper well)	DOC, iron, manganese, TDS	DOC, iron, manganese, TDS	Boron, cobalt, copper, iron, phosphorus
P4-2 (On-Site, shallow well)	Manganese, TDS	Manganese, TDS	Boron, cobalt, copper, phosphorus
P9-1 (Off-Site)	None	None	Not applicable

ODWS – Ontario Drinking Water Standards
RUL - Reasonable Use Limit
PWQO – Provincial Water Quality Objectives

6.3.1. Groundwater Results Compared to ODWS

In 2021, groundwater sampling was conducted at monitoring wells G11-01A, G11-01B, G11-01C (background wells), P4-1 and P4-2 (representative leachate source well), and P9-1 (compliance assessment well).

All measured parameters from groundwater samples collected from monitoring wells P4-1 (deeper well), and P4-2 (shallow well) met the ODWS criteria with the exception of DOC, manganese, and TDS. Monitoring well P4-1 also exceeded the ODWS for iron for the last five years. The groundwater quality at P4-1 and P4-2 is interpreted to be potentially impacted by landfill leachate and road salt from snow piles. The site has historically been used as a snow dump, with snow stockpiled within 20 m of monitoring well P-4, however, this site use has not directly increased the concentrations of TDS, sodium, and chloride. Therefore, these two wells have only been minorly impacted by leachate.

The groundwater results from monitoring well P9-1 met the ODWS criteria for all measured parameters. The groundwater results are generally consistent with previous years.

6.3.2. Groundwater Results Compared to PWQO

The groundwater results from monitoring well P4-1 and P4-2 were also compared to the PWQO as requested by the MECP, to discuss the groundwater and surface water interaction at the site. The groundwater results at monitoring well P4-1 and P4-2 met the PWQO, with the exception of boron, cobalt, copper, and total phosphorus. Monitoring well P4-1 also exceeded the PWQO for iron. These results indicate that there is a potential for surface water impacts from leachate at this location. However the closest surface water location (SW7) did not display elevated concentrations of these parameters, with the exception of slightly elevated phosphorus. Parameters for which the PWQO is a function of conditions within the surface water (such as pH, hardness, and alkalinity) were not compared to the PWQO.

6.3.3. Groundwater Results Compared to RULs

The measured groundwater concentrations from source zone wells P4-1 and P4-2 exceeded the RULs for DOC, manganese, and TDS. Monitoring well P4-1 also had a RUL exceedance for iron. As previously mentioned, the groundwater quality at P4-1 and P4-2 is interpreted to be potentially impacted by landfill leachate. As per the reasonable use guideline, the RUL values apply to off-site wells only. As a result, any exceedance above the RUL within the site boundaries is not characterized as an official exceedance, thus not considered to be a concern as leachate impact is anticipated to some level on site. Instead, this was completed for discussion purposes only and to assess leachate migration trends.

Based on the absence of elevated key leachate indicator parameters such as boron, chloride, sulphate, and sodium, it does not appear that these two wells are impacted by leachate. There is some total dissolved solids (TDS) impact in P4-1 and P4-2.

Therefore, the focus is on comparing the concentrations of off-site monitoring well P9-1 to the determined RUL values. The assessment of the on-site wells is conducted to assess trends and identify leachate migrations.

The RUL values are directly applicable to monitoring well P9-1 along the north boundary, the groundwater results at monitoring well P9-1 met the RUL values for the applicable parameters. In addition, leachate is not moving close to the property boundary at this time and is limited to immediately downgradient of the landfill at P4. Therefore, the RUL were satisfied for Limoges Landfill Site in 2021.

7.0 Landfill Gas Monitoring

In most landfills, a significant quantity of gas is generated as the waste within the landfill decomposes. The generated gases vary dependent upon the stage of decomposition and the characteristics of the waste. Carbon dioxide and methane typically make up about 65 to 100% of municipal landfill gas (Bagchi, 1990).

Depending upon the age of the landfill and the volume and nature of the waste, this gas production can result in serious fire and explosion hazard. It is important to monitor the concentrations of methane in the immediate vicinity of the waste area to ensure that methane is detected before explosive concentrations are reached. In the event that significant quantities of methane are detected, measures can be taken to control the gas. These measures customarily take the form of relief wells constructed into the waste. The methane rising within the wells can be flared, or in cases of high methane production, collected for other uses.

Under Ontario Regulation 232/98, specified methane concentration limits include:

- Less than 1.0% methane gas in an on-site building, or its foundation;
- Less than 2.5% methane gas in the subsurface at the property boundary; and,
- Less than 0.05% percent methane (i.e. not present) in a building, or its foundation, which is located off-site.

Monitoring of landfill gas migration is not normally required where the assessment shows there is no significant potential for methane to migrate below land surface to adjacent or to the off-site properties, or into buildings or enclosures on-site or off-site. Nevertheless, The Nation Municipality monitored the landfill gas from the on-site wells in October 2021.

Table 6.1: Landfill Gas Monitoring Summary (%) 2021

Well No.	CH_4	CO_2	O_2	H_2S	CO
P4-1	0	0.1	21	0	0
P4-2	0.01	0.5	20.9	0	0
P9-1	0	0.1	20.8	0	0
G11-01A	0	0.2	21.1	0	0
G11-01B	0	0.1	21.1	0	0
G11-01C	0	0.3	21.2	0	0

Based on a review of the landfill gas monitoring summary, elevated methane levels were not measured and/or were being generated at the landfill site.

EXP assessed the concentrations against the limit of 2.5%, and all methane levels were below the 2.5% methane (i.e., non-detect). Based on the above, EXP does not consider there to be a concern regarding methane production at the site.

8.0 Surface Water Quality

Surface water is present at two locations on the landfill site. There is a drainage ditch at the north end of the site, and the South Indian Creek is located along the eastern portion of the site. Water in the drainage ditch flows west to east, while the South Indian Creek flows south to north across the site. The surface water sampling locations are shown on Figure 2, with the exception of SW8 which is shown on Figure 1 in Appendix B.

Eight surface water stations were historically sampled at the Limoges Landfill site. Three (3) sampling locations (SW4, SW5, and SW6) are located along the northern drainage ditch. Sample locations SW4 and SW5 are downstream of the landfill. Sample location SW6 was selected as a background sample location for the northern drainage ditch. Four (4) sampling locations (SW1, SW2, SW3, and SW8) are located along the South Indian Creek, on the eastern portion of the site. Sampling locations SW1 and SW8 represent background surface water quality within the South Indian Creek. Sampling location SW7 is an intermittent groundwater seep, located adjacent to the landfill.

8.1. 2021 Surface Water Sampling

Staff from The Nation Municipality collected surface water samples from all the routinely monitored locations (i.e., SW1 to SW8) on May 19, July 28, and October 26, 2021. The following is a general summary of the surface water conditions during the 2021 sampling program.

Northern Ditch:

- SW6 (upstream): This station was dry in May, July and October.
- SW4 (downstream): Water appeared to be clear, but slightly sandy. The depth of the water was estimated to be 0.2 m, with a channel width of 0.4 m to 0.8 m.
- SW5 (downstream): Water appeared to be clear, but slightly sandy. The depth of the water was estimated to be 0.2 m, with a width of 0.3 to 0.6 m.

South Indian Creek:

- SW1 (upstream): Water appeared to be slightly sandy to clear. The depth of the water was estimated to be 0.5 to 0.75 m, with a channel width of 6 m to 8 m.
- SW8 (upstream): Water appeared to be slightly brown and sandy to clear. The depth of the water was estimated to be 0.4 to 0.6 m, with a channel width of 7 to 10 m.
- SW2 (upstream): Water appeared to be clear. The depth of the water was estimated to be 0.3 to 1.0 m, with a channel width of 6 to 9 m.
- SW3 (downstream): Water appeared to be slightly sandy. The depth of the water was estimated to be 0.3 to 1.0 m, with a channel width of 6 to 8 m.

Groundwater Seep:

- SW7 (downstream): Water appeared to be clear but slightly sandy. The depth of the water was estimated to be 0.4 m to 0.6 m, with a channel width of 6.5 to 8 m.

For all locations, there was no visual or olfactory evidence of leachate impact (such as a sheen or odours) within the surface water. Measurements of pH, temperature and conductivity were also measured in the field for each sample collected. Flow was observed in the drainage ditch at the northern property boundary,

flowing west to east and draining into the South Indian Creek. The South Indian Creek flow was observed flowing from south to the north.

8.2. Surface Water Impact Criteria

Sampling locations SW1 and SW8 have historically been used to represent background surface water quality within the South Indian Creek, due to their comparable water quality and the absence of landfill indicator parameters. The corresponding trigger parameters were calculated by Golder Associates in the 2016 Limoges Landfill report. The calculated surface water trigger parameter concentrations were based on data available from surface water sampling stations SW1 and SW8. It is EXP's opinion that the background period provides sufficient background data used in the trigger parameter concentration. Additional data is no longer incorporated into the trigger parameter concentration to minimize the impacts to the trigger parameter concentration based on changes in flow patterns, which could increase background concentrations.

Table 8.2: Surface Water Trigger Parameters

Key Indicator Parameters	PWQO (mg/L)	Background Range[1] SW1 and SW8 (mg/L)	75th Percentile Compliance Parameters (mg/L)	Trigger Parameter Concentration (mg/L)
Boron	0.2	<0.01 – 0.17	0.04	>0.20
Iron	0.3	0.06 – 1.5	0.82	>0.82
Total Phosphorus	0.03	<0.01 – 0.33	0.10	>0.10

Notes:

mg/L – milligrams per Litre

PWQO – Provincial Water Quality Objectives (1994b)

Shade – suitable leachate indicator parameters for the assessment purposes

1. Background surface water quality based on SW1 (1991-2015) and SW8 (2001-2015), excluding storm and summer monitoring events in 2010, and summer monitoring event 2011 which were not considered representative of typical background surface water quality

8.3. Surface Water Results

8.3.1. Compared to PWQO

The analytical results of the surface water samples were compared against the MECP Policies, Guideline, Provincial Water Quality Objectives (PWQO), July 1994. In addition to comparing the water quality results to the PWQO, EXP also reviewed the analytical results to assess trends between surface water sampling locations and to establish yearly trends. The 2021 surface water analytical results are summarized in Table 3, Appendix C. The historical surface water analytical results are presented in Appendix D, and the Certificates of Analysis are enclosed in Appendix E. Table 8.3 below summarizes any exceedances above the PWQO.

Table 8.3: Surface Water PWQO Exceedances (2021)

ID	Sample Location	Spring	Summer	Fall
Northern Ditch				
SW6	Background	Dry	Dry	Dry
SW4	Adjacent to landfill	Iron, phosphorus	Boron, iron, phosphorus	Iron, phosphorus
SW5	Adjacent to landfill	Iron, phosphorus	Boron, iron, phosphorus	Copper, phosphorus
South Indian Creek				
SW8	Background	Phosphorus	Phosphorus	Phosphorus
SW1	Background	Phosphorus	pH, phosphorus	Phosphorus
SW2	Adjacent to landfill	Phosphorus	Copper, phosphorus	Phosphorus
SW3	Downstream	Phosphorus	Phosphorus	Phosphorus
Groundwater Seep				
SW7	Adjacent to landfill	Copper, phosphorus	Phosphorus	Copper, phosphorus

Phosphorus was consistently measured above PWQO for all sampling locations during the year. Therefore, since the upstream background location SW8 had consistent phosphorus concentrations, phosphorus is not considered to be leachate indicator parameters for this site. The remaining exceedances were sporadic and do not indicate leachate impact.

Northern Ditch

Surface sample location SW6 (the background location in the north drainage ditch) was dry during all three sampling events. Sampling locations SW4 and SW5 displayed similar concentrations to previous years.

The primary leachate indicator parameters boron, chloride, sulphate, sodium and TDS are relatively stable and do not increase from upstream to downstream. A comparison of upstream background concentrations to adjacent surface water location comparison was not possible since the background location was dry during all three sampling events.

South Indian Creek

Surface sample location SW8 and SW1 (background locations in the South Indian Creek) exceeded the PWQO criterion for phosphorus during each sampling event. The phosphorus concentrations were similar to downstream sampling locations at SW2 and SW3, therefore, it is assumed that the phosphorus stems from upstream conditions and is not indicative of leachate impacts to surface water. The primary leachate indicator parameters boron, chloride, sulphate, sodium and TDS are relatively stable and do not increase

from upstream to downstream from SW8 and SW1 to SW3. This also indicates that the surface water is not being impacted by landfill leachate.

Groundwater Seep

Sampling location SW7, exceeded the PWQO criterion for phosphorus during each sampling event and copper slightly exceeded the PWQO in October. This is not indicative of leachate production and/or impacts to the surface water.

8.3.2. Compared to Trigger Parameters

Concentrations of suitable leachate indicator parameters were within the typical historical range. In general, there no significant differences between up stream and down stream surface water sample locations in the South Indian Creek during the 2021 sampling events.

The concentrations of boron were below the trigger values at both SW2 and SW3. However, the iron and phosphorus concentrations exceeded the trigger values in the spring and summer at SW2 and in the spring only at SW3. The concentrations are summarized in Table 8.4 below.

Table 8.4: Trigger Parameter Exceedance (2021)

Sample Event	SW2 (mg/L)	SW3 (mg/L)
Boron (trigger value 0.2 mg/L)		
Spring/Summer/Fall	No exceedances	No exceedances
Iron (trigger value 0.82 mg/L)		
Spring/Summer/Fall	No exceedances	No exceedances
Total phosphorus (trigger value 0.1 mg/L)		
Spring/Summer/Fall	No exceedances	No exceedances

Notes: mg/L – milligrams per Litre

There were no exceedances of the surface water trigger concentrations in 2021.

9.0 Trigger Mechanisms & Contingency Plans

The following sections describe the trigger mechanisms and contingency plans to be established for groundwater and surface water.

9.1. Groundwater

The current trigger for groundwater is the Reasonable Use Limit, as defined by MECP Policy B-7. These limits define the allowable impact to groundwater quality at the property boundary. Based on the groundwater results collected the landfill site is in compliance, in terms of impacts to off-site groundwater.

9.2. Surface Water

The Eastern Region Surface Water Group of the Ministry of the Environment, Conservation and Parks have revised a previously established set of guidelines for surface water monitoring at active waste disposal sites (*Interim Guidance Document – Surface Water Monitoring Trigger Mechanism for Waste Disposal Sites, revised March 1998*). Included in these guidelines is a three-tiered "trigger" mechanism, which prescribes an increasingly detailed, monitoring program should a decrease in surface water quality be attributed to landfilling operations. The process can ultimately lead to the design and implementation of a contingency plan to actively address surface water quality problems.

Tier I is considered an annual routine monitoring program which includes analysis of conservative tracer and site-specific PWQC parameters as well as a sampling frequency of three to four times annually. This level is considered an "Alert" level for surface water impact.

The Tier II guidelines are initiated should downstream concentrations significantly exceed background levels. The Tier II Trigger is considered a "Confirmation" level. This plan consists of an extended parameter list and increased sampling frequency, both of which are to be established on a site-specific basis with input from the MECP. Should an unacceptable reduction in surface water quality be confirmed through the Tier II monitoring plan, a Tier III contingency plan is to be initiated along with a compliance monitoring program.

Based on the available surface water data, leachate impacts in the surface water regime are considered minimal for the site. There were no exceedances of the surface water trigger concentrations in 2021.

Consequently, the site is considered at a Tier I level. Until such time that leachate impact is detected and confirmed in the downstream surface water stations, the site remains at a Tier I level.

10.0 Conclusions and Recommendations

Based on the results of the 2021 groundwater and surface water monitoring program at Limoges Landfill, the following conclusions are provided:

- The groundwater and surface water monitoring program included the collection of surface water from eight surface water monitoring locations (SW1 to SW8) in May, July and October, and the monitoring and sampling of two well nests consisting of five monitoring wells (P4-1, P4-2, G11-1A, G11-B and G11-C) and P9-1 in October.
- The groundwater flow direction is northeasterly towards the South Indian Creek.
- The current trigger for groundwater is the Reasonable Use Limit, as defined by MECP Policy B-7. These limits define the allowable impact to groundwater quality at the property boundary. Based on the groundwater results collected, the landfill site is in compliance since there area no B-7 exceedances.
- Phosphorus was consistently measured above PWQO for all surface water sampling locations during the year. Therefore, since the upstream background location SW8 had consistent phosphorus concentrations, phosphorus is not considered to be leachate indicator parameters for this site. The remaining exceedances were sporadic and do not indicate leachate impact. There were no exceedances of the surface water trigger concentrations in 2021.
- Based on a review of the landfill gas monitoring summary, elevated methane levels were not measured and/or were being generated at the landfill site. The landfill gas monitoring will continue in 2022.

11.0 Sampling Program

11.1. Groundwater Monitoring Program

It is suggested that the sampling and analysis be continued once per year in the fall. The following lists detail the parameters and sampling locations to be considered for the groundwater monitoring program.

11.1.1. Laboratory Measured Parameters

- Calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, bromide, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, total phosphorus, silicon, silver, strontium, thallium, tin, titanium, vanadium, zinc (ICP Scan) hardness (calculated from laboratory calcium and magnesium analyses), alkalinity, TDS, chloride, sulphate, nitrate, nitrite, ortho-phosphate, dissolved reactive phosphorus ammonia, DOC, COD, phenols, TKN;
- Volatile organic compounds at P4-1 and P4-2 every five years (next scheduled for 2024)

11.1.2. Field Measured Parameters

- Measurements of groundwater levels in all accessible monitoring wells;
- Measurements of temperature, conductivity, pH at each sample location

11.1.3. Sampling Locations

- P4-1, P4-2, P9-1, G11-01A, G11-01B, G11-01C, plus one duplicate per sampling event.

11.2. Surface Water Monitoring Program

It is recommended that attempts to collect surface water as per the surface water sampling be continued three times per year (spring, summer, and fall). The following lists detail the parameters and sampling locations to be considered for the surface water monitoring program.

11.2.1. Laboratory Measured Parameter

- Boron, strontium, sulphate, TDS, DOC, hardness, chloride, iron, manganese, total phosphorus, aluminum (SW2 only) and BOD (SW2 only).
- Calcium, magnesium, sodium, potassium, aluminum, barium, boron, cadmium, chromium, bromide, cobalt, copper, iron, manganese, nickel, total phosphorus, silicon, strontium, vanadium (ICP Scan) hardness (calculated from laboratory calcium and magnesium analyses) alkalinity, TDS, chloride, sulphate, nitrate, nitrite, ortho-phosphate ammonia, DOC, COD, phenols, unionized ammonia (calculated from laboratory ammonia and field temperature and pH).

11.2.2. Field Measured Parameters

- Measurements of temperature, conductivity, pH, dissolved oxygen at each sample location.
- Flow measurements; description of flow conditions and representative photographs at all sampling locations (SW1 to SW8).

11.2.3. Sample Locations

- South Indian Creek: SW1, SW2, SW3, SW8.
- Groundwater seep east of Site: SW7.
- Ditch to North of Site: SW4, SW5, SW6.
- Plus, one duplicate per sampling event.

12.0 References

- Bagchi, A. (2004), *Design of Landfills and Integrated Solid Waste Management*. Hoboken NJ: John Wiley & Sons.
- Department of Energy, Mines and Resources, *Topographic Map of Carleton Place, Ontario*: Map 31 F/1 Scale 1:50,000, Issued 1998.
- EXP Services Inc., *2017 Limoges Landfill Groundwater and Surface Water Monitoring Report*, March 2018.
- Geological Survey of Canada, *Surficial Geology – Carleton Place*: Map 1681A Scale 1:50,000, Issued 1990.
- Geological Survey of Canada, *Generalized Geology of Ottawa Hull*: Map 1508A, Scale 1:125,000, 1982.
- Ontario Ministry of the Environment, *Ontario Drinking Water Standards, Objectives and Guidelines*, Revised June 2006.
- Ministry of the Environment, April 1994, *The Incorporation of the Reasonable Use Concept in to the Ground Water Management Activities of the Ministry of the Environment.* Guideline B-7.
- Ontario Ministry of the Environment, 1994, Provincial Water Quality Objectives.
- Golder Associates Ltd., *2016 Groundwater and Surface Water Monitoring Program Limoges Landfill Site Nation Municipality*, March 2017.
- Golder Associates Ltd., *2015 Groundwater and Surface Water Monitoring Program Limoges Landfill Site Nation Municipality*, March 2016.

13.0 Closure

This report was prepared for the exclusive use of The Nation Municipality and the Ontario Ministry of the Environment, Conservation and Parks. Any other party should not rely upon the contents of this report without the express written consent of EXP. Conclusions regarding the environmental conditions at this site are based solely on the extent of observations and the information referenced herein.

EXP has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied is included or intended in this document.

Appendix A:
Recent Certificate of Authorization / Provincial Officer Order

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471104
Notice No. 4
Issue Date: June 24, 2010

The Corporation of The Nation Municipality
958 Route 500 W
Rural Route, No. 3
Casselman, Ontario
K0A 1M0

Site Location: Limoges Waste Disposal Site
Lot 29, Concession 3
The Nation Municipality, United Counties of Prescott and Russell, Ontario
K0A 1M0

You are hereby notified that I have amended Provisional Certificate of Approval No. A471104 issued on May 1, 2001 and amended on October 3, 2005, May 3, 2007 and October 16, 2008 for the use and operation of a 5 hectare landfilling area within a 16.68 hectare landfill site property , as follows:

The following items are hereby added to Schedule "A":

6. Letter dated March 8, 2010 signed by Loren Bekeris, Environmental Professional and Pual Smolkin, P.Eng., Principal, Golder Associates Ltd. to the Director, EAAB, Ontario Ministry of the Environment.

7. E-mail dated April 26, 2010 from Loren Bekeris to Nihar Bhatt, Ontario Ministry of the Environment, including attachments to this e-mail related to the Limoges Waste Disposal Site - Site Plans.

The reason(s) for this amendment to the Certificate of Approval is (are) as follows:

To approve the inclusion of the correct description of the site.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471104 dated May 1, 2001

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection

Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to eachportion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 24th day of June, 2010

THIS NOTICE WAS MAILED
ON July 9, 2010
JC
(Signed)

Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

NB/

c: District Manager, MOE Cornwall
Paul Smolkin, Golder Associates Ltd.

le 34 40380

Golder Associates

CELEBRATING 50 YEARS in 2010

April 9, 2010 Project No. 10-1127-0029

Director
Environmental Assessment and Approvals Branch
Ministry of the Environment
Floor 12A
2 St. Clair Ave. W.
Toronto, Ontario
M4V 1L5

REVISED CERTIFICATE OF REQUIREMENT FOR PART OF LOT 29, CONCESSION 3 BEING PARTS 1 AND 2 ON PLAN 50R-3174, FORMERLY TOWNSHIP OF CAMBRIDGE NOW NATION MUNICIPALITY, COUNTY OF RUSSELL LIMOGES WASTE DISPOSAL SITE, LIMOGES, ONTARIO

Dear Director:

Golder Associates Ltd., on behalf of the Nation Municipality, has prepared the attached revised Certificate of Requirement (Certificate of Prohibition) for the Limoges Waste Disposal Site (WDS) in Limoges, Ontario. This submission follows the application dated March 8, 2010 for an administrative amendment to Certificate of Approval No. A471104 for the WDS. The purpose of the amendment and the revision of the Certificate of Requirement is to remove a 5.08-hectare parcel of land from the registered description of the site in the Certificate of Requirement. The land was included in the original Certificate of Requirement in error and is not part of the approved WDS property.

The MOE is requested to approve the revised Certificate of Requirement for the Limoges WDS. Once the MOE approval is issued, Nation Municipality will register it on title to both the Limoges WDS and the adjacent 5.08-hectare parcel in the registry office.

In view of the pending sale, your attention to this matter is appreciated. If you have any questions on this application, please contact the undersigned.

Yours truly,

GOLDER ASSOCIATES LTD.

Loren Bekeris, M.Sc.
Environmental Professional

Paul Smolkin, P.Eng.
Principal

LEB/PAS/am

CC: Michael Seguin, MOE Cornwall
Mary McCuaig, Nation Municipality
Gerry Lalonde, Stantec Consulting Ltd.

Attachments: Revised Certificate of Requirement

n:\active\2010\1127 - geosciences\10-1127-0029 nation limoges lfic of a amendment\letter 002 09april 2010.docx

Additional Property Identifier(s) and/or Other Information
Code(s) foncières additionnelle(s) et renseignements supplémentaires

SCHEDULE "A"

CERTIFICATE OF REQUIREMENT

s.197(2)
Environmental Protection Act

This is to certify that pursuant to a decision issued by the Ministry of Environment in the form of Certificate of Approval No. A471104 dated May 1, 2001 with respect to the Limoges Waste Disposal Site on Part of Lot 29, Concession 3, being Parts 1 and 2 on Plan 50R-3174, formerly Township of Cambridge, now Nation Municipality, County of Russell the following person(s):

Nation Municipality

and any other persons having an interest in Part of Lot 29, Concession 3, being Parts 1 and 2 on Plan 50R-3174, formerly Township of Cambridge, now Nation Municipality, County of Russell are required, before dealing with the property in any way, to give a copy of the decision including any amendments that may be made thereto to every person who will acquire an interest in the property as a result of the dealing.

Under subsection 197(3) of the Environmental Protection Act, this requirement applies to each person who, subsequent to the registration of this certificate, acquires an interest in the real property.

FOR OFFICE USE ONLY
USAGE INTERNE

Document General
Form 4 — Land Registration Reform Act

Document général
Formule 4 — Loi portant réforme de l'enregistrement immobilier

D

FOR OFFICE USE ONLY/USAGE INTERNE

(1) Registry / Enregistrement des actes — Land Titles / Enregistrement des droits immobiliers

(2) Page 1 of/de 2 Pages

(3) Property Identifier(s) / Bloc(s) / Property / Parcelle(s) — Additional: See Schedule / Supplément en annexe

69027-0191

(4) Nature of Document / Nature du document

Certificate of Requirement - *Environmental Protection Act* - s.197(2)

(5) Consideration / Contrepartie

N/A ---------- S/O Dollars N/A ---------- S/O

(6) Description

Part of Lot 29, Concession 3, being Parts 1 and 2 on Plan 50R-3174, formerly Township of Cambridge, now Nation Municipality, County of Russell

New Property Identifiers / Nouveaux numéros fonciers — Additional: See Schedule / Supplément en annexe

Executions / Autres dispositions — Additional: See Schedule / Supplément en annexe

(7) This Document contains / Ce document contient: New Easement / Nouvelle servitude; Plan/Sketch / Plan/croquis

(8) Schedule for / Annexe: Description / Description; Additional Parties / Autres parties; Other / Divers

(9) This Document provides as follows / Teneur du document

See Schedule "A" attached.

Continued on Schedule / Suite en annexe

(10) This Document relates to instrument number(s) / Numéro(s) des actes visés par ce document

(11) Party(ies) (Set out Status or Interest) / Partie(s) (Indiquer la qualité ou l'intérêt)

Name(s)/Nom(s)	Signature(s)	Y/A	M/M	D/J
Person with authority to issue Certificate pursuant to *Environmental Protection Act*, section 197(2)				

(12) Address for Service / Domicile élu: Ministry of the Environment, 2 St. Clair Avenue West, Floor 12A, Toronto, ON M4V 1L5

(13) Party(ies) (Set out Status or Interest) / Partie(s) (Indiquer la qualité ou l'intérêt)

Name(s)/Nom(s)	Signature(s)	Y/A	M/M	D/J

(14) Address for Service / Domicile élu

(15) Municipal Address of Property / Adresse civique de l'unité foncière

(16) Document Prepared by: / Document préparé par

Paul Smolkin, P.Eng.
Golder Associates Ltd.
32 Steacie Drive
Kanata, ON K2K 2A9

Fees and Tax / Droits et taxes

Registration Fee / Droit d'enregistrement	
Total	

Golder Associates

50 YEARS 1960 to 2010

March 8, 2010

Project No. 10-1127-0029-3000

Director
Environmental Assessment and Approvals Branch, Section 27
Ministry of the Environment
Floor 12A
2 St Clair Ave W.
Toronto, Ontario
M4V 1L5

APPLICATION FOR ADMINISTRATIVE AMENDMENT
CERTIFICATE OF APPROVAL NO. A471104
LIMOGES WASTE DISPOSAL SITE, LIMOGES, ONTARIO

Dear Director:

Golder Associates Ltd. (Golder), on behalf of the Nation Municipality, has prepared the attached application for an administrative amendment to Certificate of Approval (C of A) No. A471104 for the Limoges Waste Disposal Site (WDS). The purpose of the amendment is to remove a 5.08-hectare parcel of land from the registered description of the site in the Certificate of Prohibition. The land was included in the Certificate of Prohibition in error and is not part of the approved WDS property.

Background

Certificate of Approval No. A471104 was issued on May 1, 2001 for the Limoges WDS, which is located on Part of Lot 29, Concession 3 (Cambridge Township), the Nation Municipality, Ontario (see Figure 1). The C of A allows the use and operation of a 5-hectare landfilling area within a 16.68-hectare landfill site property. As required by Condition 2.3(b) of the C of A, the Owner (Nation Municipality) completed a Certificate of Prohibition for the WDS in 2001. At that time, 5.08 hectares of land located immediately east of the WDS but not included in the 16.68-hectare landfill site property (see Figure 1) were erroneously included in the description of the site in the Certificate of Prohibition. The Certificate of Prohibition was approved by the Director and, as required by Condition 2.3(c), was registered by Nation Municipality on title to the property in the local registry office. This error was recently discovered during the title search associated with the sale of the 5.08-hectare land parcel. It is now requested to remove these 5.08 hectares of land from the Certificate of Prohibition.

Discussion

Golder has conducted regular groundwater and surface water monitoring at the WDS and has submitted annual monitoring reports to the Ministry of the Environment (MOE) since 1999. Based on the results of this monitoring, it is interpreted that the 5.08-hectare parcel is not required as part of the landfill as a buffer zone, contaminant attenuation zone or monitoring area, as further discussed below. Furthermore, this 5.08-hectare parcel has not been used for any purpose related to the landfill.

Golder Associates Ltd.
32 Steacie Drive, Kanata, Ontario, Canada K2K 2A9
Tel: +1 (613) 592 9600 Fax: +1 (613) 592 9601 www.golder.com
Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

The direction of groundwater flow at the WDS has been consistently interpreted to be toward the north/northeast, as shown on Figure 1. Groundwater quality at monitoring well P9-1, located at the downgradient (north) site boundary, is not interpreted to be impacted by landfill leachate. The Reasonable Use Performance Objectives defined under MOE Guideline B-7 are consistently satisfied at monitoring well P9-1 and the WDS is in compliance with the guideline.

South Indian Creek flows along the east side of the WDS, near the western boundary of the 5.08-hectare land parcel. Water quality at surface water monitoring station SW-2, located in the creek east of the waste footprint, is similar to background water quality and is not interpreted to be impacted by the landfill. North of the waste footprint, water quality at surface water monitoring station SW-3 has been considered to demonstrate minor evidence of leachate impact in some years; these impacts may be related to contributions from the ditch running along the north boundary of the WDS, which is interpreted to be impacted by landfill leachate.

Based on the lack of groundwater and surface water impacts between the waste footprint and the east boundary of the WDS, it is not interpreted that the 5.08-hectare land parcel is required as part of the landfill for any purpose.

Conclusion

The MOE is requested to remove the 5.08-hectare parcel of land shown in Figure 1 from the Certificate of Prohibition for the Limoges WDS, and issue a Certificate of Withdrawal. The land was added to the Certificate of Prohibition in error and was not and is not required as part of the landfill. Once the MOE approval is issued, Nation Municipality will register it on title to both the Limoges WDS and the adjacent 5.08-hectare parcel in the registry office.

An application for an administrative amendment, together with the corresponding application fee, is attached to this letter.

In view of the pending sale, your attention to this matter is appreciated. If you have any questions on this application, please contact the undersigned.

Yours truly,

GOLDER ASSOCIATES LTD.

Loren Bekeris, M.Sc.
Environmental Professional

Paul Smolkin, P.Eng.
Principal

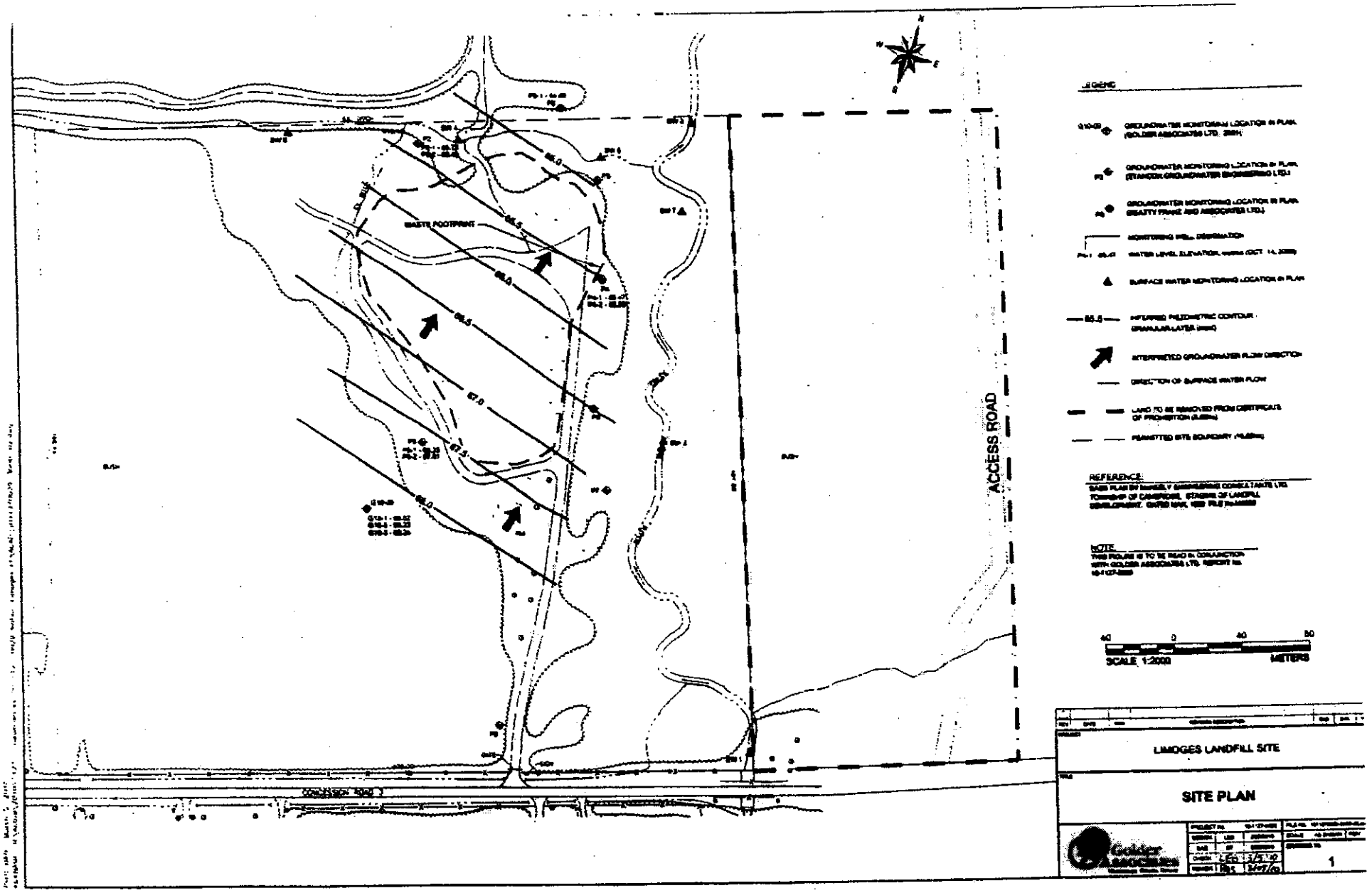
LEB/PAS/am

CC: Michael Seguin, MOE Cornwall
Mary McCuaig, Nation Municipality
Gerry Lalonde, Stantec Consulting Ltd.

Attachments: Figure 1
Application for a Provisional Certificate of Approval for a Waste Disposal Site

[illegible]

Golder Associates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LIMOGES LANDFILL SITE
SITE PLAN
Golder Associates
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634 40380

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471104
Notice No. 3
Issue Date: October 16, 2008

The Corporation of The Nation Municipality
958 Route 500 W
Rural Route, No. 3
Casselman, Ontario
K0A 1M0

Site Location: Limoges Waste Disposal Site
Lot 29, Concession 3
The Nation Municipality, United Counties of Prescott and Russell

You are hereby notified that I have amended Provisional Certificate of Approval No. A471104 issued on May 1. 2001, amended on October 3, 2005 and May 3, 2007 for the use and operation of a 5 hectare landfilling area within a 16.68 hectare landfill site property , as follows:

I. Condition 3.8 is hereby added:

3.8 The sanitary sewage pumping station within the landfill buffer zone area near the property's south east corner shall be operated in accordance with its OWRA approval and shall not interfere with the landfill site operations.

II. The following Item is hereby added to the Schedule "A":

5. Application for a Provisional Certificate of Approval for a Waste Disposal Site dated July 29, 2008, signed by Mary McCuaig, Clerk, The Corporation of the Nation Municipality, with the supporting documents to MOE.

The reason for this amendment to the Certificate of Approval is as follows:

To recognize the existence of a new sanitary sewage pump station within the total site area of the landfill site.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471104 dated May 1, 2001, as amended.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 16th day of October, 2008

THIS NOTICE WAS MAILED
ON Oct. 17, 2008
9c
(Signed)

Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

AT/
c: District Manager, MOE Cornwall
Gerry Lalonde, Stantec Consulting Ltd. ✓

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471104
Notice No. 2
Issue Date: May 3, 2007

The Corporation of The Nation Municipality
958 Route 500 W
Rural Route, No. 3
Casselman, Ontario
K0A 1M0

Site Location: Limoges Waste Disposal Site
Lot 29, Concession 3
The Nation Municipality, United Counties of Prescott and Russell

You are hereby notified that I have amended Provisional Certificate of Approval No. A471104 issued on May 1, 2001 and amended on October 3, 2005 for use and operation of a 5 hectare landfilling area within a 16.68 hectare landfill site property , as follows:

I. Condition 4.13 is hereby revoked and replaced as follows:

4.13 Cover material shall be applied as follows:

a. (i) Between June 1 and August 31, cover material consisting of a minimum of 0.15 m thickness of soil shall be applied once a week; and

(ii) Between September 1 and May 31, cover material consisting of a minimum of 0.15 m thickness of soil shall be applied once every two weeks; and

b. The Owner shall increase the frequency of cover material application if it is determined by the District Manager or by the Owner that the frequency outlined in 4.13.(a)(i) and 4.13.(a)(ii) does not provide adequate control. Alternative cover material must be approved by the Director prior to its use.

II. The following item is hereby added to Schedule "A"

4. Application for a Provisional Certificate of Approval for a Waste Disposal Site dated February 14, 2007 signed by Mary J. McCuage, Clerk, The Corporation of the Nation Municipality, with the supporting documents to MOE. re: request to revise the daily cover frequency.

The reason for this amendment to the Certificate of Approval is as follows:

to approve the municipality's request to revise the daily cover frequency.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471104 dated May 1, 2001

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., Suite 1700
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 3rd day of May, 2007

Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

KM/

c: District Manager, MOE Cornwall
Keith Holmes, Golder Associates Ltd.

Réunion Cons.
Council Mtg 17/10/05
D / M / YR

Action Reports
Clerk
Greffier

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471104
Notice No. 1
Issue Date: October 3, 2005

Municipalité de la Nation
Reçu
OCT 11 2005
Received
The Nation Municipality

The Corporation of The Nation Municipality
958 Route 500 West, RR 3
Casselman, Ontario, K0A 1M0

Site Location: Limoges Waste Disposal Site
Lot 29, Concession 3
The Nation Municipality, United Counties of Prescott and Russell

You are hereby notified that I have amended Provisional Certificate of Approval No. A471104 issued on May 1, 2001 for use and operation of a 5 hectare landfilling area within a 16.68 hectare landfill site property, as follows:

in accordance with application and cover letter dated July 6, 2005, prepared by Golder Associates Ltd., Condition 4.5.b) is hereby revoked and Conditions 3.5, 3.7 and 4.13 are hereby revoked and replaced as follows:

3.5 The Buffer around areas where new waste placement is taking place shall not be less than 75 meters. Along the northern boundary where waste has already been placed, a 25 meter buffer shall be maintained.

3.7 The Owner shall install a perimeter fencing consisting of 1.15 meter post and wire fence along County Rd. 3, with "No Trespassing" signs posted at 30 meter intervals along the fence by April 30, 2006.

4.13 Cover material shall be applied as follows:

a. (i) Between April 1 and November 30, cover material consisting of a minimum of 0.15 m thickness of soil shall be applied once a week; and

(ii) Between December 1 and March 31, cover material consisting of a minimum of 0.15 m thickness of soil shall be applied once every three weeks; and

b. The Owner shall increase the frequency of cover material application if it is determined by the District Manager or by the Owner that the frequency outlined in 4.13.(a)(i) and 4.13.(a)(ii) does not provide adequate control. Alternative cover material must be approved by the Director prior to its use.

The reasons for this amendment to the Certificate of Approval are as follows:

1. Condition 4.5.b) is revoked to reflect that the Municipality does not own weigh scales and that Annual survey is used to determine volume of waste deposited.
2. Condition 3.5 is replaced to reflect the existing historic conditions at the site.

3. Condition 3.7 is replaced to reflect that the isolated nature of the site.
4. Condition 4.13 is replaced to reflect the frequency at which the municipality is able to place daily cover and still provide adequate protection at the site.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471104 dated May 1, 2001.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of Environment and Energy
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 3rd day of October, 2005

Ian Parrott, P.Eng.
Director

NP/

c: District Manager, MOE Cornwall
Keith Holmes, Golder Associates Ltd.

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PROVISION[illegible] CERTIFICATE OF APPROVAL
FOR A WASTE DISPOSAL SITE
NO. A471104

Municipalité de la Nation
Received
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Reçu
The Nation Municipality

Under the Environmental Protection Act and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

Corporation of the Nation Municipality
958 Road 500 West
R. R. 3
Casselman, Ontario
K0A 1M0

for the use and operation of a 5 hectare landfilling area within a 16.68 hectare landfill site property,

all in accordance with the following plans and specifications:

As per the attached Schedule "A"

Located: Part Lot 29, Concession 3
(Former Township of Cambridge)
Nation Municipality (Limoges WDS)

which includes the use of the site only for the disposal of solid non-hazardous municipal waste (Note: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval)

1. Definition of Terms

1.1 In this Certificate of Approval ("Certificate"), the following definitions shall apply:

1.1.1 "Owner" means the Nation Municipality;

1.1.2 "Buffer" means those lands between the limit of fill and the boundaries of the property owned by the Corporation of Nation Municipality, that shall in no instance be less than 30 metres;

1.1.3 "Certificate" means this Certificate of Approval No. A471104 as amended from time to time and all Schedules attached to and forming part of this Certificate;

1.1.4 "District Manager" means the Manager of the Ottawa District Office, Ministry of the Environment;

1.1.5 "Director" means the one or more persons who from time to time are so designated for the purpose of Part V of the Environmental Protection Act, R.S.O. 1990, as amended from time to time;

1.1.6 "Engineer" means a professional engineer licenced under the Ontario Professional Engineers Act;

1.1.7 "EPA" means the Environmental Protection Act, R.S.O. 1990, as amended;

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1.1.8 "Landfill" or "Site" means the property owned by The Corporation of Nation Municipality for the purposes of waste disposal and this Certificate, comprising the Limit of Fill and the Buffer;

1.1.9 "Limit of Fill" means the area in which waste is approved for final disposal according to this Certificate;

1.1.10 "Ministry" or "MOE" means the Ontario Ministry of the Environment;

1.1.11 "ODWS" means the Ontario Drinking Water Standards, as amended from time to time;

1.1.12 "OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c.0.40, as amended;

1.1.13 "PWQO" means the Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives.* as amended from time to time;

1.1.14 "Regional Director" means the Director, Eastern Region, Ministry of the Environment; and

1.1.15 "RUP" means the Reasonable Use Policy (Guideline B-7) of the Ministry of the Environment.

2. General

2.1 This Certificate revokes all previously issued Provisional Certificates of Approval issued under Part V, EPA, for this site. The approval given herein, including the Terms and Conditions set out, replaces all previously issued approvals and related Terms and Conditions under Part V, EPA for this Site.

2.2 The site shall be constructed and operated in accordance with Item 1 in Schedule "A" (Nation Municipality, Operation, Development and Closure Report, Limoges Landfill Site) and in accordance with all other documents listed in Schedule "A" of this Certificate. Schedule "A" is an integral part of these Conditions of Approval.

2.3 (a) Pursuant to Section 197 of the EPA, neither the Owner nor any person having an interest in the Site shall deal with the Site in any way without first giving a copy of the Provisional Certificate of Approval to each person acquiring an interest in the Site as a result of the dealing;

(b) Within sixty (60) calendar days of the date of this Certificate of Approval, the Owner shall submit to the Director for the Director's signature two (2) copies of a completed Certificate of Prohibition containing a registerable description of the Site, in accordance with Form 1 of O. Reg. 14/92; and,

(c) Within ten (10) calendar days of receiving the Certificate of Prohibition, the Owner shall register the Certificate of Prohibition in the appropriate Land Registry Office on title and immediately following registration, submit to the Director the duplicate registered copy.

2.4 Should there be any discrepancies between items in Schedule "A", and the conditions in this Certificate, the conditions shall take precedence. In all matters requiring the interpretation and implementation of this Certificate, the conditions of the Certificate shall take precedence.

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2.5 The Owner shall comply with the Conditions and schedules in this Certificate. The requirements specified in this Certificate are minimum requirements and do not abrogate the need to take all reasonable steps to avoid violating the provisions of other applicable legislation.

2.6 The requirements of this Certificate are severable. If any requirement of this Certificate, or the application of any requirement of this Certificate, due to any circumstances, is held invalid, the application of such requirement to other circumstances and the remainder of this Certificate shall not be affected thereby.

2.7 The service area from which waste may be received shall be limited to generators within the former Township of Cambridge, Corporation of Nation Municipality.

2.8 The Owner shall allow MOE personnel, or a MOE authorized representative(s), upon presentation of credentials, to:

(a) carry out any and all inspections authorized by the EPA, OWRA, or the *Pesticides Act*, R.S.O. 1990, as amended from time to time, of any place to which this Certificate relates, and without restricting the generality of the foregoing, to:

(b) (i) enter upon the premises or the location where the records required by the conditions of this Certificate are kept;

(ii) have access to and copy, at any reasonable time, any records required by the conditions of this Certificate;

(iii) inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices or operations required by the conditions of this Certificate, and

(v) sample and monitor, at reasonable times, for the purposes of assuring compliance with the conditions of this Certificate.

2.9 The Owner shall, forthwith upon request of the Director, District Manager, or Provincial Officer (as defined in the EPA), furnish any information requested by such persons with respect to compliance with this Certificate, including but not limited to, any records required to be kept under this Certificate; and
In the event, the Owner provides the Ministry with information, records, documentation or notification in accordance with this Certificate (for the purposes of this condition referred to as "Information"),

(a) the receipt of Information by the Ministry;

(b) the acceptance by the Ministry of the Information's completeness or accuracy; or

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(c) the failure of the Ministry to prosecute, or to require the Owner to take any action, under this Certificate or any statute or regulation in relation to the Information;

shall not be construed as an approval, excuse or justification by the Ministry of any act or omission of the Owner relating to the Information, amounting to non-compliance with this Certificate or any statute or regulation.

2.10 The Owner shall notify the Director in writing of any of the following changes within thirty (30) days of the change occurring:

(a) change of owner or operator of the Site or both;
(b) change of address or address of the new owner or operator;
(c) change of partners where the owner or operator is or at any time becomes a partnership, and a copy of the most recent declaration filed under the **Business Names Act**, 1991 shall be included in the notification to the Director;

3. Site Design and Development

3.1 Any significant design optimization or modification from approved designs for the landfill not otherwise requiring an amendment to this Certificate shall be submitted to the Director for approval at least 60 days prior to its implementation along with an explanation of the reasons.

3.2 Waste may only be disposed of within the 5 hectare Limit of Fill as described in Figure 6, Item 1 of Schedule "A". Within 60 days of this Certificate coming into effect, the boundaries of the Limit of Fill shall be marked using proper surveying techniques and maintained so as to be visible throughout the year.

3.3 The maximum amount of waste, daily cover, intermediate cover and final cover placed within the Limit of Fill shall not exceed the final contours shown in Figure 6, Item 1 of Schedule "A".

3.4 Final cover shall be applied progressively, as weather conditions permit, as each part of the Limit of Fill reaches its final grades. The design of the final cover shall comply with the specifications contained in Item 1 in Schedule "A". Vegetation of completed final cover using drought-resistant, low-nutrient requirement grass and legume blends which regenerate annually shall occur within one month of its placement and final grading, or as soon as weather permits.

3.5 The Buffer shall not be less than 100 metres in all directions around the landfill.

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3.6 The Buffer shall not be used for waste disposal but may be used for receiving and recording waste arrivals, monitoring, surface water management, and the operation of other approved ancillary waste management facilities, all in accordance with Item 1 in Schedule "A". All parts of the Buffer, other than roadways, parking areas and structures shall be maintained with a healthy vegetative cover or other appropriate surface treatment which will minimize erosion.

3.7 The Owner shall install perimeter fencing consisting of 1.15 metre "post and wire" farm fence around the entire site boundary, with "No Trespassing" signs posted at 30 metre intervals around the perimeter, by April 30, 2002.

4. Site Operations

4.1 The waste disposal operating hours of the Landfill shall be 8:30 a.m. to 5:00 p.m. Monday to Saturday. The Landfill shall be closed on Sundays and statutory holidays. The Owner may provide more limited hours of operation providing that they are correctly posted at the landfill gate and that suitable public notice is given of any change. During days when the Landfill is open, on-site activity other than waste disposal may occur up to two hours prior to opening and/or up to two hours after closing. Equipment maintenance and administrative functions may occur at any time. Upon reasonable notification of the District Manager, contingency actions may proceed outside of the normal hours of operation. Emergency response may occur at any time, as required.

4.2 During non-operating hours, the Landfill entrance and exit gates shall be locked or otherwise secured against access by unauthorized persons.

4.3 No waste shall be received for disposal at the Landfill except during the operating hours and under the supervision of the landfill attendant(s).

4.4 Only solid non-hazardous waste shall be disposed of in the Landfill.

4.5 The Owner shall record the following information with respect to all wastes received at the Landfill:

a) hauler name, or "residential" if delivered by individual residents;
b) net tonnage;
c) waste category; and
d) date received.

The name and vehicle license shall be recorded for any load rejected for disposal in the Landfill along with the reason for rejection.

To Be STAMPED

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FOR A WASTE DISPOSAL SITE
NO. A471104

4.6 Access to the Landfill shall be via Concession Road No. 3, as shown in Figure 3, Item 1 of Schedule "A". Any changes to the main Landfill entrance or exit shall be submitted to the District Manager for prior approval. Other service entrances may be established for access by Owner staff or contractors, or for contingency or emergency use, provided that they are secured from entry when not in use.

4.7 The burning of wastes at the Landfill is prohibited.

4.8 Scavenging at the Landfill is prohibited, except at the designated re-use area and under the supervision of the landfill attendant.

4.9 The Owner shall take all practical steps to prevent the escape of litter from the site. Periodic pick-up of litter at the Site and along the access road in the vicinity of the Site shall be carried out as required, or every two weeks as a minimum. Private property adjacent to the Landfill shall be inspected weekly and litter shall be collected if necessary, with permission for access from the property owner. Litter fencing shall be erected around the working area of the landfill.

4.10 The Owner shall ensure that all Landfill supervisors receive initial and ongoing training with respect to the following: the Certificate and Conditions attached to the Certificate, relevant waste management regulations and legislation; environmental concerns related to the waste being handled at the site; occupational health and safety concerns pertaining to the waste being handled at the site; fire fighting protocol; and emergency and contingency measures for the prevention of off-site impacts.

4.11 No water obtained from surface water or from a well constructed on the Site shall be used for drinking purposes without prior approval from the District Manager. Any other water supply system that obtains water from a well or surface water source on the Site shall be clearly marked to indicate that the water is not potable.

4.12 Waste shall be deposited in a manner that minimizes the area of exposed waste at the Landfill working face and and shall be compacted before cover material is applied according to the requirements of this Certificate.

4.13 At the end of each working day, and within two hours of the entrance gate closure, weather permitting, cover material consisting of a minimum of 0.15 m thickness of soil and/or a mixture of composted leaves and wood chips and/or landfill fines shall be applied to all incoming wastes received at the tipping face. Any alternative cover material must be approved by the Director prior to its use.

4.14 In landfilling areas where waste placement is below the final approved contours and landfilling is to be suspended for one month or more, an interim cover consisting of a minimum of 0.30 m thickness of soil and/or a mixture of composted leaves and wood chips and/or landfill fines shall be applied.

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4.15 Where existing cover material has eroded such that waste is exposed, the cover material shall be promptly replaced.

5. Monitoring

5.1 The Owner shall monitor groundwater, surface water and leachate as per the monitoring plan described in the report listed as Item 2, Schedule "A" of this Certificate. The Owner may amend the monitoring plan from time-to-time with the prior written consent of the District Manager.

5.2 Within three months of the issuance date of this Certificate, the Owner shall establish , in addition to the existing background surface water station "SW1", a second background surface water station upstream of Concession Road 3 and start sampling immediately as per the monitoring plan described under Condition 5.1 of this Certificate.

5.3 All monitoring wells which form part of any monitoring program shall be properly capped, locked and protected from damage. Any groundwater monitoring wells that are damaged shall be repaired, replaced forthwith or properly abandoned.

5.4 In the event that the results of the monitoring programs listed in Schedule "B" are such that an off-site exceedance of the criteria set by the RUP, the ODWS and/or the PWQO has occurred as a result of the operation of the Landfill Site, the Owner shall notify the District manager as soon as reasonably possible and specify the following:

(a) details of the off-site exceedance, confirmatory monitoring requirements and the potential off-site impacts to surface water and groundwater users;

(b) the extent and timing of contingency measures to be implemented;

(c) modifications, if any, which should be made to the monitoring program; and

(d) other mitigation measures, if any, which may be necessary to reduce or prevent off-site impacts.

5.5 In the event that the results of the monitoring programs listed in Schedule "B" are such that an off-site exceedance of the RUP, ODWS or PWQO can reasonably be predicted to occur, the Owner shall include in the annual report:

(a) the details of any such predicted off-site exceedance, including the assumptions upon which the prediction is based;

(b) a discussion of the modifications, if any, to intended operations which would be necessary to prevent the predicted off-site exceedance;

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(c) a discussion of the modifications, if any, which should be made to the monitoring program; and

(d) a discussion of other mitigation measures or contingency actions, if any, which may be necessary to prevent off-site impacts.

6. Contingency Plans

6.1 Within six months of the issuance date of this certificate, the Owner shall submit, to the District Manager of the MOE, a detailed Contingency Plan and the triggering of such contingency plans for groundwater and surface water to provide adequate warning in order to mitigate any significant leachate impact from the landfill.

6.2 If it is determined by the District Manager that noise, dust, odour, litter, traffic, vector or vermin associated with the operation of the Site must be reduced or otherwise controlled to prevent adverse impacts, the Owner shall implement reasonable contingency measures as agreed to by the Owner and the District Manager.

7. Closure

7.1 At the earlier of two years prior to the anticipated date of closure or when the site has reached 90 percent of its final approved capacity, the Owner shall submit a complete plan for the closure, long term maintenance, long term monitoring and after use of the Site to the Director. The plan shall be developed in consultation with the public. The plan shall include, but not be limited to, the following:

(a) plans for fencing and access control;

(b) details of any additional cover required;

(c) details of any vegetative cover required;

(d) post-closure land use plans, including any further grading, filling or landscaping and the need for any structures;

(e) the need for any municipal or provincial approvals that would be required to implement the proposed closure plan and the schedule for obtaining such approvals;

(f) plans for the continued maintenance, operation and monitoring of the stormwater management system, and landfill gas collection/destruction system (if implemented);

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(g) plans for the continued monitoring of landfill gas, surface water, groundwater and leachate;

(h) updated contingency plans to mitigate potential impacts from landfill gas, leachate and stormwater; and

(i) details of post-closure ownership of the Site.

7.2 The Owner shall continue to be responsible for the operation, maintenance and monitoring of the Site until such time as the Owner can demonstrate to the Director that the leachate and gas being produced at the site would not cause an exceedance of the PWQO, ODWS, Reasonable Use Guideline and/or all other relevant statutes and policies respecting groundwater, surface water and air as may be applicable at that time.

8. Reporting

8.1 An Annual Report on the development, operation and monitoring of the Site shall be submitted by the Owner to the District Manager. The frequency of the report may be reduced with prior written permission of the District Manager, and provided that the Owner demonstrates to the District Manager that the site operations and monitoring results have become routine and consistent. Notwithstanding any approved change in reporting frequency, the District Manager may at any time require the Owner to return to annual submission of the Status Report if there is reasonable evidence to conclude that the site operations or monitoring results are no longer routine or consistent.

8.2 Each Annual Report shall be submitted no later than March 31 of the calendar year following the calendar year being reported upon.

8.3 The Annual Report shall, as a minimum, include the following elements:

a) Executive Summary

i) A summary of findings, conclusions and recommendations;

b) Site Operations

i) A site plan of the landfilling area showing: the current and final extent of the Limit of Fill with contours and cross-sections; and any changes to the Site layout;

ii) A report on the landfill capacity used during the reporting period and the remaining capacity;

iii) A report on the types and volumes of waste diverted from the landfill by transfer from the Site;

iv) A report on any variances from Item 1 in Schedule "A";

v) A summary of complaints regarding the Site operations and the Owner's response;

vi) An assessment as to whether or not the Owner is operating the site in a manner consistent with the Conditions of this Certificate;

c) *Environmental Quality Monitoring*

i) Site plan only if there has been any changes to the monitoring network;

ii) An analysis and interpretation of gas, surface water and groundwater monitoring data;

iii) An assessment of the surface water quality at the Site boundaries with respect to PWQO;

iv) An assessment of the adequacy of the natural attenuation of leachate and gas generated by the Landfill;

v) An assessment of the physical condition of the groundwater monitoring well installations and discussions on the extent of the contaminant plume(s) resulting from landfill leachate supported by a plume map.

d) *Recommendations*

i) Recommendations respecting any proposed changes to gas, surface water or groundwater monitoring programs or any repairs required to the monitoring well network.

ii) Recommendations respecting any proposed changes to the operation of the landfill.

iii) Recommendations respecting the requirement for any remedial works or contingency actions based on the monitoring results or operation of the Site.

9. Public Complaints Procedure

9.1 The Owner shall establish a public complaints procedure that includes:

(a) within 60 days of the date of this Certificate, posting and maintaining a copy of the landfill complaints procedures at the Site office and the municipal office of the Corporation of the Nation Municipality;

(b) within 60 days of the date of this Certificate, distributing a copy of the complaints procedures to all residences and commercial establishments within 500 m of the Landfill;

(c) designating a person to receive any complaints and to respond within ten working days with a written notice of action; and

(d) recording the name and address of each complainant, and the date, time and nature of complaint.

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Reasons:

1. Condition No. 1.1 is included to define terms that are used throughout the Certificate.

2. Condition No. 2.1, 2.2, 2.3, and 2.5 are included to ensure that the environment is protected and the Site is operated in accordance with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.

3. Condition No. 2.4 is included, pursuant to subsection 197(1) of the EPA, to ensure that any persons having an interest in the site are aware that the land has been approved and used for the purposes of waste disposal.

4. Conditions Nos. 2.6, 2.7 and 2.11 are included to clarify the legal rights and responsibilities of the Owner (severable, violation of EPA).

5. Conditions Nos. 2.9 and 2.10 are included to ensure that the appropriate Ministry staff have ready access to information and the operations of the Site.

6. Conditions Nos. 2.8, 3.3 and 4.4 are included to specify the approved areas from which waste may be accepted at the site and the amounts and types of waste that may be accepted for disposal at the site, based on the application and the supporting documentation.

7. Condition No. 3.1 is included to ensure that the proposed detailed design for the engineering works are submitted for the Director's approval in a timely manner and approved prior to the commencement of the construction.

8. Conditions No. 3.2 and 3.6 are included to ensure that enough physical space around the fill area is available for the purposes described under Condition 3.6 and in the event a need arises for mitigative measures in the future.

9. Condition 3.7 is included to prevent unauthorized entry to landfill property and reduce visual impacts of landfill.

10. Conditions No. 4.1 and 4.2 are included to specify the operating hours of the site and ensure security against access by unauthorized persons.

11. Condition No. 4.3 is included to ensure that landfilling of waste is done under supervision of a properly trained person, to ensure that it is done in accordance with the requirements of this Certificate.

12. Condition No. 4.5 is included to ensure that the Owner accurately estimates the amount of waste brought to the site so that compliance with this Certificate can be verified.

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13. Condition No. 4.6 is included to specify access to landfill.

14. Conditions Nos. 4.7, 4.8, 4.9 and 4.11 are included to ensure that certain activities are not carried out at the site that are not environmentally acceptable and not safe for human health, and to minimize litter impacts resulting from the operating activities of the Site. In light of existing groundwater contamination in the area of the landfill, even currently potable water could be contaminated anytime in the future.

15. Condition No. 4.10 is included to ensure that the Owner properly trained the staff operating the site to ensure that the operations are undertaken in accordance with the requirements of this Certificate.

16. Condition No. 4.12 is included to ensure that efficient and environmentally sound procedures are employed during the operation of the landfill site.

17. Conditions Nos. 4.13 and 4.15 are included to ensure that the waste is adequately covered with a suitable material, to minimize the environmental impacts from the landfilling operations.

18. Conditions No. 3.4 and 4.14 are included to ensure that the waste is covered with a suitable final cover material in a timely manner, to minimize the environmental impacts from the disposal of waste.

19. Condition No. 5 is included to require the Owner to undertake the monitoring activities in accordance with the methods acceptable to the Ministry, in order to demonstrate that the site is performing as designed and the impacts on the natural environment are acceptable.

20. Condition No. 6 is included to ensure that there is a plan with an organized set of procedures for identifying and responding to unforeseen but possible problems at the site. A contingency plan is necessary to ensure protection of the natural environment.

21. Condition No. 7 is included to ensure that final closure of the site is completed in an aesthetically pleasing manner and to ensure the long term protection of the natural environment.

22. Condition No. 8 is included to ensure that regular review of site development, operations and monitoring is documented and any possible improvements to site design, operations or monitoring programs are identified.

23. Condition No. 9 is included is to ensure that the Owner has a plan to adequately address public complaints in order to minimize the impacts from the operations at the site. It is also included so that if any complaints are caused by the Facility the complaints are addressed in a timely manner and action is taken to prevent further complaints.

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Schedule "A"

Supporting Documents

1. A report by Stantec Consulting Ltd. titled "Nation Municipality, Operation, Development and Closure Report, Limoges Landfill Site", dated April 30, 2000.
2. A report by Golder Associates titled "1999 Groundwater and Surface Water Monitoring Program, Limoges Landfill Site, Corporation of the Nation Municipality, Ontario", dated April 2000.
3. Township Cambridge's Application for Approval of a Waste Disposal Site (not dated), received by Approval Branch on December 2, 1996.

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In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. *The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;*
2. *The grounds on which you intend to rely at the hearing in relation to <u>each</u> portion appealed.*

In addition to these legal requirements, the Notice should also include:

3. *The name of the appellant;*
4. *The address of the appellant;*
5. *The Certificate of Approval number;*
6. *The date of the Certificate of Approval;*
7. *The name of the Director;*
8. *The municipality within which the waste disposal site is located;*

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary,*
Environmental Appeal Board,
2300 Yonge St., 12th Floor,
P.O. Box 2382
Toronto, Ontario.
M4P 1E4

<u>AND</u>

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment,
2 St. Clair Ave. W., 12A Floor,
Toronto, Ontario.
M4V 1L5

*Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board by: Tel: (416) 314-4600, Fax: (416) 314-4506 or e-mail: www.ert.gov.on.ca.

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Ministry of the Environment *Ministère de l'Environnement*

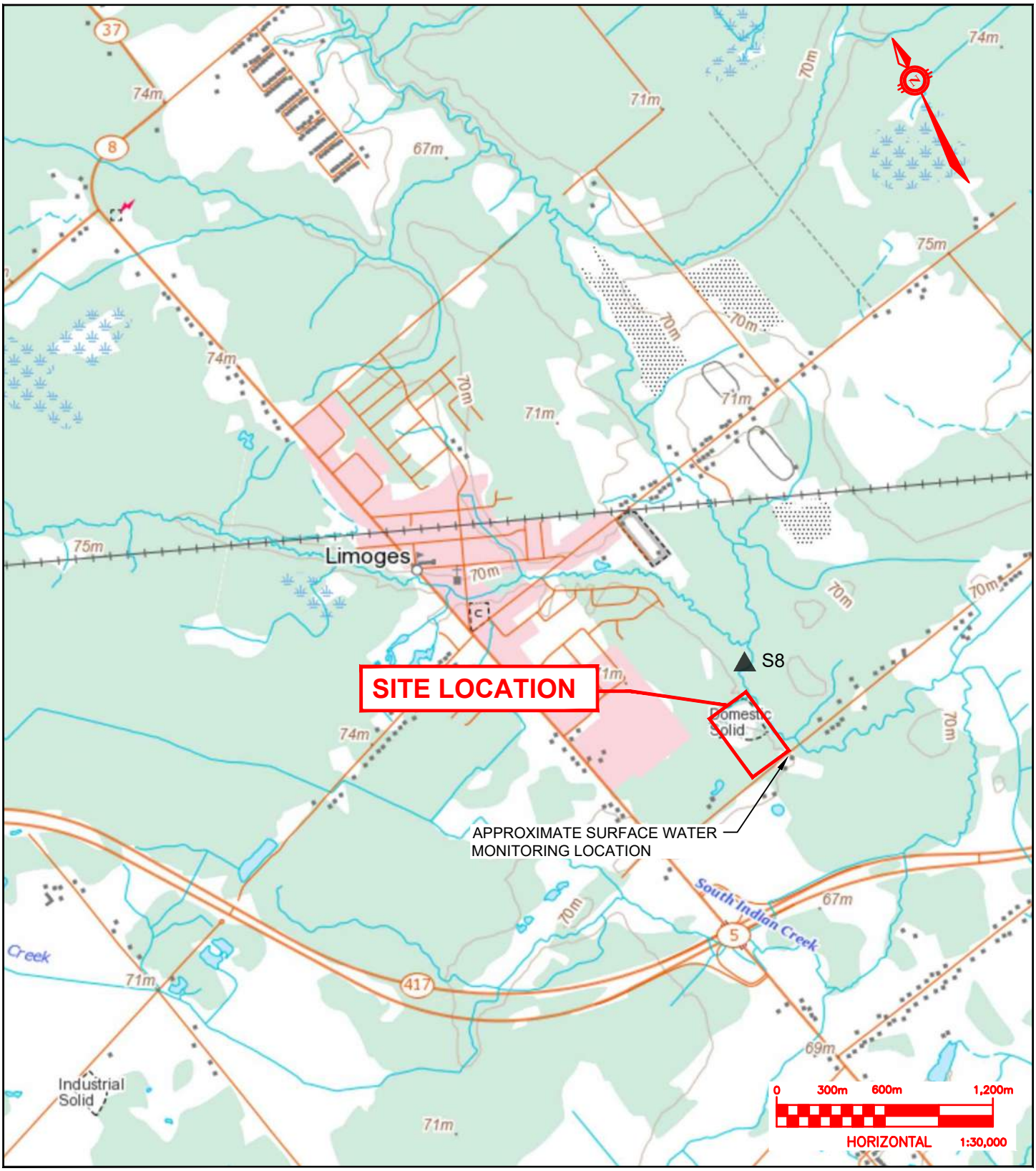
DATED AT TORONTO this 1st *day of* May, 2001.

D. Staseff, P. Eng.,
Director,
Section 39,
Environmental Protection Act

TG/br

c.: District Manager, MOE Ottawa District Office

Appendix B: Figures



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scale: 1:30 000	CLIENT: THE NATION MUNICIPALITY	project no.: OTT-00235901
date: FEB 2022	TITLE: SITE LOCATION PLAN LIMOGES MUNICIPAL LANDFILL	FIG 1
drawn by: T.M.		

Filename: e:\ott\ott-21021972-a0\60 execution\62 reports\limoges landfill\235901-en-lim.dwg
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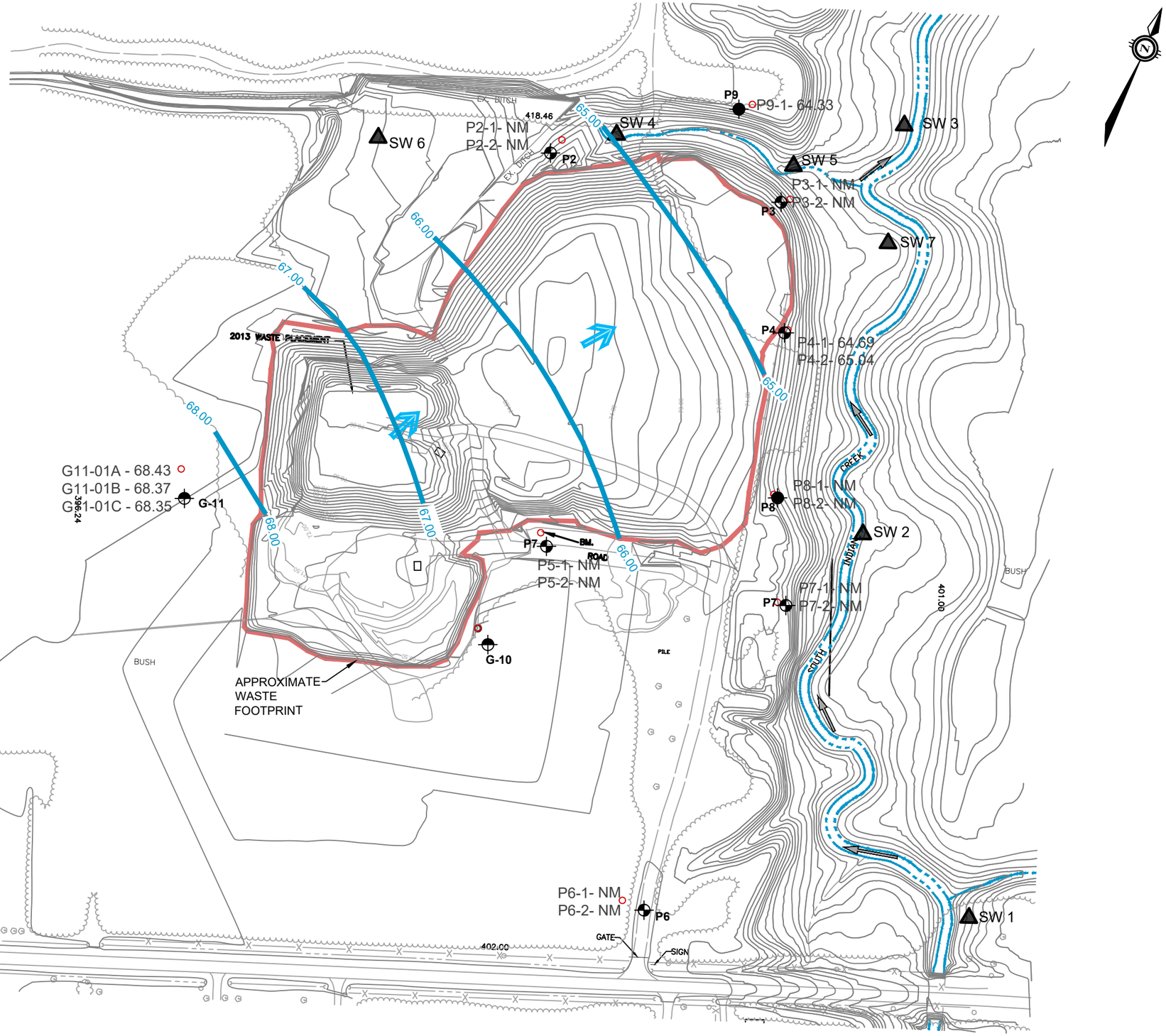
Last Plotted: 2/16/2022 11:37:50 AM Plotted by: HadiH
Pen Table:: exp environmental.ctb



0 20m 40m 80m

HORIZONTAL 1:2000

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LEGEND

- APPROXIMATE GROUNDWATER MONITORING LOCATION COMPLETED BY STANCON ENGINEERING LTD.
- APPROXIMATE GROUNDWATER MONITORING LOCATION COMPLETED BY GOLDER ASSOCIATES LTD.
- APPROXIMATE GROUNDWATER MONITORING LOCATION COMPLETED BY BEATTY, FRANZ, AND ASSOCIATES LTD.
- APPROXIMATE SURFACE WATER MONITORING LOCATION
- G-11 / P6 — MONITORING WELL IDENTIFICATION
- 64.60 — GROUNDWATER ELEVATION (metres) MEASURED ON OCTOBER 28, 2021
- 68.00 — INFERRED GROUNDWATER CONTOUR IN OVERBURDEN (metres)
- INTERPRETED GROUNDWATER FLOW DIRECTION IN OVERBURDEN
- DIRECTION OF SURFACE WATER FLOW
- NM — NOT MEASURED

BASE PLAN SUPPLIED BY STANTEC CONSULTING LTD, MUNICIPALITY OF THE NATION, 2014 WASTE CONTOURS. PROJECT 634-40380, FIGURE 4, ISSUED MARCH 2015

SCALE: 1:2000

CLIENT: THE NATION MUNICIPALITY

PROJECT: LIMOGES MUNICIPAL LANDFILL

TITLE: SITE PLAN

date: FEB 2022	project no.: OTT-00235901-A0
design by: M.M.	drawing no.: FIG 2
prepared by: T.M.	
reviewed by: M.M.	

Filename: e:\ott\ott-21021972-a0\60 execution\62 reports\limoges landfill\235901-en-lim.dwg
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SW2

SW3

SW4

SW5

SW6

SW7

SW8

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scale: N.A.	CLIENT: THE NATION MUNICIPALITY LIMOGES MUNICIPAL LANDFILL	project no.: OTT-00235901-A0
date: MARCH 2022	TITLE: SURFACE WATER STATION PHOTOS SPRING 2021	FIG 3
drawn by: M.P.		

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Last Plotted: 2/22/2022 1:16:39 PM Plotted by: HadiH Pen Table:: exp environmental.ctb

SW1

SW2

SW3

SW4

SW5

SW7

SW8

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scale: N.A.	CLIENT: THE NATION MUNICIPALITY LIMOGES MUNICIPAL LANDFILL	project no.: OTT-00235901-A0
date: MARCH 2022	TITLE: SURFACE WATER STATION PHOTOS SUMMER 2021	FIG 4
drawn by: M.P.		

Filename: e:\ott\ott-21021972-a0\60 execution\62 reports\limoges landfill\235901-en-lim-photo 2020.dwg
Last Saved: 2/21/2022 2:38:48 PM
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SW1

SW2

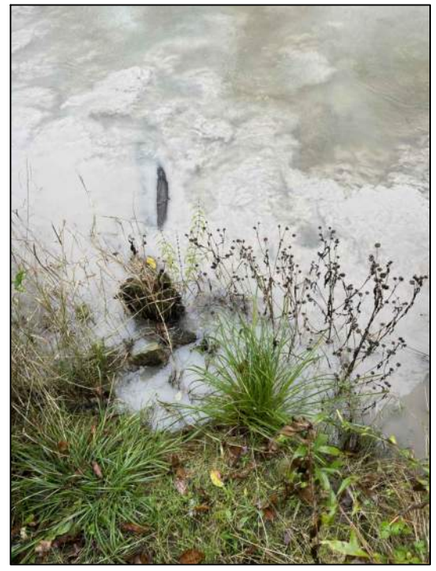
SW3

SW4

SW5

SW6

SW7



SW8

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scale: N.A.	CLIENT: THE NATION MUNICIPALITY LIMOGES MUNICIPAL LANDFILL	project no.: OTT-00235901-A0
date: MARCH 2022	TITLE: SURFACE WATER STATION PHOTOS FALL 2021	FIG 5
drawn by: M.P.		

Filename: e:\ott\dt-21021972-a0\60 execution\62 reports\limoges landfill\235901-en-lim-photo 2020.dwg
Last Saved: 2/21/2022 2:38:48 PM Plotted by: HadiH Pen Table:: exp environmental.ctb
Last Plotted: 2/22/2022 1:16:41 PM

Appendix C:
2021 Summary of Analytical Results

Table 1: Summary of Groundwater Analytical Results 2018-2021

Parameter	Unit	ODWQS(169/03)-Health [1]	ODWQS-AO [2]	RUL [3] Shallow Granular Deposits	RUL [3] Deeper Granular Deposits	P4-1					P4-2					P9-1				
						24-Oct-17	18-Oct-18	23-Oct-19	28-Oct-20	26-Oct-21	24-Oct-17	18-Oct-18	23-Oct-19	28-Oct-20	26-Oct-21	24-Oct-17	18-Oct-18	23-Oct-19	28-Oct-20	26-Oct-21
						P4-1	P4-1	P4-1	P4-1	P4-1	P4-2	P4-2	P4-2	P4-2	P4-2	P9-1	P9-1	P9-1	P9-1	P9-1
Field Parameters																				
Conductivity (Field)	uS/cm	--	--	--	--	1500	1580	1410	1280	1600	1380	1300	1270	567	951	153	181	171	176	184
pH (Field)	-	--	--	--	--	12.72	7.3	7.75	7.27	7.14	9.06	7.58	7.98	8.00	7.6	8.56	8.64	8.82	8.53	8.86
Temperature (Field)	deg c	--	15	--	--	11.6	6.68	9.72	8.25	8.67	11.4	5.99	9.4	8.56	9.73	10.26	6.6	9.27	8.01	8.31
General Chemistry																				
Alkalinity (Total as CaCO3)	mg/l	--	--	--	--	530	568	574	581	566	364	292	532	312	256	65	64	69	70	74
Ammonia Nitrogen	mg/l	--	--	--	--	4.99	4.75	6.79	6.92	8.63	1.18	0.64	1.23	3.08	0.14	0.04	0.12	0.19	0.21	0.1
Bromide	mg/l	--	--	--	--	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 4	< 0.4	< 0.4	< 0.4	< 0.40	< 0.4	< 0.4	< 0.4	< 0.4
Chemical Oxygen Demand	mg/l	--	--	--	--	119	61	97	145	116	38	12	25	33	40	86	33	450	179	90
Chloride	mg/l	--	250	128	133	*177*	*130*	83.8	57.7	83.3	*182*	***350***	76.7	9.1	26.9	1.4	1.7	1.8	2.5	2.4
Dissolved Organic Carbon	mg/l	--	5	4.85	6.1	***11.7***	***16.5***	***19.1***	***24.4***	***11.2***	***6.7***	3.1	***11.6***	***10.6***	1.5	2	1.4	1.6	2.4	5
Hardness, Calcium Carbonate	mg/l	--	--	--	--	639	576	569	556	684	285	598	484	226	357	76	75	73	79	85
Nitrate as N	mg/l	10.0	--	--	--	0.29	0.08	0.08	< 0.05	< 0.05	0.5	0.52	1.27	0.18	6.85	< 0.050	< 0.05	0.08	< 0.05	0.06
Nitrite as N	mg/l	1.0	--	--	--	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05	0.14	0.51	< 0.05	0.22	1.18	< 0.050	< 0.05	0.11	< 0.05	< 0.05
Nitrogen, Total Kjeldahl	mg/l	--	--	--	--	6.8	5.9	8.2	8.7	11.4	1.5	1	1.5	4.3	5	1.5	0.5	2	0.8	1.7
Phosphate, Ortho	mg/l	--	--	--	--	< 0.010	5.45	3.57	0.037	0.007	0.01	0.17	0.041	0.014	0.003	0.13	13.1	0.256	0.285	0.064
Phosphorus	mg/l	--	--	--	--	4.68	14.3	4.1	13	5.68	0.19	0.18	0.05	0.1	0.73	34.9	19.9	53.1	30.9	8.61
Sulphate	mg/l	--	500 [4]	265	278	35	37	33	48	106	44	< 10	22	14	151	14	17	23	16	16
Total Dissolved Solids	mg/l	--	500	378	504	***890***	***857***	***784***	***766***	***895***	***775***	***864***	***728***	*379*	***555***	87	91	98	95	104
Metals																				
Aluminum, dissolved	mg/l	--	--	--	--	0.09	0.08	0.11	0.1	0.11	0.07	0.09	0.1	0.06	0.07	0.04	0.02	0.04	0.04	0.04
Barium, dissolved	mg/l	1	--	--	--	0.435	0.406	0.385	0.355	0.422	0.213	0.206	0.179	0.082	0.131	0.051	0.032	0.026	0.024	0.027
Beryllium, dissolved	mg/l	--	--	--	--	< 0.00010	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.00010	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.00010	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron, dissolved	mg/l	5	--	--	--	0.51	0.69	0.496	0.609	0.464	0.121	0.357	0.37	0.507	0.557	0.006	< 0.005	0.008	0.007	0.011
Cadmium, dissolved	mg/l	0.005	--	--	--	0.000085	0.000064	0.000036	0.000031	< 0.000028	0.000093	0.00012	0.000128	0.000046	0.000114	< 0.000014	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium, dissolved	mg/l	--	--	--	--	202	--	180		225	98.1	--	167		122	20	--	18.4		22
Chromium, dissolved	mg/l	0.05	--	--	--	< 0.0020	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0020	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt, dissolved	mg/l	--	--	--	--	0.0054	0.0069	0.0058	0.0067	0.0078	0.0008	0.001	0.0036	0.0023	0.0035	< 0.00010	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Copper, dissolved	mg/l	--	1	--	--	< 0.0020	0.0013	0.0015	0.0012	0.0054	< 0.0020	0.0044	0.0078	0.0121	0.0183	< 0.0020	0.0011	0.001	0.001	0.0005
Iron, dissolved	mg/l	--	0.3	1.72	10.5	***11.9***	***9.12***	***9.92***	***9.96***	***14.8***	0.012	0.036	0.021	0.007	0.014	0.018	0.01	0.023	0.076	0.034
Lead, dissolved	mg/l	0.01	--	--	--	0.00006	0.00007	0.00005	0.00005	0.00023	< 0.000020	0.00006	< 0.00004	0.00005	0.00018	0.00006	0.00005	0.00004	0.00003	0.00005
Magnesium, dissolved	mg/l	--	--	--	--	32.5	--	28.9		29.5	9.66	--	16.2		12.6	6.26	--	6.59		7.29
Manganese, dissolved	mg/l	--	0.05	0.09	0.32	***1.98***	***1.87***	***1.78***	***1.83***	***2.34***	***0.555***	***0.975***	***2.26***	***0.67***	***1.96***	0.038	0.035	0.033	0.039	0.045
Molybdenum, dissolved	mg/l	--	--	--	--	0.0004	0.0004	0.0005	0.0006	0.0007	< 0.00010	0.0002	0.0003	0.0004	0.0004	0.0014	0.0013	0.0013	0.0011	0.0009
Nickel, dissolved	mg/l	--	--	--	--	0.01	0.01	0.0085	0.0093	0.0092	< 0.010	< 0.01	0.0059	0.005	0.0074	< 0.010	< 0.01	0.0003	0.0002	< 0.0002
Potassium, dissolved	mg/l	--	--	--	--	18.7	20.7	24.2	25.2	27	17.4	19.9	18.7	14.8	17.7	1.4	1.5	1.6	1.6	1.8
Silicon, dissolved	mg/l	--	--	--	--	11.5	10.5	11.4	11.1	11.6	5.29	3.16	4.16	3.24	3.59	6.71	6.49	6.38	6.79	7.51
Silver, dissolved	mg/l	--	--	--	--	< 0.000020	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.000020	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.000020	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium, dissolved	mg/l	--	200 [5]	--	--	86.3	100	69.1	68.4	55.9	**203**	80.7	104	68.1	68.3	4	6.2	4.7	6.1	9.6
Strontium, dissolved	mg/l	--	--	--	--	0.799	0.79	0.945	0.829	1.08	0.473	0.829	0.809	0.351	0.533	0.043	0.051	0.051	0.052	0.062
Thallium, dissolved	mg/l	--	--	--	--	< 0.000050	< 0.00005	< 0.0001	< 0.0001	< 0.0001	< 0.000050	< 0.00005	< 0.0001	< 0.00005	< 0.00005	< 0.000050	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin, dissolved	mg/l	--	--	--	--	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05
Titanium, dissolved	mg/l	--	--	--	--	< 0.0050	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium, dissolved	mg/l	--	--	--	--	< 0.0050	0.009	0.0014	0.0017	0.0015	< 0.0050	< 0.005	0.0006	0.0005	0.0006	< 0.0050	< 0.005	0.0009	0.0004	0.0007
Zinc, dissolved	mg/l	--	5	--	--	< 0.0050	0.006	< 0.005	< 0.005	0.007	< 0.0050	0.005	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.005	< 0.005	< 0.005	< 0.005
Phenols																				
Phenolics, Total Recoverable	mg/l	--	--	--	--	<0.0010	0.014	< 0.002	0.002	< 0.002	< 0.0010	0.007	< 0.002	0.002	< 0.002	< 0.0010	0.007	< 0.002	0.002	< 0.002

--	Chemical not analyzed or criteria not defined.
Bold/Shaded	Parameter is greater than ODWQS(169/03)-Health
Bold/Shaded	Parameter is greater than ODWQS-AO
Italics	Parameter is greater than RUL limit
(1)	Ontario Drinking Water Quality Standards - Health Based Standards (June 2003, revised June 2006).
(2)	ODWS - Aesthetic Objectives. Established for parameters that may impair the taste, odour or colour of water or which may interfere with good water quality control practices. For certain parameters, both aesthetic objectives and health-related MACs have been derived (revised June 2006).
(3)	RUL Resonable Use Limit
(4)	There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.
(5)	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

Table 1: Summary of Groundwater Analytical Results 2018-2021

Parameter	Unit	ODWQS(169/03)-Health [1]	ODWQS-AO [2]	RUL [3] Shallow Granular Deposits	RUL [3] Deeper Granular Deposits	G11-01A							G11-01B						G11-01C						
						24-Oct-17		18-Oct-18		23-Oct-19	28-Oct-20	26-Oct-21	24-Oct-17	18-Oct-18	23-Oct-19		28-Oct-20	26-Oct-21	24-Oct-17	18-Oct-18	23-Oct-19	28-Oct-20		26-Oct-21	
						11-01A	Dupl	G11-01A	Dupl.	G11-01A	G11-01A	G11-01A	11-01B	11-01B	11-01B	Duplicate	11-01B	11-01B	11-01C	11-01C	11-01C	11-01B	Duplicate	11-01B	Duplicate
Field Parameters																									
Conductivity (Field)	uS/cm	--	--	--	--	635		775		692	683	713	179	204	200		186	202	200	145	202	142		--	
pH (Field)	-	--	--	--	--	8.8		8.36		8.71	8.20	8.56	9.92	8.83	8.91		8.6	8.85	9.73	8.46	8.46	10.62		8.63	
Temperature (Field)	deg c	--	15	--	--	12.86		6.54		9.57	9.16	8.99	11.65	7.78	9.28		8.99	8.2	14.36	8.37	10.74	9.39		11.08	
General Chemistry																									
Alkalinity (Total as CaCO3)	mg/l	--	--	--	--	264	236	239	242	236	232	250	72	76	78	78	72	85	163	76	111	59	58	61	66
Ammonia Nitrogen	mg/l	--	--	--	--	0.41	0.43	0.13	0.54	0.6	0.62	0.18	0.11	0.53	0.37	0.42	0.36	0.15	< 0.010	0.07	0.11	0.1	0.1	0.02	0.03
Bromide	mg/l	--	--	--	--	0.4	0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.40	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Chemical Oxygen Demand	mg/l	--	--	--	--	144	220	8	9	57	91	95	399	179	1250	1250	1330	136	305	36	140	115	1140	121	93
Chloride	mg/l	--	250	128	133	61.8	62.1	79.7	80.7	72.7	75.6	78.9	2.7	5.2	3.9	3.9	4	5.4	0.9	1.3	1.2	2	2	2.2	2.2
Dissolved Organic Carbon	mg/l	--	5	4.85	6.1	**5.8**	**5.8**	**5.7**	**5.8**	**5.8**	*4.9*	2.6	1.9	1.4	1.7	1.8	3.5	2.2	3.2	2.5	2.6	2.6	2.9	2.1	**7.3**
Hardness, Calcium Carbonate	mg/l	--	--	--	--	71	72	70	72	73	72	87	74	73	74	72	75	81	138	69	107	69	69	63	66
Nitrate as N	mg/l	10.0	--	--	--	< 0.050	< 0.050	< 0.05	< 0.05	0.05	< 0.05	< 0.05	< 0.050	< 0.05	0.12	0.06	< 0.05	< 0.05	< 0.050	0.06	0.12	< 0.05	< 0.05	< 0.05	< 0.05
Nitrite as N	mg/l	1.0	--	--	--	< 0.050	< 0.050	< 0.05	< 0.05	0.08	< 0.05	< 0.05	< 0.050	< 0.05	0.1	0.12	< 0.05	< 0.05	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Nitrogen, Total Kjeldahl	mg/l	--	--	--	--	2.3	2.3	0.6	1.1	1.1	1.9	4.2	4.2	1	3.1	2.2	7.8	23	2.2	2.7	1.6	1.6	1.7	2.9	3.3
Phosphate, Ortho	mg/l	--	--	--	--	0.34	0.32	9.02	1.41	1.79	1.05	0.395	0.47	1.2	2.69	105	0.693	0.113	0.02	3.63	9.19	0.267	0.252	0.049	0.096
Phosphorus	mg/l	--	--	--	--	3.3	3.35	17.7	1.49	2.33	3.71	9.43	38.3	1.35	33.6	18.5	222	83.2	7.67	6.3	12.3	10.9	11	4.51	4.04
Sulphate	mg/l	--	500 [4]	265	278	2	2	1	2	2	2	2	14	18	20	20	16	16	5	5	9	6	6	6	7
Total Dissolved Solids	mg/l	--	500	378	504	376	359	*390*	*394*	*379*	*386*	*408*	98	108	108	107	100	115	165	81	120	71	70	70	75
Metals																									
Aluminum, dissolved	mg/l	--	--	--	--	0.01	0.02	0.05	0.14	0.16	0.03	0.88	0.06	0.06	0.11	0.04	0.04	0.3	0.04	0.03	0.05	0.02	0.03	0.08	0.37
Barium, dissolved	mg/l	1	--	--	--	0.02	0.047	0.024	0.024	0.019	0.028	0.029	0.036	0.012	0.013	0.012	0.013	0.016	0.059	0.022	0.024	0.015	0.016	0.014	0.019
Beryllium, dissolved	mg/l	--	--	--	--	< 0.00010	< 0.00010	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.00010	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron, dissolved	mg/l	5	--	--	--	0.173	0.173	0.18	0.184	0.197	0.18	0.187	0.012	0.009	0.009	0.009	0.01	0.012	0.006	< 0.005	0.006	< 0.005	< 0.005	< 0.005	< 0.005
Cadmium, dissolved	mg/l	0.005	--	--	--	0.000021	<0.000014	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000014	< 0.000015	< 0.000015	< 0.000015	< 0.000015	< 0.000015	<0.000014	< 0.000015	< 0.000015	0.000023	0.00002	< 0.000015	< 0.000015
Calcium, dissolved	mg/l	--	--	--	--	11.9	12.1	--	--	11.6		15.3	18.9	--	18.7	17.9		21	36.1	--	28.1			17.1	17.5
Chromium, dissolved	mg/l	0.05	--	--	--	< 0.0020	< 0.0020	< 0.001	< 0.001	< 0.001	< 0.001	0.005	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.002	< 0.0020	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003
Cobalt, dissolved	mg/l	--	--	--	--	< 0.00010	< 0.00010	< 0.0001	0.0001	0.0002	< 0.0001	0.0012	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	0.0004	< 0.00010	< 0.0001	0.0001	< 0.0001	< 0.0001	0.0001	0.0006
Copper, dissolved	mg/l	--	1	--	--	< 0.0020	< 0.0020	0.0003	0.0001	0.0017	0.0014	0.0059	< 0.002	0.0015	0.0009	< 0.0001	0.0004	0.0056	< 0.0020	0.0025	0.0025	0.002	0.0023	0.0017	0.0064
Iron, dissolved	mg/l	--	0.3	1.72	10.5	0.017	0.018	0.055	0.164	0.258	0.034	**1.45**	0.091	0.069	0.158	0.034	0.037	**0.467**	0.009	0.049	0.033	0.023	0.043	0.122	**0.627**
Lead, dissolved	mg/l	0.01	--	--	--	< 0.000020	0.000020	0.000030	0.000050	0.00012	0.00007	0.00075	0.00006	0.0001	0.0001	< 0.00002	0.00004	0.00045	< 0.000020	0.00006	0.00005	0.00003	0.00003	0.00008	0.00045
Magnesium, dissolved	mg/l	--	--	--	--	10.1	10.1	--	--	10.6		11.9	6.58	--	6.63	6.63		6.96	11.5	--	9.05			5.01	5.3
Manganese, dissolved	mg/l	--	0.05	0.09	0.32	0.026	0.026	0.026	0.031	0.034	0.026	**0.058**	**0.053**	**0.054**	**0.058**	**0.054**	**0.055**	**0.069**	0.01	0.003	0.001	0.003	0.003	0.003	0.011
Molybdenum, dissolved	mg/l	--	--	--	--	0.0061	0.0061	0.0036	0.0041	0.0035	0.0034	0.0025	0.001	0.001	0.0011	0.001	0.001	0.0009	0.0007	0.0007	0.0014	0.0009	0.0009	0.0008	0.0008
Nickel, dissolved	mg/l	--	--	--	--	< 0.010	< 0.010	< 0.01	< 0.01	0.0011	0.001	0.0042	< 0.01	< 0.01	0.0004	< 0.0002	< 0.0002	0.0011	< 0.010	< 0.01	0.0008	0.0006	0.0005	0.0005	0.0017
Potassium, dissolved	mg/l	--	--	--	--	5.1	5.1	5.1	5.1	5.1	5.4	5.8	1.4	1.4	1.5	1.5	1.5	1.6	1.1	0.5	1	0.7	0.6	0.7	0.8
Silicon, dissolved	mg/l	--	--	--	--	7.36	7.33	6.85	6.97	7.35	7.21	8.58	9.76	9.11	9.34	9.21	9.14	10.2	9.17	6.41	6.96	6.64	6.46	7.03	7.46
Silver, dissolved	mg/l	--	--	--	--	< 0.000020	< 0.000020	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.000020	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.000020	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium, dissolved	mg/l	--	200 [5]	--	--	126	126	139	138	134	141	142	10.6	11.5	9.4	9.8	9.4	12.2	11.9	4.8	5.2	3.2	3.2	2.7	2.7
Strontium, dissolved	mg/l	--	--	--	--	0.112	0.113	0.111	0.115	0.123	0.119	0.129	0.052	0.053	0.055	0.057	0.052	0.052	0.066	0.033	0.059	0.037	0.037	0.032	0.033
Thallium, dissolved	mg/l	--	--	--	--	< 0.000050	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.000050	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.000050	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin, dissolved	mg/l	--	--	--	--	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Titanium, dissolved	mg/l	--	--	--	--	< 0.0050	< 0.005	< 0.005	0.011	0.012	< 0.005	0.062	< 0.0050	< 0.005	0.008	< 0.005	< 0.005	0.025	< 0.0050	< 0.005	< 0.005	< 0.005	< 0.005	0.008	0.036
Vanadium, dissolved	mg/l	--	--	--	--	< 0.0050	< 0.005	< 0.005	< 0.005	0.0011	0.0014	0.0055	< 0.0050	< 0.005	0.0004	0.0003	0.0003	0.0014	< 0.0050	< 0.005	0.0026	0.0033	0.0031	0.0057	0.0074
Zinc, dissolved	mg/l	--	5	--	--	< 0.0050	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.011	< 0.0050	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	<0.0050	0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.006
Phenols																									
Phenolics, Total Recoverable	mg/l	--	--	--	--	< 0.0010	< 0.0010	< 0.002	< 0.002	< 0.002	0.002	< 0.002	< 0.0010	0.009	< 0.002	<10	0.002	< 0.002	<0.0010	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

--	Chemical not analyzed or criteria not defined.
Bold/Shaded	Parameter is greater than ODWQS(169/03)-Health
Bold/Shaded	Parameter is greater than ODWQS-AO
Italics	Parameter is greater than RUL limit
(1)	Ontario Drinking Water Quality Standards - Health Based Standards (June 2003, revised June 2006).
(2)	ODWS - Aesthetic Objectives. Established for parameters that may impair the taste, odour or colour of water or which may interfere with good water quality control practices. For certain parameters, both aesthetic objectives and health-related MACs have been derived (revised June 2006).
(3)	RUL Resonable Use Limit
(4)	There may be a laxative effect in some individuals when sulphate levels exceed 500 mg/L.
(5)	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

Table 2: Summary of Groundwater Analytical Results Compared to PWQO

Parameter	Unit	PWQO[1]	P4-1					P4-2				
			24-Oct-17	18-Oct-18	23-Oct-19	28-Oct-20	26-Oct-21	24-Oct-17	18-Oct-18	23-Oct-19	28-Oct-20	26-Oct-21
			P4-1	P4-1	P4-1	P4-1	P4-1	P4-2	P4-2	P4-2	P4-2	P4-2
Field Parameters												
Conductivity (Field)	uS/cm	--	1500	1580	1410	1280	1600	1380	1300	1270	567	951
pH (Field)	-	6.5 - 8.5	**12.72**	7.3	7.75	7.27	7.14	**9.06**	7.58	7.98	8.00	7.6
Temperature (Field)	deg c	--	11.6	6.68	9.72	8.25	8.67	11.4	5.99	9.4	8.56	9.73
General Chemistry												
Alkalinity (Total as CaCO3)	ug/l	-- [2]	530000	568000	574000	581000	566000	364000	292000	532000	312000	256000
Ammonia Nitrogen	ug/l	--	4990	4750	6790	6920	8630	1180	640	11230	3080	140
Bromide	ug/l	--	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400
Chemical Oxygen Demand	ug/l	--	119000	61000	97000	145000	116000	38000	12000	25000	33000	40000
Chloride	ug/l	--	177000	130000	83800	57700	83300	182000	350000	76700	9100	26900
Dissolved Organic Carbon	ug/l	--	11700	16500	19100	24400	11200	6700	3100	11600	10600	1500
Hardness, Calcium Carbonate	ug/l	--	639000	576000	569000	556000	684000	285000	598000	484000	226000	357000
Nitrate as N	ug/l	--	290	80	80	<50	<50	500	520	1270	180	6850
Nitrite as N	ug/l	--	<50	<50	<50	<50	<50	140	510	<50	220	1180
Nitrogen, Total Kjeldahl	ug/l	--	6800	5900	8200	8700	11400	1500	1000	1500	4300	5000
Phosphate, Ortho	ug/l	--	<10	5450	3570	37	7	10	170	41	14	3
Phosphorus	ug/l	-- [3]	**4680**	**14300**	**4100**	**13000**	**5680**	**190**	**180**	**50**	**100**	**730**
Sulphate	ug/l	--	35000	37000	33000	48000	106000	44000	<10000	22000	14000	151000
Total Dissolved Solids	ug/l	--	890000	857000	784000	766000	895000	775000	864000	728000	*379000*	*555000*
Metals												
Aluminum, dissolved	ug/l	--	90	80	110	100	110	70	90	100	60	70
Barium, dissolved	ug/l	--	435	406	385	355	422	213	206	179	82	131
Beryllium, dissolved	ug/l	--	<0.1	<0.1	<0.2	<0.2	<0.2	<0.1	<0.1	<0.2	<0.1	<0.1
Boron, dissolved	ug/l	200	**510**	**690**	**496**	**609**	**464**	121	**357**	**370**	**507**	**557**
Cadmium, dissolved	ug/l	0.2 [4]	0.085	0.064	0.036	0.031	<0.028	0.093	0.12	0.128	0.046	0.114
Calcium, dissolved	ug/l	--	202000	--	180000		225000	98100	--	167000		122000
Chromium, dissolved	ug/l	-- [5]	<2	<1	<1	<1	<1	<2	<1	<1	<1	<1
Cobalt, dissolved	ug/l	0.9	**5.4**	**6.9**	**5.8**	**6.7**	**7.8**	0.8	**1**	**3.6**	**2.3**	**3.5**
Copper, dissolved	ug/l	5	<2	1.3	1.5	1.2	**5.4**	<2	4.4	**7.8**	**12.1**	**18.3**
Iron, dissolved	ug/l	300	**11900**	**9120**	**9920**	**9960**	**14800**	12	36	21	7	14
Lead, dissolved	ug/l	-- [6]	0.06	0.07	0.05	0.00005	2.3	<0.02	0.06	<0.04	0.05	0.18
Magnesium, dissolved	ug/l	--	32500	--	28900		29500	9660	--	16200	--	12.6
Manganese, dissolved	ug/l	--	1980	1870	1780	1830	2340	555	975	2260	670	1960
Molybdenum, dissolved	ug/l	40	0.4	0.4	0.5	0.6	0.7	<0.1	0.2	0.3	0.4	0.4
Nickel, dissolved	ug/l	25	10	10	8.5	9.3	9.2	<10	<10	5.9	5	7.4
Potassium, dissolved	ug/l	--	18700	20700	24200	25200	27000	17400	19900	18700	14800	17700
Silicon, dissolved	ug/l	--	11500	10500	11400	11100	11600	5290	3160	4160	3240	3590
Silver, dissolved	ug/l	0.1	< 0.02	<0.1	<0.1	<0.1	<0.1	< 0.02	<0.1	<0.1	<0.1	<0.1
Sodium, dissolved	ug/l	--	86300	100000	69100	68400	55900	203000	80700	104000	68100	68300
Strontium, dissolved	ug/l	--	799	790	945	829	1080	473	829	809	351	533
Thallium, dissolved	ug/l	0.3	<0.05	<0.05	<0.1	<0.1	<0.1	<0.05	<0.05	<0.1	<0.05	<0.05
Tin, dissolved	ug/l	--	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Titanium, dissolved	ug/l	--	<5	<5	<5	M5	<5	<5	<5	<5	<5	<5
Vanadium, dissolved	ug/l	6	<5	**9**	1.4	1.7	1.5	<5	<5	0.6	0.5	0.6
Zinc, dissolved	ug/l	30 [4]	<5	6	<5	<5	7	<6	5	<5	<5	<5
Phenols												
Phenolics, Total Recoverable	ug/l	1 [7]	<1	**14**	< 0.002	0.002	<2	<1	**7**	< 0.002	0.002	<2

Footnotes: Tables should be read in conjunction with the accompanying document.

< Indicates parameter not detected above laboratory method detection limit.

-- Chemical not analyzed or criteria not defined.

Bold/Shaded Parameter is greater than PWQO

(1) Provincial Water Quality Objectives (July 1994, reprinted February 1999)

(2) Alkalinity should not be decreased by more than 25% of the natural concentration.

(3) Current scientific evidence is insufficient to develop a firm Objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines which should be supplemented by site-specific studies: To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 ug/L; A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 ug/L or less. This should apply to all lakes naturally below this value; Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 ug/L.

(4) An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.

(5) PWQO values exist for Cr(III) and Cr(VI)
If alkalinity as CaCO3 < 20 mg/L, PWQO = 5 µg/L; if alkalinity as CaCO3 from 20 to 40 mg/L, PWQO = 10 µg/L; if alkalinity as CaCO3 from 40 to 80 mg/L, PWQO = 20 µg/L; if alkalinity as CaCO3 > 80 mg/L, PWQO = 25 ug/l

(6) An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.

(7) Determined by the total reactive phenols test - the 4-AAP (4-amino-antipyrine) test. This objective should be used primarily as a screening tool. The isomer specific PWQOs for various phenolics should be employed where possible.

Table 3: Surface Water Analytical Results

Parameter	Unit	PWQO [1]	Background (South Indian Creek) SW-8 4-May-17	24-Jul-17	24-Oct-17	11-May-18	31-Jul-18	18-Oct-18	16-May-19	18-Jul-19	23-Oct-19	4-May-20	23-Jul-20	28-Oct-20	19-May-21	28-Jul-21	26-Oct-21
			SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8	SW-8
Field Measured Parameters																	
Conductivity (Field)	uS/cm	--	431	692	767	633	938	1150	141	992	1010	673	756	819	819	1150	9240
Dissolved Oxygen (Field)	ug/l	--	16060	281500	15140	13640	9240	11510	13750	14370	11030	9500	4300	14790	8900	7120	12520
pH (Field)	-	8.5	8.21	7.99	7.73	8.11	7.97	7.97	8.25	**8.56**	8.14	8.04	7.85	8.01	7.67	8.11	7.76
Temperature (Field)	deg c	--	NA	17.04	14.29	11.3	22.45	4.33	11.29	24.34	10.86	10.33	18.82	7.58	16.39	17.51	7.14
General Chemistry																	
Alkalinity	ug/l	-- [2]	104000	188000	199000	160000	155000	191000	44000	163000	167000	141000	177000	204000	182000	202000	218000
Ammonia Nitrogen	ug/l	--	20	620	60	70	130	130	40	190	100	60	250	40	110	110	20
Unionized Ammonia	ug/l	20	--	20.5	0.9	0.9	5.7	1.7	1.3	33	2.1	1.1	5.3	0.6	2.2	4.4	0.2
Biochemical Oxygen Demand	ug/l	--	<3000	4000	3000	<3000	<3000	2000	<3000	<3000	<3000	<3000	3000	<3000	-	-	-
Bromide	ug/l	--	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400
Chemical Oxygen Demand	ug/l	--	36000	34000	25000	41000	27000	14000	22000	25000	19000	16000	29000	12000	29000	19000	8000
Chloride	ug/l	--	35900	92800	88800	106000	144000	157000	2500	145000	160000	108000	160000	97500	117000	184000	101000
Dissolved Organic Carbon	ug/l	--	12500	11400	7000	9000	8100	5200	5600	7200	6200	8900	6000	78000	7100	3800	4100
Hardness	ug/l	--	129000	223000	253000	206000	204000	302000	188000	212000	234000	191000	246000	271000	220000		262000
Nitrate as N	ug/l	--	2600	50	2150	1430	190	240	190	180	260	1620	90	6280	420	<50	6910
Nitrite as N	ug/l	--	<50	1100	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	190	<50	<50
Phosphate, Ortho	ug/l	--	10	40	10	10	50	20	49	65	27	73	47	23	27	35	10
Phosphorus	ug/l	-- [3]	**50**	**110**	**30**	**60**	**100**	**40**	**140**	**90**	**50**	**110**	**130**	20	**60**	**70**	**480**
Sulphate	ug/l	--	14000	22000	29000	23000	70000	58000	9000	33000	48000	23000	34000	32000	24000	45000	39000
Total Dissolved Solids	ug/l	--	208000	370000	385000	375000	488000	550000	62000	462000	499000	358000	488000	420000	403000	546000	430000
Metals																	
Aluminum, dissolved	ug/l	--	110	40	40	60	40	50	100	30	60	40	50	60	50	40	60
Barium	ug/l	--	48	57	53	53	71	82	17	56	52	53	65	62	48	59	55
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	--	--	--	<2	<0.1	<0.1
Boron	ug/l	200	23	57	40	36	81	72	<5	128	54	25	117	46	33	72	44
Cadmium	ug/l	0.2 [4]	<0.014	**109**	0.14	<0.015	<0.015	<0.015	0.025	<0.015	<0.015	0.022	<0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	--	--	64900	55900	63100	84300	14800	59400	64500	--	67200	--	59500	64900	70200
Chromium	ug/l	-- [5]	2	3	1	1	<1	<1	2	<1	<1	3	1	1	<1	<1	<1
Cobalt	ug/l	0.9	0.4	**500**	0.2	0.4	0.2	0.2	0.4	0.4	0.2	0.7	0.4	0.2	0.3	0.2	0.2
Copper	ug/l	5	2.6	**8**	1.3	2	1.7	1.3	1.8	1.8	1.1	3	0.8	1.6	6	4	3.7
Iron	ug/l	300	**1010**	**1180**	**381**	**706**	**836**	**397**	**758**	**718**	**353**	**1390**	**884**	246	204	111	50
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	--	--	--	0.27	0.13	0.12
Magnesium	ug/l	--	--	--	--	18500	16000	15400	22300	4370	15500	17800	--	17500	--	17300	16900	21000
Manganese	ug/l	--	67	143	77	114	153	106	52	234	80	122	328	19	121	140	27
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	--	--	--	0.6	0.8	0.6
Nickel	ug/l	25	<10	**4400**	3	2.2	1	1.2	1.8	1.7	1	2.3	1.2	0.9	0.9	1	0.7
Potassium	ug/l	--	1900	2600	4100	3300	4000	5800	700	3500	5700	2300	4000	3400	2400	3400	3600
Silicon	ug/l	--	5050	4380	5390	2970	3620	3920	5430	3990	4130	3850	4150	5660	1810	3450	4760
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	<0.1	<0.1
Sodium	ug/l	--	35300	65100	59700	69100	96800	107000	3400	106000	99500	63200	97600	57700	72800	110000	64000
Strontium	ug/l	--	233	--	329	321	467	610	60	370	413	284	419	369	338	424	396
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	--	--	--	<0.05	<0.05	<0.05
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<50
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<5	<5
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	1.9	1.9	0.8	3.2	1.8	1.1	1.2	1.2	1
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	--	--	--	11	13	14
Phenols																	
Phenols	ug/l	1 [7]	<1	<1	<1	<1	**2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**

Footnotes:

Tables should be read in conjunction with the accompanying document.

< Indicates parameter not detected above laboratory method detection limit.

-- Chemical not analyzed or criteria not defined.

Bold/ Shaded Parameter is greater than PWQO

(1) Provincial Water Quality Objectives (July 1994, reprinted February 1999)

(2) Alkalinity should not be decreased by more than 25% of the natural concentration.

(3) To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 ug/L; A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 ug/L or less. This should apply to all lakes naturally below this value; Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 ug/L.

(4) An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.

(5) PWQO values exist for Cr(III) and Cr(VI)

(6) If alkalinity as CaCO3 < 20 mg/L, PWQO = 5 µg/L; if alkalinity as CaCO3 from 20 to 40 mg/L, PWQO = 10 µg/L; if alkalinity as CaCO3 from 40 to 80 mg/L, PWQO = 20 µg/L; if alkalinity as CaCO3 > 80 mg/L, PWQO = 25 ug/L. An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.

(7) Determined by the total reactive phenols test - the 4-AAP (4-amino-antipyrine) test. This objective should be used primarily as a screening tool. The isomer specific PWQOs for various phenolics should be employed where possible.

Table 3: Surface Water Analytical Results

			Background (South Indian Creek)																				
			SW-1																				
Parameter	**Unit**	**PWQO** [1]	**4-May-17**	**24-Jul-17**	**24-Oct-17**		**11-May-18**		**31-Jul-18**		**18-Oct-18**		**16-May-19**	**18-Jul-19**		**23-Oct-19**	**4-May-20**	**23-Jul-20**	**28-Oct-20**	**19-May-21**		**28-Jul-21**	**26-Oct-21**
			SW-1	SW-1	SW-1	Dup of SW-1	SW-1	Dup of SW-1	SW-1	Dup of SW-1	SW-1	Dup of SW-1	SW-1	SW-1	Duplicate	SW-1	SW-1	SW-1	SW-1	SW-1	Duplicate	SW-1	SW-1
Field Measured Parameters																							
Conductivity (Field)	uS/cm	--	438	721	530		601		901		1190		676	1090		1000	666	663	768	833		1170	701
Dissolved Oxygen (Field)	ug/l	--	22170	128400	17880		14140		10170		11540		13120	11420		11270	9760	4220	16410	5940		10470	10770
pH (Field)	-	8.5	7.96	7.43	7.6		8.25		7.79		**8.57**		7.85	**8.88**		8.09	8.34	**8.73**	8.12	7.94		**8.72**	7.31
Temperature (Field)	deg c	--	NA	16.9	14.66		11.07		22.76		4.31		9.70	24.71		10.12	10.33	21.77	7.72	16.5		18.93	7.31
General Chemistry																							
Alkalinity	ug/l	-- [2]	120000	191000	202000	202000	171000	173000	143000	140000	188000	193000	136000	150000	151000	160000	140000	145000	204000	183000	182000	195000	103000
Ammonia Nitrogen	ug/l	--	20	30	20	20	40	40	60	50	50	60	90	110	110	50	50	130	20	110	100	80	40
Unionized Ammonia	ug/l	20	--	0.2	0.2	0.2	1.3	1.3	1.7	1.4	2.6	3.1	1	**27.5**	**27.5**	1	2	**26**	0.3	3.3	0.3	12	0.1
Biochemical Oxygen Demand	ug/l	--	<3000	<3000	3000	3000	<3000	<3000	<3000	<3000	29000	3000	<3000	<3000	<3000	<3000	3000	<3000	<3000	-	-	-	-
Bromide	ug/l	--	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400
Chemical Oxygen Demand	ug/l	--	45000	35000	23000	25000	40000	34000	24000	30000	19000	17000	52000	23000	28000	15000	32000	25000	22000	32000	30000	23000	7000
Chloride	ug/l	--	43100	81100	84600	84700	112000	114000	131000	130000	185000	171000	84700	174000	175000	149000	110000	144000	95600	118000	118000	188000	39500
Dissolved Organic Carbon	ug/l	--	13800	10600	7100	7000	9300	9400	8500	8400	5200	5100	18400	7100	6600	7500	9300	6000	7800	7600	7700	3600	5900
Hardness	ug/l	--	143000	220000	252000	254000	205000	208000	197000	193000	316000	297000	189000	207000	206000	250000	185000	206000	266000	217000	219000		79000
Nitrate as N	ug/l	--	2990	50	2480	2490	790	820	150	140	380	350	2260	130	130	260	1530	<50	6310	410	410	<50	130
Nitrite as N	ug/l	--	<50	1210	< 50	< 50	<50	<50	<50	<50	<50	<50	<50	<50	<0.05	<50	<50	<50	<50	190	200	<50	<50
Phosphate, Ortho	ug/l	--	40	40	20	10	10	20	50	50	30	30	19	71	71	37	90	78	22	28	24	42	19
Phosphorus	ug/l	-- [3]	**90**	**80**	**30**	**30**	**70**	**60**	**110**	**110**	**70**	**40**	**70**	**100**	**100**	**50**	**120**	**130**	**30**	**70**	**70**	**90**	**60**
Sulphate	ug/l	--	15000	20000	29000	29000	24000	24000	76000	76000	73000	68000	19000	37000	37000	61000	23000	31000	31000	23000	23000	51000	6000
Total Dissolved Solids	ug/l	--	220000	345000	388000	388000	398000	402000	460000	469000	605000	575000	306000	503000	503000	494000	357000	420000	409000	401000	403000	551000	173000
Metals																							
Aluminum, dissolved	ug/l	--	110	40	40	50	40	30	230	30	40	50	90	30	30	60	40	30	60	40	40	50	40
Barium	ug/l	--	37	43	54	54	53	53	64	70	83	77	44	51	50	50	49	45	60	47	47	54	19
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<2	<2	<0.1	<0.1
Boron	ug/l	200	21	42	35	34	31	33	71	76	59	56	20	152	150	43	23	53	44	28	29	62	9
Cadmium	ug/l	0.2 [4]	0.018	**64**	< 0.014	< 0.014	0.020	0.021	<0.015	<0.015	<0.015	0.041	0.018	<0.015	<0.015	<0.015	0.02	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	--	--	66400	67100	55500	56500	57800	63000	87400	82100	50100	57400	56600	67800	--	54200	--	57800	58300	61000	27900
Chromium	ug/l	-- [5]	3	2	1	1	2	2	<1	<1	<1	1	<1	1	1	<1	3	2	<1	<1	<1	<1	1
Cobalt	ug/l	0.9	0.4	**500**	0.2	0.2	0.4	0.5	0.3	0.2	0.2	0.3	0.3	0.5	0.5	0.2	0.7	0.4	0.2	0.3	0.3	0.2	0.1
Copper	ug/l	5	2.5	2	1.2	1.3	2.3	2.3	1.9	1.8	1.7	6.8	1.9	2.5	2.4	1.3	3.2	1.2	1.9	2.4	4.3	5.3	6.6
Iron	ug/l	300	**884**	**807**	**355**	**326**	**843**	**852**	**766**	**853**	**420**	**403**	**637**	**604**	**599**	**350**	**1260**	**820**	226	212	207	55	106
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.09	0.16	0.19	0.23
Magnesium	ug/l	--	--	--	20100	19900	16000	16200	14500	15600	23800	22400	14200	15500	15600	19600	--	15400	--	17600	17900	16700	2310
Manganese	ug/l	--	42	77	32	32	95	97	119	130	45	43	60	255	261	52	105	184	14	114	115	91	67
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.6	0.6	0.9	0.3
Nickel	ug/l	25	<10	**4700**	2.7	2.5	2.4	2.5	1.3	1	1.6	2.7	1.2	2.3	2.5	1.1	2.4	1.4	0.9	0.9	0.9	1	0.4
Potassium	ug/l	--	2000	2200	4400	4300	3300	3400	3700	4000	6100	5800	2000	3300	3400	6300	2500	2800	3300	2300	2400	3300	1000
Silicon	ug/l	--	4620	3930	5700	5550	2880	2870	3100	3310	3610	3400	3440	3110	3100	3770	3520	3260	5460	1470	1490	3070	1080
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1
Sodium	ug/l	--	34900	59000	61800	61200	68800	69700	89900	95100	116000	110000	54100	125000	125000	95000	62600	85100	64500	72500	73800	115000	34400
Strontium	ug/l	--	222	--	358	356	332	337	474	508	696	654	284	421	422	453	292	402	358	340	347	442	235
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.05	<0.05	<5	<0.05
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<50	<50
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<5	<5	<5
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	1.2	2.7	2.6	1	3.2	2.7	1.2	1.1	1.1	1.5	0.5
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15	11	10	9
Phenols																							
Phenols	ug/l	1 [7]	<1	<1	<1	<1	<1	<1	**<2**	**<2**	**<2**	**2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**

Footnotes:

	Tables should be read in
<	Indicates parameter not d
--	Chemical not analyzed or
Bold/ Shaded	Parameter is greater than
(1)	Provincial Water Quality
(2)	Alkalinity should not be d
(3)	To avoid nuisance concer provided by a total phosp at a total phosphorus con
(4)	An Interim PWQO also ex
(5)	PWQO values exist for C
(6)	If alkalinity as CaCO3 < 2 PWQO = 25 ug/L. An Int
(7)	Determined by the total re employed where possible

Table 3: Surface Water Analytical Results

Parameter	Unit	PWQO [1]	Adjacent (South Indian Creek) SW-2 4-May-17	24-Jul-17	24-Oct-17	11-May-18	31-Jul-18	18-Oct-18	16-May-19	18-Jul-19	23-Oct-19	4-May-20	23-Jul-20	28-Oct-20	19-May-21	28-Jul-21	26-Oct-21
			SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2
Field Measured Parameters																	
Conductivity (Field)	uS/cm	--	444	711	758	647	902	1180	680	1010	1000	665	741	820	835	1150	917
Dissolved Oxygen (Field)	ug/l	--	15010	186400	20870	11980	8940	13410	15980	11770	10800	11040	6130	17000	6120	7250	12680
pH (Field)	-	8.5	8.03	7.71	7.74	8.19	7.81	8.27	7.78	**8.61**	8.05	8.48	8.1	8.11	7.95	8.31	7.74
Temperature (Field)	deg c	--	NA	17.04	14.49	11.16	22.76	4.11	9.77	24.94	10.08	10.43	20.28	7.8	16.82	18.36	7.24
General Chemistry																	
Alkalinity	ug/l	-- [2]	122000	182000	202000	172000	144000	189000	135000	154000	162000	139000	153000	224000	--	194000	--
Ammonia Nitrogen	ug/l	--	<10	<10	50	30	130	50	70	110	50	70	170	20	--	70	--
Unionized Ammonia	ug/l	20	<0.1	<0.1	0.8	0.9	3.7	1.1	0.8	19.8	0.9	4.8	6.5	0.3	--	4.6	--
Biochemical Oxygen Demand	ug/l	--	<3000	3000	4000	<3000	<3000	3000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	--	<3000
Bromide	ug/l	--	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	--	<400	--
Chemical Oxygen Demand	ug/l	--	39000	42000	28000	39000	27000	17000	42000	26000	18000	14000	28000	22000	--	20000	--
Chloride	ug/l	--	42600	81400	85500	113000	144000	161000	86600	158000	149000	110000	166000	96300	119000	185000	102000
Dissolved Organic Carbon	ug/l	--	12500	11500	6900	9000	8100	5200	15600	7100	6200	12600	5700	7800	7400	3600	4800
Hardness	ug/l	--	147000	213000	252000	210000	204000	303000	191000	210000	245000	193000	229000	269000	--	--	--
Nitrate as N	ug/l	--	3250	50	2300	770	190	320	2220	140	280	1650	<50	<50	--	<50	--
Nitrite as N	ug/l	--	<50	1150	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	--	<50	--
Phosphate, Ortho	ug/l	--	20	40	10	10	50	20	18	70	34	81	71	24	--	40	--
Phosphorus	ug/l	-- [3]	**80**	**80**	**30**	**70**	**100**	**40**	**70**	**100**	**60**	**120**	**140**	20	**60**	**80**	**50**
Sulphate	ug/l	--	16000	21000	30000	25000	70000	67000	20000	37000	61000	24000	38000	31000	24000	48000	39000
Total Dissolved Solids	ug/l	--	229000	352000	381000	402000	488000	562000	302000	480000	496000	359000	484000	428000	401000	542000	426000
Metals																	
Aluminum, dissolved	ug/l	--	180	40	50	60	40	40	90	40	60	50	160	100	40	190	70
Barium	ug/l	--	51	56	49	54	71	78	41	51	49	54	53	61	--	53	--
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	--
Boron	ug/l	200	22	44	32	31	81	58	18	129	39	26	69	45	28	54	42
Cadmium	ug/l	0.2 [4]	0.031	**104**	<0.014	0.02	<0.015	0.051	0.024	0.016	<0.015	0.023	<0.015	<0.015	--	<0.015	--
Calcium	ug/l	--	--	--	62700	57100	63100	83900	46900	58500	66200		67300		--	60500	--
Chromium	ug/l	-- [5]	3	5	1	1	<1	<1	<1	1	<1	3	1	7	--	<1	--
Cobalt	ug/l	0.9	0.6	**500**	0.2	0.4	0.2	0.2	0.3	0.5	0.2	0.7	0.3	0.2	--	0.2	--
Copper	ug/l	5	3.2	**10**	1.3	2.1	1.7	**7.3**	2.5	3.5	1.3	2.9	2.2	1.8	--	**5.5**	--
Iron	ug/l	300	**1400**	**902**	**308**	**814**	**836**	**383**	**591**	**551**	**349**	**1460**	**834**	226	201	61	80
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	--	--	--	--	0.21	--
Magnesium	ug/l	--	--	--	18500	16300	15400	22600	13500	15400	19300		17400	--	--	16500	--
Manganese	ug/l	--	70	93	35	95	153	60	57	220	51	124	187	14	104	88	19
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	--	--	--	--	0.9	--
Nickel	ug/l	25	<10	**4700**	2.6	2.3	1	2.3	1.7	2	1.1	2.4	1.2	0.9	--	1	--
Potassium	ug/l	--	1900	2200	4000	3100	4000	5600	1800	3100	6000	2300	3200	3400	--	3100	--
Silicon	ug/l	--	5350	4320	5280	2930	3620	3700	3300	3190	3990	4090	3510	5630	--	3120	--
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	--
Sodium	ug/l	--	35000	61900	58400	70400	96800	108000	52300	115000	95600	64700	99400	66700	--	113000	--
Strontium	ug/l	--	240	--	336	333	467	652	270	407	465	291	468	365	338	432	419
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.05	--
Tin	ug/l	--	--			--	--	--	--	--	--	--	--	--	--	<50	--
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	--
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	1.2	2.4	1	3.3	2.4	1.2	--	1.3	--
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	11	--
Phenols																	
Phenols	ug/l	1 [7]	<1	<1	<1	<1	**2**	**2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**		< 0.002	--

Footnotes:

< Indicates parameter not d

-- Chemical not analyzed or

Bold/ Shaded Parameter is greater than

(1) Provincial Water Quality

(2) Alkalinity should not be d

(3) To avoid nuisance concer provided by a total phosp at a total phosphorus con

(4) An Interim PWQO also ex

(5) PWQO values exist for C

(6) If alkalinity as CaCO3 < 2 PWQO = 25 ug/L. An Int

(7) Determined by the total re employed where possible

Table 3: Surface Water Analytical Results

			Downgradient (South Indian Creek)															
			SW-3															
Parameter	Unit	PWQO [1]	4-May-17	24-Jul-17	24-Oct-17	11-May-18	31-Jul-18	18-Oct-18	16-May-19	18-Jul-19	23-Oct-19	4-May-20	23-Jul-20	28-Oct-20	19-May-21	28-Jul-21		26-Oct-21
			SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	Duplicate	SW-3
Field Measured Parameters																		
Conductivity (Field)	uS/cm	--	443	830	783	843	998	1150	687	1000	1060	685	758	831	814	1120		939
Dissolved Oxygen (Field)	ug/l	--	17830	295000	14800	14020	11300	10060	13630	12670	11500	8530	7890	15700	9270	10220		13520
pH (Field)	-	8.5	8.2	7.96	7.73	8.09	7.85	7.9	7.76	**8.65**	8.06	7.95	8.08	8.05	7.66	8.01		7.71
Temperature (Field)	deg c	--	NA	16.48	14.29	11.24	21.84	4.26	10.51	22.93	10.68	9.41	18.55	7.59	--	16.69		7.14
General Chemistry																		
Alkalinity	ug/l	-- [2]	123000	195000	206000	175000	161000	193000	138000	162000	216000	142000	177000	198000	184000	199000	195000	221000
Ammonia Nitrogen	ug/l	--	40	1190	20	90	240	150	110	190	680	70	250	30	120	60	70	20
Unionized Ammonia	ug/l	20	--	**34.0**	0.3	1.8	6.7	1.3	1.3	**29.3**	12.4	1.3	8.3	0.5	NA	1.8	2.1	0.1
Biochemical Oxygen Demand	ug/l	--	<3000	13000	3000	<3000	<3000	3000	<3000	<3000	<3000	6000	3000	<3000	--	--	--	--
Bromide	ug/l	--	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400
Chemical Oxygen Demand	ug/l	--	39000	39000	24000	39000	32000	14000	61000	23000	28000	17000	23000	15000	30000	20000	21000	6000
Chloride	ug/l	--	45800	106000	91500	117000	150000	174000	87000	150000	152000	108000	159000	96600	116000	178000	173000	103000
Dissolved Organic Carbon	ug/l	--	12600	11200	7100	9000	8100	5500	17700	7200	9300	8500	6400	7700	7300	3500	3800	4500
Hardness	ug/l	--	149000	229000	256000	204000	212000	309000	187000	216000	263000	198000	252000	268000	227000	--	--	270000
Nitrate as N	ug/l	--	3310	60	2160	740	230	280	2160	170	200	1640	90	6280	400	<50	<50	7230
Nitrite as N	ug/l	--	<50	1020	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	180	<50	<50	<50
Phosphate, Ortho	ug/l	--	20	40	10	10	50	20	19	72	16	73	47	21	27	35	39	10
Phosphorus	ug/l	-- [3]	**60**	**130**	30	**50**	**100**	**50**	**70**	**100**	**30**	**110**	**90**	20	**80**	**70**	**80**	**40**
Sulphate	ug/l	--	16000	22000	29000	25000	65000	64000	20000	34000	31000	23000	34000	31000	24000	43000	45000	39000
Total Dissolved Solids	ug/l	--	231000	400000	401000	401000	489000	578000	307000	472000	521000	361000	479000	412000	407000	527000	535000	438000
Metals																		
Aluminum, dissolved	ug/l	--	90	50	50	60	50	50	80	40	90	40	40	160	50	40	50	50
Barium	ug/l	--	47	66	64	55	72	83	42	56	97	55	62	61	51	53	56	59
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	--	--	--	<2	<0.1	<0.1	<0.1
Boron	ug/l	200	27	71	46	39	86	71	19	131	**220**	28	112	45	38	58	53	44
Cadmium	ug/l	0.2 [4]	0.027	**98**	< 0.014	0.018	0.051	<0.015	<0.0015	<0.015	<0.015	0.025	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	--	--	--	67900	55800	61200	86500	48100	60400	74000	--	63800	--	52000	60200	64900	72200
Chromium	ug/l	-- [5]	2	2	1	1	<1	<1	1	1	<1	3	<1	<1	<1	<1	<1	<1
Cobalt	ug/l	0.9	0.4	**600**	0.2	0.3	0.3	0.2	0.3	0.4	0.5	0.7	0.4	0.2	0.3	0.2	0.2	0.1
Copper	ug/l	5	2.8	**10**	1.2	2.1	3.9	1.3	1.8	2	0.7	2.8	0.8	0.0017	5.7	3.4	1.9	6.4
Iron	ug/l	300	**1040**	**1640**	**380**	**801**	**1030**	**445**	**623**	**852**	**842**	**1410**	**784**	231	235	63	54	39
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	--	--	--	0.27	0.1	0.03	0.22
Magnesium	ug/l	--	--	--	19600	15800	15000	22500	13400	15800	18900	--	16800	--	17500	16100	16900	21800
Manganese	ug/l	--	70	220	93	124	196	119	65	238	278	126	330	16	139	104	94	21
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	--	--	--	0.6	0.8	0.8	0.6
Nickel	ug/l	25	<10	**4700**	4.5	2.4	2.6	1.4	1.2	1.8	1.3	2.2	1.1	0.8	0.6	1	1.1	0.7
Potassium	ug/l	--	1800	3000	4400	3400	4200	5900	1900	3500	6900	2400	3800	3400	2500	3100	3200	3600
Silicon	ug/l	--	4830	4710	5730	3500	3950	4140	3260	3710	6540	4080	3930	5550	2000	2980	3220	4870
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1
Sodium	ug/l	--	35800	72700	64300	68800	95700	109000	52700	110000	102000	65500	93300	66100	73800	108000	115000	65600
Strontium	ug/l	--	227	--	345	318	430	603	268	385	334	295	400	361	339	417	442	402
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	--	--	--	<0.05	<0.05	<0.05	<0.05
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<50	<50
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<5	<5	<5
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	1.2	2.1	0.6	3.1	1.7	1.1	1.1	1.3	1.3	0.9
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	--	--	--	13	9	8	17
Phenols																		
Phenols	ug/l	1 [7]	<1	<1	<1	<1	**2**	**2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**

Footnotes:

	Tables should be read in
<	Indicates parameter not d
--	Chemical not analyzed or
Bold/ Shaded	Parameter is greater than
(1)	Provincial Water Quality
(2)	Alkalinity should not be d
(3)	To avoid nuisance concer provided by a total phosp at a total phosphorus con
(4)	An Interim PWQO also ex
(5)	PWQO values exist for C
(6)	If alkalinity as CaCO3 < 2 PWQO = 25 ug/L. An Int
(7)	Determined by the total re employed where possible

Table 3: Surface Water Analytical Results

			Background (Northern Ditch)														
			SW-6														
Parameter	**Unit**	**PWQO** [1]	**4-May-17**	**24-Jul-17**	**24-Oct-17**	**11-May-18**	**31-Jul-18**	**18-Oct-18**	**16-May-19**	**18-Jul-19**	**23-Oct-19**	**4-May-20**	**23-Jul-20**	**28-Oct-20**	**19-May-21**	**28-Jul-21**	**26-Oct-21**
			SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6	SW-6
Field Measured Parameters																	
Conductivity (Field)	uS/cm	--	820	183000	973	675	1030	905	86	--	--	--	--	--	--	--	--
Dissolved Oxygen (Field)	ug/l	--	13600	247600	15560	16020	12460	12110	796	--	--	--	--	--	--	--	--
pH (Field)	-	8.5	8.48	7.75	7.6	8.08	8.09	7.99	8.16	--	--	--	--	--	--	--	--
Temperature (Field)	deg c	--	NA	16.75	13.43	8.74	16.13	3.22	11.19	--	--	--	--	--	--	--	--
General Chemistry																	
Alkalinity	ug/l	-- [2]	150000	275000	191000	202000	176000	179000	31000	--	--	164000	--	--	--	--	--
Ammonia Nitrogen	ug/l	--	190	20500	160	410	600	30	30	--	--	120	--	--	--	--	--
Unionized Ammonia	ug/l	20	--	**373.1**	1.6	7.5	17.2	0.4	0.6	--	--	--	--	--	--	--	--
Biochemical Oxygen Demand	ug/l	--	<3000	20000	5000	<3000	<3000	3000	<3000	--	--	<3000	--	--	--	--	--
Bromide	ug/l	--	<400	700	600	<400	400	<400	<400	--	--	<400	--	--	--	--	--
Chemical Oxygen Demand	ug/l	--	33000	80000	36000	27000	24000	14000	38000	--	--	<5000	--	--	--	--	--
Chloride	ug/l	--	160000	299000	166000	144000	190000	155000	800	--	--	122000	--	--	--	--	--
Dissolved Organic Carbon	ug/l	--	7900	7200	6600	6100	5800	5300	10000	--	--	4300	--	--	--	--	--
Hardness	ug/l	--	178000	216000	221000	179000	189000	221000	33000	--	--	176000	--	--	--	--	--
Nitrate as N	ug/l	--	200	50	<50	<50	250	<50	170	--	--	220	--	--	--	--	--
Nitrite as N	ug/l	--	<50	<50	<50	<50	<50	<50	<50	--	--	<50	--	--	--	--	--
Phosphate, Ortho	ug/l	--	20	340	10	20	50	30	18	--	--	10	--	--	--	--	--
Phosphorus	ug/l	-- [3]	**50**	**970**	**400**	**60**	**140**	**40**	**90**	--	--	**30**	--	--	--	--	--
Sulphate	ug/l	--	9000	13000	4000	5000	7000	6000	<1000	--	--	10000	--	--	--	--	--
Total Dissolved Solids	ug/l	--	432000	822000	489000	446000	498000	451000	35000	--	--	379000	--	--	--	--	--
Metals																	
Aluminum, dissolved	ug/l	--	20	20	40	40	30	30	60	--	--	30	--	--	--	--	--
Barium	ug/l	--	73	111	125	78	103	85	11	--	--	60	--	--	--	--	--
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	ug/l	200	44	50	62	45	57	42	<5	--	--	37	--	--	--	--	--
Cadmium	ug/l	0.2 [4]	<0.014	**71**	<0.014	<0.015	0.07	<0.015	0.022	--	--	<0.015	--	--	--	--	--
Calcium	ug/l	--	--	--	--	61700	47400	54100	58300	85200	--	--		--	--	--	--	--
Chromium	ug/l	-- [5]	<1	2	1	<1	<1	<1	<1	--	--	<1	--	--	--	--	--
Cobalt	ug/l	0.9	0.2	**600**	0.7	0.5	0.2	0.3	0.7	--	--	0.3	--	--	--	--	--
Copper	ug/l	5	1.3	**11**	0.8	0.7	2.6	0.1	0.8	--	--	0.9	--	--	--	--	--
Iron	ug/l	300	**1110**	**3570**	**9290**	**1240**	**1820**	**400**	**1800**	--	--	**713**	--	--	--	--	--
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	ug/l	--	--	--	17900	14800	15900	18200	2380	--	--		--	--	--	--	--
Manganese	ug/l	--	311	657	1390	1010	441	859	117	--	--	264	--	--	--	--	--
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	ug/l	25	<10	**3000**	1.9	1.1	1.7	0.7	0.8	--	--	0.9	--	--	--	--	--
Potassium	ug/l	--	2800	8900	3400	3100	3000	2800	1000	--	--	2300	--	--	--	--	--
Silicon	ug/l	--	4470	6880	8470	6730	7290	7410	3470	--	--	5840	--	--	--	--	--
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	ug/l	--	107000	231000	110000	97100	119000	102000	1500	--	--	72000	--	--	--	--	--
Strontium	ug/l	--	203	--	215	156	181	196	46	--	--	140	--	--	--	--	--
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	0.7	--	--	0.6	--	--	--	--	--
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols																	
Phenols	ug/l	1 [7]	<1.0	**49**	<1	<1	**6**	**<2**	**<2**	--	--	**<2**	--	--	--	--	--

Footnotes:

Tables should be read in

< Indicates parameter not d

-- Chemical not analyzed or

Bold/ Shaded Parameter is greater than

(1) Provincial Water Quality

(2) Alkalinity should not be d

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(3) provided by a total phosp

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If alkalinity as CaCO3 < 2

(6) PWQO = 25 ug/L. An Int

Determined by the total re

(7) employed where possible

Table 3: Surface Water Analytical Results

			Adjacent (Northern Ditch)																		
			SW-4																		
			4-May-17		24-Jul-17		24-Oct-17	11-May-18	31-Jul-18	18-Oct-18	16-May-19	18-Jul-19	23-Oct-19	4-May-20	23-Jul-20		28-Oct-20		19-May-21	28-Jul-21	26-Oct-21
Parameter	**Unit**	**PWQO** [1]	SW-4	Dup of SW-4	SW-4	Dup of SW-4	SW-4	SW-4	SW-4	SW-4	SW-4	SW-4	SW-4	SW-4	SW-4	Duplicate	SW-4	Duplicate	SW-4	SW-4	SW-4
Field Measured Parameters																					
Conductivity (Field)	uS/cm	--	1040		1690		830	566	376	830	833	0	808	700	271		986		760	849	732
Dissolved Oxygen (Field)	ug/l	--	16770		123800		14880	12070	12980	12320	14870	20160	12110	16800	8330		12270		9690	10380	9880
pH (Field)	-	8.5	8.26		7.56		7.65	8.27	6.93	8.19	7.66	6.64	8.33	8.26	**8.54**		7.74		7.68	7.86	8.18
Temperature (Field)	deg c	--	NA		13.6		13.17	8.65	16.12	3.85	10.05	15.83	10.74	7.31	13.37		8.15		10.77	12.58	7.51
General Chemistry																					
Alkalinity	ug/l	-- [2]	188000	188000	258000	255000	178000	170000	172000	168000	178000	166000	158000	229000	210000	210000	224000	227000	196000	237000	192000
Ammonia Nitrogen	ug/l	--	950	940	17000	17200	10	330	520	40	190	260	20	410	490	490	1010	1010	260	430	17
Unionized Ammonia	ug/l	20	--	--	**170.0**	**172.0**	0.1	9.4	1.5	0.5	1.4	0.8	0.6	9.4	**29.3**	**29.3**	10.1	10.1	2.6	8.1	0.3
Biochemical Oxygen Demand	ug/l	--	<3000	<3000	21000	20000	3000	<3000	<3000	4000	<3000	5000	<3000	3000	4000	<3000	<3000	<3000	-	-	--
Bromide	ug/l	--	500	<400	600	600	600	<400	400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400
Chemical Oxygen Demand	ug/l	--	33000	31000	69000	66000	29000	26000	26000	20000	20000	20000	19000	16000	24000	31000	15000	22000	22000	20000	601000
Chloride	ug/l	--	197000	197000	267000	258000	134000	133000	178000	117000	117000	86800	132000	124000	115000	115000	152000	152000	86500	94800	83100
Dissolved Organic Carbon	ug/l	--	7700	7800	6600	6800	6400	5900	5700	5400	9600	6600	5800	5800	7100	7400	8200	8300	6900	6600	7700
Hardness	ug/l	--	267000	266000	203000	205000	203000	174000	187000	217000	214000	164000	187000	219000	246000	247000	259000	258000	198000		156000
Nitrate as N	ug/l	--	250	250	50	<50	<50	70	330	<50	310	280	80	360	170	170	310	320	330	50	130
Nitrite as N	ug/l	--	<50	90	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	170	<50	<50
Phosphate, Ortho	ug/l	--	10	10	280	220	10	20	50	290	22	89	23	9	19	22	23	3	9	22	117
Phosphorus	ug/l	-- [3]	**40**	**40**	**750**	**780**	**50**	**60**	**140**	**310**	**580**	**100**	**30**	**30**	**50**	**50**	20	**40**	**30**	**60**	**100**
Sulphate	ug/l	--	36000	36000	8000	8000	5000	6000	7000	8000	16000	6000	9000	15000	17000	17000	21000	21000	13000	16000	31000
Total Dissolved Solids	ug/l	--	565000	578000	744000	750000	406000	402000	479000	390000	389000	321000	393000	448000	417000	420000	515000	513000	356000	403000	367000
Metals																					
Aluminum, dissolved	ug/l	--	30	30	20	20	40	40	30	30	40	30	40	40	50	50	50	60	30	50	990
Barium	ug/l	--	105	112	110	114	73	73	106	107	63	82	68	86	107	106	103	100	83	91	38
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<2	<0.1	<0.1
Boron	ug/l	200	118	126	46	48	52	39	54	51	81	50	51	154	**205**	200	173	168	156	**207**	132
Cadmium	ug/l	0.2 [4]	0.035	0.039	**74**	**99**	< 0.014	<0.015	<0.015	0.046	<0.0015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	--	--	--	58600	52300	46100	56200	57900	56400	43400	49800	--	63300	66500	--	--	54800	62400	37100
Chromium	ug/l	-- [5]	<1	<1	2	< 2	< 1	<1	<1	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3
Cobalt	ug/l	0.9	0.4	0.4	**700**	**600**	0.3	0.3	0.2	0.8	0.4	0.4	0.2	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.9
Copper	ug/l	5	1.7	1.7	**8**	**7**	0.6	0.6	0.4	**8.8**	1	0.4	0.4	0.7	0.4	0.4	0.3	0.9	4.4	4.6	8.1
Iron	ug/l	300	**1330**	**1430**	**4600**	**4780**	**447**	**797**	**1940**	**3810**	**947**	**1740**	**688**	**2080**	**1940**	**1040**	**1140**	**1100**	**847**	**1010**	**1330**
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.25	0.23	0.69
Magnesium	ug/l	--	--	--	--	--	15600	14300	16100	17600	14200	13600	15100	--	15800	15900	--	--	14900	15700	15400
Manganese	ug/l	--	449	479	765	794	865	819	467	1030	324	595	233	292	535	494	301	293	628	389	72
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.6	0.7	2.3
Nickel	ug/l	25	<10	<10	**3100**	**2900**	1.7	1	0.4	1.8	0.7	0.4	0.6	1	0.7	0.8	0.8	0.8	1.2	0.7	3
Potassium	ug/l	--	6500	6900	7800	8200	2900	2900	2900	2500	2500	2300	3100	4000	3700	3800	4700	4600	3300	3600	6300
Silicon	ug/l	--	4830	5130	7270	7680	7690	6520	7350	7760	5610	7410	7380	6170	7380	7210	7910	7790	7160	7490	6480
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	<0.1	<0.1
Sodium	ug/l	--	115000	121000	209000	220000	87100	84400	111000	80600	75200	66800	86700	78800	73300	74200	105000	103000	64400	66600	77700
Strontium	ug/l	--	312	336	--	--	154	144	184	184	182	139	167	196	208	208	249	244	192	216	222
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<0.05	<0.05	<0.05
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<50
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<5	72
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	<5	<5	0.5	1.1	0.6	0.8	1.1	1.2	0.7	0.6	0.6	0.8	5.2
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14	19	15
Phenols																					
Phenols	ug/l	1 [7]	<1	<1	**33**	**33**	<1	<1	**3**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**

Footnotes:

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Table 3: Surface Water Analytical Results

			Adjacent (Northern Ditch)														
			SW-5														
Parameter	**Unit**	**PWQO** [1]	**4-May-17**	**24-Jul-17**	**24-Oct-17**	**11-May-18**	**31-Jul-18**	**18-Oct-18**	**16-May-19**	**18-Jul-19**	**23-Oct-19**	**4-May-20**	**23-Jul-20**	**28-Oct-20**	**19-May-21**	**28-Jul-21**	**26-Oct-21**
			SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5	SW-5
Field Measured Parameters																	
Conductivity (Field)	uS/cm	--	828	1300	844	843	1170	1130	916	912	1060	804	744	1010	791	916	905
Dissolved Oxygen (Field)	ug/l	--	18740	169800	15270	16790	14920	13230	17030	13920	11500	19.27	9450	12940	11710	14890	13330
pH (Field)	-	8.5	7.91	7.51	7.56	8.17	7.9	7.92	7.72	**8.57**	8.18	8.26	8.26	7.93	7.72	7.95	7.74
Temperature (Field)	deg c	--	NA	13.37	13.57	7.90	15.89	4.03	10.65	16.20	10.2	7.22	13.73	7.95	11.05	13.14	7.18
General Chemistry																	
Alkalinity	ug/l	-- [2]	197000	247000	241000	217000	217000	217000	185000	209000	233000	196000	243000	234000	208000	262000	186000
Ammonia Nitrogen	ug/l	--	670	5710	490	1120	910	870	530	850	910	570	740	1170	380	700	70
Unionized Ammonia	ug/l	20	--	**47.4**	4.1	**27.4**	**26.0**	11.6	6.3	**89.1**	**27.3**	17.1	**44.1**	18.3	3.4	15.4	0.4
Biochemical Oxygen Demand	ug/l	--	4000	21000	5000	<3000	<3000	3000	<3000	5000	<3000	<3000	7000	<3000	--	--	--
Bromide	ug/l	--	400	600	500	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400
Chemical Oxygen Demand	ug/l	--	34000	58000	38000	36000	30000	19000	25000	36000	32000	<5000	39000	20000	22000	24000	671000
Chloride	ug/l	--	128000	199000	148000	177000	200000	165000	127000	112000	149000	124000	126000	151000	91200	102000	71000
Dissolved Organic Carbon	ug/l	--	8800	9200	7700	7500	8200	6600	9900	9000	9700	5700	8400	8600	7200	7300	9000
Hardness	ug/l	--	22800	277000	283000	275000	264000	297000	234000	233000	281000	216000	287000	271000	213000	--	171000
Nitrate as N	ug/l	--	300	390	610	200	500	<50	430	490	190	360	330	390	430	100	680
Nitrite as N	ug/l	--	<50	110	<50	<50	<50	<50	<50	<50	<50	<50	60	<50	170	<50	<50
Phosphate, Ortho	ug/l	--	10	80	<10	<10	20	10	86	124	8	5	19	20	8	14	48
Phosphorus	ug/l	-- [3]	**150**	**400**	30	**80**	**100**	20	**150**	**150**	20	**30**	**160**	**30**	**40**	**50**	**320**
Sulphate	ug/l	--	29000	29000	22000	31000	34000	25000	20000	19000	26000	17000	23000	24000	16000	20000	32000
Total Dissolved Solids	ug/l	--	453000	625000	519000	563000	602000	530000	422000	431000	520000	428000	481000	523000	378000	442000	347000
Metals																	
Aluminum, dissolved	ug/l	--	30	30	50	60	50	40	50	60	50	50	50	50	40	40	40
Barium	ug/l	--	95	119	113	105	142	115	81	123	116	77	134	103	84	95	40
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	--	--	--	<2	<0.1	<0.1
Boron	ug/l	200	104	188	164	178	195	178	108	182	**278**	131	**269**	196	181	**252**	128
Cadmium	ug/l	0.2 [4]	0.022	**90**	<0.014	0.025	<0.015	<0.015	0.034	0.023	<0.015	<0.015	0.015	0.442	<0.015	<0.015	<0.015
Calcium	ug/l	--	--	75300	83500	78800	84700	85700	62700	65700	80100	--	76700	--	59900	70700	43100
Chromium	ug/l	-- [5]	1	3	1	<1	<1	<1	2	1	<1	<1	2	<1	<1	<1	<1
Cobalt	ug/l	0.9	0.8	**1000**	0.5	0.6	0.7	0.6	0.9	0.9	0.5	0.5	**1**	0.5	0.5	0.5	0.3
Copper	ug/l	5	2.4	**10**	0.8	1.5	0.6	0.3	2.8	1.6	0.5	1.2	1.6	1.8	5	4.7	**5.2**
Iron	ug/l	300	**2300**	**6270**	**1170**	**3200**	**2910**	**1240**	**3880**	**4410**	**931**	**1390**	**6130**	**1010**	**622**	**641**	42
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	--	--	--	0.21	0.2	0.19
Magnesium	ug/l	--	--	--	20000	18900	19700	20100	15000	16800	19700	--	17600	--	15400	16600	15500
Manganese	ug/l	--	455	859	714	764	710	618	463	747	363	302	746	315	570	400	81
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	--	--	--	0.7	0.7	2
Nickel	ug/l	25	<10	**4800**	3	2.5	0.9	1.4	2.1	1.8	1.4	1.3	1.9	1.2	0.9	1.2	1.3
Potassium	ug/l	--	5000	6900	6700	7900	7200	6000	3900	5700	7300	4100	6200	5800	4400	5300	6600
Silicon	ug/l	--	5510	7270	7850	6850	7440	6770	6170	7770	7650	6040	8210	7740	6940	7370	4500
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	--	--	--	<0.1	<0.1	<0.1
Sodium	ug/l	--	83400	134000	91700	98800	122000	94800	78000	81300	104000	75500	78300	103000	64600	69100	66100
Strontium	ug/l	--	283	--	294	288	303	321	212	246	311	192	263	265	219	254	262
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	--	--	--	<0.05	<0.05	<0.05
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	<50	<50	<50
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	<5	<5	<5
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	2.2	1.8	0.6	0.7	2.7	0.5	0.5	0.5	2.3
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	--	--	--	11	17	12
Phenols																	
Phenols	ug/l	1 [7]	<1	**4**	<1	<1	**7**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**

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Table 3: Surface Water Analytical Results

			Groundwater Seep												
			SW-7												
Parameter	Unit	PWQO [1]	4-May-17	24-Jul-17	16-May-19	18-Jul-19	23-Oct-19	4-May-20		23-Jul-20	28-Oct-20	19-May-21	28-Jul-21	26-Oct-21	
			SW-7	SW-7	SW-7	SW-7	SW-7	SW-7	Duplicate	SW-7	SW-7	SW-7	SW-7	SW-7	Duplicate
Field Measured Parameters															
Conductivity (Field)	uS/cm	--	866	1300	863	1010	1010	668		745	819	853	1170	924	
Dissolved Oxygen (Field)	ug/l	--	25090	362300	15860	11770	10630	13750		6530	17510	7470	7290	10950	
pH (Field)	-	8.5	8.03	7.59	7.66	**8.61**	8.23	8.4		8.03	8.05	7.84	8.35	7.71	
Temperature (Field)	deg c	--	NA	15.77	14.26	24.94	10.99	10.52		19.92	7.65	16.3	17.85	7.69	
General Chemistry															
Alkalinity	ug/l	-- [2]	368000	480000	292000	156000	161000	140000	139000	159000	200000	180000	197000	224000	225000
Ammonia Nitrogen	ug/l	--	180	230	60	130	50	60	60	120	20	90	70	20	10
Unionized Ammonia	ug/l	20	--	2.7	0.6	**23.4**	1.5	2.7	2.7	4.6	0.3	1.7	4.2	0.2	0.1
Biochemical Oxygen Demand	ug/l	--	<3000	4000	<3000	<3000	<3000	<3000	<3000	<3000	<3000	--	--	--	--
Bromide	ug/l	--	<400	400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400	<400
Chemical Oxygen Demand	ug/l	--	55000	252000	55000	26000	20000	15000	17000	24000	13000	31000	19000	15000	10000
Chloride	ug/l	--	48500	40400	47700	156000	161000	109000	109000	169000	96400	118000	180000	107000	105000
Dissolved Organic Carbon	ug/l	--	16100	17300	16800	7000	6200	9000	9400	5800	7700	7600	3900	4500	4600
Hardness	ug/l	--	436000	507000	373000	206000	240000	186000	183000	240000	264000	218000	--	278000	277000
Nitrate as N	ug/l	--	520	50	170	140	160	1640	1650	<50	6270	390	<50	7350	7390
Nitrite as N	ug/l	--	<50	380	<50	<50	<50	<50	<50	<50	<50	200	<50	<50	<50
Phosphate, Ortho	ug/l	--	10	30	20	72	34	76	76	72	22	26	35	10	6
Phosphorus	ug/l	-- [3]	**70**	**1050**	**100**	**90**	**50**	**110**	**110**	**110**	20	**110**	**100**	**60**	**50**
Sulphate	ug/l	--	55000	21000	35000	36000	51000	24000	24000	39000	31000	25000	48000	39000	39000
Total Dissolved Solids	ug/l	--	536000	618000	430000	474000	502000	356000	354000	482000	409000	402000	552000	449000	447000
Metals															
Aluminum, dissolved	ug/l	--	50	50	60	40	50	50	50	50	50	50	50	50	50
Barium	ug/l	--	98	277	83	48	49	51	50	48	59	47	59	60	61
Berryllium	ug/l	1100	--	--	--	--	--	--	--	--	--	<2	<0.1	<0.1	<0.1
Boron	ug/l	200	**381**	**469**	348	125	37	24	22	69	45	33	58	46	47
Cadmium	ug/l	0.2 [4]	0.045	**802**	0.028	<0.015	<0.015	0.019	0.022	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	--	--	111000	57200	65700	--	--	62200	--	58800	67900	74400	74100
Chromium	ug/l	-- [5]	1	15	<1	1	4	3	3	<1	<1	<1	<1	<1	<1
Cobalt	ug/l	0.9	0.4	**4000**	0.6	0.4	0.3	0.7	0.7	0.1	0.2	0.3	0.2	0.1	0.1
Copper	ug/l	5	2.3	**48**	2	2.3	1.6	3	3	2.1	1.6	**5.7**	3.7	2.7	**5.8**
Iron	ug/l	300	290	**11800**	290	**563**	**366**	**1340**	**1330**	73	222	209	60	43	46
Lead	ug/l	5	--	--	--	--	--	--	--	--	--	0.23	0.14	0.15	0.19
Magnesium	ug/l	--	--	--	21100	15400	18500	--	--	16400	--	17300	17400	22400	22400
Manganese	ug/l	--	105	4230	243	184	61	118	116	202	15	119	110	22	22
Molybdenum	ug/l	40	--	--	--	--	--	--	--	--	--	0.6	0.9	0.6	0.6
Nickel	ug/l	25	<10	**14800**	2.7	2	1.5	2.3	2.4	0.9	0.9	1	1.1	0.7	0.7
Potassium	ug/l	--	15400	18300	14000	3200	5900	2200	2200	3000	3300	2400	3300	3800	3800
Silicon	ug/l	--	1720	12400	5390	3300	3990	3690	3710	2680	5400	1890	3140	5000	5010
Silver	ug/l	0.1	--	--	--	--	--	--	--	--	--	<0.1	<0.1	<0.1	<0.1
Sodium	ug/l	--	30800	30700	25400	112000	103000	61600	60500	96100	64300	7160	117000	67600	67400
Strontium	ug/l	--	778	--	625	395	446	278	274	441	353	334	455	399	397
Thallium	ug/l	0.3	--	--	--	--	--	--	--	--	--	<0.05	<0.05	<0.05	<0.05
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	<50	<50	<50	<50
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	<5	<5	<5	<5
Vanadium	ug/l	6	<5	<5	0.7	2	1.2	3.2	3.3	1.5	1.1	1.2	1.3	0.9	0.9
Zinc	ug/l	30 [4]	--	--	--	--	--	--	--	--	--	16	1.1	9	11
Phenols															
Phenols	ug/l	1 [7]	<1	<1	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**	**<2**

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Parameter	Unit	ODWQS-AO [2]	P2-1 19-Nov-1991	P2-1 03-Dec-1997	P2-1 21-Apr-1998	P2-1 14-May-1999	P2-1 02-Sep-1999	P2-1 19-Oct-1999	P2-1 03-Nov-2000	P2-1 28-Jun-2001	P2-1 04-Oct-2001	P2-1 31-May-2002	P2-1 02-Oct-2002	P2-1 08-Apr-2003	P2-1 28-Oct-2003
General Chemistry															
Alkalinity (Total as CaCO3)	mg/l	--	126	111	105	136	123	128	140	--	--	125	108	114	110
Ammonia Nitrogen	mg/l	--	--	0.14	0.19	0.53	0.3	0.27	0.37	--	--	0.45	0.27	0.16	0.24
Bicarbonate	mg/l	--	--	--	1	--	--	--	--	--	--	--	--	--	--
Bromide	mg/l	--	--	0.05	<0.5	--	--	--	--	--	--	--	--	--	--
Carbonate (CO3)	mg/l	--	--	135.2	125.6	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	mg/l	--	39	6	9	10	<3	8	46	--	--	--	--	--	--
Chloride	mg/l	250	7.2	10.9	7.2	8	8	7	9	28	9	9	8	8	8
Color	color unit	5	451	116	2030	--	--	--	--	--	--	--	--	--	--
Conductivity (Field)	uS/cm	--	244	267	249	150	240	195	383	345	230	390	440	420	250
Cyanide	mg/l	--	0.1	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	mg/l	5	1.8	1.7	1	2.5	1.9	2.3	15.9	3.3	1.5	2.8	1.5	1.2	0.6
Fluoride	mg/l	--	0.3	0.3	<0.1	--	--	--	--	--	--	--	--	--	--
Hardness, Calcium Carbonate	mg/l	--	--	94.4	93.3	110.1	103.5	96.9	122	98	78	71	96	75	83
Hydrogen Sulfide	mg/l	0.05	<0.02	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate as N	mg/l	--	<0.1	0.09	<0.2	0.1	<0.1	0.18	<0.1	--	--	--	--	--	--
Nitrite as N	mg/l	--	0.06	<0.02	<0.2	<0.1	<0.1	<0.1	<0.1	--	--	--	--	--	--
Nitrogen, Organic	mg/l	--	<0.1	--	--	--	--	--	--	--	--	--	--	--	--
pH (Field)	-	--	7.48	8.15	7.99	7.8	7.2	8.2	7.64	7.8	8.3	7.8	7.6	7.4	7.2
Phosphate, Ortho	mg/l	--	--	<0.1	<1	0.27	0.13	0.51	0.11	--	--	--	--	--	--
Phosphorus	mg/l	--	0.24	0.97	6.4	8.38	--	2.91	10.1	0.46	12.6	13.2	5.24	0.04	5.56
Phosphorus (dissolved reactive)	mg/l	--	--	--	--	--	--	--	--	--	0.04	0.09	0.06	0.04	0.08
Sulphate	mg/l	500 [4]	16.4	16.6	16.2	10	10	8	12	50	11	8	10	14	14
Temperature (Field)	deg c	15	--	--	--	8.5	9.5	3	9.5	9	12	12	12	7	9
Total Dissolved Solids	mg/l	500	364	155	134	176	148	156	184	320	136	185	170	168	163
Total Organic Carbon	mg/l	--	2.41	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity	ntu	5 [10]	306	67	49	--	--	--	--	--	--	--	--	--	--
Metals															
Aluminum, dissolved	mg/l	--	--	0.13	0.08	<0.03	<0.03	<0.03	2.02	--	--	--	--	--	--
Antimony, dissolved	mg/l	--	--	<0.1	<0.1	--	--	--	--	--	--	--	--	--	--
Arsenic, dissolved	mg/l	--	<0.001	<0.1	<0.1	--	--	--	--	--	--	--	--	--	--
Barium, dissolved	mg/l	--	0.99	0.017	0.015	<0.01	0.02	-- [11]	0.04	--	--	--	--	--	--
Beryllium, dissolved	mg/l	--	--	<0.0005	<0.0005	<0.01	<0.01	<0.01	<0.002	--	--	--	--	--	--
Bismuth, dissolved	mg/l	--	--	<0.1	<0.1	--	--	--	--	--	--	--	--	--	--
Boron, dissolved	mg/l	--	0.11	0.03	0.02	<0.01	<0.01	-- [11]	0.02	0.09	<0.01	<0.05	<0.05	<0.05	0.03
Cadmium, dissolved	mg/l	--	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0001	--	--	--	--	--	--
Calcium, dissolved	mg/l	--	21	23.7	22.8	26	25	24	29	21	18	17	22	17	20
Chromium, dissolved	mg/l	--	**0.51**	<0.005	<0.005	<0.01	<0.01	<0.01	<0.01	--	--	--	--	--	--
Cobalt, dissolved	mg/l	--	--	<0.005	<0.005	<0.01	<0.01	<0.01	0.0012	--	--	--	--	--	--
Copper, dissolved	mg/l	1	0.51	0.005	<0.003	<0.005	<0.005	<0.005	0.001	--	--	--	--	--	--
Iron, dissolved	mg/l	0.3	236	0.05	0.15	0.05	0.03	0.02	2.03	0.11	<0.01	0.03	0.02	0.03	0.02
Lead, dissolved	mg/l	--	**0.24**	--	--	<0.002	<0.002	<0.002	<0.001	--	--	--	--	--	--
Magnesium, dissolved	mg/l	--	--	8.53	8.79	11	10	9	12	11	8	7	10	8	8
Manganese, dissolved	mg/l	0.05	4.44	0.044	0.061	0.06	0.06	0.05	0.11	0.02	0.05	0.05	0.055	0.049	0.038
Mercury, dissolved	mg/l	--	<0.0001	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum, dissolved	mg/l	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	--	--	--	--	--	--
Nickel, dissolved	mg/l	--	0.06	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	--	--	--	--	--	--
Potassium, dissolved	mg/l	--	--	3	<1	3	3	3	2	--	--	--	--	--	--
Selenium, dissolved	mg/l	--	<0.001	<0.1	<0.1	--	--	--	--	--	--	--	--	--	--
Silicon, dissolved	mg/l	--	--	--	--	7.7	8	8.3	10.1	--	--	--	--	--	--
Silver, dissolved	mg/l	--	<0.05	<0.003	0.005	<0.01	0.02	<0.01	0.0001	--	--	--	--	--	--
Sodium, dissolved	mg/l	200 [5]	23	25.3	15.1	20	21	20	19	--	--	--	--	--	--
Strontium, dissolved	mg/l	--	--	0.083	0.068	0.085	0.085	0.089	0.105	0.131	0.07	0.076	0.074	0.067	0.076
Sulfur	mg/l	--	--	5.9	5.3	5	4	3	4	--	--	--	--	--	--
Thallium, dissolved	mg/l	--	--	--	--	<0.2	<0.5	<0.2	<0.001	--	--	--	--	--	--
Tin, dissolved	mg/l	--	--	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	--	--	--	--	--	--
Titanium, dissolved	mg/l	--	--	<0.005	0.006	<0.01	<0.01	<0.01	0.07	--	--	--	--	--	--
Vanadium, dissolved	mg/l	--	--	<0.005	<0.005	<0.01	<0.01	<0.01	0.004	--	--	--	--	--	--
Zinc, dissolved	mg/l	5	0.61	0.019	<0.005	<0.01	<0.01	<0.01	<0.01	--	--	--	--	--	--
Phenols															
Phenolics, Total Recoverable	mg/l	--	<0.002	--	--	<0.001	<0.001	<0.001	<0.001	--	--	--	--	--	--

Historical Data completed by Golder
2017 data entered by: MM
2017 data checked by: DC

Parameter	Unit	PWQO [1]	SW-1 30-Oct-1991	SW-1 03-Dec-1997	SW-1 21-Apr-1998	SW-1 17-May-1999	SW-1 02-Sep-1999	SW-1 20-Oct-1999	SW-1 08-Aug-2000	SW-1 03-Nov-2000	SW-1 23-Dec-2000 [2]	SW-1 26-Jun-2001	SW-1 30-Aug-2001	SW-1 05-Oct-2001	SW-1 10-Dec-2001	SW-1 30-May-2002	SW-1 30-Jul-2002	SW-1 03-Oct-2002	SW-1 11-Dec-2002
General Chemistry																			
Alkalinity (Total as CaCO3)	ug/l	-- [3]	154000	219000	123000	167000	104000	216000	141000	228000	--	177000	121000	--	185000	167000	153000	130000	97000
Ammonia, unionized	ug/l	20	<20	0.3	0.2	<20	<100	<20	<20	<20	--	<20	<20	--	<20	<20	<20	<20	<20
Ammonia, unionized (Field)	ug/l	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia Nitrogen	ug/l	--	<100	70	40	<20	80	30	80	40	--	100	40	--	40	140	30	<20	50
Bicarbonate	ug/l	--	--	--	1000	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biochemical Oxygen Demand, 5 Day	ug/l	--	5000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromide	ug/l	--	--	120	<50	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbonate (CO3)	ug/l	--	--	266800	147600	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	ug/l	--	40000	19000	37000	40000	13000	23000	38000	38000	--	69000	16000	--	22000	32000	26000	23000	<5000
Chloride	ug/l	--	185000	119000	85000	113000	22000	148000	52000	104000	--	161000	40000	36000	110000	103000	53000	36000	41000
Color	color unit	--	21	40	145	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conductivity (Field)	uS/cm	--	932	886	539	580	225	620	468	890	--	728	685	210	200	220	310	350	348
Cyanide	ug/l	5 [4]	<5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	ug/l	--	--	6900	12100	14900	4700	9600	11400	7500	--	11000	5300	5900	8600	11000	9900	6400	3300
Dissolved Oxygen (Field)	ug/l	--	--	--	--	9300	6700	--	7300	11540	--	**4400**	**3800**	7000	8340	6100	**4660**	**4000**	**2010**
Fluoride	ug/l	--	--	100	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hardness, Calcium Carbonate	ug/l	--	262000	344200	157900	194000	107800	292700	150000	260000	--	208000	125000	124000	231000	186000	156000	129000	110000
Nitrate as N	ug/l	--	<100	2800	<200	840	190	2660	1900	1390	--	220	<100	<100	4010	240	<100	<100	600
Nitrite as N	ug/l	--	<100	<200	<200	<100	<100	<100	<100	<100	--	<100	<100	<100	<100	<100	<100	<100	<100
Nitrogen, Nitrate-Nitrite	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH (Field)	-	8.5	7.69	7.67	7.74	7.8	6.8	7.7	7.7	7.33	--	7.8	7.3	7.4	7.3	7.4	7.6	7.3	7
Phosphate, Ortho	ug/l	--	--	<100	<1000	<30	40	30	240	<30	--	60	<30	--	60	80	190	130	180
Phosphorus	ug/l	-- [5]	**200**	**38**	**50**	**50**	**70**	**40**	**170**	**60**	--	**60**	**40**	**100**	**100**	**60**	**120**	**90**	**80**
Sulphate	ug/l	--	--	58200	22900	26000	10000	60000	22000	30000	--	33000	9000	11000	65000	22000	15000	7000	18000
Temperature (Field)	deg c	--	--	--	--	20	17	1	20.1	3.4	--	20.8	16	12	2	13	20	11	-1
Total Dissolved Solids	ug/l	--	--	497000	291000	396000	168000	560000	272000	472000	--	536000	240000	204000	463000	475000	323000	242000	226000
Total Organic Carbon	ug/l	--	11700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	ug/l	--	30000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity	ntu	-- [6]	0.56	5.7	8.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Aluminum, dissolved	ug/l	--	**230**	**580**	**322**	<30	**270**	<30	**130**	**310**	--	<50	<50	**320**	50	<50	<10	<10	<10
Antimony	ug/l	20	--	<0.5	<0.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/l	100 [8]	<1	<2	<2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	ug/l	--	--	69	43	40	30	70	40	60	--	70	30	30	40	50	40	30	30
Beryllium	ug/l	--	--	<1	<1	<10	<10	<10	<2	<2	--	<2	<2	<2	<2	<2	<1	<1	<1
Bismuth	ug/l	--	--	<1	<1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	ug/l	200	--	25	23	10	<10	30	50	30	--	40	30	<10	<50	120	<20	<50	<50
Cadmium	ug/l	0.2 [8]	<0.2	<0.1	<0.1	<0.15	<0.15	<0.15	<0.1	<0.1	--	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Calcium	ug/l	--	67000	90200	41700	53000	30000	81000	42000	66000	--	52000	35000	33000	61000	48000	41000	35000	31000
Chromium	ug/l	-- [9]	<2	<5	<5	<10	<10	<10	<10	<10	--	2	<1	--	3	1	<1	2	1
Cobalt	ug/l	0.9	--	0.2	0.3	<0.4	<0.4	<0.4	0.3	0.3	--	0.6	0.3	--	0.5	0.5	0.3	<0.2	0.2
Copper	ug/l	5	<5	2.2	2.8	<5	<5	<5	2	1	--	<1	<1	--	3	2	1	1	1
Iron	ug/l	300	**540**	**580**	**840**	**690**	**590**	210	180	**410**	--	**960**	**450**	**650**	80	**540**	**340**	60	210
Lead	ug/l	-- [10]	<12	<0.5	<0.5	<2	<2	<2	<1	<1	--	<1	<1	--	<1	<1	<1	<1	<1
Magnesium	ug/l	--	23000	28900	13000	15000	8000	22000	11000	23000	--	19000	9000	10000	19000	16000	13000	10000	8000
Manganese	ug/l	--	--	58	90	210	120	10	30	40	--	220	150	140	40	210	307	162	79
Mercury	ug/l	0.2 [11]	<0.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/l	40	--	<1	<1	<10	<10	<10	<10	<10	--	<10	<10	<10	<10	<10	<5	<5	<5
Nickel	ug/l	25	<5	<1	<1	<10	<10	<10	<10	<10	--	<10	<10	<10	<10	<10	<5	<5	<5
Potassium	ug/l	--	6000	4000	1800	3000	3000	5000	5000	4000	--	4000	3000	--	3000	3000	3000	4000	3000
Selenium	ug/l	100	<1	<2	<2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silicon	ug/l	--	--	--	--	2100	3900	3900	3550	3520	--	4120	3760	4440	4620	1140	3070	3300	4200

Parameter	Unit	PWQO [1]	SW-1 30-Oct-1991	SW-1 03-Dec-1997	SW-1 21-Apr-1998	SW-1 17-May-1999	SW-1 02-Sep-1999	SW-1 20-Oct-1999	SW-1 08-Aug-2000	SW-1 03-Nov-2000	SW-1 23-Dec-2000 [2]	SW-1 26-Jun-2001	SW-1 30-Aug-2001	SW-1 05-Oct-2001	SW-1 10-Dec-2001	SW-1 30-May-2002	SW-1 30-Jul-2002	SW-1 03-Oct-2002	SW-1 11-Dec-2002
Silver	ug/l	0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.1	**0.2**	<0.1	--	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	ug/l	--	78000	65600	52600	68000	20000	113000	42000	71000	--	105000	26000	--	76000	65000	39000	24000	24000
Strontium	ug/l	--	--	451	287	341	143	622	249	380	--	466	179	145	386	328	218	159	164
Sulfur	ug/l	--	--	--	--	7000	4000	19000	9000	10000	--	--	--	--	--	--	--	--	--
Thallium	ug/l	0.3	--	--	--	<5	<5	<5	<1	<1	--	<1	<1	--	<1	<1	<1	<1	<1
Tin	ug/l	--	--	<1	<1	<50	<50	<50	<10	<10	--	<10	<10	--	<10	<10	<10	<10	<10
Titanium	ug/l	--	--	19	14	<10	<10	<10	<10	10	--	40	20	20	<10	<10	<10	<10	<10
Vanadium	ug/l	6	--	0.7	2.4	<7	<7	<7	<10	2	--	4	1	<10	2	2	1	1	<1
Zinc	ug/l	30 [8]	7	8	4	<10	<10	<10	<10	<10	--	<10	<10	<10	<10	<10	<5	<5	<5
Petroleum Hydrocarbons																			
Benzene	ug/l	100	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
Ethylbenzene	ug/l	8	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
m,p-Xylenes	ug/l	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
o-Xylene	ug/l	40	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
Toluene	ug/l	0.8	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
Phenols																			
Phenolics, Total Recoverable	ug/l	1 [12]	<2	--	--	<1	<1	1	**2**	<1	--	<1	<1	--	<1	<1	<1	<1	<1
Semi-VOCs																			
Styrene	ug/l	4	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
VOCs																			
1,1,1,2-Tetrachloroethane	ug/l	20	--	--	--	--	--	--	--	<0.6	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	ug/l	10	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	ug/l	70	--	--	--	--	--	--	--	<0.6	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	ug/l	800	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	ug/l	200	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
1,1-Dichloroethylene	ug/l	40	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	ug/l	5	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	ug/l	2.5	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	ug/l	100	--	--	--	--	--	--	--	<0.7	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	ug/l	0.7	--	--	--	--	--	--	--	<0.7	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	ug/l	--	--	--	--	--	--	--	--	<0.3	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	ug/l	2.5	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	ug/l	4	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
Bromodichloromethane	ug/l	200	--	--	--	--	--	--	--	<0.3	--	--	--	--	--	--	--	--	--
Bromoform	ug/l	60	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
Bromomethane	ug/l	0.9	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	ug/l	--	--	--	--	--	--	--	--	<0.9	--	--	--	--	--	--	--	--	--
Chlorobenzene	ug/l	15	--	--	--	--	--	--	--	<0.2	--	--	--	--	--	--	--	--	--
Chloroethane	ug/l	--	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
Chloroform	ug/l	--	--	--	--	--	--	--	--	2.1	--	--	--	--	--	--	--	--	--
Chloromethane	ug/l	700	--	--	--	--	--	--	--	<1	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	ug/l	200	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	<0.2	--	--	--	--	--	--	--	--	--
Dibromochloromethane	ug/l	40	--	--	--	--	--	--	--	<0.3	--	--	--	--	--	--	--	--	--
Methylene Chloride	ug/l	100	--	--	--	--	--	--	--	<4	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	ug/l	50	--	--	--	--	--	--	--	<0.3	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	ug/l	200	--	--	--	--	--	--	--	<0.4	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	ug/l	7	--	--	--	--	--	--	--	<0.2	--	--	--	--	--	--	--	--	--
Trichloroethene	ug/l	20	--	--	--	--	--	--	--	<0.3	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	ug/l	--	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--
Vinyl Chloride	ug/l	600	--	--	--	--	--	--	--	<0.5	--	--	--	--	--	--	--	--	--

Parameter	Unit	SW-1 09-Apr-2003	SW-1 05-Aug-2003	SW-1 30-Aug-2003	SW-1 27-Oct-2003	SW-1 06-Jan-2004	SW-1 20-May-2004	SW-1 27-May-2004	SW-1 13-Jul-2004	SW-1 11-Aug-2004	SW-1 13-Oct-2004	SW-1 16-Apr-2005	SW-1 06-May-2005	SW-1 18-Jun-2005	SW-1 04-Aug-2005	SW-1 28-Oct-2005	SW-1 09-May-2006	SW-1 03-Aug-2006
General Chemistry																		
Alkalinity (Total as CaCO3)	ug/l	108000	156000	--	127000	154000	160000	150000	166000	--	196000	146000	--	84000	177000	171000	153000	137000
Ammonia, unionized	ug/l	<20	<20	--	<20	<20	<20	<20	<20	--	<20	0.48	--	0.75	<20	0.12	<20	<20
Ammonia, unionized (Field)	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia Nitrogen	ug/l	180	40	--	30	120	110	150	100	--	40	90	--	150	<50	<50	<20	150
Bicarbonate	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biochemical Oxygen Demand, 5 Day	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromide	ug/l	--	--	--	--	--	--	--	--	--	--	<500	--	<3500	<1000	<1000	--	--
Carbonate (CO3)	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	ug/l	31000	31000	--	24000	21000	42000	40000	39000	--	31000	24000	--	60000	15000	35000	25000	40000
Chloride	ug/l	114000	135000	108000	76000	121000	118000	107000	109000	--	99000	86300	--	27100	136000	79000	98000	72000
Color	color unit	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conductivity (Field)	uS/cm	240	220	--	390	640	604	575	700	--	480	520	--	790	640	450	460	220
Cyanide	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	ug/l	11400	11700	--	8900	8100	14800	12800	12100	--	12300	9100	--	18100	10300	12900	12000	12600
Dissolved Oxygen (Field)	ug/l	--	**3610**	--	**5880**	5220	7750	8600	**4020**	--	8010	9880	--	9000	9400	**6000**	11400	8000
Fluoride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hardness, Calcium Carbonate	ug/l	172000	179000	--	189000	204000	204300	203600	54300	--	222600	172300	--	110000	207000	198000	175000	158000
Nitrate as N	ug/l	790	<100	--	4940	1540	1900	3200	<200	--	<200	1100	--	3000	<200	4000	650	1230
Nitrite as N	ug/l	<100	<100	--	<100	<100	<200	<200	<200	--	<200	<200	--	<1000	<300	--	<100	<100
Nitrogen, Nitrate-Nitrite	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH (Field)	-	7.5	7.3	--	7.2	7	7.87	7.6	7.2	--	7.3	7.6	--	7.4	7.5	7.3	8.5	7.2
Phosphate, Ortho	ug/l	130	220	--	220	140	<1000	<1000	<1000	--	<1000	<1000	--	<3000	<1000	43	130	650
Phosphorus	ug/l	**70**	**100**	**120**	**300**	**60**	**93**	**67**	**166**	--	**46**	**56**	--	**140**	**98**	**71**	**40**	**290**
Sulphate	ug/l	32000	15000	--	29000	28000	19800	28300	13400	--	25200	22400	--	14000	8000	47000	19000	24000
Temperature (Field)	deg c	1	20	--	3	--	17.3	11.5	14	--	11	6	--	11	22	5	19	19
Total Dissolved Solids	ug/l	437000	487000	--	384000	502000	428000	420000	406000	--	414000	330000	--	160000	330000	490000	411000	362000
Total Organic Carbon	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity	ntu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																		
Aluminum, dissolved	ug/l	40	10	--	50	50	41	36	13	--	7	**296**	--	**124**	14	73	40	20
Antimony	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	ug/l	50	30	--	50	50	52	48	45	--	48	44	--	40	48	48	40	50
Beryllium	ug/l	<1	<1	--	<1	<1	<1	<1	<1	--	<1	<1	--	<0.5	<0.5	<0.5	<1	<1
Bismuth	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	ug/l	<50	<50	--	30	20	28	32	23	--	19	27	--	20	37	30	30	30
Cadmium	ug/l	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	--	0.2	<0.1	--	0.2	<0.1	<0.1	<0.1	<0.1
Calcium	ug/l	49000	47000	--	51000	57000	56400	56600	52100	--	60500	48300	--	30000	60000	61000	47000	45000
Chromium	ug/l	4	6	--	2	9	<5	<5	<5	--	<5	<5	--	<5	<5	<5	2	3
Cobalt	ug/l	0.4	0.4	--	0.3	0.4	0.4	0.4	0.7	--	0.2	0.3	--	0.6	<0.5	<0.5	0.3	0.5
Copper	ug/l	3	<1	--	3	2	2.8	1.5	1.5	--	2.8	3.5	--	<5	1.8	2	2	3
Iron	ug/l	**600**	**480**	**370**	**450**	**540**	**890**	**800**	**1450**	**410**	290	**730**	**710**	**1300**	**360**	**470**	**710**	**740**
Lead	ug/l	<1	<1	--	<1	<1	<0.5	<0.5	0.6	--	<0.5	<0.5	--	0.7	<0.2	<0.5	<1	<1
Magnesium	ug/l	12000	15000	--	15000	15000	15400	15100	15600	--	17300	12500	--	8000	20000	18000	14000	11000
Manganese	ug/l	121	276	--	19	90	95	123	522	--	60	104	--	33	200	23	90	80
Mercury	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/l	<5	<5	--	<5	<5	<1	<1	<1	--	<1	<1	--	<1	<1	<1	<5	<5
Nickel	ug/l	<5	<5	--	<5	<5	2	1	2	--	<1	1	--	2	1.1	1	<5	<5
Potassium	ug/l	3000	3000	--	5000	4000	2900	2900	2900	--	4500	2200	--	3700	4400	3500	2000	6000
Selenium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silicon	ug/l	3600	2200	--	5000	8100	3220	4230	2680	--	3430	4080	--	6400	2800	6000	1600	6300

Parameter	Unit	SW-1 09-Apr-2003	SW-1 05-Aug-2003	SW-1 30-Aug-2003	SW-1 27-Oct-2003	SW-1 06-Jan-2004	SW-1 20-May-2004	SW-1 27-May-2004	SW-1 13-Jul-2004	SW-1 11-Aug-2004	SW-1 13-Oct-2004	SW-1 16-Apr-2005	SW-1 06-May-2005	SW-1 18-Jun-2005	SW-1 04-Aug-2005	SW-1 28-Oct-2005	SW-1 09-May-2006	SW-1 03-Aug-2006
Silver	ug/l	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	--	<0.5	<0.5	<0.5	<0.1	<0.1
Sodium	ug/l	68000	77000	--	46000	79000	65100	54900	59100	--	57400	45700	--	27000	100000	57000	56000	51000
Strontium	ug/l	321	264	--	273	322	375	320	305	--	--	289	--	170	330	320	269	281
Sulfur	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	ug/l	<1	<1	--	<1	<1	<0.05	<0.05	<0.05	--	<0.05	<0.05	--	<0.05	<0.05	<0.05	<0.1	<0.1
Tin	ug/l	<10	<10	--	<10	<10	<1	<1	<1	--	--	<1	--	<1	<1	<1	<10	<10
Titanium	ug/l	20	10	--	20	20	17	14	48	--	<5	14	--	74	17	18	20	30
Vanadium	ug/l	2	3	--	2	3	2.5	1.7	3.2	--	0.8	1.4	--	4	1.8	2	2	4
Zinc	ug/l	5	<5	--	<10	<10	13	**34**	6	--	9	8	--	11	<5	<5	<10	<10
Petroleum Hydrocarbons																		
Benzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylenes	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols																		
Phenolics, Total Recoverable	ug/l	<1	<1	--	<1	<1	<1	<1	<1	--	<1	<1	--	1	<1	<1	<1	<1
Semi-VOCs																		
Styrene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																		
1,1,1,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Parameter	Unit	SW-1 29-Aug-2006	SW-1 24-Nov-2006	SW-1 17-May-2007	SW-1 19-Jul-2007	SW-1 07-Aug-2007	SW-1 04-Sep-2007	SW-1 26-Oct-2007	SW-1 29-Apr-2008	SW-1 04-Jul-2008	SW-1 25-Jul-2008	SW-1 29-Oct-2008	SW-1 09-Apr-2009	SW-1 10-Jun-2009	SW-1 04-Aug-2009	SW-1 15-Oct-2009	SW-1 21-Apr-2010	SW-1 04-May-2010
													SW-1	S-7	SW-1	S-1	SW-1	SW-1
General Chemistry																		
Alkalinity (Total as CaCO3)	ug/l	160000	164000	146000	138000	--	161000	144000	99000	165000	75000	155000	132000	185000	192000	206000	144000	--
Ammonia, unionized	ug/l	<20	<20	<20	<20	--	<20	<20	<20	<20	<20	<20	--	--	--	--	--	--
Ammonia, unionized (Field)	ug/l	--	--	--	--	--	--	--	--	--	--	--	<20	<20	<20	<20	<20	--
Ammonia Nitrogen	ug/l	80	70	180	60	--	20	<20	40	70	40	90	60	150	50	<20	40	--
Bicarbonate	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biochemical Oxygen Demand, 5 Day	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromide	ug/l	--	--	--	--	--	--	--	<250	<250	<250	<250	<250	290	<250	<250	<250	--
Carbonate (CO3)	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	ug/l	30000	30000	26000	22000	--	18000	26000	50000	24000	32000	23000	25000	10000	25000	17000	30000	--
Chloride	ug/l	121000	69000	89000	115000	--	77000	74000	43000	68000	21000	60000	57000	160000	119000	127000	80000	--
Color	color unit	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conductivity (Field)	uS/cm	640	400	500	500	--	500	543	325	525	700	330	410	700	789	750	565	--
Cyanide	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	ug/l	9800	12200	12000	9800	--	10600	11500	16700	13300	14900	8200	9300	11400	11700	7300	12400	--
Dissolved Oxygen (Field)	ug/l	5500	14800	--	11100	--	11400	8400	8890	5820	6220	8350	12720	7500	6210	11800	10760	--
Fluoride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hardness, Calcium Carbonate	ug/l	179000	199000	169000	163000	--	179000	163000	119000	192000	85000	205000	143000	215000	215000	262000	171000	--
Nitrate as N	ug/l	100	1820	1700	<100	--	290	<100	1830	3370	1720	4560	3170	400	1490	2510	1080	--
Nitrite as N	ug/l	<100	<100	<100	<100	--	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	--
Nitrogen, Nitrate-Nitrite	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
pH (Field)	-	8.1	7.6	8.03	8.06	--	8.06	7.86	7.9	7.8	7.9	7.3	8.4	8.1	7.72	8.1	8.05	--
Phosphate, Ortho	ug/l	310	280	130	170	--	120	150	80	50	260	100	50	140	100	70	40	--
Phosphorus	ug/l	**90**	**90**	**90**	**90**	**270**	**180**	**60**	**100**	**60**	**180**	**90**	**100**	**100**	**60**	30	**60**	--
Sulphate	ug/l	24000	29000	23000	26000	--	16000	18000	14000	21000	10000	30000	18000	29000	26000	48000	20000	--
Temperature (Field)	deg c	18	1.8	--	20	--	8	11	8.4	17	22	3.9	2.7	15.6	20.4	5.7	12.5	--
Total Dissolved Solids	ug/l	487000	391000	408000	469000	--	389000	353000	248000	380000	165000	393000	322000	621000	520000	580000	384000	--
Total Organic Carbon	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity	ntu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																		
Aluminum, dissolved	ug/l	30	80	40	10	--	10	<10	**210**	60	**210**	30	70	20	20	<10	60	--
Antimony	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	ug/l	50	40	40	40	--	40	30	40	50	30	50	40	50	50	60	40	--
Beryllium	ug/l	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--
Bismuth	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	ug/l	40	40	20	30	60	40	20	20	40	20	30	20	50	50	40	20	--
Cadmium	ug/l	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	**0.3**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--
Calcium	ug/l	47000	55000	48000	44000	--	47000	44000	33000	54000	24000	54000	39000	53000	58000	72000	47000	--
Chromium	ug/l	3	3	2	6	--	5	3	4	4	3	2	3	6	6	4	3	--
Cobalt	ug/l	0.3	0.4	0.3	0.4	--	0.4	0.3	0.5	0.4	0.5	0.4	0.4	0.5	0.3	0.3	0.4	--
Copper	ug/l	2	1	2	1	--	2	1	3	2	3	2	2	2	2	2	2	--
Iron	ug/l	**530**	**590**	**570**	**680**	**600**	**630**	**740**	**890**	**710**	**960**	**690**	**590**	**920**	**550**	290	**920**	**810**
Lead	ug/l	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	--
Magnesium	ug/l	15000	15000	12000	13000	--	15000	13000	9000	14000	6000	17000	11000	20000	17000	20000	13000	--
Manganese	ug/l	160	90	90	320	--	160	170	50	50	50	40	50	150	60	30	140	--
Mercury	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/l	<5	<5	<5	<5	--	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	--
Nickel	ug/l	<5	<5	<5	<5	--	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	--
Potassium	ug/l	5000	3000	2000	4000	--	4000	6000	2000	3000	4000	4000	3000	3000	3000	4000	2000	--
Selenium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silicon	ug/l	2700	6100	4400	2800	--	4000	4300	6200	6400	4300	6800	4700	3400	6200	6200	4100	--

Parameter	Unit	SW-1 29-Aug-2006	SW-1 24-Nov-2006	SW-1 17-May-2007	SW-1 19-Jul-2007	SW-1 07-Aug-2007	SW-1 04-Sep-2007	SW-1 26-Oct-2007	SW-1 29-Apr-2008	SW-1 04-Jul-2008	SW-1 25-Jul-2008	SW-1 29-Oct-2008	SW-1 09-Apr-2009	SW-1 10-Jun-2009	SW-1 04-Aug-2009	SW-1 15-Oct-2009	SW-1 21-Apr-2010	SW-1 04-May-2010
													SW-1	S-7	SW-1	S-1	SW-1	SW-1
Silver	ug/l	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--
Sodium	ug/l	70000	50000	49000	78000	--	54000	47000	34000	51000	17000	44000	34000	109000	75000	73000	51000	--
Strontium	ug/l	373	236	254	263	--	260	227	198	291	160	240	249	644	541	470	311	--
Sulfur	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	ug/l	<0.1	<0.1	0.2	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	--
Tin	ug/l	<10	<10	<10	<10	--	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	--
Titanium	ug/l	20	10	10	20	--	20	10	40	20	40	30	20	20	20	10	20	--
Vanadium	ug/l	4	2	2	4	--	5	3	3	3	5	3	3	6	5	3	3	--
Zinc	ug/l	<10	<10	<10	<10	--	<10	<10	10	<10	<10	<10	<10	<10	<10	<10	<10	--
Petroleum Hydrocarbons																		
Benzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylenes	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols																		
Phenolics, Total Recoverable	ug/l	<1	<1	<1	<1	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	--
Semi-VOCs																		
Styrene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																		
1,1,1,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Parameter	Unit	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1
		14-Jul-2010	20-Aug-2010	25-Oct-2010	02-May-2011	17-May-2011	12-Aug-2011	27-Oct-2011	29-Nov-2011	30-Apr-2012	18-May-2012	10-Jul-2012	10-Aug-2012	31-Oct-2012	25-Apr-2013	11-Jul-2013	22-Oct-2013	30-Apr-2014
		L-7	S-7	L-3	SW-1	SW-1	SW-1	SW-1	SW - 1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1
General Chemistry																		
Alkalinity (Total as CaCO3)	ug/l	182000	158000	205000	141000	--	146000	210000	188000	150000	--	180000	--	190000	130000	200000	200000	160000
Ammonia, unionized	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ammonia, unionized (Field)	ug/l	<20	<20	<20	<20	--	<20	<20	<20	<20	--	<20	--	<20	<20	<20	<20	<20
Ammonia Nitrogen	ug/l	230	90	40	<50	--	<50	<50	<50	<50	--	<50	--	62	74	130	<50	100
Bicarbonate	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biochemical Oxygen Demand, 5 Day	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromide	ug/l	1080	1550	<250	<1000	--	<1000	<1000	<1000	<1000	--	<1000	--	<1000	<1000	<1000	<1000	<1000
Carbonate (CO3)	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	ug/l	35000	25000	20000	45000	--	31000	32000	17000	38000	--	43000	--	28000	50000	41000	22000	29000
Chloride	ug/l	715000	1070000	92000	71000	--	754000	118000	127000	120000	--	270000	--	300000	85000	120000	110000	100000
Color	color unit	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conductivity (Field)	uS/cm	2633	3336	674	540	--	2528	817	768	710	--	1263	--	1433	563	959	676	599
Cyanide	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	ug/l	9200	8700	10300	17000	--	9400	9000	6600	14000	--	11000	--	8900	13000	13000	9400	<200
Dissolved Oxygen (Field)	ug/l	5100	7750	10410	**5310**	--	6490	8300	8540	12300	--	7140	--	**3940**	11200	5190	8310	9880
Fluoride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hardness, Calcium Carbonate	ug/l	292000	384000	260000	180000	--	370000	280000	250000	190000	--	250000	--	300000	180000	250000	270000	200000
Nitrate as N	ug/l	130	120	2670	1100	--	<100	1500	600	1100	--	<100	--	<100	2000	370	4500	1540
Nitrite as N	ug/l	<100	<100	<100	10	--	<10	10	<10	11	--	<10	--	<10	<10	10	11	<10
Nitrogen, Nitrate-Nitrite	ug/l	--	--	--	--	--	<100	1500	600	1100	--	<100	--	<100	2000	380	4500	1540
pH (Field)	-	7.62	7.67	7.78	8.2	--	7.87	8.17	7.91	7.98	--	8.02	--	7.26	7.53	6.92	7.08	7.4
Phosphate, Ortho	ug/l	80	60	50	40	--	<10	<10	<10	<10	--	<10	--	11	11	30	11	14
Phosphorus	ug/l	**110**	**60**	**60**	**86**	--	**75**	**36**	**52**	**50**	--	**92**	--	**59**	**200**	**84**	**46**	**48**
Sulphate	ug/l	122000	139000	32000	23000	--	143000	49000	51000	31000	--	58000	--	100000	27000	31000	34000	29000
Temperature (Field)	deg c	24.4	22.7	7.1	11.6	--	22.1	6.4	5	9.5	--	22.6	--	11.2	11.6	24.1	10.3	8.9
Total Dissolved Solids	ug/l	1910000	2500000	502000	338000	--	2090000	592000	518000	468000	--	714000	--	888000	348000	540000	476000	370000
Total Organic Carbon	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity	ntu	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																		
Aluminum, dissolved	ug/l	10	20	30	**120**	--	10	17	17	53	--	13	--	<5.0	85	30	16	42
Antimony	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	ug/l	100	120	60	37	--	98	53	51	52	--	53	--	74	42	53	60	48
Beryllium	ug/l	<1	<1	<1	<0.5	--	<0.5	<0.5	<0.5	<0.50	--	<0.50	--	<0.50	<0.50	<0.50	--	--
Bismuth	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	ug/l	160	**250**	30	20	--	190	40	30	29	--	62	--	62	17	50	35	25
Cadmium	ug/l	<0.1	<0.1	<0.1	<0.1	--	<0.1	<0.1	<0.1	<0.10	--	<0.10	--	<0.10	<0.10	<0.10	<0.10	<0.10
Calcium	ug/l	69000	91000	71000	54000	--	88000	73000	69000	53000	--	70000	--	90000	47000	67000	75000	62000
Chromium	ug/l	6	5	4	<5	--	<5	<5	<5	<5.0	--	<5.0	--	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt	ug/l	0.6	0.4	0.4	<0.5	--	<0.5	<0.5	<0.5	<0.50	--	<0.50	--	<0.50	<0.50	<0.50	<0.50	<0.50
Copper	ug/l	3	2	2	2	--	3	2	2	2.1	--	1.3	--	1.6	2.2	1.9	1.6	1.9
Iron	ug/l	**570**	**450**	**690**	**700**	**780**	**400**	**500**	**600**	**1000**	**1300**	**510**	**560**	**310**	**850**	**850**	**740**	**970**
Lead	ug/l	<1	<1	<1	<0.5	--	<0.5	<0.5	<0.5	<0.50	--	<0.50	--	<0.50	<0.50	<0.50	--	--
Magnesium	ug/l	29000	38000	20000	11000	--	36000	24000	22000	16000	--	22000	--	28000	14000	17000	20000	17000
Manganese	ug/l	300	250	80	84	--	230	56	74	92	--	390	--	160	60	120	44	87
Mercury	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/l	<5	<5	<5	<1	--	0.8	0.6	<0.5	<0.50	--	<0.50	--	0.72	0.51	0.78	--	--
Nickel	ug/l	<5	<5	<5	<1	--	2	1	<1	1.7	--	1.4	--	1.8	1.5	1	<1.0	<1.0
Potassium	ug/l	10000	18000	3000	3200	--	16000	5000	3800	2500	--	4400	--	10000	2300	2300	3700	2600
Selenium	ug/l	--	--	--	--	--	--	--	--	--	--	<2.0	--	<2.0	<2.0	<2.0	--	--
Silicon	ug/l	4100	3900	6700	2300	--	4000	6200	5000	3400	--	3200	--	4500	3400	3700	6900	3300

Parameter	Unit	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1
		14-Jul-2010	20-Aug-2010	25-Oct-2010	02-May-2011	17-May-2011	12-Aug-2011	27-Oct-2011	29-Nov-2011	30-Apr-2012	18-May-2012	10-Jul-2012	10-Aug-2012	31-Oct-2012	25-Apr-2013	11-Jul-2013	22-Oct-2013	30-Apr-2014
		L-7	S-7	L-3	SW-1	SW-1	SW-1	SW-1	SW - 1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1
Silver	ug/l	<0.1	<0.1	<0.1	<0.1	--	<0.1	0.1	<0.1	<0.10	--	<0.10	--	<0.10	<0.10	<0.10	--	--
Sodium	ug/l	478000	615000	66000	44000	--	490000	95000	81000	80000	--	160000	--	210000	54000	83000	71000	72000
Strontium	ug/l	3010	4900	365	300	--	3400	620	450	410	--	880	--	1400	300	450	380	380
Sulfur	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	ug/l	<0.1	<0.1	<0.1	<0.05	--	<0.05	<0.05	<0.05	<0.050	--	<0.050	--	<0.050	<0.050	<0.050	--	--
Tin	ug/l	<10	<10	<10	<1	--	<1	<1	<1	<1.0	--	<1.0	--	<1.0	<1.0	<1.0	--	--
Titanium	ug/l	30	20	20	19	--	21	18	25	43	--	12	--	14	31	28	--	--
Vanadium	ug/l	4	3	3	2	--	2.2	2.2	1.4	2.7	--	1.9	--	2.7	2.2	2.9	1.8	2.3
Zinc	ug/l	<10	<10	<10	7	--	<5	<5	<5	7.3	--	<5.0	--	<5.0	5.5	<5.0	--	--
Petroleum Hydrocarbons																		
Benzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylenes	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols																		
Phenolics, Total Recoverable	ug/l	1	<1	<1	<1	--	<1	1	<1	<1.0	--	**2.8**	--	<1.0	<1.0	<1.0	<1.0	1.0
Semi-VOCs																		
Styrene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs																		
1,1,1,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Parameter	Unit	SW-1 11-Jul-2014 SW-1	SW-1 22-Oct-2014 SW-1	SW-1 13-May-2015 SW-1	SW-1 23-Jul-2015 SW-1	SW-1 20-Aug-2015 SW-1	SW-1 30-Sep-2015 SW-1	SW-1 18-May-2016 DUPE	SW-1 18-May-2016 SW1	SW-1 19-Aug-2016 SW-1	SW-1 31-Oct-2016 SW-1	SW-1 4-May-17 SW-1	SW-1 24-Jul-17 SW-1	SW-1 24-Oct-17 SW-1	Duplicate of SW-1 24-Oct-17 ****
General Chemistry															
Alkalinity (Total as CaCO3)	ug/l	160000	200000	140000	170000	--	180000	170000	170000	140000	180000	120000	191000	202000	202000
Ammonia, unionized	ug/l	--	--	--	--	--	--	--	--	--	--	--			
Ammonia, unionized (Field)	ug/l	<20	<20	<20	<20	--	<20	<20	<20	<20	<20	--	--	--	--
Ammonia Nitrogen	ug/l	52	63	<50	64	--	90	<50	<50	72	<50	20	30	20	20
Bicarbonate	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Biochemical Oxygen Demand, 5 Day	ug/l	--	--	--	--	--	--	--	--	--	--	<3000	<3000	3000	3000
Bromide	ug/l	<1000	<1000	<1000	<1000	--	<1000	<1000	<1000	<2000	<1000	<400	<400	<400	<400
Carbonate (CO3)	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	ug/l	25000	27000	32000	23000	--	29000	29000	33000	33000	11000	45000	35000	23000	25000
Chloride	ug/l	120000	82000	110000	190000	--	110000	110000	110000	200000	110000	43100	81100	84600	84700
Color	color unit	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conductivity (Field)	uS/cm	775	602	686	914	--	934	747	747	1057	822	438	721	530	530
Cyanide	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	ug/l	9800	9400	14000	10000	--	9400	9900	9900	8600	8700	13800	10600	7100	7000
Dissolved Oxygen (Field)	ug/l	5530	12880	10310	**4450**	--	7490	11720	11720	7040	11560	22170	128400	17880	17880
Fluoride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hardness, Calcium Carbonate	ug/l	200000	240000	190000	220000	--	230000	200000	200000	220000	250000	143000	220000	252000	254000
Nitrate as N	ug/l	740	4820	2380	<100	--	1390	220	230	250	5030	2990	50	2480	2490
Nitrite as N	ug/l	21	21	24	12	--	15	<10	<10	22	20	<50	1210	< 50	< 50
Nitrogen, Nitrate-Nitrite	ug/l	760	4840	2400	<100	--	1400	220	230	270	5050	--	--	--	--
pH (Field)	-	7.77	7.57	7.94	7.11	--	7.43	8.1	8.1	7.65	7.77	7.96	7.43	7.6	7.6
Phosphate, Ortho	ug/l	50	14	<10	36	--	57	<10	12	52	28	40	40	20	10
Phosphorus	ug/l	**78**	**34**	**45**	**95**	--	**120**	**44**	**46**	**97**	**42**	**90**	**80**	30	30
Sulphate	ug/l	39000	30000	22000	40000	--	35000	22000	23000	88000	49000	15000	20000	29000	29000
Temperature (Field)	deg c	19.6	9.8	13.4	22.3	--	15	15.3	15.3	20.7	6.7	NA	16.9	14.66	14.66
Total Dissolved Solids	ug/l	386000	436000	464000	584000	--	454000	440000	440000	536000	528000	220000	345000	388000	388000
Total Organic Carbon	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Suspended Solids	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Turbidity	ntu	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals															
Aluminum, dissolved	ug/l	16	26	40	10	--	9	22	22	8	25	110	40	40	50
Antimony	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	ug/l	49	54	54	56	--	49	45	44	59	58	37	43	54	54
Beryllium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bismuth	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron	ug/l	50	36	24	48	--	26	25	25	85	35	21	42	35	34
Cadmium	ug/l	<0.10	<0.1	<0.1	<0.1	--	<0.1	<0.10	<0.10	<0.1	<0.10	0.018	64	< 0.014	< 0.014
Calcium	ug/l	59000	70000	56000	59000	--	58000	59000	59000	63000	71000	--	--	66400	67100
Chromium	ug/l	<5.0	<5	<5	<5	--	<5	<5.0	<5.0	<5	<5.0	3	2	1	1
Cobalt	ug/l	<0.50	<0.5	<0.5	0.5	--	<0.5	<0.50	<0.50	<0.5	<0.50	0.4	**500**	0.2	0.2
Copper	ug/l	1.9	2	3	2	--	3	1.7	2.1	2	2.3	2.5	2	1.2	1.3
Iron	ug/l	**790**	290	**740**	**1000**	**390**	**530**	**710**	**720**	**690**	**390**	**884**	**807**	**355**	**326**
Lead	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Magnesium	ug/l	15000	22000	16000	18000	--	18000	17000	17000	16000	20000	--	--	20100	19900
Manganese	ug/l	84	24	58	300	--	55	71	73	140	17	42	77	32	32
Mercury	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	ug/l	1.8	1	1	2	--	<1	1.1	1.1	2	1.2	<10	**4700**	2.7	2.5
Potassium	ug/l	3200	3600	2600	3500	--	7000	2200	2300	6300	4100	2000	2200	4400	4300
Selenium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silicon	ug/l	5600	7600	5800	6100	--	4900	2900	2900	4600	5900	4620	3930	5700	5550

Parameter	Unit	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	Duplicate of SW-1
		11-Jul-2014	22-Oct-2014	13-May-2015	23-Jul-2015	20-Aug-2015	30-Sep-2015	18-May-2016	18-May-2016	19-Aug-2016	31-Oct-2016	4-May-17	24-Jul-17	24-Oct-17	24-Oct-17
		SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	DUPE	SW1	SW-1	SW-1	SW-1	SW-1	SW-1	****
Silver	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sodium	ug/l	81000	63000	70000	110000	--	70000	80000	80000	130000	73000	34900	59000	61800	61200
Strontium	ug/l	340	370	370	420	--	340	330	330	550	420	222	--	358	356
Sulfur	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tin	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Titanium	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	ug/l	2.6	1.5	2.2	3.6	--	1.8	1.9	1.8	1.8	1.8	<5	<5	<5	<5
Zinc	ug/l	--	--	--	--	--	--	--	--	--	--				
Petroleum Hydrocarbons															
Benzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Ethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
m,p-Xylenes	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
o-Xylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Toluene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols															
Phenolics, Total Recoverable	ug/l	<1.0	<1.0	<1.0	<1.0	--	<1.0	<1.0	<1.0	<1.0	<1.0	<1	<1	<1	<1
Semi-VOCs															
Styrene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
VOCs															
1,1,1,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,1-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2,2-Tetrachloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1,2-Trichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,1-Dichloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dibromoethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichloropropane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3,5-Trimethylbenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,3-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromodichloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromoform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bromomethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carbon Tetrachloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloroform	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
cis-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibromochloromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Methylene Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tetrachloroethylene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,2-Dichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
trans-1,3-Dichloropropene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichloroethene	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Trichlorofluoromethane	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	ug/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Appendix D:
Laboratory Certificates of Analysis

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-15058

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-May-21
DATE REPORTED: 08-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW1	SW2	SW3	SW4
			Sample I.D.		B21-15058-1	B21-15058-2	B21-15058-3	B21-15058-4
			Date Collected		19-May-21	19-May-21	19-May-21	19-May-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	25-May-21/O	217		227	198
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	01-Jun-21/O	183		184	196
TDS(ion sum calc.)	mg/L	1	Calc.	02-Jun-21/O	401	401	407	356
Chloride	mg/L	0.5	SM4110C	26-May-21/O	118	119	116	86.5
Nitrite (N)	mg/L	0.05	SM4110C	26-May-21/O	0.19		0.18	0.17
Nitrate (N)	mg/L	0.05	SM4110C	26-May-21/O	0.41		0.40	0.33
Bromide	mg/L	0.4	SM4110C	26-May-21/O	< 0.4		< 0.4	< 0.4
Sulphate	mg/L	1	SM4110C	26-May-21/O	23	24	24	13
Aluminum	mg/L	0.01	SM 3120	25-May-21/O	0.04	0.04	0.05	0.03
Barium	mg/L	0.001	SM 3120	25-May-21/O	0.047		0.051	0.083
Beryllium	mg/L	0.002	SM 3120	25-May-21/O	< 0.002		< 0.002	< 0.002
Boron	mg/L	0.005	SM 3120	25-May-21/O	0.028	0.028	0.038	0.156
Cadmium	mg/L	0.000015	EPA 200.8	03-Jun-21/O	< 0.000015		< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	25-May-21/O	57.8		62.0	54.8
Chromium	mg/L	0.001	EPA 200.8	03-Jun-21/O	< 0.001		< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0003		0.0003	0.0004
Copper	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0024		0.0057	0.0044
Iron	mg/L	0.005	SM 3120	25-May-21/O	0.212	0.201	0.235	0.847
Lead	mg/L	0.00002	EPA 200.8	03-Jun-21/O	0.00009		0.00027	0.00025
Magnesium	mg/L	0.02	SM 3120	25-May-21/O	17.6		17.5	14.9
Manganese	mg/L	0.001	SM 3120	25-May-21/O	0.114	0.104	0.139	0.628
Molybdenum	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0006		0.0006	0.0006
Nickel	mg/L	0.0002	EPA 200.8	03-Jun-21/O	0.0009		0.0008	0.0012
Potassium	mg/L	0.1	SM 3120	25-May-21/O	2.3		2.5	3.3
Silicon	mg/L	0.01	SM 3120	25-May-21/O	1.47		2.00	7.16
Silver	mg/L	0.0001	EPA 200.8	03-Jun-21/O	< 0.0001		< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	25-May-21/O	72.5		73.8	64.4

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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Final Report

C.O.C.: ---

REPORT No. B21-15058

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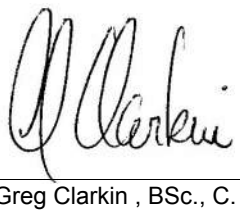
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-May-21
DATE REPORTED: 08-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW1	SW2	SW3	SW4
			Sample I.D.		B21-15058-1	B21-15058-2	B21-15058-3	B21-15058-4
			Date Collected		19-May-21	19-May-21	19-May-21	19-May-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	25-May-21/O	0.340	0.338	0.339	0.192
Thallium	mg/L	0.00005	EPA 200.8	03-Jun-21/O	< 0.00005		< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	25-May-21/O	< 0.05		< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	25-May-21/O	< 0.005		< 0.005	< 0.005
Vanadium	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0011		0.0011	0.0006
Zinc	mg/L	0.005	SM 3120	25-May-21/O	0.015		0.013	0.014
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-May-21/K	0.11		0.12	0.26
Ammonia (N)-unionized	mg/L	0.01	CALC	25-May-21/K	< 0.01		< 0.01	0.01
o-Phosphate (P)	mg/L	0.002	PE4500-S	25-May-21/K	0.028		0.027	0.009
Phosphorus-Total	mg/L	0.01	E3199A.1	03-Jun-21/K	0.07	0.06	0.08	0.03
Phenolics	mg/L	0.002	MOEE 3179	26-May-21/K	< 0.002		< 0.002	< 0.002
BOD(5 day)	mg/L	3	SM 5210B	22-May-21/K		< 3		
COD	mg/L	5	SM5220C	21-May-21/K	32		30	22
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	26-May-21/O	7.6	7.4	7.3	6.9



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Lab Manager - Ottawa District

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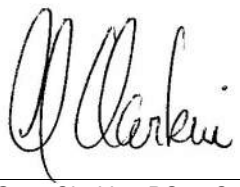
DATE RECEIVED: 19-May-21
DATE REPORTED: 08-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW5	SW7	SW8	Duplicate
			Sample I.D.		B21-15058-5	B21-15058-6	B21-15058-7	B21-15058-8
			Date Collected		19-May-21	19-May-21	19-May-21	19-May-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	25-May-21/O	213	218	220	219
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	01-Jun-21/O	208	180	182	182
TDS(ion sum calc.)	mg/L	1	Calc.	02-Jun-21/O	378	402	403	403
Chloride	mg/L	0.5	SM4110C	26-May-21/O	91.2	118	117	118
Nitrite (N)	mg/L	0.05	SM4110C	26-May-21/O	0.17	0.20	0.19	0.20
Nitrate (N)	mg/L	0.05	SM4110C	26-May-21/O	0.43	0.39	0.42	0.41
Bromide	mg/L	0.4	SM4110C	26-May-21/O	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	1	SM4110C	26-May-21/O	16	25	24	23
Aluminum	mg/L	0.01	SM 3120	25-May-21/O	0.04	0.05	0.05	0.04
Barium	mg/L	0.001	SM 3120	25-May-21/O	0.084	0.047	0.048	0.047
Beryllium	mg/L	0.002	SM 3120	25-May-21/O	< 0.002	< 0.002	< 0.002	< 0.002
Boron	mg/L	0.005	SM 3120	25-May-21/O	0.181	0.033	0.033	0.029
Cadmium	mg/L	0.000015	EPA 200.8	03-Jun-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	25-May-21/O	59.9	58.8	59.5	58.3
Chromium	mg/L	0.001	EPA 200.8	03-Jun-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0005	0.0003	0.0003	0.0003
Copper	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0050	0.0057	0.0060	0.0043
Iron	mg/L	0.005	SM 3120	25-May-21/O	0.622	0.209	0.204	0.207
Lead	mg/L	0.00002	EPA 200.8	03-Jun-21/O	0.00021	0.00023	0.00027	0.00016
Magnesium	mg/L	0.02	SM 3120	25-May-21/O	15.4	17.3	17.3	17.9
Manganese	mg/L	0.001	SM 3120	25-May-21/O	0.570	0.119	0.121	0.115
Molybdenum	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0007	0.0006	0.0006	0.0006
Nickel	mg/L	0.0002	EPA 200.8	03-Jun-21/O	0.0009	0.0010	0.0009	0.0009
Potassium	mg/L	0.1	SM 3120	25-May-21/O	4.4	2.4	2.4	2.4
Silicon	mg/L	0.01	SM 3120	25-May-21/O	6.94	1.89	1.81	1.49
Silver	mg/L	0.0001	EPA 200.8	03-Jun-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	25-May-21/O	64.6	71.6	72.8	73.8



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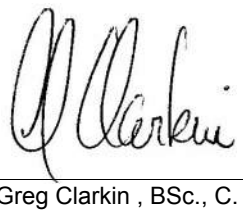
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-May-21
DATE REPORTED: 08-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW5	SW7	SW8	Duplicate
			Sample I.D.		B21-15058-5	B21-15058-6	B21-15058-7	B21-15058-8
			Date Collected		19-May-21	19-May-21	19-May-21	19-May-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	25-May-21/O	0.219	0.334	0.338	0.347
Thallium	mg/L	0.00005	EPA 200.8	03-Jun-21/O	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	25-May-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	25-May-21/O	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0005	0.0012	0.0012	0.0011
Zinc	mg/L	0.005	SM 3120	25-May-21/O	0.011	0.016	0.011	0.011
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	25-May-21/K	0.38	0.09	0.11	0.10
Ammonia (N)-unionized	mg/L	0.01	CALC	25-May-21/K	0.03	< 0.01	< 0.01	< 0.01
o-Phosphate (P)	mg/L	0.002	PE4500-S	25-May-21/K	0.008	0.026	0.027	0.024
Phosphorus-Total	mg/L	0.01	E3199A.1	03-Jun-21/K	0.04	0.11	0.06	0.07
Phenolics	mg/L	0.002	MOEE 3179	26-May-21/K	< 0.002	< 0.002	< 0.002	< 0.002
BOD(5 day)	mg/L	3	SM 5210B	22-May-21/K				
COD	mg/L	5	SM5220C	21-May-21/K	22	31	29	30
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	26-May-21/O	7.2	7.6	7.1	7.7



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-23682

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Jul-21
DATE REPORTED: 05-Aug-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW1	SW2	SW3	SW4
			Sample I.D.		B21-23682-1	B21-23682-2	B21-23682-3	B21-23682-4
			Date Collected		28-Jul-21	28-Jul-21	28-Jul-21	28-Jul-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	29-Jul-21/O	195	194	199	237
TDS(ion sum calc.)	mg/L	1	Calc.	03-Aug-21/O	551	542	527	403
Chloride	mg/L	0.5	SM4110C	29-Jul-21/O	188	185	178	94.8
Nitrite (N)	mg/L	0.05	SM4110C	29-Jul-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	29-Jul-21/O	< 0.05	< 0.05	< 0.05	0.05
Bromide	mg/L	0.4	SM4110C	29-Jul-21/O	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	1	SM4110C	29-Jul-21/O	51	48	43	16
Aluminum	mg/L	0.01	SM 3120	29-Jul-21/O	0.05	0.19	0.04	0.05
Barium	mg/L	0.001	SM 3120	29-Jul-21/O	0.054	0.053	0.053	0.091
Beryllium	mg/L	0.0001	EPA 200.8	29-Jul-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	29-Jul-21/O	0.062	0.054	0.058	0.207
Cadmium	mg/L	0.000015	EPA 200.8	29-Jul-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	29-Jul-21/O	61.0	60.5	60.2	62.4
Chromium	mg/L	0.001	EPA 200.8	29-Jul-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0002	0.0002	0.0002	0.0003
Copper	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0053	0.0055	0.0034	0.0046
Iron	mg/L	0.005	SM 3120	29-Jul-21/O	0.055	0.061	0.063	1.01
Lead	mg/L	0.00002	EPA 200.8	29-Jul-21/O	0.00019	0.00021	0.00010	0.00023
Magnesium	mg/L	0.02	SM 3120	29-Jul-21/O	16.7	16.5	16.1	15.7
Manganese	mg/L	0.001	SM 3120	29-Jul-21/O	0.091	0.088	0.104	0.389
Molybdenum	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0009	0.0009	0.0008	0.0007
Nickel	mg/L	0.0002	EPA 200.8	29-Jul-21/O	0.0010	0.0010	0.0010	0.0008
Potassium	mg/L	0.1	SM 3120	29-Jul-21/O	3.3	3.1	3.1	3.6
Silicon	mg/L	0.01	SM 3120	29-Jul-21/O	3.07	3.12	2.98	7.49
Silver	mg/L	0.0001	EPA 200.8	29-Jul-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	29-Jul-21/O	115	113	108	66.6
Strontium	mg/L	0.001	SM 3120	29-Jul-21/O	0.442	0.432	0.417	0.216

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Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-23682

Report To:

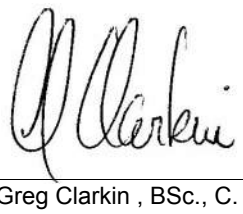
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Jul-21
DATE REPORTED: 05-Aug-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

	Client I.D.				SW1	SW2	SW3	SW4
	Sample I.D.				B21-23682-1	B21-23682-2	B21-23682-3	B21-23682-4
	Date Collected				28-Jul-21	28-Jul-21	28-Jul-21	28-Jul-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Thallium	mg/L	0.00005	EPA 200.8	29-Jul-21/O	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	29-Jul-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	29-Jul-21/O	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0015	0.0013	0.0013	0.0008
Zinc	mg/L	0.005	SM 3120	29-Jul-21/O	0.010	0.011	0.009	0.019
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	30-Jul-21/K	0.08	0.07	0.06	0.43
Ammonia (N)-unionized	mg/L	0.01	CALC	30-Jul-21/K	< 0.01	< 0.01	< 0.01	0.03
o-Phosphate (P)	mg/L	0.002	PE4500-S	30-Jul-21/K	0.042	0.040	0.035	0.022
Phosphorus-Total	mg/L	0.01	E3199A.1	03-Aug-21/K	0.09	0.08	0.07	0.06
Phenolics	mg/L	0.002	MOEE 3179	30-Jul-21/K	< 0.002	< 0.002	< 0.002	< 0.002
COD	mg/L	5	SM5220C	03-Aug-21/K	23	20	20	20
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	28-Jul-21/O	3.6	3.6	3.5	6.6
Anion Sum	meq/L		Calc.	03-Aug-21/O	10.2	10.1	9.88	7.75
Cation Sum	meq/L		Calc.	03-Aug-21/O	9.52	9.38	9.12	7.50
% Difference	%		Calc.	03-Aug-21/O	3.66	3.61	4.00	1.64
Ion Ratio	AS/CS		Calc.	03-Aug-21/O	1.08	1.07	1.08	1.03
Sodium Adsorption Ratio	-		Calc.	03-Aug-21/O	3.37	3.32	3.19	1.95
Conductivity (calc.)	µmho/cm		Calc.	03-Aug-21/O	1015	1001	974	746



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-23682

Report To:

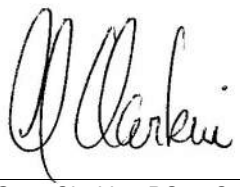
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Jul-21
DATE REPORTED: 05-Aug-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW5	SW7	SW8	Duplicate
			Sample I.D.		B21-23682-5	B21-23682-6	B21-23682-7	B21-23682-8
			Date Collected		28-Jul-21	28-Jul-21	28-Jul-21	28-Jul-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	29-Jul-21/O	262	197	202	195
TDS(ion sum calc.)	mg/L	1	Calc.	03-Aug-21/O	442	552	546	535
Chloride	mg/L	0.5	SM4110C	29-Jul-21/O	102	180	184	173
Nitrite (N)	mg/L	0.05	SM4110C	29-Jul-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	29-Jul-21/O	0.10	< 0.05	< 0.05	< 0.05
Bromide	mg/L	0.4	SM4110C	29-Jul-21/O	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	1	SM4110C	29-Jul-21/O	20	48	45	45
Aluminum	mg/L	0.01	SM 3120	29-Jul-21/O	0.04	0.05	0.04	0.05
Barium	mg/L	0.001	SM 3120	29-Jul-21/O	0.095	0.059	0.059	0.056
Beryllium	mg/L	0.0001	EPA 200.8	29-Jul-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	29-Jul-21/O	0.252	0.058	0.072	0.053
Cadmium	mg/L	0.000015	EPA 200.8	29-Jul-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	29-Jul-21/O	70.7	67.9	64.9	64.9
Chromium	mg/L	0.001	EPA 200.8	29-Jul-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0005	0.0002	0.0002	0.0002
Copper	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0047	0.0037	0.0040	0.0019
Iron	mg/L	0.005	SM 3120	29-Jul-21/O	0.641	0.060	0.111	0.054
Lead	mg/L	0.00002	EPA 200.8	29-Jul-21/O	0.00020	0.00014	0.00013	0.00003
Magnesium	mg/L	0.02	SM 3120	29-Jul-21/O	16.6	17.4	16.9	16.9
Manganese	mg/L	0.001	SM 3120	29-Jul-21/O	0.400	0.110	0.140	0.094
Molybdenum	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0007	0.0009	0.0008	0.0008
Nickel	mg/L	0.0002	EPA 200.8	29-Jul-21/O	0.0012	0.0011	0.0010	0.0011
Potassium	mg/L	0.1	SM 3120	29-Jul-21/O	5.3	3.3	3.4	3.2
Silicon	mg/L	0.01	SM 3120	29-Jul-21/O	7.37	3.14	3.45	3.22
Silver	mg/L	0.0001	EPA 200.8	29-Jul-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	29-Jul-21/O	69.1	117	110	115
Strontium	mg/L	0.001	SM 3120	29-Jul-21/O	0.254	0.455	0.424	0.442



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-23682

Report To:

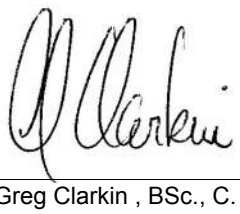
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Jul-21
DATE REPORTED: 05-Aug-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW5	SW7	SW8	Duplicate
			Sample I.D.		B21-23682-5	B21-23682-6	B21-23682-7	B21-23682-8
			Date Collected		28-Jul-21	28-Jul-21	28-Jul-21	28-Jul-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Thallium	mg/L	0.00005	EPA 200.8	29-Jul-21/O	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	29-Jul-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	29-Jul-21/O	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/L	0.0001	EPA 200.8	29-Jul-21/O	0.0005	0.0013	0.0012	0.0013
Zinc	mg/L	0.005	SM 3120	29-Jul-21/O	0.017	0.011	0.013	0.008
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	30-Jul-21/K	0.70	0.07	0.11	0.07
Ammonia (N)-unionized	mg/L	0.01	CALC	30-Jul-21/K	0.05	< 0.01	< 0.01	< 0.01
o-Phosphate (P)	mg/L	0.002	PE4500-S	30-Jul-21/K	0.014	0.035	0.035	0.039
Phosphorus-Total	mg/L	0.01	E3199A.1	03-Aug-21/K	0.05	0.10	0.07	0.08
Phenolics	mg/L	0.002	MOEE 3179	30-Jul-21/K	< 0.002	< 0.002	< 0.002	< 0.002
COD	mg/L	5	SM5220C	03-Aug-21/K	24	19	19	21
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	28-Jul-21/O	7.3	3.9	3.8	3.8
Anion Sum	meq/L		Calc.	03-Aug-21/O	8.53	10.0	10.2	9.72
Cation Sum	meq/L		Calc.	03-Aug-21/O	8.13	10.0	9.52	9.72
% Difference	%		Calc.	03-Aug-21/O	2.36	0.0535	3.32	0.00961
Ion Ratio	AS/CS		Calc.	03-Aug-21/O	1.05	1.00	1.07	1.000
Sodium Adsorption Ratio	-		Calc.	03-Aug-21/O	1.92	3.28	3.14	3.29
Conductivity (calc.)	µmho/cm		Calc.	03-Aug-21/O	812	1020	1008	991



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-35549

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Oct-21
DATE REPORTED: 17-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW1	SW2	SW3	SW5
			Sample I.D.		B21-35549-1	B21-35549-2	B21-35549-3	B21-35549-4
			Date Collected		26-Oct-21	26-Oct-21	26-Oct-21	26-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	05-Nov-21/O	79		270	171
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	13-Nov-21/O	103		221	186
TDS(ion sum calc.)	mg/L	1	Calc.	14-Nov-21/O	173	426	438	347
Chloride	mg/L	0.5	SM4110C	06-Nov-21/O	39.5	102	103	71.0
Nitrite (N)	mg/L	0.05	SM4110C	06-Nov-21/O	< 0.05		< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	06-Nov-21/O	0.13		7.23	0.68
Bromide	mg/L	0.4	SM4110C	06-Nov-21/O	< 0.4		< 0.4	< 0.4
Sulphate	mg/L	1	SM4110C	06-Nov-21/O	6	39	39	32
Aluminum	mg/L	0.01	SM 3120	05-Nov-21/O	0.04	0.07	0.05	0.04
Barium	mg/L	0.001	SM 3120	05-Nov-21/O	0.019		0.059	0.040
Beryllium	mg/L	0.0001	EPA 200.8	12-Nov-21/O	< 0.0001		< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	05-Nov-21/O	0.009	0.042	0.044	0.128
Cadmium	mg/L	).000015	EPA 200.8	12-Nov-21/O	< 0.000015		< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	05-Nov-21/O	27.9		72.2	43.1
Chromium	mg/L	0.001	EPA 200.8	12-Nov-21/O	0.001		< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0001		0.0001	0.0003
Copper	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0066		0.0064	0.0052
Iron	mg/L	0.005	SM 3120	05-Nov-21/O	0.106	0.080	0.039	0.042
Lead	mg/L	0.00002	EPA 200.8	12-Nov-21/O	0.00023		0.00022	0.00019
Magnesium	mg/L	0.02	SM 3120	05-Nov-21/O	2.31		21.8	15.5
Manganese	mg/L	0.001	SM 3120	05-Nov-21/O	0.067	0.019	0.021	0.081
Molybdenum	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0003		0.0006	0.0020
Nickel	mg/L	0.0002	EPA 200.8	12-Nov-21/O	0.0004		0.0007	0.0013
Potassium	mg/L	0.1	SM 3120	05-Nov-21/O	1.0		3.6	6.6
Silicon	mg/L	0.01	SM 3120	05-Nov-21/O	1.08		4.87	4.50
Silver	mg/L	0.0001	EPA 200.8	12-Nov-21/O	< 0.0001		< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	05-Nov-21/O	34.4		65.6	66.1
Strontium	mg/L	0.001	SM 3120	05-Nov-21/O	0.235	0.419	0.402	0.262

R.L. = Reporting Limit
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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-35549

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Oct-21
DATE REPORTED: 17-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW1	SW2	SW3	SW5
			Sample I.D.		B21-35549-1	B21-35549-2	B21-35549-3	B21-35549-4
			Date Collected		26-Oct-21	26-Oct-21	26-Oct-21	26-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Thallium	mg/L	0.00005	EPA 200.8	12-Nov-21/O	< 0.00005		< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	05-Nov-21/O	< 0.05		< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	05-Nov-21/O	< 0.005		< 0.005	< 0.005
Vanadium	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0005		0.0009	0.0023
Zinc	mg/L	0.005	SM 3120	05-Nov-21/O	0.009		0.017	0.012
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	04-Nov-21/K	0.04		0.02	0.07
Ammonia (N)-unionized	mg/L	0.01	CALC	04-Nov-21/K	< 0.01		< 0.01	< 0.01
o-Phosphate (P)	mg/L	0.002	PE4500-S	04-Nov-21/K	0.019		0.010	0.048
Phosphorus-Total	mg/L	0.01	E3199A.1	24-Nov-21/K	0.06	0.05	0.04	0.32
Phenolics	mg/L	0.002	MOEE	03-Nov-21/K	< 0.002		< 0.002	< 0.002
BOD(5 day)	mg/L	3	SM 5210B	30-Oct-21/K		< 3		
COD	mg/L	5	SM5220C	02-Nov-21/K	7		6	671
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	15-Dec-21/O	5.9	4.8	4.5	9.0
Anion Sum	meq/L		Calc.	14-Nov-21/O	3.31		8.66	6.45
Cation Sum	meq/L		Calc.	14-Nov-21/O	3.11		8.35	6.48
% Difference	%		Calc.	14-Nov-21/O	2.97		1.82	0.234
Ion Ratio	AS/CS		Calc.	14-Nov-21/O	1.06		1.04	0.995
Sodium Adsorption Ratio	-		Calc.	14-Nov-21/O	1.68		1.74	2.20
Conductivity (calc.)	µmho/cm		Calc.	14-Nov-21/O	329		809	640

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Oct-21
DATE REPORTED: 17-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW6	SW7	SW8	Duplicate
			Sample I.D.		B21-35549-5	B21-35549-6	B21-35549-7	B21-35549-8
			Date Collected		26-Oct-21	26-Oct-21	26-Oct-21	26-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	05-Nov-21/O	156	278	262	277
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	13-Nov-21/O	192	224	218	225
TDS(ion sum calc.)	mg/L	1	Calc.	14-Nov-21/O	367	449	430	447
Chloride	mg/L	0.5	SM4110C	06-Nov-21/O	83.1	107	101	105
Nitrite (N)	mg/L	0.05	SM4110C	06-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	06-Nov-21/O	0.13	7.35	6.91	7.39
Bromide	mg/L	0.4	SM4110C	06-Nov-21/O	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	1	SM4110C	06-Nov-21/O	31	39	39	39
Aluminum	mg/L	0.01	SM 3120	05-Nov-21/O	0.99	0.05	0.06	0.05
Barium	mg/L	0.001	SM 3120	05-Nov-21/O	0.038	0.060	0.055	0.061
Beryllium	mg/L	0.0001	EPA 200.8	12-Nov-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	05-Nov-21/O	0.132	0.046	0.044	0.047
Cadmium	mg/L	).000015	EPA 200.8	12-Nov-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	05-Nov-21/O	37.1	74.4	70.2	74.1
Chromium	mg/L	0.001	EPA 200.8	12-Nov-21/O	0.003	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0009	0.0001	0.0002	0.0001
Copper	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0081	0.0027	0.0037	0.0058
Iron	mg/L	0.005	SM 3120	05-Nov-21/O	1.33	0.043	0.050	0.046
Lead	mg/L	0.00002	EPA 200.8	12-Nov-21/O	0.00069	0.00015	0.00012	0.00019
Magnesium	mg/L	0.02	SM 3120	05-Nov-21/O	15.4	22.4	21.0	22.4
Manganese	mg/L	0.001	SM 3120	05-Nov-21/O	0.072	0.022	0.027	0.022
Molybdenum	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0023	0.0006	0.0006	0.0006
Nickel	mg/L	0.0002	EPA 200.8	12-Nov-21/O	0.0030	0.0007	0.0007	0.0007
Potassium	mg/L	0.1	SM 3120	05-Nov-21/O	6.3	3.8	3.6	3.8
Silicon	mg/L	0.01	SM 3120	05-Nov-21/O	6.48	5.00	4.76	5.01
Silver	mg/L	0.0001	EPA 200.8	12-Nov-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	05-Nov-21/O	77.7	67.6	64.0	67.4
Strontium	mg/L	0.001	SM 3120	05-Nov-21/O	0.222	0.399	0.396	0.397

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Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-35549

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Oct-21
DATE REPORTED: 17-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW6	SW7	SW8	Duplicate
			Sample I.D.		B21-35549-5	B21-35549-6	B21-35549-7	B21-35549-8
			Date Collected		26-Oct-21	26-Oct-21	26-Oct-21	26-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Thallium	mg/L	0.00005	EPA 200.8	12-Nov-21/O	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	05-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	05-Nov-21/O	0.072	< 0.005	< 0.005	< 0.005
Vanadium	mg/L	0.0001	EPA 200.8	12-Nov-21/O	0.0052	0.0009	0.0010	0.0009
Zinc	mg/L	0.005	SM 3120	05-Nov-21/O	0.015	0.009	0.014	0.011
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	04-Nov-21/K	0.17	0.02	0.02	0.01
Ammonia (N)-unionized	mg/L	0.01	CALC	04-Nov-21/K	0.02	< 0.01	< 0.01	< 0.01
o-Phosphate (P)	mg/L	0.002	PE4500-S	04-Nov-21/K	0.117	0.010	0.010	0.006
Phosphorus-Total	mg/L	0.01	E3199A.1	24-Nov-21/K	100	0.06	0.48	0.05
Phenolics	mg/L	0.002	MOEE	03-Nov-21/K	< 0.002	< 0.002	< 0.002	< 0.002
BOD(5 day)	mg/L	3	SM 5210B	30-Oct-21/K				
COD	mg/L	5	SM5220C	02-Nov-21/K	601	15	8	10
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	15-Dec-21/O	7.7	4.5	4.1	4.6
Anion Sum	meq/L		Calc.	14-Nov-21/O	6.84	8.83	8.51	8.81
Cation Sum	meq/L		Calc.	14-Nov-21/O	6.74	8.60	8.11	8.57
% Difference	%		Calc.	14-Nov-21/O	0.703	1.35	2.39	1.34
Ion Ratio	AS/CS		Calc.	14-Nov-21/O	1.01	1.03	1.05	1.03
Sodium Adsorption Ratio	-		Calc.	14-Nov-21/O	2.71	1.76	1.72	1.76
Conductivity (calc.)	µmho/cm		Calc.	14-Nov-21/O	673	829	793	825

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Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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REPORT No. B21-35569

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		P4-1	P4-2	P9-1	G11-01A
			Sample I.D.		B21-35569-1	B21-35569-2	B21-35569-3	B21-35569-4
			Date Collected		27-Oct-21	27-Oct-21	27-Oct-21	27-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	04-Nov-21/O	684	357	85	87
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	16-Nov-21/O	566	256	74	250
TDS(ion sum calc.)	mg/L	1	Calc.	17-Nov-21/O	895	555	104	408
Chloride	mg/L	0.5	SM4110C	06-Nov-21/O	83.3	26.9	2.4	78.9
Nitrite (N)	mg/L	0.05	SM4110C	06-Nov-21/O	< 0.05	1.18	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	06-Nov-21/O	< 0.05	6.85	0.06	< 0.05
Bromide	mg/L	0.4	SM4110C	06-Nov-21/O	< 0.4	< 0.4	< 0.4	< 0.4
Sulphate	mg/L	1	SM4110C	06-Nov-21/O	106	151	16	2
Aluminum	mg/L	0.01	SM 3120	04-Nov-21/O	0.11	0.07	0.04	0.88
Barium	mg/L	0.001	SM 3120	04-Nov-21/O	0.422	0.131	0.027	0.029
Beryllium	mg/L	0.0001	EPA 200.8	18-Nov-21/O	< 0.0002	< 0.0001	< 0.0001	< 0.0001
Boron	mg/L	0.005	SM 3120	04-Nov-21/O	0.464	0.557	0.011	0.187
Cadmium	mg/L	).000015	EPA 200.8	18-Nov-21/O	< 0.000028	0.000114	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	04-Nov-21/O	225	122	22.0	15.3
Chromium	mg/L	0.001	EPA 200.8	18-Nov-21/O	< 0.001	< 0.001	< 0.001	0.005
Cobalt	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0078	0.0035	< 0.0001	0.0012
Copper	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0054	0.0183	0.0005	0.0059
Iron	mg/L	0.005	SM 3120	04-Nov-21/O	14.8	0.014	0.034	1.45
Lead	mg/L	0.00002	EPA 200.8	18-Nov-21/O	0.00023	0.00018	0.00005	0.00075
Magnesium	mg/L	0.02	SM 3120	04-Nov-21/O	29.5	12.6	7.29	11.9
Manganese	mg/L	0.001	SM 3120	04-Nov-21/O	2.34	1.96	0.045	0.058
Molybdenum	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0007	0.0004	0.0009	0.0025
Nickel	mg/L	0.0002	EPA 200.8	18-Nov-21/O	0.0092	0.0074	< 0.0002	0.0042
Potassium	mg/L	0.1	SM 3120	04-Nov-21/O	27.0	17.7	1.8	5.8
Sodium	mg/L	0.2	SM 3120	04-Nov-21/O	55.9	68.3	9.6	142
Silicon	mg/L	0.01	SM 3120	04-Nov-21/O	11.6	3.59	7.51	8.58
Silver	mg/L	0.0001	EPA 200.8	18-Nov-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		P4-1	P4-2	P9-1	G11-01A
			Sample I.D.		B21-35569-1	B21-35569-2	B21-35569-3	B21-35569-4
			Date Collected		27-Oct-21	27-Oct-21	27-Oct-21	27-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	04-Nov-21/O	1.08	0.533	0.062	0.129
Thallium	mg/L	0.00005	EPA 200.8	18-Nov-21/O	< 0.0001	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	04-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	04-Nov-21/O	< 0.005	< 0.005	< 0.005	0.062
Vanadium	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0015	0.0006	0.0007	0.0055
Zinc	mg/L	0.005	SM 3120	04-Nov-21/O	0.007	< 0.005	< 0.005	0.011
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	04-Nov-21/K	8.63	0.14	0.10	0.18
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	24-Nov-21/K	11.4	5.0	1.7	4.2
o-Phosphate (P)	mg/L	0.002	PE4500-S	04-Nov-21/K	0.007	0.003	0.064	0.395
DRP - Dissolved Reactive Phosphate (P)	mg/L	0.002	PE4500-S	04-Nov-21/K	< 0.002	< 0.002	0.016	0.332
Phosphorus-Total	mg/L	0.01	E3199A.1	24-Nov-21/K	5.68	0.73	8.61	9.43
Phenolics	mg/L	0.002	MOEE	04-Nov-21/K	< 0.002	< 0.002	< 0.002	< 0.002
COD	mg/L	5	SM5220C	02-Nov-21/K	116	40	90	95
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	09-Dec-21/O	11.2	1.5	5.0	2.6
Anion Sum	meq/L		Calc.	17-Nov-21/O	15.9	9.60	1.89	7.30
Cation Sum	meq/L		Calc.	17-Nov-21/O	18.3	10.6	2.17	8.16
% Difference	%		Calc.	17-Nov-21/O	7.06	5.17	6.93	5.59
Ion Ratio	AS/CS		Calc.	17-Nov-21/O	0.868	0.902	0.870	0.894
Sodium Adsorption Ratio	-		Calc.	17-Nov-21/O	0.930	1.57	0.454	6.62
Conductivity (calc.)	µmho/cm		Calc.	17-Nov-21/O	1455	915	202	738
TDS(calc.)/EC(actual)	-		Calc.	17-Nov-21/O	0.646	0.608	0.604	0.578
EC(calc.)/EC(actual)	-		Calc.	17-Nov-21/O	1.05	1.00	1.17	1.04

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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Tel: 613-526-0123
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DATE RECEIVED: 28-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		G11-01B	G11-01C	Duplicate	
			Sample I.D.		B21-35569-5	B21-35569-6	B21-35569-7	
			Date Collected		27-Oct-21	27-Oct-21	27-Oct-21	
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	04-Nov-21/O	81	63	66	
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	16-Nov-21/O	85	61	66	
TDS(ion sum calc.)	mg/L	1	Calc.	17-Nov-21/O	115	70	75	
Chloride	mg/L	0.5	SM4110C	06-Nov-21/O	5.4	2.2	2.2	
Nitrite (N)	mg/L	0.05	SM4110C	06-Nov-21/O	< 0.05	< 0.05	< 0.05	
Nitrate (N)	mg/L	0.05	SM4110C	06-Nov-21/O	< 0.05	< 0.05	< 0.05	
Bromide	mg/L	0.4	SM4110C	06-Nov-21/O	< 0.4	< 0.4	< 0.4	
Sulphate	mg/L	1	SM4110C	06-Nov-21/O	16	6	7	
Aluminum	mg/L	0.01	SM 3120	04-Nov-21/O	0.30	0.08	0.37	
Barium	mg/L	0.001	SM 3120	04-Nov-21/O	0.016	0.014	0.019	
Beryllium	mg/L	0.0001	EPA 200.8	18-Nov-21/O	< 0.0001	< 0.0001	< 0.0001	
Boron	mg/L	0.005	SM 3120	04-Nov-21/O	0.012	< 0.005	< 0.005	
Cadmium	mg/L	).000015	EPA 200.8	18-Nov-21/O	< 0.000015	< 0.000015	< 0.000015	
Calcium	mg/L	0.02	SM 3120	04-Nov-21/O	21.0	17.1	17.5	
Chromium	mg/L	0.001	EPA 200.8	18-Nov-21/O	0.002	< 0.001	0.003	
Cobalt	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0004	0.0001	0.0006	
Copper	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0056	0.0017	0.0064	
Iron	mg/L	0.005	SM 3120	04-Nov-21/O	0.467	0.122	0.627	
Lead	mg/L	0.00002	EPA 200.8	18-Nov-21/O	0.00045	0.00008	0.00045	
Magnesium	mg/L	0.02	SM 3120	04-Nov-21/O	6.96	5.01	5.30	
Manganese	mg/L	0.001	SM 3120	04-Nov-21/O	0.069	0.003	0.011	
Molybdenum	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0009	0.0008	0.0008	
Nickel	mg/L	0.0002	EPA 200.8	18-Nov-21/O	0.0011	0.0005	0.0017	
Potassium	mg/L	0.1	SM 3120	04-Nov-21/O	1.6	0.7	0.8	
Sodium	mg/L	0.2	SM 3120	04-Nov-21/O	12.2	2.7	2.7	
Silicon	mg/L	0.01	SM 3120	04-Nov-21/O	10.2	7.03	7.46	
Silver	mg/L	0.0001	EPA 200.8	18-Nov-21/O	< 0.0001	< 0.0001	< 0.0001	

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-35569

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 28-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Limoges Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		G11-01B	G11-01C	Duplicate	
			Sample I.D.		B21-35569-5	B21-35569-6	B21-35569-7	
			Date Collected		27-Oct-21	27-Oct-21	27-Oct-21	
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	04-Nov-21/O	0.052	0.032	0.033	
Thallium	mg/L	0.00005	EPA 200.8	18-Nov-21/O	< 0.00005	< 0.00005	< 0.00005	
Tin	mg/L	0.05	SM 3120	04-Nov-21/O	< 0.05	< 0.05	< 0.05	
Titanium	mg/L	0.005	SM 3120	04-Nov-21/O	0.025	0.008	0.036	
Vanadium	mg/L	0.0001	EPA 200.8	18-Nov-21/O	0.0014	0.0057	0.0074	
Zinc	mg/L	0.005	SM 3120	04-Nov-21/O	< 0.005	< 0.005	0.006	
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	04-Nov-21/K	0.15	0.02	0.03	
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	24-Nov-21/K	23.0	2.9	3.3	
o-Phosphate (P)	mg/L	0.002	PE4500-S	04-Nov-21/K	0.113	0.049	0.096	
DRP - Dissolved Reactive Phosphate (P)	mg/L	0.002	PE4500-S	04-Nov-21/K	0.038	0.025	0.034	
Phosphorus-Total	mg/L	0.01	E3199A.1	24-Nov-21/K	83.2	4.51	4.04	
Phenolics	mg/L	0.002	MOEE	04-Nov-21/K	< 0.002	< 0.002	< 0.002	
COD	mg/L	5	SM5220C	02-Nov-21/K	136	121	93	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	09-Dec-21/O	2.2	2.1	7.3	
Anion Sum	meq/L		Calc.	17-Nov-21/O	2.19	1.41	1.51	
Cation Sum	meq/L		Calc.	17-Nov-21/O	2.23	1.41	1.49	
% Difference	%		Calc.	17-Nov-21/O	0.884	0.0247	0.978	
Ion Ratio	AS/CS		Calc.	17-Nov-21/O	0.982	1.00	1.02	
Sodium Adsorption Ratio	-		Calc.	17-Nov-21/O	0.589	0.148	0.147	
Conductivity (calc.)	µmho/cm		Calc.	17-Nov-21/O	217	139	147	
TDS(calc.)/EC(actual)	-		Calc.	17-Nov-21/O	0.560	0.561	0.554	
EC(calc.)/EC(actual)	-		Calc.	17-Nov-21/O	1.06	1.11	1.08	

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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Appendix E: Checklist

Appendix D-Monitoring and Screening Checklist
General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.
Instructions: A complete checklist consists of:
(a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
(b) completed contact information for the Competent Environmental Practitioner (CEP)
(c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
Definition of Surface water CEP:
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information	
Waste Disposal Site (WDS) Name	Limoges Waste Disposal Site
Location (e.g. street address, lot, concession)	Lot 29, Concession 3
GPS Location (taken within the property boundary at front gate/ front entry)	481567, 50118600 (Zone 18)
Municipality	The Nation Municipality
Client and/or Site Owner	The Nation Municipality
Monitoring Period (Year)	2018
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	Provisional Certificate of Approval No. A471104 (originally issued June 24, 1980)
Director's Order No.:	
Provincial Officer's Order No.:	

Other:			
Report Submission Frequency	◯ **Annual** ◯ **Other**	Specify:	
The site is: **(Operation Status)**	◯ **Open** ◯ **Inactive** ◯ **Closed**		
Is there an active waste transfer station at the site?	◯ **Yes** ◯ **No**		
Does this WDS have a Closure Plan?	◯ **Not yet submitted** ◯ **Submitted and under review** ◯ **Submitted and approved**		
Total Approved Capacity	1425245.00	*Units*	Cubic Metres
Maximum Approved Fill Rate		*Units*	
Total Waste Received within Monitoring Period (Year)	3654.00	*Units*	Cubic Metres
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*	Calculated from tipping fees plus 20% added for cover		
Estimated Remaining Capacity	78656.00	*Units*	Cubic Metres
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*	Estimation based on Calculation		
Estimated Remaining Capacity *Date Last Determined*	2017-12-22		
Non-Hazardous Approved Waste Types	☒ Domestic ☒ Industrial, Commercial & Institutional (IC&I) ☐ Source Separated Organics (Green Bin) ☒ Tires	☒ Contaminated Soil ☒ Wood Waste ☒ Blue Box Material ☐ Processed Organics ☒ Leaf and Yard Waste	☐ Food Processing/Preparation Operations Waste ☐ Hauled Sewage Other:
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*			

Year Site Opened *(enter the Calendar Year only)*	2000	**Current ECA Issue Date**	1-May-2001
Is your Site required to submit Financial Assurance?		◯ **Yes** ◯ **No**	
Describe how your WDS is designed.		◯ Natural Attenuation only ◯ Fully engineered Facility ◯ Partially engineered Facility	
Does your Site have an approved Contaminant Attenuation Zone?		◯ **Yes** ◯ **No**	
If closed, specify ECA, control or authorizing document closure date:			
Has the nature of the operations at the site changed during this monitoring period?	◯ **Yes** ◯ **No**		
If yes, provide details:			

Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)	◯ Yes ◯ No

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	◯ **Yes** ◯ **No**	
2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/ control document(s):	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document.	◯ **Yes** ◯ **No** ◯ **Not Applicable**	
b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If no, list exceptions below or attach additional information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◯ **Yes** ◯ **No**	If no, specify:
Sampling and Monitoring Program Results/WDS Conditions and Assessment:		
5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/ or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	◯ **Yes** ◯ **No**	If no, the potential design and operational concerns/exceptions are as follows:
6) The site meets compliance and assessment criteria.	◯ **Yes** ◯ **No**	If no, list and explain exceptions:
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	◯ **Yes** ◯ **No**	If no, list exceptions and explain reason for increase/change: Increasing concentrations of sodium and chloride at P4-2 potentially contributed from the site being used as a snow dump.

1) Is one or more of the following risk reduction practices in place at the site: ***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	◯ **Yes** ◯ **No**	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☐ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken:	

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◯ **No changes to the monitoring program are recommended** ◯ **The following change(s) to the monitoring program is/ are recommended:**	
◯ **No Changes to site design and operation are recommended** ◯ **The following change(s) to the site design and operation is/are recommended:**	
Name:	Robert Renaud, M.Sc., P.Geo
Seal:	Add Image

Signature:		**Date:**	
CEP Contact Information:	Mark McCalla, B.Sc., P.Geo		
Company:	EXP Services Inc.		
Address:	100-2650 Queensview Drive, Ottawa, ON, K2B 8H6		
Telephone No.:	613-677-1899 ext 63243	Fax No. :	613-225-7337
E-mail Address:	mark.mccalla@exp.com		
Co-signers for additional expertise provided:			
Signature:		**Date:**	
Signature:		**Date:**	

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):	
Name (s)	1) South Indian Creek; 2) Northern Drainage Ditch

Distance(s)	1) 40 m from foot print; 2) 20 from foot print

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	◯ **Yes** ◯ **No**	If no, identify issues:
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):	◯ **Yes** ◯ **No** ◯ **Not applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.	◯ **Yes** ◯ **No** ◯ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◯ **Yes** ◯ **No**	If no, specify:

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):	◯ **Yes** ◯ **No**

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. ECA limit, PWQO, background	e.g. X% above PWQO
Total Phosphorus	PWQO- at compliance location (SW3)	May, 400% above PWQO July, 400% above PWQO October, 200% above PWQO
6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	◯ **Yes** ◯ **No**	Total Phosphorus - background (SW8) concentrations in spring, summer, and fall were300%, 350%, and 2400% above PWQO, respectively Total Phosphorus - background (SW1) concentrations in spring, summer, and fall were 350%,450%, and 300% above PWQO, respectively

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	◯ **Yes** ◯ **No**	If no, list parameters and stations that is outside the expected range. Identify whether parameter concentrations show an increasing trend or are within a high historical range: All surface water locations including background consistently exceed PWQO for total phosphorus.
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	◯ Yes ◯ No ◯ Not Known ◯ Not Applicable	If yes, provide details and whether remedial measures are necessary: P4-1 exceeds PWQO in 2018 for: pH, Total Phosphorus, boron, iron, cobalt, copper P4-2 exceeds PWQO in 2018 for: pH, Total Phosphorus, boron, cobalt, and copper Parameters for which the PWQO is a function of conditions within the surface water (such as pH, hardness, and alkalinity) were not compared to the PWQO.
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken:

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◯ **No Changes to the monitoring program are recommended** ◯ **The following change(s) to the monitoring program is/are recommended:**	
◯ **No changes to the site design and operation are recommended** ◯ **The following change(s) to the site design and operation is/ are recommended:**	

CEP Signature	
Relevant Discipline	P.Geo. with relevant experience
Date:	
CEP Contact Information:	Mark McCalla, B.Sc., P.Geo.
Company:	EXP Services Inc.
Address:	100-2650 Queensview Drive, Ottawa, ON, K2B 8H6
Telephone No.:	613-688-1899 ext. 63243
Fax No. :	613-225-7337
E-mail Address:	mark.mccalla@exp.com

Save As		**Print Form**

2021 Central Landfill Groundwater and Surface Water Monitoring Report

Client:
The Nation Municipality
958 Road 500 West, R.R.3
Casselman, Ontario
K0A 1M0

Type of Document:
Final

Project Number:
OTT-00235901-A0

Prepared By: Mark McCalla, P.Geo.

Reviewed By: Shawn Doherty, P. Eng.

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
Canada

Date Submitted:
March 7, 2022

2021 Central Landfill Groundwater and Surface Water Monitoring Report

Client:
The Nation Municipality
958 Road 500 West, R.R.3
Casselman, Ontario
K0A 1M0

Type of Document:
Draftl

Project Number:
OTT-00235901-A0

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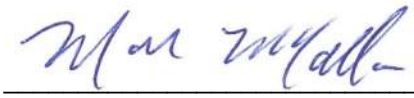

Mark McCalla, P.Geo.
Senior Environmental Geoscientist
Earth and Environment

Shawn Doherty, P. Eng.
Environmental Engineer
Earth and Environment

Date Submitted:
March 7, 2022

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Figure 4 - Surface Water Sampling Station Photos Fall

Executive Summary

EXP Services (EXP), was retained by The Nation Municipality to prepare the 2021 monitoring report for the Central Landfill Site in The Nation Municipality in Ontario. The landfill site is owned and operated by The Nation Municipality and is located on the east side of Concession Road 5. Located approximately 2.2 km west of the Village of Casselman, the Central Landfill Site is adjacent to the Casselman landfill. The landfill site has been in operation since the early 1990's and was closed August 1, 2001. It has a total area of approximately 22.28 ha, with a waste footprint of approximately 3 ha.

The Central Landfill operates under Provisional Certificate of Approval #A471101 (C of A) Amendment No.1 issued by the Ontario Ministry of the Environment and Climate Change (MOECC) dated June 7, 1982.

Based on the results of the 2021 groundwater and surface water monitoring program at Central Landfill, the following conclusions are provided:

- The surface water monitoring program included the collection of surface water from four (4) surface water monitoring locations in the spring and fall.
- The surface water sample location SW 3 (Ravine 2) exceeds the PWQO standards for copper and phosphorus. Copper was present at similar concentrations in 2017 and 2019, which suggests that it may be sporadic and not necessarily indicative of landfill leachate impact.
- The estimated flow from Ravine 2 and Ravine 3 was 0.9 m^3/min based on the measured historical ranges. Given that the historical flow in the South Nation River north of the Site is more than 5,000 m^3/min, the surface water discharge from Ravine 2 and Ravine 3 has little impact to the surface water quantity / quality of the South Nation River.
- In conclusion, the landfill is in compliance with respect to surface water quality, since it does not appear that Ravine 2 and Ravine 3 have been impacted by landfill leachate and there is no impact to the South Nation River.
- Since groundwater discharges to the surface water in Ravine 1, the analytical results for the groundwater sample from G99-6 was compared to the PWQO for discussion purposes. The groundwater quality from G99-6 has displayed relatively consistent concentrations for key indicator parameters such as boron, chloride, sulphate, and TDS. This is interpreted to be representative of the groundwater to surface water interaction, which indicates potential minor landfill leachate impacts to the surface water quality in Ravine 1 based on the boron concentration.
- The migration of methane at the site is not considered a concern as methane was not identified at elevated concentrations above 2.5% at the site in 2021.

1.0 Introduction

1.1. Background

EXP Services (EXP), was retained by The Nation Municipality to prepare the 2021 monitoring report for the Central Landfill Site in The Nation Municipality, Ontario. The landfill site is owned and operated by the Nation Municipality and is located on the east side of Concession Road 5. Located approximately 2.2 km west of the Village of Casselman, the Central Landfill Site is adjacent to the Casselman landfill shown on Figure 1 in Appendix B. The landfill site has been in operation since the early 1990's and was closed August 1, 2001. It has a total area of approximately 22.28 ha with a waste footprint of approximately 3 ha, shown on Figure 2 in Appendix B.

The Central Landfill operates under Provisional Certificate of Approval #A471101 (C of A) Amendment No.3 issued by the Ontario Ministry of the Environment and Climate Change (MOECC) dated December 1, 2010 (Appendix "A").

1.2. Objective

The current monitoring and sampling programs were conducted to assess potential impacts to the South Nation River attributed to the adjacent Central Landfill. The Ontario Ministry of Environment, Conservation and Parks (MECP) approved the discontinuation of the groundwater monitoring program for compliance assessment. However, for the purpose of determining the leachate strength and composition discharging from Ravine No. 1 groundwater was assessed at G99-5 and G-99-6.

1.3. Scope of Work

The work undertaken for the 2021 program covered by this report includes the following.

Completed by The Nation Municipality

- The measurement of groundwater elevations during the fall sampling event.
- The collection of groundwater samples, during the fall, from the monitoring well network and the submission of the samples to an analytical laboratory for detailed geochemical analysis. Field measurements were taken for general water characteristics prior to sample collection. The sampling methodology and an interpretation of the results are discussed in Section 5 and the data is presented in Appendix C.
- The collection of surface water samples, during the spring and fall, from pre-determined surface water sampling locations and the submission of the samples to an analytical laboratory for geochemical analysis. Field measurements were taken for general water characteristics. The sampling methodology and an interpretation of the results are discussed in Section 5 and the data is presented in Appendix C.

Completed by EXP

- An interpretation of the geochemical data to assess the current characteristics and extent of the leachate contaminant plume in the groundwater flow system. An assessment of the impact to groundwater quality at the property boundary with respect to the MECP Reasonable Use criteria, Policy B-7.
- Preparation of an annual monitoring report based on field and laboratory results.

2.0 Site Description

2.1. Site Location

The landfill site is located on the east side of Concession Road 5. Located approximately 2.2 km west of the Village of Casselman, the Central Landfill Site is adjacent to the Casselman landfill shown on Figure 1 in Appendix B. The landfill site has been in operation since the early 1990's and was closed August 1, 2001. It has a total area of approximately 22.3 hectares, with a waste footprint of approximately 3 hectares as shown on Figure 2 in Appendix B.

2.2. Certificate of Approval

The Central Landfill site operates under Provisional Certificate of Approval No. A471101 that was originally dated June 7, 1982 (Appendix "A").

- The C of A was amended (No. 1) on August 1, 2001, it indicated no more waste was to be disposed of at the site, and a closure plans must be completed by August 31, 2002. Additional monitoring wells were to be installed along the eastern boundary, and off-site leachate contamination needs to be addressed with respect to the Reasonable Use Guideline.
- The C of A was amended (No. 2) on December 14, 2004, which recognized the additional property purchased by increasing the Contaminant Attenuation Zone and the total size of the landfill site from 16.37 ha to 22.73 ha.
- The C of A was amended (No. 3) on December 1, 2010, which recognized the acknowledgement of a transfer of parcel of land containing Ravine 1 to the Corporation of the Village of Casselman reducing the site from 22.73 ha to 22.28 ha.

The C of A specified that the site, when in operation, had approval for acceptance of the following waste types: domestic, commercial, and "other" (which was limited to agricultural waste, wire and wood waste).

Technical review comments were completed by the MECP district office (Appendix "A"):

- The technical review, dated June 17, 2005, recognized that Guideline B-7 was no longer applicable to the site, however Guideline B-9 was now applicable. Since the landfill was closed with a low permeable cover and the potential for non-conformance with Guideline B-9 was negligible, approval to discontinue the groundwater monitoring program was granted, with the exception of the collection of groundwater samples from G99-6 to determine leachate strength discharging to Ravine 1. The Nation Municipality and the Village of Casselman are required to address the surface water impacts in ravine/ South Nation River jointly as both landfills are contributing to the impacts.
- The technical review, dated September 26, 2011, indicated additional surface water samples should be collected upstream of Ravine No.2 to establish background water quality. It also indicated that the sampling of Ravine No. 3 discharge should be undertaken when flowing surface water conditions occur to the South Nation River.
- The technical review, dated May 2, 2012, indicated that while, the discontinuation of post-closure surface water monitoring program was proposed, the technical review did not support the recommendations at that time.
- The technical review, dated September 23, 2015, indicated the reviewer was in agreement with the proposed monitoring program and the surface water at Ravine No. 2 (SW3) and Ravine No. 3 (SW18) was marginally impacted landfill leachate. However, the discharges are unlikely to

significantly increase the total contaminate load in the large volume of flow into the South Nation River.

An inspection report, dated May 28, 2014, documented an inspection completed by the local MECP district officer. The inspection indicated the landfill sign needed to be updated; the monitoring wells needed to be closed and locked; hunting equipment needed to be removed; road access needed to be maintained; and, the removal of the custodian shelter had yet to be completed.

2.3. Previous Studies

Previous site investigations were performed by McNeely Engineering Consultants Ltd. (McNeely), StanCon Groundwater Engineering Ltd. (StanCon), and Golder Associates as summarized below:

Date	Consultant Involved	Investigation
1991	McNeely Engineering Consultants Ltd.	*Site Development and Operations Plan*
1991	StanCon Groundwater Engineering Ltd.	*Hydrogeological Investigation*
1999 to 2000	Golder Associates Ltd.	*Hydrogeological Investigation* and *Groundwater and Surface Water Monitoring Program*
2001 to 2004	Golder Associates Ltd.	*Groundwater and Surface Water Monitoring Program*
2003	Golder Associates Ltd.	*Assessment of Site Compliance at the Nation Municipality Central Landfill Site and Village of Casselman Landfill Site, Relative Contribution from each Landfill Site to Leachate-Impacted Surface Water in the Main Ravine, Summary of Existing and Proposed Closure-Related Activities and Overview of Conceptual Mitigation Measures*
2005 to 2017	Golder Associates Ltd.	*Surface Water Monitoring Program*
2017 to 2019	EXP Services Inc.	*Surface Water Monitoring Program*

2.4. Topography and Drainage

The site is relatively flat, with a slight downward slope from the south to the north. A slight mound is present within the landfill footprint. North of the landfill footprint, the ground surface has a steep drop of approximately 11 m down to the South Nation River. Three ravines are present along the northern side of the property that lead to the South Nation River. A low-lying marsh area is present in the south-east portion of the site. The topography and site drainage are shown on Figure 2 in Appendix B.

2.5. Geology

Based on the results of previous investigations completed by others, in general, the overburden geological conditions consist of a silty sand unit underlain by silty clay to a depth greater than 20 m. It is interpreted that the silty sand unit pinches out in the vicinity of the three ravines along the northern property boundary towards the South Nation River, where silty clay was found near ground surface.

3.0 Landfill Monitoring Network

3.1. Previous Programs

A groundwater and surface water monitoring network consisting of monitoring wells and surface water monitoring stations was initially established in 1991, and then expanded in subsequent years. In 2005, the network was reduced upon approval from the MECP technical review. In 2005, the MECP recognized that Guideline B-7 was no longer applicable to the site, however Guideline B-9 was now applicable. Since the landfill was closed with a low permeable cover and the potential for non-conformance with Guideline B-9 was negligible, approval to discontinue the groundwater monitoring program was granted, with the exception of the collection of groundwater samples from G99-6 to determine leachate strength discharging to Ravine 1. The locations of the monitoring wells and surface water stations are presented in Figure 2, Appendix B.

Water level measurements and groundwater and surface water samples have been collected from these locations in previous years by others. The Nation Municipality staff began measuring water levels and collecting groundwater and surface water samples in 2017. The annual monitoring program has occurred every year since 1999.

3.2. Monitoring Well Placement

The monitoring well network consists of two (2) monitoring wells (G99-5 and G99-6) strategically placed to determine leachate strength discharging to surface water via Ravine 1. However, monitoring well G99-5 has not been sampled since 2008 due to dry conditions but is still present as part of the well network. The well network is listed below in Table 5.1 and shown on Figure 2, Appendix B.

3.3. Surface Water Locations

The surface water monitoring network includes four (4) surface water locations to monitor potential impacts from the landfill. The sample locations are located upgradient along the South Nation River (SW 7), Ravine No.2 (SW 3), Ravine No.3 (SW 18), and upgradient of the fill area (SW 17). The surface water sampling locations are shown on Figure 2 in Appendix B. Photos of the sample locations are presented on Figure 3 and 4 in Appendix B.

South Nation River:

- SW 7 is located approximately 130 m upgradient of the eastern edge of the landfill and is considered to be representative of background quality for the South Nation River.

Low Lying Marsh Area:

- SW 17 is located approximately 95 m upgradient of the fill area in a periodically flooded low lying marsh area that drains into Ravine 2 and is considered representative of background quality for Ravine 2.

Ravine 1:

- Monitoring well G99-6 is monitored to determine leachate strength discharging to Ravine 1, located at the top of Ravine 1 in the northwest corner of the site. Surface water and monitoring well G99-5 is not sampled in this ravine because it is dry.

Ravine 2:

- SW 3 is located just upstream of the discharge of Ravine 2 into the South Nation River and is considered representative of the Ravine 2 discharge quality.

Ravine 3:

- SW 18 is located just upstream of discharge of Ravine 3 into the South Nation River and is considered representative of the Ravine 3 discharge quality.

Based on the above, there no official downgradient water stations in the South Nation River. Instead, the water quality from the Ravines allow one to establish the potential for impacts to the South Nation River.

4.0 Methodology

4.1. Groundwater Monitoring Program

The groundwater monitoring program consisted of a single sampling event carried out on October 22, 2021. The sampling session included monitoring of wells G99-5 and G99-6, which are in the northwest corner of the Central Landfill located at the top of Ravine 1, although G99-5 was confirmed dry again in 2021. The locations of monitoring wells are illustrated on Figure 2 Appendix B.

During the fall sampling event, groundwater level measurements were undertaken, landfill gas monitoring was completed, and groundwater samples were collected from monitoring well G99-6. The current groundwater monitoring program was approved by the MECP in 2015.

The depth to groundwater was measured using a manual water tape, relative to the top of well casing. These measurements were used to determine the groundwater elevation (above sea level).

The following sections describe the monitoring program conducted by The Nation Municipality in 20210, the groundwater analytical results obtained, and an assessment of the site impact on groundwater quality in terms of compliance with provincial policy and guidelines.

4.2. Groundwater Sampling Protocols

Standard field techniques were used during the sampling activities. The well was purged of a minimum three well volumes of water or until dry, prior to sample collection, to ensure collection of a representative groundwater sample. Dedicated HDPE tubing with an attached foot valve was used to purge and sample the well. While purging the well, field readings of pH, conductivity, ORP, DO, turbidity and temperature were measured using a multimeter (Horiba U-52). All field staff used disposable vinyl gloves during the sampling program to minimize cross-contamination.

All samples were retrieved and placed in laboratory-prepared bottles. Groundwater was filtered using a 45 µm filter attached to the HDPE tubing to minimize the amount of sediment introduced into the sample bottles for metals analysis. All samples were subsequently delivered to Caduceon Environmental Laboratories in Ottawa, Ontario, under chain of custody protocols.

The groundwater sample was analyzed for the following parameters: metals (ICP scan), hardness (calculated from laboratory calcium and magnesium analyses), alkalinity, total dissolved solids (TDS), chloride, sulphate, nitrate, nitrite, total phosphorus, ortho-phosphate, ammonia, dissolved organic carbon (DOC), chemical oxygen demand (COD).

4.2.1. Groundwater Sampling Guidelines

The results of the groundwater quality analyses for 2021 along with historical analytical results are summarized in tables (Appendix C). The analytical results were compared Provincial Water Quality Objectives (PWQO) as requested by the MECP in June 2005.

Prior to 2005, the groundwater quality was compared to the Ontario Drinking Water Standards (ODWS), as well as Guideline B-7 Reasonable Use Limits to assess the discharge of contaminants from the landfill. Guideline B-7 was considered applicable to the site in 2005. Since the Central Landfill is closed, the MECP has stated that Guideline B-7 is no longer applicable. Instead, Guideline B-9 was considered applicable.

With respect to Guidelines B-9 and B-7, the potential for off-site impacts to existing water supplies was considered negligible at the Central Landfill site since the groundwater discharge point is considered to be

surface water (via Ravine 1) and no existing water supply wells are located prior to the discharge point therefore the site is in compliance with Guidelines B-9 and B-7. This aided in the rational for the discontinuation of the groundwater monitoring program for groundwater compliance assessments in 2005.

4.3. Surface Water Sampling Protocols

The surface water monitoring program consisted of two monitoring sessions carried out on May 19 and October 22, 2021. The sampling session included the collection of four (4) surface water samples from monitoring locations in the vicinity of the Central Landfill. The surface water monitoring locations are illustrated on Figure 2 in Appendix B and discussed in Section 7.1. The four (4) surface water locations are meant to monitor potential impacts from the landfill

Field readings of pH, conductivity, ORP, DO, turbidity and temperature were measured using a multimeter (Horiba U-52) at the time of sampling collection. The stream and flow conditions were noted at each sample location during the time of sampling.

The surface water samples are collected by inserting a laboratory supplied sampling bottle below the top of the surface water, while minimizing the amount of sediment that enters the bottle. The National Municipality staff used fresh vinyl gloves at each sampling location, in order to minimize the potential for cross-contamination. As a general rule, surface water locations that display less than 5 cm of water are not sampled and are considered dry (to minimize collection of sediment and thus produce erroneous results). Samples were submitted to Caduceon Environmental Laboratories for analysis.

All surface water samples collected were analyzed for the following parameters: metals (ICP scan), hardness (calculated from laboratory calcium and magnesium analyses) alkalinity, BOD, TDS, TSS, turbidity, chloride, sulphate, nitrate, nitrite, DOC, COD, TKN, ammonia, and total phosphorus.

4.3.1. Surface Water Guidelines

The surface water analytical results were compared to the Provincial Water Quality Objectives (PWQO) to ensure that the surface water quality is not negatively impacted by the landfill leachate.

4.4. Gas Monitoring Program

Under Ontario Regulation 232/98, specified methane concentration limits include:

- Less than 1.0% methane gas in an on-site building, or its foundation;
- Less than 2.5% methane gas in the subsurface at the property boundary; and,
- Less than 0.05% percent methane (i.e. not present) in a building, or its foundation, which is located off-site.

Monitoring of landfill gas migration is not normally required where the assessment shows there is no significant potential for methane to migrate below land surface to adjacent or to the off-site properties, or into buildings or enclosures on-site or off-site. Nevertheless, The Nation Municipality monitored the landfill gas from the on-site wells in the fall of 2021.

The Nation Municipality conducted the landfill gas monitoring program using the GEM 5000 Landfill Gas Monitor, which measures for methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) and the results are summarized below in Table 7.1. The device measures the landfill gas concentrations as the well cap is partially opened, and the gas sampling tubing is inserted.

The gas levels are then compared against Ontario Regulation 232/98 standards for methane gas levels of 2.5%, which is the criteria for methane at the property boundary.

5.0 Ground Water Results

5.1. Observations

Groundwater monitoring was completed at monitoring well G99-6 on October 22, 2021. The water was observed to be clear with no odours noted. Monitoring well G99-5 was dry. No sample has been collected from G99-5 since 2008 due to low water table conditions.

5.2. Groundwater Elevations

Groundwater level measurements were recorded in G99-6, the groundwater level for 2021 is shown below in Table 5.1.

Table 5.1: Groundwater Elevations (2021)

Well No.	Ground Surface Elevation[1] (mASL)	Top of Casing Elevation[1] (mASL)	Well Depth (mbTOP)	October 22, 2021	
				Water Level (mbTOP)	Ground Water Elevation (mASL)
G99-5	62.44	63.33	3.66	DRY	NA
G99-6	61.27	62.18	8.97	6.86	55.32

Note:
ASL = Above Sea Level
mbTOP = metres below top of pipe
NA – not applicable

A groundwater flow diagram was not constructed since water levels can only be measured from one monitoring well. Based on historical groundwater data completed by Golder (when more wells / data was available), the groundwater flow was interpreted to be in a northern direction towards the South Nation River. However, groundwater flow near Ravine 1 is influenced by the ravine and diverted towards Ravine 1. Monitoring well G99-6 is considered representative of the groundwater entering Ravine 1 and contributing to surface water runoff for Ravine 1.

5.3. Groundwater Quality

Groundwater monitoring well G99-6 is located in the northwest corner of the landfill near Ravine 1. Monitoring well G99-6 is interpreted to contribute to groundwater discharge into Ravine 1. Therefore, groundwater quality at this monitoring well represents the groundwater chemistry that contributes to Ravine 1 surface water runoff. As a result, the analytical results for the groundwater sample(s) were compared to the PWQO for discussion purposes as requested by the MECP in 2005. Analytical results for the current sampling program are summarized in Appendix C.

It is noted that the groundwater samples to be analysed for metal parameters were field filtered, therefore the results obtained were for dissolved metals and the PWQO surface water guidelines are for total metals (i.e., non-filtered).

5.3.1. Groundwater Results compared to PWQO

The 2021 groundwater analytical results are presented in Appendix C. The Certificates of Analysis are presented in Appendix E. Since groundwater discharges to the surface water in Ravine 1, the analytical

results for the groundwater sample(s) collected from G99-6 were compared to the PWQO for discussion purposes. Table 5.2 (below) is a summary of the groundwater exceedances.

Table 5.2: Groundwater compared to PWQO (2021)

ID	Location	Above PWQO standards
G99-6	Northwest corner of landfill near Ravine 1	Aluminum, boron, copper, phosphorus and zinc

Note:
PWQO – Provincial Water Quality Objectives

Based on a review of the data, phosphorous continues to exceed the applicable PWQO criteria The concentrations of key indicator parameters such as boron, iron, TDS, sulphate, chloride, and sodium have all been relatively consistent and do not show any significant trends. This would suggest that there are no variations in the leachate plume.

The continued presence of leachate indicator parameters suggests potential minor landfill leachate impacts to the surface water quality in Ravine 1, as evidenced by elevated levels of aluminum, boron, copper, phosphorus, and zinc. However, the concentrations are relatively consistent and no evidence of increased leachate impact is observed.

EXP does note that the elevated copper concentrations are not present in the duplicate sample and may be indicative of sampling procedures / suspended solids in the well. As such, there is the potential that some of the elevated metal concentrations stem from higher suspended solids.

6.0 Landfill Gas Monitoring

6.1. Landfill Gas Monitoring

In most landfills, a significant quantity of gas is generated as the waste within the landfill decomposes. The generated gases vary dependent upon the stage of decomposition and the characteristics of the waste. Carbon dioxide and methane typically make up about 65 to 100% of municipal landfill gas (Bagchi, 1990).

Depending upon the age of the landfill and the volume and nature of the waste, this gas production can result in serious fire and explosion hazard. It is important to monitor the concentrations of methane in the immediate vicinity of the waste area to ensure that methane is detected before explosive concentrations are reached. In the event that significant quantities of methane are detected, measures can be taken to control the gas. These measures customarily take the form of relief wells constructed into the waste. The methane rising within the wells can be flared, or in cases of high methane production, collected for other uses.

Under Ontario Regulation 232/98, specified methane concentration limits include:

- Less than 1.0% methane gas in an on-site building, or its foundation;
- Less than 2.5% methane gas in the subsurface at the property boundary; and,
- Less than 0.05% percent methane (i.e. not present) in a building, or its foundation, which is located off-site.

Monitoring of landfill gas migration is not normally required where the assessment shows there is no significant potential for methane to migrate below land surface to adjacent or to the off-site properties, or into buildings or enclosures on-site or off-site. Nevertheless, The Nation Municipality monitored the landfill gas from the on-site wells on October 22, 2021.

The Nation Municipality conducted the landfill gas monitoring program using the GEM 5000 Landfill Gas Monitor, which measures for methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) and the results are summarized below.

The gas levels are then compared against Ontario Regulation 232/98 standards for methane gas levels of 2.5%, which is the criteria for methane at the property boundary.

Table 6.1: Landfill Gas Monitoring Summary (%) 2021

Well No.	CH_4	CO_2	O_2	H_2S	CO
G99-5	0.1	0.9	21.1	0	0
G99-6	0.1	0.5	21.2	0	0

Based on a review of the landfill gas monitoring summary, elevated methane levels are not measured and/or being generated at the landfill site.

EXP assessed the concentrations against the limit of 2.5%, and all methane levels were below the 2.5% methane (i.e. non-detect). Based on the above, EXP does not consider there to be a concern regarding methane production at the site.

7.0 Surface Water Quality

7.1. Surface Water Monitoring Program

The Nation Staff collected surface water samples from all of the sampling locations on May 19 and October 22, 2021. The following is a general summary of the surface water conditions during the 2021 sampling program:

South Nation River:

- SW 7: Water appeared to be cloudy in the spring but more clear in the fall. The depth of the water at the sampling location was estimated to be 0.3 m in the spring and unknown in the fall, with a channel width of 27 to 30 m. The October sample was collected from the Nation River where the ravine enters the river
- The historical flow in the South Nation River north of the Site is more than 5,000 m^3/min. EXP is not aware of any drought or high water conditions that would alter that flow rate in 2021.

Low Lying Marsh Area:

- SW 17: Water appeared to be clear to brown. The depth of the water was estimated to be 0.6 m, with a width of 1 m in May to 10 m in October with no flow or stagnant conditions.

Ravine 1:

- No surface water sample was collected, due to dry conditions (ie. not sufficient water to sample). However, monitoring well G99-6 was interpreted to contribute to groundwater discharge into Ravine 1. Therefore, groundwater quality at this monitoring well represents the groundwater chemistry that contribute to Ravine 1 surface water runoff.

Ravine 2:

- SW 3: Water appeared to be clear. The depth of the water was estimated to be 0.25 m, with a channel width of 2.8 in May to 30 m in October. The October sample was collected from the Nation River where the ravine enters the river.
- The historical flow in Ravine 2 at SW 3 ranges between 0.002 m^3/min to 0.6 m^3/min, based on historical measurements completed by Golder from 2005 to 2016. The flow in the ravines vary significantly based on snow melt and rain events.

Ravine 3:

- SW 18: Water appeared to be yellowish to clear. The depth of the water was estimated to be at least 0.25 m, with a channel width of 2.8 m to 30 m. The October sample was collected from the Nation River where the ravine enters the river.
- The historical flow in Ravine 3 at SW 18 ranges between no flow (dry conditions) to 0.25 m^3/min, based on historical measurements completed by Golder from 2005 to 2016. The flow in the ravines vary significantly based on snow melt and rain events.

There was no visual or olfactory evidence of leachate impact (such as a sheen or odours) within the surface water from any location. Measurements of pH, temperature and conductivity were also measured in the field for each sample collected.

7.2. Surface Water Results

The analytical results of the surface water samples were compared against the MECP Policies, Guideline, PWQO, July 1994. In addition to comparing the water quality results to the PWQO, EXP also reviewed the analytical results to assess trends between surface water sampling locations and to establish yearly trends. The 2021 surface water analytical results are summarized in Appendix D. The Certificates of Analysis are presented in Appendix E. Table 7.1 below summarizes any exceedances above the PWQO.

Table 7.1: Surface Water PWQO Exceedances (2021)

ID	Sample Location	Spring	Fall
South Nation River			
SW 7	Background, approx. 130 m upgradient of landfill	Phosphorus	Phosphorus
Low lying marsh area			
SW 17	Background for Ravine 2, approx. 95 m upgradient of landfill	Phosphorus	pH and phosphorus
Ravine 2			
SW 3	Just before it discharges to the South Nation River	Copper, phosphorus	Copper, phosphorus
Ravine 3			
SW 18	Just before it discharges the South Nation River	Phosphorus	Phosphorus

Based on a review of the surface water PWQO exceedances, it is event that exceedances are consistently present for phosphorous. Given that the phosphorus is present in upgradient stations in the South Nation River and consistently measured, it is anticipated that the phosphorus is naturally occurring and is not considered a surface water exceedance for the discussion below. Copper and pH were observed as exceendances at other sampling locations and discussed further below.

South Nation River (SW7):

The upstream surface water sample location SW 7 had PWQO exceedances for phosphorus which is considered to be naturally occurring. The concentrations of the key indicator parameters (boron, chloride, hardness, sulphate, total dissolved solids) were relatively consistent with previous results and did not exceed the PWQO or show notable leachate impact.

Low lying marsh area (SW17):

The sample location in the low-lying marsh area, SW 17 had exceedances for pH (October) and total phosphorous above the PWQO standards. The elevated pH reading in the fall was just slightly above the PWQO standard whereas phosphorous is considered to be naturally occurring. The concentrations of the key indicator parameters were relatively consistent with previous results and did not exceed the PWQO and do not show leachate impact.

Ravine 2 (SW3):

The surface water sample location SW 3 exceedances above the PWQO standards for copper and phosphorus. Copper was present in similar concentrations in 2017 and 2019, which suggest that its variable in nature and not necessarily indicative of landfill leachate impact.

Based on the current and historical results, the concentrations of the key indicator parameters (boron, chloride, sulphate, total dissolved solids) were relatively consistent with previous results and do not suggest notable leachate impacts.

Ravine 3 (SW18):

The exceedances above the PWQO standard for phosphorus in the spring and fall are considered likely to be naturally occurring.

When comparing the current results against previous data, the concentrations of the key indicator parameters (boron, chloride, sulphate, total dissolved solids) were relatively consistent. Therefore, this location has not likely been impacted by landfill leachate.

7.3. Surface Water Compliance

The surface water quality of South Nation River in the background sample SW7 displayed concentrations of phosphorous that exceeded the PWQO, thus suggesting that phosphorous is naturally occurring and is not indicative of leachate impact although it exceeds the PWQO. For this surface water quality assessment, it is considered that MOE, 1994 Policy 2 applies to the site. Policy 2 indicates “Water quality which presently does not meet the Provincial Water Quality Objectives shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the Objectives”.

In conclusion, the landfill is in compliance with respect to surface water quality, since it does not appear that surface water from Ravine 2 and Ravine 3 have been impacted by landfill leachate and the discharge from Ravine 2 and Ravine 3 is unlikely to increase the total contaminant load in the South Nation River due to the large volume of flow and the minor concentrations of the PWQO exceedances.

8.0 Conclusions and Recommendations

Based on the results of the 2021 groundwater and surface water monitoring program at Central Landfill, the following conclusions are provided:

- The surface water monitoring program included the collection of surface water from four (4) surface water monitoring locations in the spring and fall.
- The surface water sample location SW 3 (Ravine 2) exceeds the PWQO standards for copper and phosphorus. Copper was present at similar concentrations in 2017 and 2019, which suggests that it may be sporadic and not necessarily indicative of landfill leachate impact.
- The estimated flow from Ravine 2 and Ravine 3 was 0.9 m^3/min based on the measured historical ranges. Given that the historical flow in the South Nation River north of the Site is more than 5,000 m^3/min, the surface water discharge from Ravine 2 and Ravine 3 has little impact to the surface water quantity / quality of the South Nation River.
- In conclusion, the landfill is in compliance with respect to surface water quality, since it does not appear that Ravine 2 and Ravine 3 have been impacted by landfill leachate and there is no impact to the South Nation River.
- Since groundwater discharges to the surface water in Ravine 1, the analytical results for the groundwater sample from G99-6 was compared to the PWQO for discussion purposes. The groundwater quality from G99-6 has displayed relatively consistent concentrations for key indicator parameters such as boron, chloride, sulphate, and TDS. This is interpreted to be representative of the groundwater to surface water interaction, which indicates potential minor landfill leachate impacts to the surface water quality in Ravine 1 based on the boron concentration.
- The migration of methane at the site is not considered a concern as methane was not identified at elevated concentrations above 2.5% at the site in 2021.

9.0 Sampling Program

9.1. Groundwater Monitoring Program

It is suggested that the sampling and analysis be continued once per year in the fall. The following lists detail the parameters and sampling locations to be considered for the groundwater monitoring program.

9.1.1. Laboratory Measured Parameters

- ICP Metal Scan: calcium, magnesium, sodium, potassium, aluminum, barium, beryllium, boron, bromide, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, silicon, silver, strontium, thallium, tin, titanium, vanadium, zinc.
- Hardness (calculated from laboratory calcium and magnesium analyses), alkalinity, TDS, chloride, sulphate, nitrate, nitrite, total phosphorus, ortho-phosphate, ammonia, DOC, COD;

9.1.2. Field Measured Parameters

- Measurements of groundwater levels in all accessible monitoring wells (once a year in the fall);
- Measurements of temperature, conductivity, pH at each sample location

9.1.3. Sampling Locations

- G99-5 and G99-6

9.2. Surface Water Monitoring Program

It is suggested that the sampling and analysis be continued twice per year in the spring and fall. The following lists detail the parameters and sampling locations to be considered for the surface water monitoring program.

9.2.1. Laboratory Measured Parameter

- ICP Metal Scan: calcium, magnesium, sodium, potassium, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, manganese, molybdenum, nickel, silicon, silver, strontium, thallium, tin, titanium, vanadium, zinc
- Hardness (calculated from laboratory calcium and magnesium analyses) alkalinity, BOD, TDS, TSS, turbidity, chloride, sulphate, nitrate, nitrite, DOC, COD, TKN, ammonia, and total phosphorus.

9.2.2. Field Measured Parameters

- Measurements of temperature, conductivity, pH, dissolved oxygen at each sample location.
- Flow measurements; description of flow conditions and representative photographs at all sampling locations.

9.2.3. Sample Locations

- Ravine 2: SW 3; Ravine 3: SW 18; Low-lying marsh area: SW 17; South Nation River: SW 7.

10.0 References

- Bagchi, A. (2004), *Design of Landfills and Integrated Solid Waste Management*. Hoboken NJ: John Wiley & Sons.
- Department of Energy, Mines and Resources, *Topographic Map of Carleton Place, Ontario*: Map 31 F/1 Scale 1:50,000, Issued 1998.
- Geological Survey of Canada, *Surficial Geology – Carleton Place*: Map 1681A Scale 1:50,000, Issued 1990.
- Geological Survey of Canada, *Generalized Geology of Ottawa Hull*: Map 1508A, Scale 1:125,000, 1982.
- Ontario Ministry of the Environment, *Ontario Drinking Water Standards, Objectives and Guidelines*, Revised June 2006.
- Ministry of the Environment, April 1994, *The Incorporation of the Reasonable Use Concept in to the Ground Water Management Activities of the Ministry of the Environment.* Guideline B-7.
- Ontario Ministry of the Environment, 1994, Provincial Water Quality Objectives.
- Golder Associates Ltd., *2016 Surface Water Monitoring Program Central Landfill Site Nation Municipality*, March 2017.
- Golder Associates Ltd., *2015 Surface Water Monitoring Program Central Landfill Site Nation Municipality*, March 2016.

11.0 Closure

This report was prepared for the exclusive use of The Nation Municipality and the Ontario Ministry of the Environment and Climate Change. Any other party should not rely upon the contents of this report without the express written consent of EXP. Conclusions regarding the environmental conditions at this site are based solely on the extent of observations and the information referenced herein.

EXP has attempted to conduct the services reported herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied is included or intended in this document.

Appendix A:
Recent Certificate of Authorization / Provincial Officer Order

Ministry of the Environment
Ontario

REVISED
Provisional Certificate No.
A 471101

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

Under the Environmental Protection Act and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

Township of Cambridge,
R.R. #1,
St. Albert, Ontario.

THIS IS A TRUE COPY OF THE ORIGINAL CERTIFICATE MAILED ON June 14/82
Director

for the use and operation of a landfilling site

all in accordance with the following plans and specifications:

Located: Part of Lot 14, Concession 5,
Township of Cambridge,
Counties of Prescott & Russell.

which includes the use of the site only for the disposal of the following categories of waste (NOTE: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval) domestic, commercial, and 'other' limited to agricultural waste, wire and wood waste.

and subject to the following conditions:

1. No operation shall be carried out at the site after sixty days from this condition becoming enforceable unless this certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the site and a duplicate registered copy thereof has been returned by the applicant to the Director.
2. The wastes shall be compacted and covered at least once each month from April 15th to November 15th, inclusive, and at least four times during the remainder of the year.
3. The practice of open burning of municipal refuse at the landfill site shall be discontinued immediately.

Dated this 7th day of June, 1982.

Director, Section 38
Environmental Protection Act

Ontario

Ministry of the Environment / Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471101
Notice No. 1

Municipalité de la Nation
Received
AUG 16 2001
Reçu
The Nation Municipality

Corporation of the Nation Municipality
958 Highway 500 West
Casselman, Ontario
K0A 1M0

Site Location: Central Landfill
Lot 14, Concession 5, the former Township of Cambridge, Part 1 & 3 R.P. 4127
The Nation Municipality, United Counties Of Prescott & Russell

You are hereby notified that I have amended Provisional Certificate of Approval No. A471101 issued on June 7, 1982 for the use and operation of 3 hectare landfill within 16.37 hectare total Site area, as follows:

1. No waste shall be disposed of at the Central Landfill Site effective the issuance date of this Notice.

2. All work related to the closure of the Central Landfill shall be completed by August 31, 2002.

3. The Central Landfill Site shall be closed as per the closure plan and final contours indicated on Figure 5 of the 2001 supporting documentation prepared by Stantec Consulting Limited for the site. Groundwater and Surface Water monitoring shall be carried out as per Tables 4 and 5 of the same document.

4. Within six months of the issuance date of this Notice, The Nation Municipality shall install appropriate number of additional monitoring wells along the eastern boundary of the Central Landfill and submit justification for the number of wells and a map showing the location of the same to the District Manager, Cornwall Ditrict Office, Ministry of the Environment.

5. By August 31, 2002, the Corporation of the Nation Municipality shall address off-site leachate contamination so that the Central Landfill Site complies with the Reasonable Use Guideline of the Ministry of the Environment.

all in accordance with the application for Certificate of Approval dated February 22, 2001, and the supporting information and documentation prepared by Stantec Consulting Limited.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471101 dated June 7, 1982, as amended.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as

amended, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Appeal Board
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 1st day of August, 2001

Henry Jun, P.Eng.
Director
Section 39, *Environmental Protection Act*

TG/
c: District Manager, MOE Cornwall

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471101
Notice No. 2

The Corporation of The Nation Municipality
Rural Route, No. 3
Casselman, Ontario
K0A 1M0

Site Location: Central (Cambridge) Waste Disposal Site
1081 County Road 3
The Nation Municipality, United Counties of Prescott and Russell
K0A 1M0

You are hereby notified that I have amended Provisional Certificate of Approval No. A471101 issued on June 7, 1982 for the disposal of solid municipal waste, as follows:

6. Approval is hereby granted to increase the size of the waste disposal property for the Central (Cambridge) Landfill Site from 16.37 hectares to 22.73 hectares.

The reason for this amendment to the Certificate of Approval is as follows: The Nation Municipality has complied with Condition 5 of the Certificate by increasing the property size to include a 6.36 hectare Contaminant Attenuation Zone.

all in accordance with the June 30, 2004 letter from Golder Associates Ltd. and attached Figure No.1 (Leachate Attenuation Zone to the East) showing the new site area.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471101 dated June 7, 1982, as amended.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation toeach portion appealed.

The Notice should also include:

3. The name of the appellant;

4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of Environment and Energy
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 14th day of December, 2004

THIS NOTICE WAS MAILED
ON Dec. 17, 2004
9C
(Signed)

Ian Parrott, P.Eng.
Director
Section 39, *Environmental Protection Act*

TG/

c: District Manager, MOE Cornwall
M. Gauthier, M Sc., Project Manager, Golder Associates Ltd. ✓

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A471101
Notice No. 3
Issue Date: December 1, 2010

The Corporation of The Nation Municipality
958 Route 500 W
Rural Route, No. 3
Casselman, Ontario, K0A 1M0

Site Location: 1081 County Road 3
Part 1, Part 3, Reference Plan 4127
Lot Part of 14, Concession 5
The Nation Municipality, United Counties of Prescott and Russell, K0A 1M0

You are hereby notified that I have amended Provisional Certificate of Approval No. A471101 issued on June 7, 1982 and amended on August 1, 2001 and December 14, 2004 for a 3 hectare (closed) landfilling site within a total site area of 22.28 hectares , as follows:

In accordance with the Application for a Certificate of Approval for a Waste Disposal Site dated July 23, 2010, and supporting documentation prepared by Golder Associates dated July 22, 2010, the following Conditions are added to the Certificate:

7. The total Site area is reduced to 22.28 hectares from 22.73 hectares, acknowledging the transfer of a parcel of land containing Ravine 1 to the Corporation of the Village of Casselman.

8. The groundwater and surface water monitoring programs shall continue as per details outlined in Table 1 and Table 2 of the supporting documentation prepared by Golder Associates dated July 22, 2010.

9. The District Manager, Ontario Ministry of the Environment Cornwall District Office, shall from time to time, authorize modifications to the monitoring program.

The reason for this amendment is to acknowledge the transfer of a parcel of land containing Ravine 1 and the modifications to the groundwater and surface water monitoring program as a result of this transfer.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A471101 dated June 7, 1982 and subsequent amendments.

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* **Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 1st day of December, 2010

Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

NP/
c: District Manager, MOE Cornwall
Paul Smolkin, Golder Associates Ltd.

Ministry of the Environment

133 Dalton Avenue
P O Box 820
Kingston ON K7L 4X6

Ministère de l'Environnement

133 avenue Dalton
C P 820
Kingston ON K7L 4X6

51 KWCA05610
(52296)

Ontario

1-613/549-4000 1-800/267-0974 Fax: 613/543-6905

MEMORANDUM

June 17, 2005

TO: M. Robert
Sr. Environmental Officer
Cornwall Area Office
Eastern Region

FROM: F. Crossley
Hydrogeologist
Technical Support Section
Eastern Region

RE: 2004 Groundwater and Surface Water Monitoring Program
Central Landfill Site
Nation Municipality, A471101

Purpose

The purpose of this review is to evaluate the "2004 Monitoring Report" dated March, 2005 (received April, 2005) by Golder Associates Limited (GAL) with respect to Guideline B-7/B-9.

Summary

- The Central waste disposal site is a closed site thus Guideline B-7 is no longer applicable however Guideline B-9 is now in effect. In applying Guideline B-7, the Central waste disposal site is in conformance. The Central waste disposal site is in conformance with Guideline B-9.

- The hydrogeological conceptual model is leachate migration in the shallow surficial sand unit to the north (northwest and northeast) with limited vertical migration due to the underlying aquitard (silty clay unit). The shallow groundwater flow is to the northwest discharging to Ravine 1 which in turn flows to the South Nation River, another component to the north discharging to Ravines 2 and 3 which in turn flow to the South Nation River and another component to the northeast which flows to the South Nation River.

- The leachate impacted groundwater discharges to the surface water (drainage ditches and/or Ravine (1, 2 and 3) and/or South Nation River) due to the geology. Therefore the potential for leachate to impact the surface water quality is considered high.

MINISTRY OF THE ENVIRONMENT
JUN 21 2005

- The consultants proposed groundwater monitoring program is outlined in Table 7. The focus of the groundwater monitoring program is along the eastern boundary. Since the site is officially closed with a low permeable cover and the potential for non conformance with Guideline B-9 is negligible, the groundwater monitoring can be discontinued.

- The consultants may wish to re-continue the monitoring of G99-6 to determine leachate strength discharging to Ravine 1.

- The Nation Municipality and the Village of Casselman have to address the surface water impacts in the ravine/South Nation River as a joint venture as both landfills are contributing to the impacts.

Certificate of Approval

The Central waste disposal site operates under Certificate of Approval A471101. The site is located in Lot 14, Concession V, Geographic Region of Cambridge Township, Nation Municipality. The site is licenced for the use and operation of a landfill on 3 hectares within a total site area of 22.73 hectares. The area was increased from 16.37 hectares to 22.73 hectares to include a contaminant attenuation zone along the eastern licenced property (December, 2004). The site is licenced to receive domestic, commercial and other limited to agricultural waste, wire and wood waste. The site closed August 2001. The landfill operates as a naturally attenuating site.

Background

The adjacent property, directly to the west of the Central, is operated as a landfill (A471106) by the Village of Casselman. The present status of this site is "semi closed". The municipality wishes to "mothball" the site (Village of Casselman).

Geology

The consultants determined the geology to be:

- A silty sand unit ranging in thickness up to 4.0 metres (surficial sand unit).

- A silty clay unit with an average depth of approximately 22-32 metres below ground surface based on water well record information.

- A sand and gravel unit overlying bedrock (water well records).

- A bedrock unit consisting of limestone and is approximately 36 metres below ground surface (water well records).

- The maximum depth of the subsurface investigation is 10.4 metres (silty clay unit).

Hydrogeology

GAL determined the physical hydrogeological characteristics to be:

- The surficial sand unit is an upper groundwater bearing unit.
- The horizontal hydraulic gradient is 0.01.
- The estimated hydraulic conductivity (rising head) of the surficial sand unit is 8.3×10^{-5} to 4.2×10^{-4} cm/sec. with a geometric mean of 1.9×10^{-4} cm/sec.
- The shallow groundwater flow is to the northwest (towards Ravine 1), to the north (Ravines 2 and 3) towards the South Nation River and to the northeast (Figure 2).
- The silty clay unit is an aquitard.
- The estimated hydraulic conductivity (rising head) of the silty clay unit ranges from 2.3×10^{-6} to 7.0×10^{-5} cm/sec. with a geometric mean of 7.6×10^{-6} cm/sec. within the weathered zone with expected lower hydraulic conductivities in the intact zone (1×10^{-4} to 1×10^{-7} cm/sec.).
- The hydrogeological conceptual model is leachate migration in the surficial sand unit with limited vertical migration due to the underlying aquitard (silty clay unit) and discharging to the ravine (Ravine 1) which in turn discharges to the South Nation River.

Background Water Quality

Monitoring wells P4, G99-8, G00-3 and G00-4C are completed in the surficial sand unit and located upgradient of the waste. These monitoring wells have not been sampled since 2000. Monitoring wells G00-4A and G00-4B are completed in the silty clay unit and are located upgradient of the waste. The water quality in these monitoring wells appear to be representative of background water quality.

Leachate Quality

Chloride and boron have been determined to be the leachate indicator parameters at the site. These parameters are good conservative tracers of leachate.

Downgradient Water Quality

The focus of the groundwater monitoring program is to determine conformance along the eastern property boundary. Leachate impacts are evident in the following monitoring wells during 2004: P2; 99-7 (slight) and 02-3. The leachate impacts are within the monitoring well network and within the contaminant attenuation zone.

Guideline B-7/G-9

Guideline B-7 applies to operating waste disposal sites. The Central waste disposal site is closed and capped with a low permeable cover. Since the site is closed, Guideline B-7 no longer applies, thus Guideline B-9 is now in effect.

In applying Guideline B-7, the site is in conformance with the guideline. The south licenced property boundary is upgradient with respect to groundwater flow. The Provincial Water Quality Objectives apply to the north (South Nation River) and west (Ravine 1) licenced property boundaries as these boundaries are surface water. The eastern licenced property boundary has been determined (monitoring) to be conformance with the guideline.

In applying Guideline B-9, the site is in conformance. The potential for off-site impacts to existing wells is negligible as there are no downgradient wells located between the waste and the discharge point, thus Guideline B-9 is met.

Groundwater Monitoring

The groundwater monitoring program is outlined in Table 7. The proposed groundwater monitoring program for 2005 is a reduction from the 2004 monitoring program. The consultants intend to continue assessing the eastern property boundary.

F. Crossley, P.Geo.
/sh

c: B.W. Metcalfe
V. Castro
K. Hosler
File SI LU CA CV/GW-07-04, Cambridge Township (A471101)
FC/IDS #3835-6ASNDA

Ministry of the Environment

P.O. Box 22032
Kingston, Ontario
K7M 8S5
613/549-4000 or 1-800/267-0974
Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032
Kingston (Ontario)
K7M 8S5
613/549-4000 ou 1-800/267-0974
Fax: 613/548-6908

Ontario

MEMORANDUM

26 September 2011

TO: M. Seguin
Senior Environmental Officer
Cornwall Area Office
Eastern Region

FROM: B. W. Metcalfe
Senior Environmental Officer
Water Resources Unit, Surface Water Group
Technical Support Section
Eastern Region

RE: 2010 Surface Water Monitoring Program
Central Landfill
Part of Lot 14, Concession 5, Geographic Township of Cambridge
The Nation Municipality, United Counties of Prescott & Russell
Certificate of Approval No. A447101

I have reviewed the noted report dated February 2011, prepared by Golder Associates Limited (GAL) for the Corporation of the Nation Municipality and the following comments are offered relative to surface water impact concerns.

Site Background Information

The Central Landfill Site is located between Regional Road 3 (to the south) and the South Nation River (to the north), on Part Lot 14, Concession V, in the former Township of Cambridge in the Nation Municipality, Ontario. The Central Landfill Site is licensed under Provisional Certificate of Approval (C of A) A471101. The landfill site was licensed for the disposal of domestic, commercial and other waste limited to agricultural waste, wire and wood waste. The Central Landfill Site ceased receiving wastes on August 1, 2001, and closure works were completed between 2001 and 2002.

The adjacent property to the west of the Central landfill Site is a landfill site owned and operated by the Village of Casselman. Fill materials at the Casselman LFS consist of domestic waste.

Since the beginning of 2003, filling operations at the Casselman Landfill Site have been halted indefinitely and between 2003 and 2010, all waste intended for landfilling from the Village of

Casselman was diverted to the Laflèche Environmental Inc. Eastern Ontario Eastern Handling Facility (EOWHF); therefore no waste disposal occurred at the site. Closure-related activities including, the re-shaping of waste materials and covering activities were completed in the summer of 2005. The Village of Casselman Landfill Site will be maintained in a "mothballed" condition over the period of the contract with Laflèche Environmental Incorporated (LEI). While the Casselman LFS remains in a mothballed status, environmental monitoring will continue at the Village of Casselman Landfill Site as stipulated per conditions of the amended Certificate of Approval No. 3931-4ZVJVR for the purpose of evaluating temporal trends in water levels, and in the ground water and surface water quality at the site.

An issue of concern has been that surface water discharging from the Casselman Landfill property contributes to leachate impacts to surface water discharging the South Nation River via Ravine No.1 that flows along the property boundary between the two landfills, but discharges on Central Landfill Site property. In late 2008 and early 2009, a leachate collection system was constructed by the Corporation of the Village of Casselman at the Casselman Landfill Site, which included the installation of a 100 m^3 capacity storage tank to collect leachate impacted surface runoff and groundwater from the former gully and the eastern ravine. The water collected in the tank is then pumped out and hauled off-site by tanker truck to the Village of Casselman sewage pumping station where it is then pumped to the Village of Casselman Lagoon for disposal.

On December 7, 2009, an agreement was signed between the Nation Municipality and the Village of Casselman to convey ownership of the land encompassing Ravine No. 1, such that the impact of the Casselman Landfill leachate in Ravine No. 1 will no longer constitute a state of non-compliance related to surface water impacts for the Central Landfill Site.

On December 1, 2010, the Township received Amending Notice No. 3 to Certificate of Approval No. A471101, acknowledging the transfer of a parcel of land adjacent to the Central Landfill property to the west, containing Ravine No. 1, to the Village of Casselman. The conveyance of ownership of the land encompassing Ravine No. 1 to the Village of Casselman results that the impact of the Casselman Landfill leachate in Ravine No. 1 no longer affects the state of compliance related to surface water impacts for the Central Landfill Site. Additionally, there is a reduction in the surface water monitoring program for the Central Landfill Site as a result of the noted land transfer transaction.

Surface Water Regime

The surface water of concern to be protected relative to the egress of landfill site leachate impacted waters is the South Nation River located north of and immediately adjacent to the landfill site.

There are two ravines which direct surface water from the site to the South Nation River. Ravine No. 2 is located approximately 185 metres east of the western property boundary of the Central

LFS. It discharges surface water into the South Nation River. The surface water in Ravine No. 2 is now derived primarily from the upgradient marsh, rather than from leachate impacted surface water (LISW). The second on-site ravine, identified as Ravine No. 3, is located approximately 105 metres east of the western property boundary of the Central LFS. It originates at the crest of the slope to the South Nation River. Ravine No. 3 has no definite surface water flow channel, but rather consists of ephemeral groundwater seeps.

2010 Surface Water Sampling Program

The purpose of the 2010 surface water sampling program was to assess impact to the South Nation River attributed to the adjacent Central Landfill, in particular from the discharge of leachate impacted surface water from Ravine No. 2 into the river.

The 2010 surface water monitoring program for the Central LFS included bi-annual surface water monitoring at the stations located in the South Nation River (SW7) and Ravine No. 2 (SW3) and a bi-annual measurement of surface water flow in Ravine No. 2 (at SW3). Surface water samples were collected on April 27 and October 22, 2010.

2010 Surface Water Flow

Flow in Ravine No. 2 was observed in April and October 2010. Measured flow rates in 2010 ranged from 270 L/min (October) to 420 L/min (April).

Flow in Ravine No. 3 was observed in April and October 2010. Measured flow rate in April 2010 was 54 L/min. Flow was observed in October but could not be quantified due to obstruction by a large quantity of debris in the ravine drainage course. As in previous years, saturated ground conditions with shallow groundwater seeps were observed in Ravine No. 3 in both April and November.

2010 Surface Water Sampling Results

South Nation River, Upstream Background (SW-7):

Surface water sample station SW-7 is located upstream of the Central Landfill Site and is considered to be representative of background water quality conditions in the South Nation River.

The general chemistry surface water quality of the South Nation River upstream of the landfill site at SW7 during 2010 was characterized having BOD (< 2 mg/L), COD (19 mg/L), field Dissolved Oxygen (10.22 – 11.91 mg/L), field Conductivity (465 - 626 µS/cm), Chlorides (23 – 42 mg/L), field pH (7.71 – 8.53), Alkalinity (224 – 228 mg/L), Hardness (270 – 280 mg/L), Total Ammonia (<0.05 – 0.320 mg/L), Un-ionized Ammonia (<0.02 mg/L), Nitrates (1.6 – 2.9 mg/L), Total Phosphorus (0.030 – 0.055 mg/L), and Total Suspended Solids (< 10 – 21 mg/L).

PWQO exceedances were limited only for Total Phosphorus (0.055 mg/L, exceeded 0.03 mg/L) and Iron (0.8 mg/L, 0.30 mg/L).

Ravine No. 2 (SW3):

Surface water sampling station SW3 is located in Ravine No. 2, near where it discharges into the South Nation River.

The general chemistry surface water quality of Ravine No. 2 during 2010 was characterized having BOD (< 2 – 7 mg/L), COD (32 - 53 mg/L), field Dissolved Oxygen (8.45 – 12.66 mg/L), field Conductivity (631 – 965 µS/cm), Chlorides (21 – 62 mg/L), field pH (13.3 – 13.74), Alkalinity (386 – 391 mg/L), Hardness (370 – 380 mg/L), Total Ammonia (<0.05 – 2.5 mg/L), Un-ionized Ammonia (<0.02 – 0.107 mg/L), Nitrates (2.6 - 5 mg/L), Total Phosphorus (0.023 – 0.25 mg/L), and Total Suspended Solids (<10 - 160 mg/L).

PWQO exceedance occurred for Un-ionized Ammonia (0.107 mg/L, exceeded 0.02 mg/L), pH (8.62, slightly exceeded 8.5), Total Phosphorus (0.25 mg/L, exceeded 0.03 mg/L), Boron (0.21 mg/L, slightly exceeded 0.20), Cobalt (0.0013 – 0.0039 mg/L, consistently exceeded 0.0009 mg/L), Iron (4.8 mg/L, exceeded 0.30 mg/L) and Vanadium 0.011 mg/L, exceeded 0.006 mg/L).

- The surface water quality at SW3 during 2010 was interpreted to be marginally impacted by the Central Landfill Site.

Surface Water Quality Impact Assessment Summary

The reviewer is in basic agreement with GAL's surface water quality impact assessment for the Central Landfill Site. The surface water quality for Ravine No. 2 (SW3) appeared to be slightly impacted. Results of the April 2010 sampling session show elevated levels of several parameters, including unionized ammonia, phosphorus, chromium, cobalt, copper, iron and vanadium. GAL identified parameters at SW3 considered to be consistently exceeding background concentrations in the South Nation River (SW7) to include, alkalinity, barium, boron, cobalt, COD, conductivity, copper, DOC, hardness, nickel, potassium, silicon, sodium, TKN, organic nitrogen, and TDS.

Recommendations

- GAL had noted that background surface water quality in Ravine No. 2 has not been assessed. GAL had previously recommended in the 2005 monitoring report (Golder, 2006), sampling of the surface water in the low-lying marsh upstream of the fill area, for the purpose of establishing background conditions in Ravine No. 2, which was attempted as part of the 2006 monitoring program. However, no samples were collected from the marsh due to insufficient surface water. The reviewer would recommend that the landfill site Owner collect samples of the surface water in the low-lying marsh upstream of the fill area, for the purpose of establishing background conditions in Ravine No. 2, if sufficient surface water conditions permit.

- Flow in Ravine No. 3 was reported observed in April and October 2010. As in previous years, saturated ground conditions with shallow groundwater seeps were observed in Ravine No. 3 in both April and November. The reviewer recommends that, in future, the landfill site Owner collect surface water samples from the on-site Ravine No. 3 drainage course when flowing surface water conditions which discharge directly to the South Nation River are observed.

- The reviewer has no objection to the landfill site Owner's proposed surface water monitoring program for 2011, as presented in Table 4 of the 2010 Surface Water Monitoring Program Report, with the provision that the reviewer's above noted concerns are addressed i.e., include the addition of providing sampling of Ravine No. 2 upstream to establish background water quality data and sampling of Ravine No. 3 discharge when flowing surface water conditions occur to the South Nation River.

B.W. Metcalfe

Bruce Metcalfe
BWM/gl

c: F. Crossley
B. Metcalfe (Abate2011\aba4111.mem) 4606-8JNPXE \ X-ref. 2432-8JNPSV
File SW PR NA C5 03 06, Central Landfill Site, Nation Municipality
File SW 07 02 13 06 02, South Nation River

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Ontario

MEMORANDUM

02 May 2012

TO: Michael Seguin
Senior Environmental Officer
Cornwall Area Office
Eastern Region

FROM: B. W. Metcalfe
Senior Environmental Officer
Water Resources Unit, Surface Water Group
Technical Support Section
Eastern Region

RE: 2011 Surface Water Monitoring Program
Central Landfill
Nation Municipality
Provisional Certificate of Approval No. A471101

I have reviewed the noted report dated February 2012 prepared by Golder Associates Limited (GAL) for the Corporation of the Nation Municipality and the following comments are offered relative to surface water impact concerns.

Site Background Information

The Central Landfill Site is located between Regional Road 3 (to the south) and the South Nation River (to the north), on Part Lot 14, Concession V, in the former Township of Cambridge in the Nation Municipality, Ontario. The Central Landfill Site is licensed under Provisional Certificate of Approval (PC of A) A471101. The landfill site was licensed for the disposal of domestic, commercial and other waste limited to agricultural waste, wire and wood waste. The Central Landfill Site ceased receiving wastes on August 1, 2001, and closure works were completed between 2001 and 2002.

The adjacent property to the west of the Central Landfill Site is a landfill site owned and operated by the Village of Casselman. Fill materials at the Casselman LFS consist of domestic waste. Since the beginning of 2003, filling operations at the Casselman Landfill Site have been halted indefinitely and between 2003 and 2011, all waste intended for landfilling from the Village of Casselman was diverted to the Laflèche Environmental Inc., Eastern Ontario Eastern Handling Facility (EOWHF); therefore no waste disposal occurred at the site. Closure-related

activities including, the re-shaping of waste materials and covering activities were completed in the summer of 2005. The Village of Casselman Landfill Site will be maintained in an interim closure status (i.e., "mothballed" condition over the period of the contract with Laflèche Environmental Incorporated (LEI)). While the Casselman LFS remains in an interim closure status, environmental monitoring will continue at the Village of Casselman Landfill Site as stipulated per conditions of the amended Certificate of Approval No. 3931-4ZVJVR for the purpose of evaluating temporal trends in water levels, and in the ground water and surface water quality at the site.

An issue of concern has been that surface water discharging from the Casselman Landfill property contributes to leachate impacts to surface water discharging the South Nation River via Ravine No.1 that flows along the property boundary between the two landfills, but discharges on Central Landfill Site property. In late 2008 and early 2009, a leachate collection system was constructed by the Corporation of the Village of Casselman at the Casselman Landfill Site, which included the installation of a 100 m^3 capacity storage tank to collect leachate impacted surface runoff and groundwater from the former gully and the eastern ravine. The water collected in the tank is then pumped out and hauled off-site by tanker truck to the Village of Casselman sewage pumping station where it is then pumped to the Village of Casselman Lagoon for disposal.

On December 7, 2009, an agreement was signed between the Nation Municipality and the Village of Casselman to convey ownership of the land encompassing Ravine No. 1, such that the impact of the Casselman Landfill leachate in Ravine No. 1 will no longer constitute a state of non-compliance related to surface water impacts for the Central Landfill Site.

On December 1, 2010, the Township received Amending Notice No. 3 to Certificate of Approval No. A471101, acknowledging the transfer of a parcel of land adjacent to the Central Landfill property to the west, containing Ravine No. 1, to the Village of Casselman. The conveyance of ownership of the land encompassing Ravine No. 1 to the Village of Casselman results that the impact of the Casselman Landfill leachate in Ravine No. 1 no longer affects the state of compliance related to surface water impacts for the Central Landfill Site. Additionally, there is a reduction in the surface water monitoring program for the Central Landfill Site as a result of the noted land transfer transaction.

Previous Review Comments from Ontario Ministry of Environment

GAL stated that to date no comments had been received on the 2010 Surface Water Monitoring Program Report, Central Landfill Site (March 2011).

- The reviewer provided technical comments on the 2010 Surface Water Monitoring Program, Central Landfill Site (GAL, March 2011) in the memorandum dated September 26, 2011 from B. Metcalfe, Senior Environmental Officer, Water Resources Unit, Surface Water Group, Technical Support Section to M. Seguin, Senior Environmental Officer, Cornwall Area Office, Eastern Region.

Surface Water Regime

The surface water of concern to be protected relative to the egress of landfill site leachate impacted waters is the South Nation River located north of and immediately adjacent to the landfill site. Based on historical groundwater elevations at monitoring wells at the Central Landfill and the Casselman Landfill sites, the direction of groundwater flow is generally northerly towards the South Nation River.

There are two ravines which direct surface water from the site to the South Nation River. Ravine No. 2 is located approximately 185 metres east of the western property boundary of the Central LFS. The surface water in Ravine No. 2 is now considered to be derived primarily from an upgradient marsh, rather than from leachate impacted surface water (LISW). The second on-site ravine, identified as Ravine No. 3, is located approximately 105 metres east of the western property boundary of the Central LFS. It originates at the crest of the slope to the South Nation River. Ravine No. 3 has no definite surface water flow channel, but rather consists of ephemeral groundwater seeps.

2011 Surface Water Monitoring Program

The purpose of the surface water monitoring program is to assess impacts to the South Nation River attributed to the Central Landfill Site, in particular, from the discharge of leachate impacted water from Ravine No. 2. GAL noted that the water quality of Ravine No. 3 was not monitored during 2011.

Biannual surface water monitoring was carried out at surface water stations SW3 and SW7 on May 20 and November 21, 2011. The collected samples were analyzed for routine inorganic chemistry and metals parameters. Temperature, pH, conductivity and dissolved oxygen were measured in the field at the time of sample collection.

Surface Water Flow

Flow in Ravine No.2 was observed in May and November 2011. Measured flow rates in 2011 ranged from 16 L/min (November) to 557 L/min (May).

Flow in Ravine No. 3 was observed in both May and December of 2011. GAL reported however, that flow could not be quantified during these events due to the shallow depth of the stream.

2011 Surface Water Sampling Results

South Nation River, Upstream Background (SW-7)

Surface water sample station SW-7 is located upstream of the Central Landfill Site and is considered to be representative of background water quality conditions in the South Nation River.

The general chemistry surface water quality of the South Nation River upstream of the landfill site at SW7 during 2011 was characterized having BOD (< 2 mg/L), COD (21 - 26 mg/L), field Dissolved Oxygen (8.64 – 9.77 mg/L), field Conductivity (486 - 629 µS/cm), Chlorides (21 – 38 mg/L), field pH (7.84 – 8.8), Alkalinity (234 mg/L, November), Hardness (220 – 280 mg/L), Total Ammonia (<0.05 mg/L), Un-ionized Ammonia (<0.02 mg/L), Nitrates (1.7 – 2.5 mg/L), Total Phosphorus (0.038 – 0.058 mg/L), and Total Suspended Solids (< 10 mg/L).

PWQO exceedances were limited only for Total Phosphorus (0.038 – 0.055 mg/L, exceeded 0.03 mg/L), pH (8.8, exceeded 8.5, November) and Iron (0.45 mg/L, exceeded 0.30 mg/L, May).

Ravine No. 2 (SW3)

Surface water sampling station SW3 is located in Ravine No. 2, near where it discharges into the South Nation River.

The general chemistry surface water quality of Ravine No. 2 during 2011 was characterized having BOD (< 2 mg/L), COD (34 - 48 mg/L), field Dissolved Oxygen 10.5 – 14.95 mg/L), field Conductivity (570 – 996 µS/cm), Chlorides (19 – 61 mg/L), field pH (8.33 – 9.1), Alkalinity (441 mg/L, November)), Hardness (250 – 400 mg/L), Total Ammonia (0.09 – 0.17 mg/L), Un-ionized Ammonia (<0.02 mg/L), Nitrates (<0.1 – 2 mg/L), Total Phosphorus (0.042 – 0.13 mg/L), and Total Suspended Solids (<10 - 110 mg/L).

PWQO exceedance occurred for pH (9.1, exceeded 8.5, November), Total Phosphorus (0.042 – 0.13 mg/L, exceeded 0.03 mg/L), Aluminum (3.8 mg/L, significantly exceeded 0.075 mg/L, November), Barium (0.14 mg/L, slightly exceeded 0.1 mg/L, November), Chromium (0.011 mg/L, exceeded 0.001 mg/L Cr^{+6} and 0.0089 mg/L Cr^{+3}, November), Cobalt (0.004 mg/L, exceeded 0.0009 mg/L, November), Copper (0.009 mg/L, exceeded 0.005 mg/L, November), Iron (4.0 mg/L, exceeded 0.30 mg/L, November) and Vanadium 0.0091 mg/L, exceeded 0.006 mg/L, November).

- The surface water quality at SW3 during 2011 was interpreted by GAL to be marginally impacted by the Central Landfill Site and similar to that observed previously in 2010.

Surface Water Quality Impact Assessment

The background surface water quality of the South Nation River upstream of the landfill site (SW7) during 2011 was determined to have PWQO exceedances limited only for Total Phosphorus, pH and Iron. GAL identified the water quality of Ravine No.2 (SW3) during 2011 to exhibit parameters consistently exceeding background levels in the South Nation River (SW7) including ammonia, barium, boron, calcium, cobalt, COD, conductivity, copper, DOC, hardness, magnesium, nickel, potassium, silicon, sodium, TKN and TDS. PWQO exceedances were observed for total phosphorus, aluminum, barium, chromium, cobalt, copper, iron, vanadium and pH. It was GAL's assessment that the Ravine No. 2 surface water quality monitored at SW3 was marginally impacted to not impacted by landfill leachate.

It was GAL's assessment that the observations of the flow from Ravine No. 2 when routine biannual sampling event flow measurements were initiated commencing in April 2009 up to November 2011 ranged 29 L/min (Aug. 31/09) to 557 L/min (May 20/11) were such to suggest that Ravine No. 2 contributes little, if any, flow to the South Nation River. A review of the flow data monitored since 2009 showed Ravine No. 2 to show consistent streamflow discharge to the South Nation River.

Based on the water quality and quantity data referred to by GAL it was the consultant's overall conclusion that the landfill is in compliance with respect to surface water quality.

- It is the reviewer's opinion that the surface water quality characterized for Ravine No. (SW3) during 2011 would appear to have continued to be impacted to a limited degree as evidenced notably by the presence of several metals which exceeded their respective PWQOs. The reviewer does not support the consultant's surface water impact assessment conclusion as the surface water data particularly for Ravine No. 2 appears to show the water quality to be consistently impacted to a measured degree and that Ravine No. 2 appears to show consistent streamflow discharge to the South Nation River since it has been routinely measured since 2009.

Recommendations

The landfill site Owner proposed that the 2012 surface water monitoring program for the Central Landfill consist of surface flow estimates and collection and analysis of surface water samples from sample stations SW3 (Ravine No. 2) for the purpose of monitoring surface water quality discharging into the river from Ravine No. 2 and from SW7 (South Nation River, upstream background), biannually in the spring (March/April) and fall (October/November). The proposed monitoring frequency and parameter list is the same as that proposed in Table 2 of the supporting documentation included in the application to amend the C of A dated July 22, 2010, and referenced in C of A No. A471101, Amending Notice 3, dated December 1, 2010.

- The landfill site Owner should be referred to the reviewer's comments and recommendations regarding the surface water monitoring program for the Central Landfill which remain relevant and were previously presented in the memorandum dated September 26, 2011 from B. Metcalfe, Senior Environmental Officer, Water Resources Unit, Surface Water Group, Technical Support Section to M. Seguin, Senior Environmental Officer, Cornwall Area Office, Eastern Region.

Proposed Discontinuation of Monitoring at the Central Landfill Site

The landfill site Owner has additionally proposed that the post closure monitoring and the maintenance inspection program at the Central Landfill be discontinued following the completion of the 2012 monitoring program.

The reviewer would comment that landfill sites possess the potential to generate contaminants which are hazardous to humans, animals and plants and which can pollute and degrade the environment in the vicinity of the landfill site. Contaminant generation and migration from the landfill can continue for many decades after the closure of the landfill. Closure activities at the Central Landfill were completed in 2002; however, the landfill site Owner should not assume that the potential to generate contaminants will be eliminated after ten (10) years subsequent to site closure. The reviewer would comment that approval of land occupied by a landfill site after 25 years of formal closure in many instances is issued conditional upon the continuation of long-term monitoring and operation controls of landfill generated contaminants. The Central Landfill design is based on natural attenuation. The proximity of the Central Landfill being situated immediately adjacent the South Nation River, a significant surface water feature to be protected, and to which the river has been determined to be receptor to groundwater and leachate impacted groundwater discharge in addition to leachate impacted surface water discharging directly from the landfill site via Ravines No. 2 and No. 3. The Ministry considers cumulative effects of contaminants on the environment and notably the Central Landfill is situated immediately adjacent the Village of Casselman Landfill which is also located immediately adjacent the South Nation River.

- The Ministry uses a pre-cautionary, science-based approach in its decision making to protect human health and the environment. Relative to the above noted concerns it is the reviewer's considered opinion there is reasonable justification for the continued surface water monitoring program for the Central Landfill beyond the 2012 sampling year. The reviewer does not support the landfill site Owner's proposed discontinuation of the post-closure surface water monitoring program for the Central Landfill commencing in 2013.

Bruce Metcalfe
BWM/gl

c: F. Crossley
B. Metcalfe (Aba2012\aba1512.mem) 0075-8SZHFK \ X-ref. 2045-8S8SVF
File SW PR NM C5 03 06, Central Landfill Site, Nation Municipality
File SW 07 02 13 06 02, South Nation River

ec: P. Taylor
J. Ryan

Ontario

Ministry of the Environment
Ministère de l'Environnement

Closed Waste Disposal Site Inspection Report

Client:	The Corporation of The Nation Municipality Mailing Address: 958 Route 500 W, Rural Route, 3, Casselman, Ontario, Canada, K0A 1M0 Physical Address: 958 Route 500 W R.R. #3, The Nation, Municipality, United Counties of Prescott and Russell, Ontario, Canada, K0A 1M0 Telephone: (613)764-5444, Extension: 222, FAX: (613)764-3310, email: mmccuaig@nationmun.ca Client #: 8081-4GBRZH, Client Type: Municipal Government, NAICS: 913910 Additional Address Info: R.R. #3		
Inspection Site Address:	Central Landfill Address: Lot: Part of 14, Concession: 5, Part 1 Part 3 Reference Plan 4127 Lot 14 Concession 5 Part 1 & 3 R.P. 4127, Geographic Township: CAMBRIDGE, The Nation, Municipality, United Counties of Prescott and Russell, K0A 1M0 District Office: Cornwall GeoReference: Map Datum: NAD83, Zone: 18, Accuracy Estimate: 1-10 metres eg. Good Quality GPS, Method: GPS, UTM Easting: 490512, UTM Northing: 5018796, UTM Location Description: municipal landfill site, LIO GeoReference: Zone: , UTM Easting: , UTM Northing: , Latitude: 45.3212, Longitude: -75.1227		
Contact Name:	Mary McCuaig	**Title:**	Clerk
Contact Telephone:	(613) 764-5444 ext222	**Contact Fax:**	(613) 764-3310
Last Inspection Date:	2008/04/16		
Inspection Start Date:	2014/05/28	**Inspection Finish Date:**	2014/05/28
Region:	Eastern		

1.0 INTRODUCTION

The Ministry of the Environment's role in waste management is as a regulator. The Ministry fulfils this role by enforcing the requirements of the Environmental Protection Act, the Ontario Water Resources Act, as well as relevant waste management Regulations and Guidelines. The Ministry sets the operating standards for waste disposal sites (i.e. types of waste that can be received, geographical area serviced, monitoring and reporting programs) through legislation and Environmental Compliance Approvals (ECA(s)). The standards are designed by the Ministry to protect human health and the environment, therefore the Ministry is responsible for monitoring compliance and enforcing the standards. The Ministry conducts the monitoring and enforcement functions by responding to pollution incident reports, conducting field inspections of waste disposal sites, and by reviewing monitoring reports submitted by each landfill operator.

The Corporation of the Nation Municipality, previously referred to as the Township of Cambridge, owns and operates the Central Landfill Site, hereafter referred to as 'the site', located on Lot 14, Concession 5 in the Municipality of the Nation. Adjacent to the site is the Casselman landfill, owned and operated by the Village of Casselman under Environmental Compliance Approval (ECA) No. 3931-4AVJVR. The landfill provided disposal services between 1967 and 2000 to approximately 900 people, it was licensed for the disposal of domestic, commercial and other waste limited to agricultural waste, wire and wood waste. The total area of the site is 16.37 hectares with a waste disposal area of 3 hectares. On December 10th 1999, the Ministry of the Environment, advised the Municipality to proceed with the immediate closure because the site was in a Fill Beyond Approved Limits/Overfill situation. The landfill ceased to receive waste on August 1st, 2001 and closure works were completed between 2001 and 2002.

On May 28th 2014, Senior Environmental Officer, Michael Seguin, and summer student Stephanie Valade with the

Ontario Ministry of the Environment, conducted a solid non-hazardous waste disposal site inspection at the Central Landfill. The purpose of this inspection was to assess compliance with ECA No. A471101, the Environmental Protection Act (EPA), Ontario Regulation 232/98 and Ontario Regulation 347, as well as all other related waste management guidelines and policies. The main focus of this inspection was to ensure that no waste is being deposited on the site, that sufficient cover material has been applied and maintained on the waste, and that leachate runoff is managed as per requirements.

2.0 INSPECTION OBSERVATIONS

Certificate of Approval Number(s): ● Yes ○ No

ECA No. A471101 issued to the Corporation of the Nation Municipality on June 7th 1982. This ECA was amended three times:
-Notice No. 1 issued on August 1st, 2001 with regards to the closure of the landfill,
-Notice No. 2 issued on December 14th, 2004 with regards to increasing the size of the waste disposal site,
-Notice No. 3 issued on December 1st, 2010 with regards to groundwater and surface water monitoring programs, and to decrease the size of the waste disposal site.

2.1 FINANCIAL ASSURANCE

Ministry Guideline F-15: Financial Assurance identifies the criteria for the use of financial assurance by the Ministry to ensure that various regulatory requirements are met. This site is owned and operated by The Corporation of The Nation Municipality, therefore Financial Assurance is not required.

2.2 CLOSURE PLAN

As per Section 46 of the EPA, no land use should occur within the landfill for a minimum of 25 years following closure, or until the monitoring can demonstrate that the landfill no longer poses a threat to the environment, as approved by the Ministry. A closure plan was submitted as part of an application for an ECA amendment in February 2001. The closure plan written by Stantec Consulting Ltd. outlined the following requirements:

The intended final use of the north portion of the landfill is to return the land to natural vegetation that is visually compatible with the surrounding land use, and to use the south portion of the site for the construction of a lagoon to store leachate impacted water collected from the north limit. The leachate would be stored in the lagoon for a period of up to six (6) months until flow conditions within the South Nation river are favourable for its release. The lagoon was never constructed.

In the application to amend ECA No. A471101 prepared by Stantec Ltd. in 2001, the following site work, cleanup and improvements were also completed on site:

- Fill in depressions within the 30m wide east buffer, adjacent to the proposed fill area
- Improve the condition of the entrance road by adding granular to the base
- Cut and remove the existing trees and shrubs within the area to be shaped
- Excavate the existing waste from within the proposed lagoon location and deposit within the fill area
- Shape and compact waste to the contours shown in Figure 5 of the report
- Haul final cover material, spread, moderately compact to a thickness of 600mm, as per OPSS 570
- Spread seed over organic cover as per OPSS 572 specifications
- Excavate perimeter ditch to control runoff along the east and south sides of the fill area
- Remove existing soil stockpiles along the north limit
- Shape the construction and dry goods area and access road to retention structure
- Shape waste in Ravines 2 and 3
- A general cleanup of the site to remove debris and other waste types
- Replace the padlock and keys to the existing gate
- Removal of existing entrance sign and replacement with a new sign that indicates that the landfill is closed and no longer accepts waste
- Make repairs to existing fence along the south side
- Removal of culvert on access trail behind municipal office or installation of a gate to control unauthorized access
- Erect page wire fence along the east property limit

-As described in the application for an ECA for the closure of the Central Landfill the custodian shelter was to be removed from the site, however, at the time of the inspection the shelter was still located on the site. See Section 5.0 Actions Required.

-The closure plan was approved by the Ministry on August 1st, 2001 through an amendment notice No. 1 to Certificate of Approval Number A471101.

2.3 ACCESS CONTROL

The site can be accessed from the main entrance off Langlais Road just west of the Nation's municipal office and public works yard. A second entrance is located behind the municipal building. There is no fence around the landfill site, however, access to the site is limited by the South Nation River to the north, the Casselman landfill site to the west, and dense forest vegetation to the south and east.

-At the time of the inspection, access to the site was granted by the Nation Municipality. The roadway to the site was mostly covered in vegetation and broken tree branches. Figure 4 displays the visible vegetation on the path to the site. See Section 5.0 Actions Required.

-There is a sign at the main entrance which informs the public that the site is closed and is no longer receiving waste. At the time of the inspection, however, heavy vegetation was covering the sign, the site's ECA number was not printed on the sign, and the name shown on the sign was the Casselman landfill, as per Ministry records, the name of the site is Central Landfill. See Section 5.0 Actions Required.

-Section 46 of the Environmental Protection Act requires that no use be made of the land used for the disposal of wastes within a period of 25 years from the year in which it ceased to be used. Hunting equipment was observed on the north portion of the property. This equipment included a pile of wood covered by a red substance, a hunting camera was facing this pile of wood and a hunting stand was tied onto a nearby tree. See Section 5.0 Actions Required.

2.4 FINAL COVER

The closure of a landfill site requires the application of final cover to isolate the landfilled waste from surface exposure for public health and aesthetic reasons. As well, the final cover determines the infiltration of precipitation and thereby greatly influences the waste decomposition rate and long term management of leachate.

The Closure Plan for the Central Landfill which was approved as part of the August 1st, 2001 Notice to amend ECA No. A471101, required the application of a minimal final cover over the landfill site and the implementation of remedial measures that would collect, store and manage leachate generated from the site. The final cover design shall consist of a 600mm thickness of soil cover overlain by 150mm of organic material and seeded and was applied to the landfill during the year 2001.

-At the time of the inspection, sufficient cover material had been applied to the waste. Some observations were made at the south end of the property where some waste was beginning to protrude through the cover material. No actions are required at this time, however, the Municipality should ensure that all waste is sufficiently covered as to not create and environmental, health, or aesthetic problem.

2.5 LEACHATE CONTROL SYSTEM

This site does not require a leachate control system. However, many changes to on-site leachate management have been completed by the Municipality:

-In a letter dated September 23rd 2003 from the Nation Municipality, a portion of land on the east side of the landfill was to be sold to the Nation Municipality from private owners. This portion of land was to be used as a natural attenuation zone.

-In previous reports, (Golder, 2003) it has been shown that leachate discharging from the Casselman Landfill property contributed to leachate impacts of surface water discharging to the South Nation River via Raving No. 1 that flows between the two adjacent properties. In December 2009 a portion of land was sold to the Village of Casselman from the Central Landfill. This portion of land included Ravine No. 1, such that the impact of the Casselman Landfill leachate in Ravine No. 1 no longer affects the state of compliance related to surface water impacts from the Central Landfill site.

-At the time of the inspection, some leachate impacted water was observed at the north end of the property in stagnant water. No actions are required at this time, however, the Municipality should ensure that leachate impacts are mitigated as much as possible.

2.6 METHANE GAS CONTROL SYSTEM

Section 11.3 of Ontario Regulation 347 requires all landfill sites with a capacity of 1.5 million cubic metres or greater to install a gas collection and flaring system in those parts no longer receiving waste. This landfill does not fall under this requirement because its capacity is less than that of the 1.5 million cubic metres requirement.

-At the time of the inspection, landfill gas odours were not evident.

2.7 MONITORING PROGRAMS:

The 2012 Surface Water Monitoring Program submitted by Golder Associates outlines the groundwater and surface water program objectives:

Groundwater Monitoring
The groundwater monitoring program for compliance assessment at the Central Landfill site has been discontinued. However, for the purpose of determining the strength and composition of leachate impacted groundwater generated by the Central Landfill site, monitors G99-5 and G99-6 (located in the fill area east of Ravine No. 1) was completed as part of the 2012 monitoring program.

Surface Water Monitoring
The purpose of the surface water monitoring program is to assess potential impacts to the South Nation River attributed to the adjacent Central Landfill, in particular from the discharge of surface water from Ravine No. 2. the 2012 surface water monitoring program for the Central Landfill included biannual surface water monitoring at the stations location in the South Nation River (SW7) and Ravine No. 2 (SW3), and biannual measurements of surface water flow in Ravine No. 2 (at SW3).

-The overall condition of the on-site monitoring wells was good however, monitoring wells must be closed and locked when monitoring is not taking place. At the time of the inspection, one of the casing covering the monitoring well was open and none of the wells had a locking device to prevent unauthorized persons from accessing the well. See Section 5.0 Actions Required.

2.8 GROUND WATER/SURFACE WATER IMPACTS

Water Resources staff in the Ministry's Technical Support Section reviewed the 2012 Annual Monitoring Report for the Central Landfill and made the following comments in regards to the surface water and ground water impacts:

-The surface water of concern to be protected relative to the landfill site is the South Nation River located north of and immediately adjacent to the Central LFS. Based on historical groundwater elevations at monitoring wells at the Central Landfill and the Casselman Landfill sites, the direction of groundwater flow is generally northerly towards the South Nation River. There are two ravines which direct surface water from the Central LFS to the South Nation River. Ravine No. 2 is located approximately 185 metres east of the western property boundary of the Central LFS. The surface water in Ravine No. 2 is now considered to be derived primarily from an upgradient marsh, rather than from leachate impacted surface water (LISW). The second on-site ravine, identified as Ravine No. 3, is located approximately 105 metres east of the western property boundary of the Central LFS. It originates at the crest of the slope to the South Nation River. Ravine No. 3 has no definite surface water flow channel, but rather consists of ephemeral groundwater seeps.

-The background surface water quality of the South Nation River upstream of the landfill site (SW7) during 2012 was determined to have Provincial Water Quality Objectives (PWQO) exceedances limited only for Total Phosphorus, pH and Iron and as such was similar to 2011 water quality conditions. Golder identified the water quality of Ravine No.2 (SW3) during 2012 to have PWQO exceedances for unionized ammonia, total phosphorus and iron. The reviewer would note that unionized ammonia of 0.15 mg/L did significantly exceed the PWQO of 0.02 mg/L. The reviewer is in agreement with Golder's assessment that the Ravine No. 2 surface water quality monitored at SW3 was marginally impacted to not impacted by the landfill leachate. Based on the water quality and quantity data referred to by Golder, it was the consultant's overall conclusion that the landfill is in compliance with respect to surface water quality. The stream flow from Ravine No. 2 is relatively low (maximum discharge of 600 L/min) in comparison to the total flow in the South Nation River (7Q20 flow of 7,800 L/min). The reviewer concurs with Golder's assessment that the low volume discharge from the Central LFS Ravine No. 2 during 2012 was unlikely to significantly increase the total contaminant load as a result of the relative dilution effect afforded by the South Nation River receiving stream.

-Figures 6, 7, and 8 show a surface water pond located to the south of the property with some waste floating in the pond. Figure 9 from the site visit photographs displays leachate-impacted water. As previously mentioned by the Technical Support Staff, the low level of leachate will not have a significantly large impact on the South Nation River, therefore, no actions are required at this time.

2.9 Registration On Title:

On December 8th, 1988, the existence and location of the Central waste disposal site was registered on title. However, since the closure of the site, no new registration on title to this effect has occurred.

3.0 REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES

Based on prior file review, there are no previous non-compliance issues related to the Central Landfill.

4.0 SUMMARY OF INSPECTION FINDINGS (HEALTH/ENVIRONMENTAL IMPACT)

Was there any indication of a known or anticipated human health impact during the inspection and/or review of relevant material, related to this Ministry's mandate ?

No

Specifics:

Was there any indication of a known or anticipated environmental impact during the inspection and/or review of relevant material ?

No

Specifics:

Was there any indication of a known or suspected violation of a legal requirement during the inspection and/or review of relevant material which could cause a human health impact or environmental impairment ?

Yes

Specifics:

- One monitoring well located on the west portion of the property was observed to be unlocked and open, other monitoring wells observed on site were unlocked.

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material ?

No

Specifics:

Was there any indication of minor administrative non-compliance?

Yes

Specifics:

- Section 46 of the Environmental Protection Act requires that no use be made of the land used for the disposal of waste within a period of 25 years from the year in which it ceased to be used. Hunting equipment was observed at the north end of the property. The equipment included a pile of wood covered by a red substance, a hunting camera facing the wood and a hunting stand were also noted. It is suggested that this is bear bait.
- An application for an environmental compliance approval for the closure of the Central Landfill was submitted to the Ministry on February 28th 2011. In the report, Stantec described general site work and cleanup of the site, removing the custodian shelter was one of the recommendations, however, at the time of the inspection the shelter was still located on the site.

5.0 ACTION(S) REQUIRED

1. The sign at the entrance was covered in heavy vegetation, the ECA number was not displayed on the sign, and the name of the landfill on the sign was the Casselman landfill.

   The Ministry advises the Municipality to ensure that the sign is clearly visible by removing the vegetation which is obstructing the sign, that the ECA No. (A471101) is printed on the sign, and the name is changed from the Casselman landfill to 'Central Landfill'.

   By no later than July 31st 2014, The Corporation of the Municipality of the Nation must advise Ministry staff that the aformentioned recommendation has been completed.

2. In order to ensure that no contamination or damage occurs to the monitoring wells they must remain closed and locked when monitoring is not occuring. A monitoring well located on the west portion of the property was observed to be unlocked and open, other monitoring wells observed on site were unlocked.

   The Ministry advises the Municipality to ensure that all monitoring wells remain closed and locked when monitoring is not taking place.

   By no later than July 31st, 2014, please advise Ministry staff that the action previously mentioned has been completed.

3. Section 46 of the Environmental Protection Act requires that no use be made of the land used for the disposal of wastes within a period of 25 years from the year in which it ceased to be used. Hunting equipment was observed at the north end of the property, which included a pile of wood covered by a red substance, a hunting camera facing the wood and a hunting stand were also noted.

   By no later than June 30th 2014, please advise Ministry that the equipment has been removed from the site.

4. Site access is served by a road, at the time of the inspection, the access road was covered by heavy vegetation and broken tree branches.

   Please ensure that access to the site is clear, by removing and maintaining the access road.

   By no later than July 31st 2014, please advise Ministry staff that the aforementioned recommendation has been completed.

5. An application for an environmental compliance approval for the closure of the Central Landfill was submitted to the Ministry on February 28th 2001. In the report, Stantec described general site work and cleanup of the site, removing the custodian shelter was one of the recommendations, however, at the time of the inspection the shelter was still located on the site.

   Please ensure that all requirements outlined in this report have been completed by removing the custodian shelter located on the site.

   By no later than July 31st 2014, please advise Ministry staff that the aforementioned recommendation has been completed.

6.0 OTHER INSPECTION FINDINGS

Not applicable.

7.0 INCIDENT REPORT

Applicable
3667-9KKH5S

8.0 ATTACHMENTS

Site Visit Photographs.docx

PREPARED BY:
Environmental Officer:
Name: **Michael Seguin**
District Office: **Cornwall Area Office**
Date: **2014/06/17**
Signature

REVIEWED BY:
District Supervisor:
Name: **Tracy Hart**
District Office: **Cornwall Area Office**
Date: **2014/06/26**

Signature:

Tracy Hart.

File Storage Number: SI PR NA C5 610

Note:
"This inspection report does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they may apply to this facility. It is, and remains, the responsibility of the owner and/or the operating authority to ensure compliance with all applicable legislative and regulatory requirements"

Figure 1 – Monitoring well, NW quadrant of property

Figure 2 – Monitoring well, NW quadrant of property

Figure 3 – Monitoring well, west side of waste mound

Figure 4 – Entrance path to landfill site

Figure 5 – Final cover for the landfill area

Figure 6 – Pond located to the south of the landfill area

Figure 7 – Pond located to the south of the landfill area

Figure 8 – Uncovered waste located in the pond on the south end of the property

Figure 9 – Stagnant water located near Ravine 3

Figure 10 – Some uncovered waste on the east side of the waste mound

Figure 11 – Pile of wood covered by a red substance located to the south of the property

Figure 12 – What seems to be a hunting stand in a tree on the south end of the property

Figure 13 – Hunting camera facing the pile of wood (see Figure 11)

Figure 14 – Sign for the Central Landfill located at the entrance to the site

Figure 15 – Sign located at the entrance to the Central Landfill

Ministry of the Environment
and Climate Change

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Ministère de l'Environnement et de l'Action
en matière de changement climatique

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Ontario

M E M O R A N D U M

23 September 2015

TO: Melissa Lee
Senior Environmental Officer
Cornwall Area Office
Eastern Region

FROM: Bruce Metcalfe
Senior Environmental Officer
Water Resources Unit – Surface Water Group
Technical Support Section
Eastern Region

RE: 2014 Annual Monitoring Report – Central Landfill Site
Part Lot 14, Concession 5, geographic Township of Cambridge
The Nation Municipality
United Counties of Prescott and Russell
Environmental Compliance Approval (ECA) No. A471101

I have reviewed the noted report titled "2014 Surface Water Monitoring Program, Central Landfill, Corporation of the Nation Municipality", dated February 2015, prepared by Golder Associates (Golder) for the Corporation of the Nation Municipality. The following comments are offered relative to surface water impact concerns.

Site Background Information

The Central Landfill Site (LFS) is located between Regional Road 3 (to the south) and the South Nation River (to the north), on Part Lot 14, Concession V, in the former Township of Cambridge in the Nation Municipality, Ontario. The Central LFS is licensed under Provisional ECA A471101. The LFS was licensed for the disposal of domestic, commercial and other waste limited to agricultural waste, wire and wood waste. The Central LFS ceased receiving wastes on August 1, 2001 and closure works were completed between 2001 and 2002. The Central LFS is a closed LFS.

Village of Casselman Landfill Site

The adjacent property to the west of the Central LFS is the Casselman LFS owned and operated by the Village of Casselman. Fill materials at the Casselman LFS consist of domestic waste. Since the beginning of 2003, filling operations at the Casselman LFS have been halted indefinitely since 2003 and all waste intended for landfilling from the Village of Casselman was diverted to the Laflèche Environmental Inc. (LEI) Eastern Ontario Eastern Waste Handling Facility (EOWHF), therefore no waste disposal occurred at the Casselman LFS. Closure-related activities including the re-shaping of waste materials and covering activities were completed in the summer of 2005. The Casselman LFS will be maintained in an interim closure status i.e. "mothballed" condition over the period of the contract with LEI. While the Casselman LFS remains in an interim closure status, environmental monitoring will continue at the Village of Casselman LFS as stipulated per conditions of the amended ECA No. 3931-4ZVJVR for the purpose of evaluating temporal trends in water levels and in the ground water and surface water quality at the site.

On December 7, 2009, an agreement was signed between the Nation Municipality and the Village of Casselman to convey ownership of the land encompassing Ravine No. 1, such that the impact of the Casselman Landfill leachate in Ravine No. 1 will no longer constitute a state of non-compliance related to surface water impacts for the Central LFS.

On December 1, 2010, the Township received Amending Notice No. 3 to ECA No. A471101, acknowledging the transfer of a parcel of land adjacent to the Central LFS property to the west, containing Ravine No. 1, to the Village of Casselman. The conveyance of ownership of the land encompassing Ravine No. 1 to the Village of Casselman results that the impact of the Casselman Landfill leachate in Ravine No. 1 no longer affects the state of compliance related to surface water impacts for the Central LFS. Additionally, there is a reduction in the surface water monitoring program for the Central LFS as a result of the noted land transfer transaction.

Surface Water Regime

The surface water of concern to be protected relative to the egress of landfill site leachate impacted waters is the South Nation River located north of and immediately adjacent to the Central LFS. Based on historical groundwater elevations at monitoring wells at the Central LFS and the Casselman LFS, the direction of groundwater flow is generally northerly towards the South Nation River.

There are two ravines which direct surface water from the Central LFS to the South Nation River. Ravine No. 2 is located approximately 185 metres (m) east of the western property boundary of the Central LFS. The surface water in Ravine No. 2 is now considered to be derived primarily from an upgradient marsh, rather than from leachate impacted surface water (LISW). The second on-site ravine, identified as Ravine No. 3, is located approximately 105 m east of the western property boundary of the Central LFS. It originates at the crest of the slope to the South Nation River. Ravine No. 3 and has no definite surface water flow channel, but rather consists of ephemeral groundwater seeps.

Groundwater Monitoring

Based on historical groundwater elevations at monitoring wells at the Central LFS and the Casselman LFS, the direction of groundwater flow has been determined to be generally northerly towards the South Nation River.

Per the letter dated June 17, 2005, the MOE groundwater reviewer indicated that because the site is now closed, Guideline B-7 is no longer applicable to the site and Guideline B-9 is now applicable. It was further determined that since the site is closed and the potential for non-conformance with Guideline B-9 is negligible, the groundwater monitoring program was ultimately discontinued. For the purpose of determining the strength and composition of leachate impacted groundwater generated at the Central LFS, monitoring of groundwater monitoring well G99-6 (located in the fill area east of Ravine No. 1) was completed as part of the 2014 monitoring program. Monitoring of groundwater monitoring well G99-5 was attempted in 2014 but could not be located.

Golder reported that groundwater monitoring was competed at well G99-6 on November 28, 2014; however, Golder reported that for the sampling event it was observed that a small animal had fallen into the well and subsequently had decomposed. As a result, concentrations of ammonia, unionized ammonia, BOD, COD and DOC were significantly elevated compared to the historical range, i.e. not representative of groundwater quality conditions, but rather to atypical conditions specific to well G99-6 for the November 28, 2014 sampling event.

2014 Surface Water Monitoring Program

The purpose of the surface water monitoring program is to assess potential impacts to the South Nation River attributed to the adjacent Central LFS, in particular, from the discharge of leachate impacted water from Ravine No. 2 and Ravine No. 3.

Bi-annual surface water monitoring was carried out at surface water stations SW3, SW7, SW17 and SW18 on April 27 (spring) and November 27 (fall), 2014. Surface water stations SW17 and SW18 were observed to be dry on November 27, 2014 and therefore not sampled. The collected samples were analyzed for routine inorganic chemistry and metals parameters. Temperature, pH, conductivity and dissolved oxygen were measured in the field at the time of sample collection.

Ravine No. 2 (SW3):

Surface water sampling station SW3 is located in Ravine No. 2, just upstream of where it discharges into the South Nation River. Flow in Ravine No. 2 was observed in April and November 2014. The measured rate of flow in April 2014 was 36 L/min.

The general chemistry surface water quality of Ravine No. 2 during 2014 was characterized having BOD (<2 – 3 mg/L), COD (10 - 32 mg/L), field Dissolved Oxygen (8.02 – 12.16 mg/L), field Conductivity (517 – 738 µS/cm), Chlorides (34 – 50 mg/L), field pH (7.3 – 8.68), Alkalinity (270 - 380 mg/L), Hardness (300 – 370 mg/L), Total Ammonia (<0.050 – 0.300 mg/L), Un-ionized Ammonia (<0.02 mg/L), Nitrates (<0.10 – 3.9 mg/L), Total Phosphorus (0.033 – 0.20 mg/L), and Total Suspended Solids (<10 - 74 mg/L).

- Provincial Water Quality Objectives (PWQO) exceedance was observed for pH (8.68 exceeded 8.5, Nov. 28/14), Total Phosphorus (0.033 – 0.20 mg/L exceeded 0.03 mg/L), Cobalt (0.0016 mg/L exceeded 0.0009 mg/L, Nov. 28/14) and Iron (1.2 mg/L exceeded 0.3 mg/L, Nov. 28/14).

- Golder noted that the parameters which exceeded PWQO are not considered leachate indicator parameters for the Central LFS. The reviewer is in agreement with Golder's assessment that the surface water quality of Ravine No. 2 at SW3 during 2014 was interpreted to be marginally impacted by the leachate from the Central LFS.

Ravine No. 3 (SW18):

Surface water sampling station SW18 is located in Ravine No. 3, near where it discharges into the South Nation River. Flow in Ravine No. 3 is primarily due to ephemeral groundwater seepage and occurs only intermittently. The measured rate of flow in April 2014 was 251 L/min. Surface water sample station SW18 was able to be sampled in April 2014.

The general chemistry surface water quality of Ravine No. 3 for the April 27, 2014 sampling event was characterized having BOD (<2 mg/L), COD (35 mg/L), field Dissolved Oxygen (12.44 mg/L), field Conductivity (747 µS/cm), Chlorides (23 mg/L), field pH (6.61), Alkalinity (360 mg/L), Hardness (320 mg/L), Total Ammonia (8.1 mg/L), Un-ionized Ammonia (<0.02 mg/L), Nitrates (1.73 mg/L), Total Phosphorus (0.031 mg/L) and Total Suspended Solids (<10 mg/L).

- PWQO exceedance was observed for Total Phosphorus (0.031 mg/L slightly exceeded 0.03 mg/L), Cobalt (0.0012 mg/L exceeded 0.0009 mg/L) and Iron (0.55 mg/L exceeded 0.3 mg/L).

- Golder noted that the parameters which exceeded PWQO are not considered leachate indicator parameters for the Central LFS. The reviewer is in agreement with Golder's assessment that the surface water quality of Ravine No. 3 at SW18 during 2014 was interpreted to be marginally impacted by the leachate from the Central LFS.

South Nation River – Upstream of LFS (SW7):

Surface water sampling station SW7 is located approximately 130 m upstream of the eastern edge of the Central LFS, and approximately 330 m upstream of where Ravine No. 1 discharges into the South Nation River. Sample station SW7 is considered to represent background surface water quality in the South Nation River upstream of the LFS.

The general chemistry surface water quality of the South Nation River at SW7 during 2014 was characterized having BOD (<2 mg/L), COD (17 - 22 mg/L), field Dissolved Oxygen (8.89 – 11.58 mg/L), field Conductivity (889 - 1158 µS/cm), Chlorides (37 – 38 mg/L), field pH (7.03 – 8.64), Alkalinity (200 - 240 mg/L), Hardness (250 - 320 mg/L), Total Ammonia (0.077 – 0.290 mg/L), Un-ionized Ammonia (<0.02 mg/L), Nitrates (2.68 – 5.43 mg/L), Total Phosphorus (0.050 – 0.10 mg/L) and Total Suspended Solids (15 - 18 mg/L).

- PWQO exceedances were observed for pH (8.64 exceeded 8.5, Nov. 28/14), Total Phosphorus (0.05 – 0.10 mg/L exceeded 0.03 mg/L) and Iron (0.63 – 0.97 mg/L exceeded 0.30 mg/L).

- Based on the water quality data for the 2014 sampling events the surface water quality of the South Nation River it was determined that Policy 2 (Water Management – Policies, Guidelines, Provincial Water Quality Guidelines of the MOEE, July 1994), i.e. parameter concentrations naturally exceed the PWQO applies to the above noted parameters pH, Total Phosphorus and Iron. Policy 2 states that "water quality which presently does not meet the PWQO shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the objectives".

Surface Water Quality Impact Assessment Summary

The reviewer is in agreement with Golder's surface water quality impact assessment for 2014:

- PWQO exceedances in the South Nation River upstream of the Central LFS include pH, Total Phosphorus and Iron. MOECC Surface Water Management Policy 2 designation applies to these parameters. Policy 2 states that "water quality which presently does not meet the PWQO shall not be degraded further and all practical measures shall be taken to upgrade the water quality to the objectives".

- The water quality parameters identified to currently exceed the PWQO in the Ravine No. 2 and No 3 discharges to the South Nation River include pH, Total Phosphorus, Cobalt and Iron.

- The surface water quality sampling of Ravine No. 2 (SW3) and Ravine No. 3 (SW18) for 2014 indicates the surface water discharging from these on-site ravines is marginally impacted by landfill leachate.

- The Ravine No. 2 and No. 3 discharges are characterized to be seasonally ephemeral or primarily due to ephemeral groundwater seepage and occurs only intermittently. Observations of flow from Ravine No. 2 and Ravine No. 3 (600 L/min and 225 L/min, respectively) suggest that stream flow discharge from these ravines are relatively low in comparison to total low 7Q20 flow (7,800 L/min) in the South Nation River. The Ravine No.2 and No. 3 surface water discharges are unlikely to significantly increase the total contaminant load in the large volume of flow in the South Nation River.

Conclusions and Recommendations

The reviewer is in overall agreement with the with the surface water quality impact assessment and conclusions presented in the 2014 Surface Water Monitoring Program Report for the Central LFS.

- The surface water quality sampling of Ravine No. 2 (SW3) and Ravine No. 3 (SW18) for 2014 indicates the surface water discharging from these on-site ravines is marginally impacted by landfill leachate. The Ravine No. 2 and No. 3 surface water discharges are unlikely to significantly increase the total contaminant load in the large volume of flow in the South Nation River.

- The reviewer is in agreement with the proposed groundwater monitoring program for the purpose of characterizing the current leachate chemistry and the surface water monitoring program for determining the surface water quality impact for the 2015 monitoring year as presented in the 2014 Surface Water Monitoring Program Report for the Central LFS.

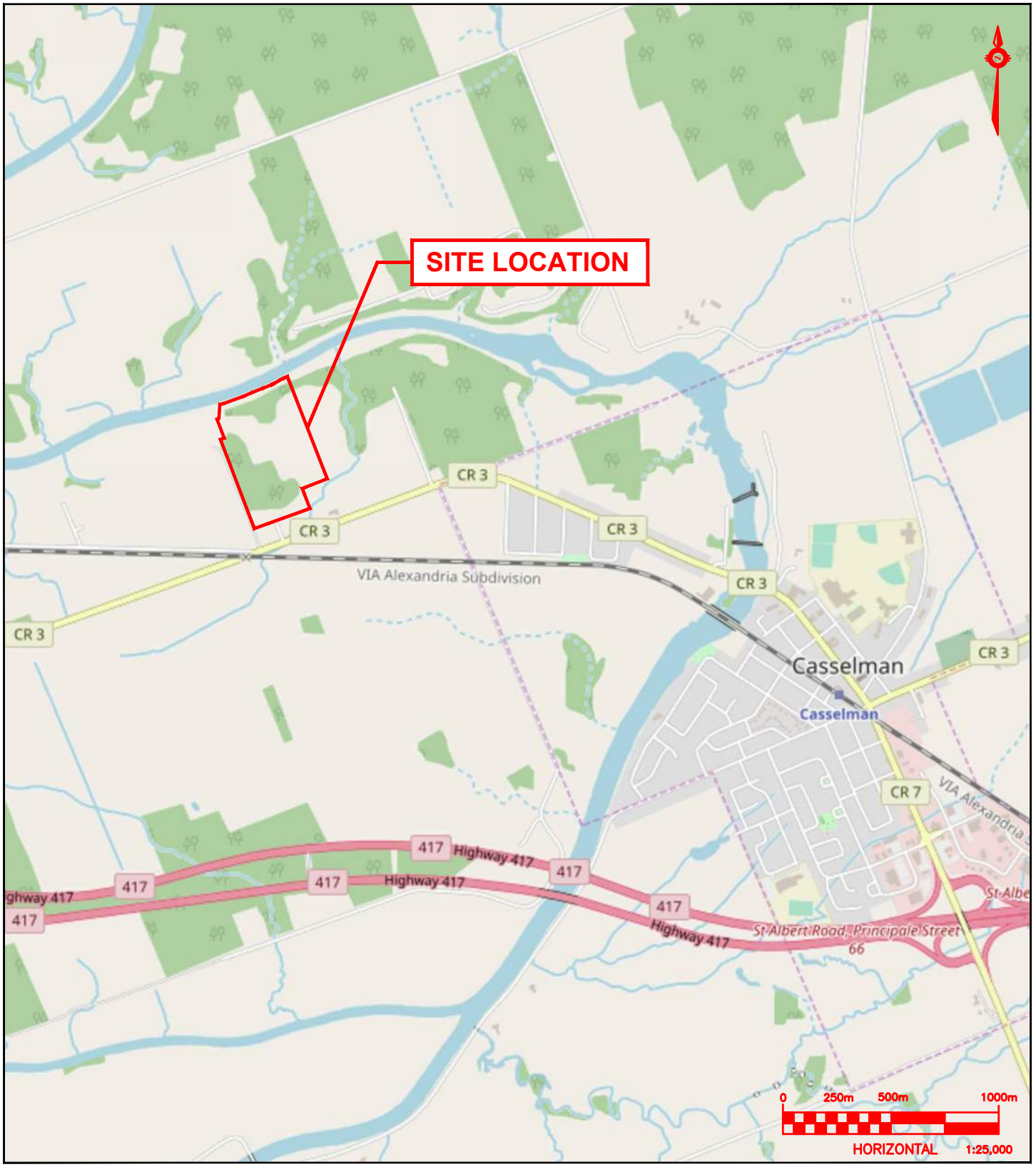
B.W. Metcalfe

Bruce Metcalfe
BWM/kh

ec: Michael Séguin, Cornwall Area Supervisor, MOECC Eastern Region
Greg Faaren, Water Resources Unit Supervisor, MOECC Eastern Region
Peter Taylor, Technical Support Services Manager, MOECC Eastern Region

c: Kyle Stephenson, Hydrogeologist, MOECC Eastern Region
Bruce Metcalfe (Aba2015\aba4415.mem) 4225-9Y2Q76 \ X-ref. 3141-9Y2Q76
File SW PR NA C5 03 06, Central Landfill Site, Nation Municipality
File SW 13 06 07 02, South Nation River

Appendix B: Figures



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scale 1:25 000	PROJECT: THE NATION MUNICIPALITY CENTRAL LANDFILL LOT 14, CONCESSION 5, PART 1 & 3 R.P. 4127	project no. OTT-00235901-A0
date MARCH 2022		design D.C. / checked R.R.
drawn by J.R.	TITLE: SITE LOCATION PLAN	FIG 1

Filename: e:\ott\ott-2102197-a0\60 execution\62 reports\central\235901-en.dwg
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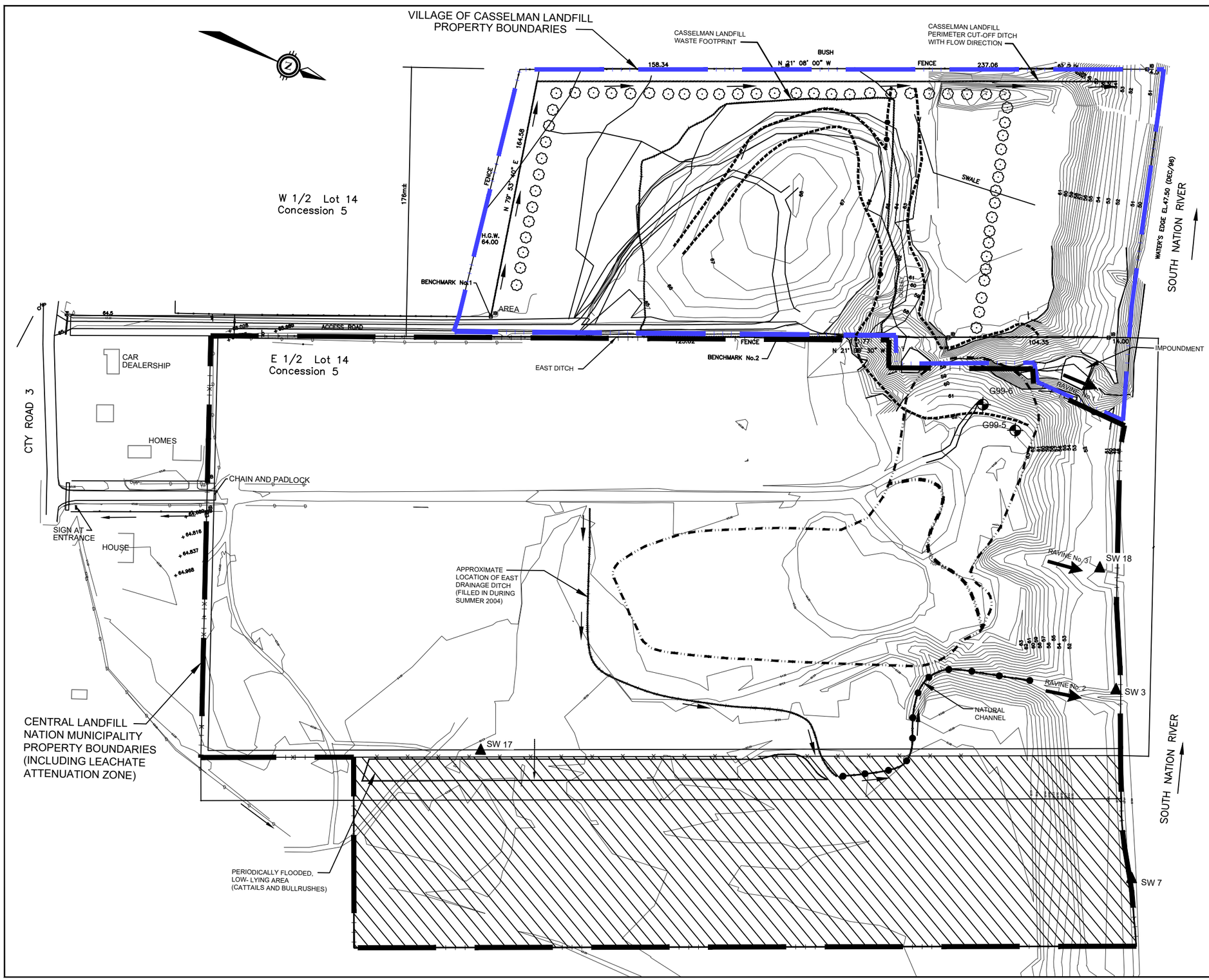

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BASE PLAN OBTAINED FROM GOLDER ASSOCIATES, PROJECT 1649522, PHASE 4000, FIGURE 2, ISSUED 2017-03-03.

LEGEND

- SURFACE WATER SAMPLING LOCATION IN PLAN
- PROPERTY PURCHASED BY NATION MUNICIPALITY IN SEPTEMBER 2003 REGISTERED AS A LEACHATE ATTENUATION ZONE IN 2004
- APPROXIMATE EXTENT OF CONSTRUCTION MATERIAL, DRY BRUSH, AND SAND/SILT/GRAVEL FILL MATERIALS
- APPROXIMATE EXTENT OF DOMESTIC WASTE
- GROUND SURFACE CONTOUR (STANTEC SURVEY, MAY, 2021)
- APPROXIMATE LOCATION OF RAVINE PRIOR TO FILLING OPERATIONS

SCALE
0 25m 50m 100m
HORIZONTAL 1:2500

CLIENT
THE NATION MUNICIPALITY

PROJECT
CENTRAL LANDFILL

TITLE
SITE PLAN

date: MARCH 2022	project no.: OTT-00235901-A0
design by: D.C.	drawing no.: FIG 2
prepared by: J.R.	
reviewed by: R.R.	

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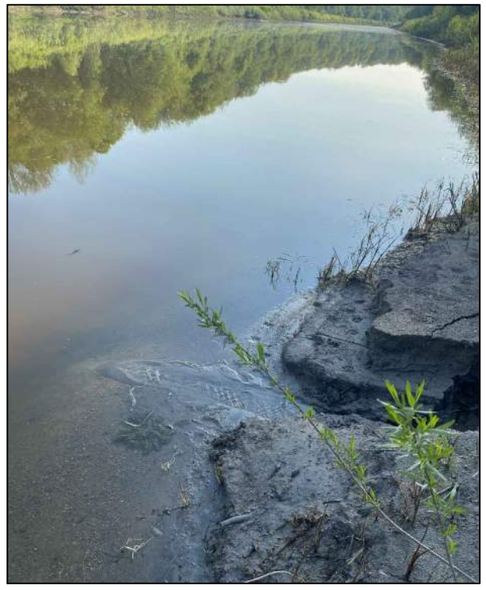
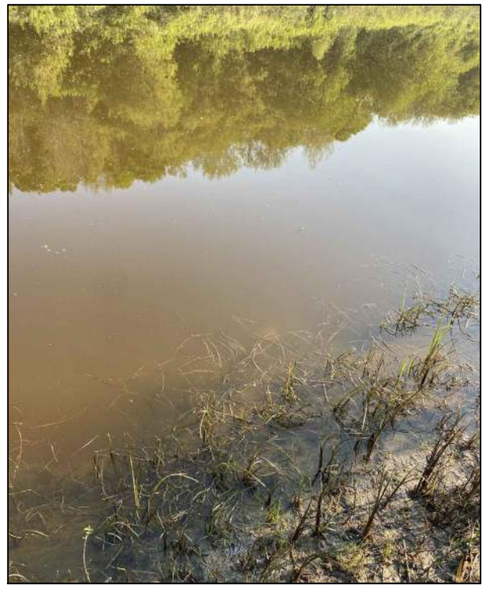


SW3



SW7

SW18

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scale: N.A.	CLIENT: THE NATION MUNICIPALITY CENTRAL MUNICIPAL LANDFILL	project no.: OTT-00235901-A0
date: MARCH 2022	TITLE: SURFACE WATER STATION PHOTOS SPRING 2021	FIG 3
drawn by: M.P.		

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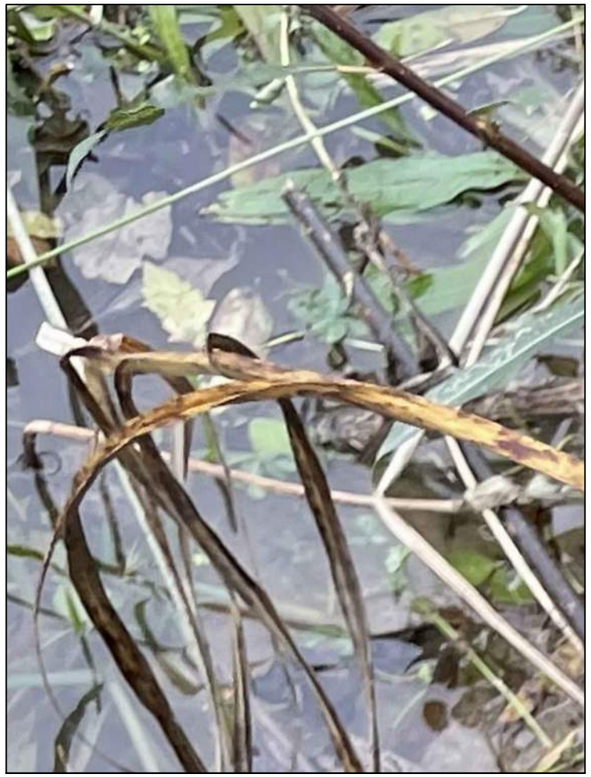
SW3



SW7

SW18

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date: MARCH 2022	TITLE: SURFACE WATER STATION PHOTOS FALL 2021	FIG 4
drawn by: M.P.		

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Appendix C:
2021 Summary of Groundwater Analytical Results

Parameter	Unit	PWQO [1]	G99-5 13-May-1999	G99-5 18-Oct-1999 [2]	G99-5 25-Jul-2000	G99-5 30-Oct-2000 [2]	G99-5 26-Oct-2005	G99-5 29-Nov-2006	G99-5 29-Nov-2007 [2]	G99-5 21-Nov-2008	G99-5 19-Oct-2009 [2] 99-5	G99-5 22-Oct-2010 [2] G99-5	G99-5 21-Nov-2011 [2] 99-5	G99-5 19-Nov-2012 [2] G99-5
General Chemistry														
Alkalinity (Total as CaCO3)	ug/l	-- [4]	334000	--	313000	--	--	679000	--	630000	--	--	--	--
Ammonia, unionized	ug/l	20	<20	--	<20	--	<20	<20	--	<20	--	--	--	--
Ammonia Nitrogen	ug/l	--	30	--	150	--	<50	230	--	<50	--	--	--	--
Biochemical Oxygen Demand, 5 Day	ug/l	--	--	--	<1000	--	--	<2000	--	<2000	--	--	--	--
Chemical Oxygen Demand	ug/l	--	24000	--	23000	--	--	22000	--	40000	--	--	--	--
Chloride	ug/l	--	31000	--	27000	--	30000	27000	--	35000	--	--	--	--
Conductivity	uS/cm	--	1000	--	1200	--	210	1650	--	1800	--	--	--	--
Dissolved Organic Carbon	ug/l	--	10400	--	8200	--	--	7900	--	13100	--	--	--	--
Hardness, Calcium Carbonate	ug/l	--	764000	--	850000	--	990000	990000	--	1100000	--	--	--	--
Nitrate as N	ug/l	--	<100	--	100	--	--	7000	--	1700	--	--	--	--
Nitrite as N	ug/l	--	<100	--	<100	--	--	<10	--	<10	--	--	--	--
pH	-	8.5	7.55	--	7.4	--	7.1	6.9	--	6.9	--	--	--	--
Phosphate	ug/l	--	<30	--	<10	--	--	--	--	--	--	--	--	--
Phosphorus	ug/l	-- [5]	**570**	--	**770**	--	--	**1600**	--	**1100**	--	--	--	--
Phosphorus (dissolved reactive)	ug/l	--	--	--	--	--	<50	<10	--	10	--	--	--	--
Sulphate	ug/l	--	403000	--	592000	--	--	354000	--	978000	--	--	--	--
Temperature	deg c	-- [6]	9	--	14	--	10.6	11.1	--	7	--	--	--	--
Total Dissolved Solids	ug/l	--	1004000	--	1340000	--	1270000	1370000	--	1600000	--	--	--	--
Metals														
Aluminum, dissolved	ug/l	-- [7]	<30	--	<50	--	26	5	--	<5	--	--	--	--
Barium, dissolved	ug/l	--	50	--	50	--	63	55	--	73	--	--	--	--
Beryllium, dissolved	ug/l	-- [8]	<10	--	<2	--	<0.5	<0.5	--	<1	--	--	--	--
Boron, dissolved	ug/l	200 [9]	**490**	--	**500**	--	**630**	**690**	--	**660**	--	--	--	--
Cadmium, dissolved	ug/l	0.2 [10]	<5	--	<0.1	--	<0.1	<0.1	--	<0.1	--	--	--	--
Calcium, dissolved	ug/l	--	240000	--	299000	--	310000	320000	--	340000	--	--	--	--
Chromium, dissolved	ug/l	-- [11]	40	--	<10	--	<5	<5	--	<5	--	--	--	--
Cobalt, dissolved	ug/l	0.9	<10	--	0.7	--	<0.5	<0.5	--	<3	--	--	--	--
Copper, dissolved	ug/l	5	<5	--	4	--	5	5	--	**6**	--	--	--	--
Iron, dissolved	ug/l	300	90	--	60	--	130	<50	--	<100	--	--	--	--
Lead, dissolved	ug/l	-- [12]	<2	--	<1	--	<0.5	<0.5	--	<0.5	--	--	--	--
Magnesium, dissolved	ug/l	--	40000	--	25000	--	54000	50000	--	55000	--	--	--	--
Manganese, dissolved	ug/l	--	10	--	<10	--	4	<2	--	<2	--	--	--	--
Molybdenum, dissolved	ug/l	40	<10	--	<10	--	2	2	--	1	--	--	--	--
Nickel, dissolved	ug/l	25	<10	--	<10	--	1	2	--	<5	--	--	--	--
Potassium, dissolved	ug/l	--	20000	--	23000	--	23000	22000	--	28000	--	--	--	--
Silicon, dissolved	ug/l	--	2600	--	3340	--	6300	5200	--	4800	--	--	--	--
Silver, dissolved	ug/l	0.1	<10	--	<0.1	--	<0.5	**0.2**	--	<0.1	--	--	--	--
Sodium, dissolved	ug/l	--	32000	--	22000	--	52000	34000	--	38000	--	--	--	--
Strontium, dissolved	ug/l	--	818	--	1020	--	1100	1200	--	1300	--	--	--	--
Thallium, dissolved	ug/l	0.3 [13]	<200	--	<1	--	<0.05	<0.05	--	<0.05	--	--	--	--
Tin, dissolved	ug/l	--	<50	--	<10	--	<1	<1	--	<1	--	--	--	--
Titanium, dissolved	ug/l	--	<10	--	<10	--	<5	<5	--	<5	--	--	--	--
Vanadium, dissolved	ug/l	6	<10	--	2	--	1	1	--	<1	--	--	--	--
Zinc, dissolved	ug/l	30 [10]	20	--	<10	--	<5	19	--	9	--	--	--	--

Parameter	Unit	PWQO [1]	G99-5 28-Nov-2014 [3] G99-5	G99-5 26-Oct-2015 [2] 99-5	G99-5 15-Nov-2016 [2] 99-5	G99-5 30-Oct-2017 [2] 99-5	G99-5 10/19/2018 [2] 99-5	G99-5 10/17/2019 [2] 99-5	G99-5 10/19/2020 [2] 99-5	G99-5 10/22/2021 [2] 99-5
General Chemistry										
Alkalinity (Total as CaCO3)	ug/l	-- [4]	--	--	--	--	--	--	--	--
Ammonia, unionized	ug/l	20	--	--	--	--	--	--	--	--
Ammonia Nitrogen	ug/l	--	--	--	--	--	--	--	--	--
Biochemical Oxygen Demand, 5 Day	ug/l	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	ug/l	--	--	--	--	--	--	--	--	--
Chloride	ug/l	--	--	--	--	--	--	--	--	--
Conductivity	uS/cm	--	--	--	--	--	--	--	--	--
Dissolved Organic Carbon	ug/l	--	--	--	--	--	--	--	--	--
Hardness, Calcium Carbonate	ug/l	--	--	--	--	--	--	--	--	--
Nitrate as N	ug/l	--	--	--	--	--	--	--	--	--
Nitrite as N	ug/l	--	--	--	--	--	--	--	--	--
pH	-	8.5	--	--	--	--	--	--	--	--
Phosphate	ug/l	--	--	--	--	--	--	--	--	--
Phosphorus	ug/l	-- [5]	--	--	--	--	--	--	--	--
Phosphorus (dissolved reactive)	ug/l	--	--	--	--	--	--	--	--	--
Sulphate	ug/l	--	--	--	--	--	--	--	--	--
Temperature	deg c	-- [6]	--	--	--	--	--	--	--	--
Total Dissolved Solids	ug/l	--	--	--	--	--	--	--	--	--
Metals										
Aluminum, dissolved	ug/l	-- [7]	--	--	--	--	--	--	--	--
Barium, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Beryllium, dissolved	ug/l	-- [8]	--	--	--	--	--	--	--	--
Boron, dissolved	ug/l	200 [9]	--	--	--	--	--	--	--	--
Cadmium, dissolved	ug/l	0.2 [10]	--	--	--	--	--	--	--	--
Calcium, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Chromium, dissolved	ug/l	-- [11]	--	--	--	--	--	--	--	--
Cobalt, dissolved	ug/l	0.9	--	--	--	--	--	--	--	--
Copper, dissolved	ug/l	5	--	--	--	--	--	--	--	--
Iron, dissolved	ug/l	300	--	--	--	--	--	--	--	--
Lead, dissolved	ug/l	-- [12]	--	--	--	--	--	--	--	--
Magnesium, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Manganese, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Molybdenum, dissolved	ug/l	40	--	--	--	--	--	--	--	--
Nickel, dissolved	ug/l	25	--	--	--	--	--	--	--	--
Potassium, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Silicon, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Silver, dissolved	ug/l	0.1	--	--	--	--	--	--	--	--
Sodium, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Strontium, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Thallium, dissolved	ug/l	0.3 [13]	--	--	--	--	--	--	--	--
Tin, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Titanium, dissolved	ug/l	--	--	--	--	--	--	--	--	--
Vanadium, dissolved	ug/l	6	--	--	--	--	--	--	--	--
Zinc, dissolved	ug/l	30 [10]	--	--	--	--	--	--	--	--

Parameter	Unit	PWQO [1]	G99-6 13-May-1999	G99-6 18-Oct-1999	G99-6 25-Jul-2000	G99-6 30-Oct-2000	G99-6 15-May-2003	G99-6 26-Oct-2005	G99-6 29-Nov-2006	G99-6 29-Nov-2007	G99-6 21-Nov-2008	G99-6 19-Oct-2009 99-6
General Chemistry												
Conductivity (field)	uS/cm	--	1400	1300	1750	1825	1910	240	1780	1450	2450	--
pH (field)	-	8.5	7	6.6	7.1	6.8	6.8	7.3	6.7	7.9	6.8	--
Temperature (field)	deg c	-- [6]	26	21	26	12	18	11.1	15.8	9.9	10	--
Alkalinity (Total as CaCO3)	ug/l	--	421000	509000	465000	470000	412000	--	574000	548000	510000	537000
Ammonia, unionized	ug/l	20	<20	<20	<20	<20	<20	<20	<20	<20	<20	--
Ammonia Nitrogen	ug/l	--	190	160	350	230	140	<50	70	110	<50	60
Biochemical Oxygen Demand, 5 Day	ug/l	--	--	--	3000	<1000	<1000	--	<2000	<2000	<2000	<2000
Chemical Oxygen Demand	ug/l	--	43000	41000	29000	29000	20000	--	25000	32000	25000	46000
Chloride	ug/l	--	49000	51000	38000	33000	39000	33000	33000	29000	35000	30000
Dissolved Organic Carbon	ug/l	--	15600	14600	11300	11100	8000	--	9600	10500	8300	12200
Hardness, Calcium Carbonate	ug/l	--	1128100	1183000	959000	1130000	1110000	1700000	990000	1200000	1500000	1300000
Nitrate as N	ug/l	--	<100	<100	<100	<100	<100	--	<100	<100	5500	900
Nitrite as N	ug/l	--	<100	<100	<100	<100	<100	--	<10	<10	<10	20
Phosphate	ug/l	--	<30	<30	<10	<30	240	--	--	--	--	--
Phosphate, Ortho	ug/l	--	--	--	--	--	--	--	--	--	--	--
Phosphorus	ug/l	-- [5]	**2000**	**1310**	**1110**	10	**1660**	--	**48**	**400**	**710**	**470**
Phosphorus (dissolved reactive)	ug/l	--	--	--	--	--	80	<50	<10	<10	<10	<10
Sulphate	ug/l	--	743000	665000	640000	621000	723000	--	546000	715000	635000	830000
Total Dissolved Solids	ug/l	--	1664000	1672000	1492000	1680000	1410000	2200000	1280000	1740000	1270000	1470000
Metals												
Aluminum, dissolved	ug/l	-- [7]	<30	<30	**110**	<50	<10	8	<5	<5	<5	<5
Barium, dissolved	ug/l	--	80	--	90	70	60	98	55	60	77	66
Beryllium, dissolved	ug/l	-- [8]	<10	<10	<2	<2	<1	<0.5	<0.5	<0.5	<1	<0.5
Boron, dissolved	ug/l	200 [9]	**1170**	--	**1030**	**900**	**970**	**1800**	**760**	**1000**	**1200**	**1100**
Cadmium, dissolved	ug/l	0.2 [10]	<5	<5	<0.1	<0.1	<0.1	**0.4**	0.2	**0.5**	**0.3**	0.2
Calcium, dissolved	ug/l	--	302000	319000	247000	312000	320000	440000	250000	330000	420000	360000
Chromium, dissolved	ug/l	-- [11]	<10	<10	<10	<10	7	<5	<5	<5	<5	<5
Cobalt, dissolved	ug/l	0.9	<10	<10	**1.7**	**1.3**	**1.2**	**1.6**	0.9	0.6	<3	<3 [15]
Copper, dissolved	ug/l	5	<5	<10	1	1	3	<10	3	**6**	**6**	4
Iron, dissolved	ug/l	300	**310**	**870**	**950**	**1700**	**720**	<50	<50	<100	<100	<100
Lead, dissolved	ug/l	-- [12]	<2	<2	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium, dissolved	ug/l	--	91000	94000	83000	85000	75000	140000	87000	100000	120000	100000
Manganese, dissolved	ug/l	--	1310	1420	2000	2070	1430	1600	1500	1900	730	380
Molybdenum, dissolved	ug/l	40	<10	<10	<10	<10	5	2	1	2	<1	<1
Nickel, dissolved	ug/l	25	<10	<10	<10	<10	<5	5	4	7	<5	<10 [15]
Potassium, dissolved	ug/l	--	13000	13000	14000	16000	18000	39000	19000	20000	27000	22000
Silicon, dissolved	ug/l	--	9000	10200	11500	11000	9700	12000	10000	11000	10000	9800
Silver, dissolved	ug/l	0.1	<10	**10**	<0.1	<0.1	<0.1	<0.5	<0.1	**0.2**	<0.1	<0.1
Sodium, dissolved	ug/l	--	88000	86000	69000	64000	63000	90000	67000	58000	55000	49000
Strontium, dissolved	ug/l	--	976	1010	1060	1060	854	1600	1000	1200	1600	1400
Thallium, dissolved	ug/l	0.3 [13]	<200	<200	<1	<1	<1	<0.05	<0.05	<0.05	<0.05	<0.05
Tin, dissolved	ug/l	--	<50	--	<10	<10	<10	<1	<1	<1	<1	<1
Titanium, dissolved	ug/l	--	<10	<10	<10	<10	<10	<50	<5	<5	<5	<5
Vanadium, dissolved	ug/l	6	<10	<10	5	<1	2	2	1	2	2	1
Zinc, dissolved	ug/l	30 [10]	20	**330**	10	**50**	6	**310**	**280**	**690**	**540**	**790**

Parameter	Unit	PWQO [1]	G99-6 22-Oct-2010 G-3	G99-6 21-Nov-2011 99-6	G99-6 19-Nov-2012 99-5	G99-6 11-Nov-2013 99-6	G99-6 28-Nov-2014 [14] 99-6	G99-6 26-Oct-2015 99-6	G99-6 15-Nov-2016 99-6	G99-6 30-Oct-17 99-6	Dup 30-Oct-17 99-6	G99-6 19-Oct-18 99-6	Dup 19-Oct-18 99-6
General Chemistry													
Conductivity (field)	uS/cm	--	1669	1800	1760	1778	2682	2132	1780	2070	2060	1820	1800
pH (field)	-	8.5	7.18	7.06	6.85	**8.9**	6.91	6.85	6.99	7.39	7.39	7.47	7.47
Temperature (field)	deg c	-- [6]	11.8	10.1	12	7.03	8.5	10.4	12.9	10.48	10.48	11	11
Alkalinity (Total as CaCO3)	ug/l	--	496000	501000	510000	560000	890000	550000	510000	531000	510000	442000	442000
Ammonia, unionized	ug/l	20	0.16	0.11	0.08	5.22	**40.19**	1.3	0.21	--	--	--	--
Ammonia Nitrogen	ug/l	--	<50	<50	<50	<50	30000	960	91	20	<10	50	60
Biochemical Oxygen Demand, 5 Day	ug/l	--	<2000	<2000	<2000	<2000	240000	51000	<2000	<3000	<3000	<3000	<3000
Chemical Oxygen Demand	ug/l	--	20000	33000	27000	89000	460000	440000	27000	59000	49000	13000	14000
Chloride	ug/l	--	27000	24000	22000	19000	29000	18000	14000	8700	8900	10100	10100
Dissolved Organic Carbon	ug/l	--	9000	9700	8400	11000	92000	11000	8700	10600	10900	--	--
Hardness, Calcium Carbonate	ug/l	--	1200000	1100000	1100000	1200000	1600000	1400000	1100000	1380000	1380000	1040000	1010000
Nitrate as N	ug/l	--	<100	<100	110	1000	<500	<100	<100	360	360	<50	<50
Nitrite as N	ug/l	--	10	<10	<10	21	<50	<10	28	<50	<50	<50	<50
Phosphate	ug/l	--	--	--	--	--	--	--	--	--	--	--	--
Phosphate, Ortho	ug/l	--	--	--	--	13	2700	53	13	40	30	30	30
Phosphorus	ug/l	-- [5]	**55**	**100**	**100**	**2800**	**3800**	**3400**	**90**	**280**	**300**	**40**	**40**
Phosphorus (dissolved reactive)	ug/l	--	10	10	<10	--	--	--	--	--	--	--	--
Sulphate	ug/l	--	670000	630000	640000	780000	820000	840000	600000	673000	668000	627000	625000
Total Dissolved Solids	ug/l	--	1270000	1520000	1550000	1790000	2210000	1920000	1420000	2070000	2060000	1321000	1309000
Metals													
Aluminum, dissolved	ug/l	-- [7]	<5	<5	<5	<5.0	<5.0	<5.0	<5.0	**140**	**140**	**120**	**120**
Barium, dissolved	ug/l	--	54	43	45	45	68	55	46	80	55	38	43
Beryllium, dissolved	ug/l	-- [8]	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	<0.1	<0.1	< 0.1	< 0.1
Boron, dissolved	ug/l	200 [9]	**860**	**720**	**680**	**910**	**1300**	**1100**	**760**	**930**	**938**	**672**	**657**
Cadmium, dissolved	ug/l	0.2 [10]	**0.4**	0.2	<0.1	<0.10	<0.10	<0.10	<0.10	<0.014	<0.014	< 0.015	< 0.015
Calcium, dissolved	ug/l	--	330000	300000	300000	350000	460000	400000	300000	407000	408000	299000	291000
Chromium, dissolved	ug/l	-- [11]	<5	<5	<5	<5.0	5.3	<5.0	<5.0	<2.0	<2.0	< 1	< 1
Cobalt, dissolved	ug/l	0.9	<1 [15]	<0.5	<0.5	<1.0	<1.0 [17]	<1.0 [17]	<1.0 [15]	<1.0 [15]	<1.0 [15]	0.2	0.2
Copper, dissolved	ug/l	5	3	4	2	2.5	<1.0	<1.0	3.5	<2.0	<2.0	0.8	1.1
Iron, dissolved	ug/l	300	<100	<100	<100	<100	**830**	**1700**	**630**	**414**	**394**	28	**580**
Lead, dissolved	ug/l	-- [12]	<0.5	<0.5	<0.5	<0.50	<0.50	<0.50	<0.50	0.04	<0.02	< 0.02	< 0.02
Magnesium, dissolved	ug/l	--	99000	86000	81000	81000	99000	92000	74000	87400	87400	70100	68700
Manganese, dissolved	ug/l	--	570	120	320	61	2000	410	460	234	233	294	293
Molybdenum, dissolved	ug/l	40	<1	0.8	0.8	0.84	<0.50	0.59	0.90	1.2	1.1	1.4	1.3
Nickel, dissolved	ug/l	25	4	<5 [16]	<5	2.7 [15]	3.4	2.6	5.2	<10	10	4.1	3.6
Potassium, dissolved	ug/l	--	16000	17000	15000	18000	30000	22000	17000	21500	21600	15800	15600
Silicon, dissolved	ug/l	--	10000	9300	9100	8500	11000	9000	9200	9070	9030	7470	7570
Silver, dissolved	ug/l	0.1	<0.1	<0.1	<0.1	<0.10	<0.10	<0.10	<0.10	<0.02	<0.02	< 0.1	< 0.1
Sodium, dissolved	ug/l	--	53000	45000	42000	37000	38000	37000	33000	35500	35400	33800	33000
Strontium, dissolved	ug/l	--	1200	1100	1100	1300	1600	1500	1100	1380	1400	1050	1030
Thallium, dissolved	ug/l	0.3 [13]	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.05	<0.05	< 0.05	< 0.05
Tin, dissolved	ug/l	--	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<50	<50	< 50	< 50
Titanium, dissolved	ug/l	--	<5	<5	<5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	< 5	< 5
Vanadium, dissolved	ug/l	6	1	0.8	1.1	0.89	2.7	0.58	<0.50	2.6	2.8	0.2	0.4
Zinc, dissolved	ug/l	30 [10]	**750**	**650**	**590**	**790**	<10 [17]	<10 [17]	**610**	**189**	**203**	**414**	**666**

Parameter	Unit	PWQO [1]	G99-6	Dup	G99-6	Duplicate	G99-6	Duplicate
			17-Oct-19		19-Oct-20		22-Oct-21	
			99-6	99-6	99-6	99-6	99-6	99-6
General Chemistry								
Conductivity (field)	uS/cm	--	1812	1827	1876	7020	1860	
pH (field)	-	8.5	7.2		7.4		7.05	
Temperature (field)	deg c	-- [6]	10.89		10.08		8.82	
Alkalinity (Total as CaCO3)	ug/l	--	439000	443000	459000	215000	484000	486000
Ammonia, unionized	ug/l	20	0.3	0.2	0.138	0.552	0.03	0.06
Ammonia Nitrogen	ug/l	--	80	60	30	120	20	40
Biochemical Oxygen Demand, 5 Day	ug/l	--	<3000	<3000	<3000	<3000	--	--
Chemical Oxygen Demand	ug/l	--	33000	86000	11000	18000	19000	20000
Chloride	ug/l	--	13800	14700	7500	54700	8100	8200
Dissolved Organic Carbon	ug/l	--	--	--	--	--	8900	8800
Hardness, Calcium Carbonate	ug/l	--	1090000	1060000	1130000	300000	1080000	1080000
Nitrate as N	ug/l	--	<50	<50	50	160	<50	<50
Nitrite as N	ug/l	--	<50	<50	<50	<50	<50	<50
Phosphate	ug/l	--	--	--	17	.	--	--
Phosphate, Ortho	ug/l	--	362	153			5	6
Phosphorus	ug/l	-- [5]	**360**	**160**	**100**	**60**	**30**	**40**
Phosphorus (dissolved reactive)	ug/l	--	--	--	--	--	--	--
Sulphate	ug/l	--	581000	613000	368000	53000	610000	582000
Total Dissolved Solids	ug/l	--	1295000	1320000	1371000	379000	1342000	1315000
Metals								
Aluminum, dissolved	ug/l	-- [7]	**130**	**130**	**90**	**60**	**110**	**110**
Barium, dissolved	ug/l	--	39	38	41	68	39	39
Beryllium, dissolved	ug/l	-- [8]	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1
Boron, dissolved	ug/l	200 [9]	**715**	**702**	**698**	53	**706**	**706**
Cadmium, dissolved	ug/l	0.2 [10]	< 0.028	< 0.028	0.085	<0.015	0.085	0.084
Calcium, dissolved	ug/l	--	311000	303000	329000	82300	310000	311000
Chromium, dissolved	ug/l	-- [11]	< 1	< 1	<1	<1	<1	<1
Cobalt, dissolved	ug/l	0.9	0.8	0.8	0.3	0.2	0.3	0.4
Copper, dissolved	ug/l	5	1	1.2	2.5	1.9	**7.6**	2.4
Iron, dissolved	ug/l	300	153	153	59	35	83	81
Lead, dissolved	ug/l	-- [12]	< 0.04	< 0.04	0.06	0.06	0.19	0.02
Magnesium, dissolved	ug/l	--	75300	74100	75600	23000	74700	74600
Manganese, dissolved	ug/l	--	201	194	217	17	249	250
Molybdenum, dissolved	ug/l	40	1	1	0.9	2.6	0.7	0.7
Nickel, dissolved	ug/l	25	3.7	3.5	4.8	1	4.8	4.9
Potassium, dissolved	ug/l	--	16700	16500	15800	4300	15700	15700
Silicon, dissolved	ug/l	--	73300	73600	8510	2840	8460	8400
Silver, dissolved	ug/l	0.1	< 0.1	< 0.1	<0.1	<0.1	<0.1	<0.1
Sodium, dissolved	ug/l	--	33000	32600	29200	33200	32100	32000
Strontium, dissolved	ug/l	--	1170	1140	1140	836	1150	1140
Thallium, dissolved	ug/l	0.3 [13]	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05
Tin, dissolved	ug/l	--	< 50	< 50	<50	<50	<50	<50
Titanium, dissolved	ug/l	--	< 5	< 5	<5	<5	<5	<5
Vanadium, dissolved	ug/l	6	0.5	0.6	0.9	1.9	0.6	0.6
Zinc, dissolved	ug/l	30 [10]	**240**	**233**	**810**	<5	**863**	**868**

Footnotes:

	Tables should be read in conjunction with the accompanying document.
<	Indicates parameter not detected above laboratory method detection limit.
>	Indicates parameter detected above equipment analytical range.
--	Chemical not analyzed or criteria not defined.
Value	Parameter is greater than PWQO
(1)	Provincial Water Quality Objectives (July 1994, reprinted February 1999)
(2)	Monitoring location was dry during this sampling event. No sample was collected.
(3)	Monitoring location could not be located.
(4)	Alkalinity should not be decreased by more than 25% of the natural concentration.
(5)	Current scientific evidence is insufficient to develop a firm Objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines which should be supplemented by site-specific studies: To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 ug/L; A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 ug/L or less. This should apply to all lakes naturally below this value; Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 ug/L.
(6)	(1) General: The natural thermal regime of any body of water shall not be altered so as to impair the quality of the natural environment. In particular, the diversity, distribution and abundance of plant and animal life shall not be significantly changed. (2) Waste Heat Discharge: (a) Ambient Temperature Changes: The temperature at the edge of a mixing zone shall not exceed the natural ambient water temperature at a representative control location by more than 10°C (18°F). However, in special circumstances, local conditions may require a significantly lower temperature difference than 10°C (18°F). Potential dischargers are to apply to the MOEE for guidance as to the allowable temperature rise for each thermal discharge. This ministry will also specify the nature of the mixing zone and the procedure for the establishment of a representative control location for temperature recording on a case-by-case basis. (b) Discharge Temperature Permitted: The maximum temperature of the receiving body of water, at any point in the thermal plume outside a mixing zone, shall not exceed 30°C (86°F) or the temperature of a representative control location plus 10°C (18°F) or the allowed temperature difference, which ever is the lesser temperature. These maximum temperatures are to be measured on a mean daily basis from continuous records. (c) Taking and Discharging of Cooling Water: Users of cooling water shall meet both the Objectives for temperature outlined above and the "Procedures for the Taking and Discharge of Cooling Water" as outlined in the MOEE publication Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters(1994).
(7)	At pH 4.5 to 5.5 the Interim PWQO is 15 µg/L based on inorganic monomeric aluminum measure in clay-free samples; At pH > 5.5 to 6.5, no condition should be permitted which would increase the acid soluble inorganic aluminum concentration in clay-free samples to more than 10% above natural background concentrations for waters representative of that geological area of the Province that are unaffected by man-made inputs. At pH > 6.5 to 9.0, the Interim PWQO is 75 µg/L based on total aluminum measured in clay-free samples. If natural background aluminum concentrations in water bodies unaffected by man-made inputs are greater than the numerical Interim PWQO (above), no condition is permitted that would increase the aluminum concentration in clay-free samples by more than 10% of the natural background level. Note: pH values of < 6.5 and > 8.5 are outside the range considered acceptable by the PWQO for pH. See the Scientific Criteria Document for Development of Provincial Water Quality Objectives and Guidelines - Aluminum for a discussion of analytical procedures.
(8)	If hardness as CaCO3 < 75 mg/L, PWQO = 11 µg/L; if hardness as CaCO3 > 75 mg/L, PWQO = 1100 µg/L.
(9)	See Section 1.2.3. of PWQO. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.
(10)	An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.
(11)	PWQO values exist for Cr(III) and Cr(VI)
(12)	If alkalinity as CaCO3 < 20 mg/L, PWQO = 5 µg/L; if alkalinity as CaCO3 from 20 to 40 mg/L, PWQO = 10 µg/L; if alkalinity as CaCO3 from 40 to 80 mg/L, PWQO = 20 µg/L; if alkalinity as CaCO3 > 80 mg/L, PWQO = 25 ug/L. An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.
(13)	See Section 1.2.2. of PWQO. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.
(14)	Nitrite/Nitrate: Due to the sample matrix, some sample required dilution. Detection limits were adjusted accordingly.
(15)	Detection Limit was raised due to matrix interferences.
(16)	Metal analysis:Detection Limit was raised due to matrix interferences.
(17)	Metal Analysis:Detection Limit was raised due to matrix interferences.

Appendix D:
2021 Summary of Surface Water Analytical Results

Table 2
Surface Water Quality Monitoring Results

Parameter	Unit	PWQO [1]	SW3 4-May-17 RAVINE 2	SW3 30-Oct-17 RAVINE 2	SW3 11-May-18 RAVINE 2	SW3 10/19/2018 [2] RAVINE 2	SW3 16-May-19 RAVINE 2	Dupe of SW3 16-May-19 RAVINE 2	SW3 17-Oct-19 RAVINE 2	SW3 4-May-20 RAVINE 2	SW3 19-Oct-20 RAVINE 2	SW3 19-Oct-20 Duplicate	SW3 19-May-21 RAVINE 2	SW3 22-Oct-21 RAVINE 2
General Chemistry														
Conductivity (field)	uS/cm	--	548	395	530	--	548	549	745	721	685	1902	690	818
Dissolved Oxygen (field)	ug/l	-- [5]	24470	13670	16480	--	15940		27220	13660	8270		10110	10420
pH (field)	-	8.5	7.78	7.68	8.43	--	7.76		**8.54**	8.15	8.09		8.28	8.23
Temperature (field)	deg c	-- [7]	--	11.18	12.4	--	11.03		10.84	6.51	10.4		18.04	11.3
Alkalinity (Total as CaCO3)	ug/l	--	254000	205000	268000	--	191000	194000	253000	327000	214000	482000	254000	230000
Ammonia, unionized	ug/l	20	--	19	**39**	--	0.8	0.6	4.2	**46**	2.2	<0.1	4.2	3.1
Ammonia Nitrogen	ug/l	--	960	20	650	--	60	50	70	3520	120	20	70	70
Biochemical Oxygen Demand, 5 Day	ug/l	--	<3000	<3000	<3000	--	<3000	<3000	6000	8000	<3000	<3000	<3000	<3000
Chemical Oxygen Demand	ug/l	--	43000	55000	25000	--	25000	39000	61000	11000	17000	23000	26000	21000
Chloride	ug/l	--	9700	37000	30700	--	35300	35300	90800	18400	54000	8000	44100	57600
Dissolved Organic Carbon	ug/l	--	7600	11100	10800	--	11200	11300	19800	13100	6700	3200	11900	6500
Hardness, Calcium Carbonate	ug/l	--	291000	267000	322000	--	248000	249000	253000	329000	289000	1150000	282000	291000
Nitrate as N	ug/l	--	3190	1510	3320	--	2670	2680	<50	4100	1160	<50	2190	5580
Nitrite as N	ug/l	--	<50	<50	<50	--	<50	<50	<50	<50	<50	<50	<50	<50
Nitrogen, Total Kjeldahl	ug/l	--	1980	1700	1400	--	700	700	1500	4400	800	300	900	1000
Phosphorus	ug/l	-- [6]	**260**	**580**	**60**	--	**80**	**70**	**240**	**60**	**50**	**90**	**80**	**60**
Sulphate	ug/l	--	13000	32000	34000	--	27000	27000	25000	14000	52000	645000	42000	59000
Total Dissolved Solids	ug/l	--	316000	318000	318000	--	289000	290000	406000	392000	371000	1398000	369000	394000
Total Suspended Solids	ug/l	--	92000	150000	13000	--	1000	12000	1650	44000	10000	87000	19000	11000
Turbidity	ntu	--	177	71.6	14.9	--	13.4	11.9	1.11	33.1	6.7	12.3	6500	7000
Metals														
Barium	ug/l	--	**113**	**101**	60	--	53	53	65	83	69	44	61	75
Beryllium	ug/l	-- [9]	<2	<2	<2	--	<0.1	<0.1	<0.1	<2	<2	<2	<2	<0.2
Boron	ug/l	200 [10]	144	38	30	--	26	27	**226**	**204**	59	**718**	58	46
Cadmium	ug/l	0.2 [11]	0.034	0.065	0.023	--	< 0.015	< 0.015	< 0.015	0.022	<0.015	0.071	<0.015	<0.015
Calcium	ug/l	--	77400	70900	65900	--	68400	68900	64400	91700	80200	33600	74200	79500
Chromium	ug/l	-- [12]	10	7	1	--	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	ug/l	0.9	**2.8**	**2.3**	0.3	--	0.3	0.3	0.9	0.9	0.2	0.4	0.4	0.2
Copper	ug/l	5	**9.5**	**8**	1.9	--	2	2	**5.5**	3.8	1.8	2.8	**10.8**	**5.6**
Iron	ug/l	300	**6570**	**4010**	448	--	**409**	**403**	60	41	105	103	45	23
Lead	ug/l	-- [13]	2.1	1.92	0.26	--	0.19	0.19	0.05	0.05	0.07	0.05	0.18	0.16
Magnesium	ug/l	--	23800	21900	21100	--	18800	18600	22500	24200	21600	75300	23600	22500
Manganese	ug/l	--	174	167	59	--	38	38	35	8	19	224	8	11
Molybdenum	ug/l	40	0.4	2.1	3.7	--	1.8	1.9	0.8	0.4	3.1	0.8	2.7	3.9
Nickel	ug/l	25	8.8	11.6	2.4	--	1.2	1.3	4.1	2.5	0.9	4.6	1.1	1.1
Potassium	ug/l	--	12300	6900	2800	--	2500	2500	22700	17300	3800	15100	4500	5300
Silicon	ug/l	--	13900	9500	1950	--	2160	2180	3720	3880	2630	8120	700	5080
Silver	ug/l	0.1	0.02	<0.02	<0.1	--	<0.1	<0.1	<0.1	<1	<1	<1	<0.1	<0.1
Sodium	ug/l	--	19000	28000	25200	--	21500	21300	28500	25900	31200	28800	28200	32100
Strontium	ug/l	--	290	453	460	--	419	416	328	305	768	1090	534	705
Thallium	ug/l	0.3 [14]	<0.05	<0.05	<0.05	--	<0.05	<0.05	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tin	ug/l	--	<50	<50	<50	--	<50	<50	< 50	<50	<50	<50	<50	<50
Titanium	ug/l	--	311	192	20	--	16	16	<5	<5	<5	<5	<5	<5
Vanadium	ug/l	6	**11**	**7**	<5	--	<5	<5	1.4	0.9	1.3	0.7	<5	1.8
Zinc	ug/l	30 [11]	**77**	**43**	8	--	16	13	<5	<5	<5	**850**	14	17

Prior to 2016, data entered by Golder
Entered by: MM
Checked by: LW

Table 2
Surface Water Quality Monitoring Results

Parameter	Unit	PWQO [1]	SW17 4-May-17 Marsh area	SW17 30-Oct-17 Marsh area	Dup of SW17 30-Oct-17 Marsh area	SW17 11-May-18 Marsh Area	Dup of SW17 11-May-18 Marsh Area	SW17 19-Oct-18 Marsh Area	Dup of SW17 19-Oct-18 Marsh Area	SW17 16-May-19 Marsh Area	SW17 4-May-20 Marsh Area	SW17 19-Oct-20 Marsh Area	SW17 19-May-21 Marsh Area	SW17 22-Oct-21 Marsh Area
General Chemistry														
Conductivity (Field)	uS/cm	--	271	314	314	0.3	0.3	0.76	0.76	0.361	384	393	452	444
Dissolved Oxygen (Field)	ug/l	-- [5]	20120	12220	12220	9000	9000	5010	5010	14560	11340	2340	4690	2260
pH (Field)	-	8.5	7.81	8.28	8.28	**9.25**	**9.25**	**8.57**	**8.57**	8.38	**9.43**	7.8	8.08	**9.71**
Temperature (Field)	deg c	-- [7]	--	11.78	11.78	10.2	10.2	5.48	5.48	11.28	9.64	8.87	15.01	9.71
Alkalinity (Total as CaCO3)	ug/l	-- [4]	143000	177000	176000	211000	210000	229000	229000	176000	192000	194000	226000	207000
Ammonia Nitrogen	ug/l	--	80	<10	<10	40	100	30	30	60	10	20	30	30
Ammonia, unionized	ug/l	20	--	<0.39	<0.39	3.2	6.9	0.11	0.11	2.4	3.2	6.4	0.96	14.4
Biochemical Oxygen Demand, 5 Day	ug/l	--	<3000	<3000	<3000	<3000	<3000	4000	4000	<3000	5000	5000	<3000	<3000
Chemical Oxygen Demand	ug/l	--	27000	40000	37000	25000	22000	27000	33000	21000	7000	52000	25000	37000
Chloride	ug/l	--	900	1200	1300	1300	42300	3300	2900	1700	2300	3300	2300	3900
Dissolved Organic Carbon	ug/l	--	6600	9900	10000	9400	7800	14500	14700	10800	9800	17500	11700	14900
Hardness, Calcium Carbonate	ug/l	--	157000	178000	195000	213000	277000	266000	277000	198000	205000	209000	215000	186000
Nitrate as N	ug/l	--	<50	<50	<50	<50	2280	<50	<50	18	<50	<50	<50	<50
Nitrite as N	ug/l	--	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Nitrogen, Total Kjeldahl	ug/l	--	750	500	800	500	600	600	600	500	500	800	500	800
Phosphorus	ug/l	-- [6]	**50**	**50**	**90**	**30**	**60**	**30**	**30**	**50**	**60**	**100**	**50**	**70**
Sulphate	ug/l	--	2000	2000	2000	<1000	33000	23000	23000	2000	3000	<1000	2000	4000
Total Dissolved Solids	ug/l	--	149000	169000	168000	212000	329000	268000	272000	185000	508	203000	222000	206000
Total Suspended Solids	ug/l	--	4000	52000	64000	3000	<3000	10000	8000	4000	<3000	3000	<3000	<3000
Turbidity	ntu	-- [8]	3.5	2.3	1.8	1.2	14.1	1.8	1.7	1.1	2400	5400	800	1200
Metals														
Barium	ug/l	--	35	37	52	100	78	57	58	36	38	45	44	41
Beryllium	ug/l	-- [9]	<2	<2	<2	<2	<2	<2	<2	<0.1	<2	<2	<2	<0.2
Boron	ug/l	200 [10]	<5	9	**14**	129	30	<5	<5	< 5	<5	<5	<5	<5
Cadmium	ug/l	0.2 [11]	0.014	0.022	0.022	0.019	0.026	<0.015	<0.015	< 0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	45900	55100	60100	88100	73500	78100	81400	59700	61300	61700	64200	51700
Chromium	ug/l	-- [12]	1	<2	2	1	<1	<1	<1	< 1	<1	<1	<1	<1
Cobalt	ug/l	0.9	0.1	<1	<1	1	0.3	0.1	0.1	0.2	<0.1	0.2	0.2	0.2
Copper	ug/l	5	1.3	4.5	3.2	3.4	1.9	0.9	0.6	0.9	1	1.6	1.8	3.6
Iron	ug/l	300	203	272	**450**	**633**	**536**	37	40	73	35	173	80	53
Lead	ug/l	-- [13]	0.04	0.3	0.21	0.27	0.27	<0.02	<0.02	0.04	0.03	0.06	0.08	0.12
Magnesium	ug/l	--	10300	9830	10900	24800	22700	17200	17800	11900	12700	13200	13300	13800
Manganese	ug/l	--	29	145	217	63	65	9	9	29	7	255	50	180
Molybdenum	ug/l	40	0.1	<0.1	<0.01	1.1	3.4	0.5	0.5	0.1	0.2	<0.1	0.1	2
Nickel	ug/l	25	1.5	2.6	2.4	3.8	2.3	<0.2	<0.2	0.5	0.4	0.6	0.3	0.6
Potassium	ug/l	--	1700	2700	2700	14400	2900	4800	4900	1700	1700	6100	1700	5500
Silicon	ug/l	--	4800	5470	5460	6560	2070	6620	6720	4340	4870	6810	3690	7490
Silver	ug/l	0.1	<0.02	<0.02	<0.02	<0.1	<0.1	<0.1	<0.1	< 0.1	<0.1	<0.1	<0.1	<0.1
Sodium	ug/l	--	2200	1600	2700	26000	27300	4700	4700	2300	2800	2000	2900	2100
Strontium	ug/l	--	109	126	159	387	514	187	191	132	130	119	151	120
Thallium	ug/l	0.3 [14]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	<0.05	<0.05	<0.005	<0.05
Tin	ug/l	--	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Titanium	ug/l	--	7	<5	<5	29	25	<5	<5	<5	<5	<5	<5	<5
Vanadium	ug/l	6	<5	<5	<5	<5	<5	<5	<5	<5	0.3	<0.1	<5	0.1
Zinc	ug/l	30 [11]	**158**	<5	22	28	26	15	19	11	<5	<5	13	12

Prior to 2016, data entered by Golder
Entered by: MM
Checked by: LW

Table 2
Surface Water Quality Monitoring Results

Parameter	Unit	PWQO [1]	SW7 4-May-17 South Nation River	SW7 30-Oct-17 South Nation River	SW7 11-May-18 South Nation River	SW7 19-Oct-18 South Nation River	SW7 16-May-19 South Nation River	SW7 17-Oct-19 South Nation River	Dupe of SW7 17-Oct-19 South Nation River	SW7 4-May-20 South Nation River	SW7 19-Oct-20 South Nation River	SW7 19-May-21 South Nation River	SW7 22-Oct-21 South Nation River
General Chemistry													
Conductivity (field)	uS/cm	--	384	216	500	870	542	802	786	591	694	689	812
Dissolved Oxygen (field)	ug/l	-- [5]	16930	13300	12790	12730	15550	17830		9330	9290	7240	10520
pH (field)	-	8.5	8.02	7.62	8.24	8.41	7.84	**8.6**		8.5	8.18	8.24	8.31
Temperature (field)	deg c	-- [7]	--	11.51	12.9	8.14	11.31	11.02		11.23	10.62	17.86	11.33
Alkalinity (Total as CaCO3)	ug/l	--	145000	61000	209000	182000	187000	200000	204000	190000	212000	223000	230000
Ammonia, unionized	ug/l	20	--	<0.08	3.2	1.6	0.6	3	3	3.4	3.4	3.6	3.6
Ammonia Nitrogen	ug/l	--	60	<10	100	40	50	40	40	120	120	60	80
Biochemical Oxygen Demand, 5 Day	ug/l	--	<3000	<3000	<3000	3000	<3000	<3000	<3000	7000	<3000	<3000	<3000
Chemical Oxygen Demand	ug/l	--	34000	84000	22000	8000	21000	28000	27000	10000	21000	24000	18000
Chloride	ug/l	--	16100	15600	42700	82400	36500	90600	88800	45200	54500	49800	59600
Dissolved Organic Carbon	ug/l	--	6700	9200	7800	7400	11200	7500	7700	8900	6500	10700	6700
Hardness, Calcium Carbonate	ug/l	--	202000	102000	259000	301000	243000	283000	271000	254000	298000	261000	289000
Nitrate as N	ug/l	--	3280	1270	2300	100	2680	<50	<50	1410	1160	1510	5570
Nitrite as N	ug/l	--	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Nitrogen, Total Kjeldahl	ug/l	--	900	1200	800	700	700	700	800	800	900	900	1000
Phosphorus	ug/l	-- [6]	**130**	**320**	**60**	**80**	**80**	**90**	**90**	**70**	**50**	**60**	**60**
Sulphate	ug/l	--	16000	9000	33000	82000	28000	59000	59000	38000	52000	49000	59000
Total Dissolved Solids	ug/l	--	207000	112000	320000	434000	286000	433000	427000	540	375000	352000	395000
Total Suspended Solids	ug/l	--	32000	150000	15000	17000	17000	37000	13000	26000	6000	8000	7000
Turbidity	ntu	--	38.2	214	14.9	6.6	12.1	0.2	14.8	17000	7000	5400	7500
Metals													
Barium	ug/l	--	60	76	72	**91**	51	61	58	52	72	54	74
Beryllium	ug/l	-- [9]	<2	<2	<2	<2	<0.1	<0.1	<0.1	<2	<2	<2	<0.2
Boron	ug/l	200 [10]	26	18	29	53	23	61	59	26	50	29	46
Cadmium	ug/l	0.2 [11]	0.035	0.084	0.026	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	53500	26900	68400	76300	66200	69500	66000	68100	82700	68100	78900
Chromium	ug/l	-- [12]	2	15	<1	<1	<1	<1	<1	<1	<1	<1	<1
Cobalt	ug/l	0.9	0.6	**3.7**	0.3	0.1	0.3	0.3	0.3	0.1	0.2	0.3	0.1
Copper	ug/l	5	3	**11.8**	1.9	0.7	1.9	1.2	1.4	1.4	2.5	**5.4**	3.9
Iron	ug/l	300	**1570**	**7310**	**498**	42	**444**	24	27	45	34	43	22
Lead	ug/l	-- [13]	2.07	3.05	0.28	<0.02	0.21	0.05	0.08	0.15	0.06	0.23	0.12
Magnesium	ug/l	--	16600	8510	21400	26800	18800	26700	25700	20400	22100	22000	22400
Manganese	ug/l	--	73	162	60	18	39	11	11	43	8	4	10
Molybdenum	ug/l	40	1.9	0.3	3.6	7.3	1.7	5	5.2	2	3.2	2.8	3.8
Nickel	ug/l	25	2.7	13.5	2.3	<0.2	1.1	1.9	1.9	0.7	0.9	0.8	1
Potassium	ug/l	--	2500	7600	2700	4500	2300	4400	4200	2300	3800	2300	5300
Silicon	ug/l	--	5430	12100	1930	1630	2120	1950	1910	1440	2600	120	5020
Silver	ug/l	0.1	0.02	0.03	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	ug/l	--	13100	15400	25600	53200	21700	62400	60300	25500	32100	27000	32100
Strontium	ug/l	--	316	122	481	754	421	765	736	463	789	533	701
Thallium	ug/l	0.3 [14]	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tin	ug/l	--	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Titanium	ug/l	--	73	327	23	<5	18	<5	<5	<5	<5	<5	<5
Vanadium	ug/l	6	<5	**12**	<5	<5	<5	2.5	2.6	0.9	1.2	<5	1.7
Zinc	ug/l	30 [11]	**60**	**71**	29	14	18	<5	7	6	<5	12	18

Prior to 2016, data entered by Golder
Entered by: MM
Checked by: LW

Table 2
Surface Water Quality Monitoring Results

Parameter	Unit	PWQO [1]	SW18 4-May-17 RAVINE 3	SW18 30-Oct-17 RAVINE 3	SW18 11-May-18 RAVINE 3	SW18 10/19/2018 [2] RAVINE 3	SW18 16-May-19 RAVINE 3	SW18 4-May-20 RAVINE 3	SW18 4-May-20 Duplicate	SW18 19-Oct-20 RAVINE 3	SW18 19-May-21 RAVINE 3	SW18 19-May-21 Duplicate	SW18 22-Oct-21 RAVINE 3	SW18 22-Oct-21 Duplicate
General Chemistry														
Conductivity (Field)	uS/cm	--	387	714	0.53	--	912	870	889	688	703		818	
Dissolved Oxygen (Field)	ug/l	-- [5]	17770	11950	16480	--	24490	12490		16990	7120		11370	
pH (Field)	-	8.5	7.8	7.53	8.43	--	7.92	**8.53**		8.19	8.06		8.2	
Temperature (Field)	deg c	-- [7]	--	12.15	9.7	--	11.56	10.8		10.43	17.18		11.28	
Alkalinity (Total as CaCO3)	ug/l	-- [4]	149000	383000	268000	--	379000	370000	366000	214000	222000	229000	232000	233000
Ammonia Nitrogen	ug/l	--	70	<10	650	--	80	30	20	130	60	50	80	70
Ammonia, unionized	ug/l	20	--	<0.07	**35.1**	--	1.7	2.1	1.4	3.8	1.8	1.5	3.6	3.1
Biochemical Oxygen Demand, 5 Day	ug/l	--	<3000	<3000	<3000	--	< 3000	3000	3000	<3000	4000	<3000	<3000	<3000
Chemical Oxygen Demand	ug/l	--	32000	56000	25000	--	15000	12000	13000	24000	24000	27000	21000	16000
Chloride	ug/l	--	15900	10000	30700	--	9200	9200	9500	54300	50100	2400	57100	57000
Dissolved Organic Carbon	ug/l	--	7100	9100	10800	--	10400	8900	9100	6700	10400	12300	6900	6800
Hardness, Calcium Carbonate	ug/l	--	208000	423000	322000	--	486000	447000	471000	292000	272000	219000	27700	271000
Nitrate as N	ug/l	--	3260	1650	3320	--	490	330	390	1170	1530	<50	5510	5510
Nitrite as N	ug/l	--	<50	50	<50	--	<50	<50	<50	<50	<50	<50	<50	<50
Nitrogen, Total Kjeldahl	ug/l	--	1280	1000	1400	--	600	400	500	900	900	500	1000	1000
Phosphorus	ug/l	-- [6]	**140**	**290**	**60**	--	**140**	**60**	**80**	**50**	**70**	**60**	**60**	**60**
Sulphate	ug/l	--	18000	35000	22000	--	96000	92000	91000	52000	50000	2000	59000	5900
Total Dissolved Solids	ug/l	--	213000	417000	369000	--	535000	585000	593000	373000	358000	225000	388000	386000
Total Suspended Solids	ug/l	--	28000	90000	16000	--	39000	29000	31000	5000	5000	<3000	8000	7000
Turbidity	ntu	-- [8]	38.5	81.8	20	--	30.5	11700	10700	5500	4700	900	7200	9700
Metals														
Barium	ug/l	--	61	101	49	--	64	47	49	70	57	45	71	69
Beryllium	ug/l	-- [9]	<2	<2	<2	--	<0.1	<2	<2	<2	<2	<2	<0.2	<0.2
Boron	ug/l	200 [10]	30	32	<5	--	**282**	**270**	**285**	49	33	<5	47	47
Cadmium	ug/l	0.2 [11]	0.016	0.089	<0.015	--	0.037	<0.015	0.018	<0.015	<0.015	<0.015	<0.015	<0.015
Calcium	ug/l	--	55300	101000	63600	--	149000	136000	143000	81400	71200	65800	75800	73900
Chromium	ug/l	-- [12]	2	4	<1	--	2	<1	<1	<1	<1	<1	<1	<1
Cobalt	ug/l	0.9	0.5	**1.1**	<0.1	--	**7**	0.1	0.1	0.2	0.2	0.2	0.1	0.1
Copper	ug/l	5	3.1	**7.9**	0.3	--	2.7	1.2	1.2	2	5.3	3.2	1.3	4.5
Iron	ug/l	300	**1520**	**2260**	226	--	**2030**	19	18	25	46	82	19	22
Lead	ug/l	-- [13]	0.6	1.31	<0.27	--	0.88	0.04	0.05	0.07	0.22	0.14	0.04	0.15
Magnesium	ug/l	--	16900	41500	13200	--	27600	26100	27500	21600	22900	13300	21300	21100
Manganese	ug/l	--	65	91	54	--	194	20	21	7	4	51	9	8
Molybdenum	ug/l	40	2	1.8	0.2	--	0.4	0.4	0.4	3.2	2.8	0.1	3.4	3.5
Nickel	ug/l	25	2.8	6.1	1.4	--	2.3	1.2	1.2	0.8	0.7	0.3	0.9	1
Potassium	ug/l	--	2600	6800	1900	--	7800	7500	7900	3700	2400	1700	5100	5000
Silicon	ug/l	--	5400	7500	3590	--	5470	4780	4940	2510	160	3710	4850	4760
Silver	ug/l	0.1	<0.02	<0.02	<0.1	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	ug/l	--	13300	17100	3800	--	16300	16000	16800	31000	28300	2900	30400	29800
Strontium	ug/l	--	328	489	168	--	608	550	579	766	556	151	665	654
Thallium	ug/l	0.3 [14]	<0.05	<0.05	<0.05	--	< 0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Tin	ug/l	--	<50	<50	<50	--	<50	<50	<50	<50	<50	<50	<50	<50
Titanium	ug/l	--	70	109	<5	--	46	<5	<5	<5	<5	<5	<5	<5
Vanadium	ug/l	6	<5	<5	<5	--	<5	0.5	0.5	1.4	<5	<5	1.5	1.5
Zinc	ug/l	30 [11]	**48**	30	30	--	**32**	7	5	<5	17	10	17	12

Prior to 2016, data entered by Golder
Entered by: MM
Checked by: LW

Footnotes:

	Tables should be read in conjunction with the accompanying document.
<	Indicates parameter not detected above laboratory method detection limit.
>	Indicates parameter detected above equipment analytical range.
--	Chemical not analyzed or criteria not defined.
Value	Parameter is greater than PWQO
(1)	Provincial Water Quality Objectives (July 1994, reprinted February 1999)
(2)	Monitoring location was dry during this sampling event. No sample was collected.
(3)	Dry
(4)	Alkalinity should not be decreased by more than 25% of the natural concentration.
(5)	Objective depends on water temperature and biota. Dissolved oxygen concentrations should not be less than the values specified in the PWQO document for cold water biota (e.g. salmonid fish communities) and warm water biota (e.g. centrarchid fish communities).
(6)	Current scientific evidence is insufficient to develop a firm Objective at this time. Accordingly, the following phosphorus concentrations should be considered as general guidelines which should be supplemented by site-specific studies: To avoid nuisance concentrations of algae in lakes, average total phosphorus concentrations for the ice-free period should not exceed 20 ug/L; A high level of protection against aesthetic deterioration will be provided by a total phosphorus concentration for the ice-free period of 10 ug/L or less. This should apply to all lakes naturally below this value; Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 30 ug/L.
(7)	(1) General: The natural thermal regime of any body of water shall not be altered so as to impair the quality of the natural environment. In particular, the diversity, distribution and abundance of plant and animal life shall not be significantly changed. (2) Waste Heat Discharge: (a) Ambient Temperature Changes: The temperature at the edge of a mixing zone shall not exceed the natural ambient water temperature at a representative control location by more than 10°C (18°F). However, in special circumstances, local conditions may require a significantly lower temperature difference than 10°C (18°F). Potential dischargers are to apply to the MOEE for guidance as to the allowable temperature rise for each thermal discharge. This ministry will also specify the nature of the mixing zone and the procedure for the establishment of a representative control location for temperature recording on a case-by-case basis. (b) Discharge Temperature Permitted: The maximum temperature of the receiving body of water, at any point in the thermal plume outside a mixing zone, shall not exceed 30°C (86°F) or the temperature of a representative control location plus 10°C (18°F) or the allowed temperature difference, which ever is the lesser temperature. These maximum temperatures are to be measured on a mean daily basis from continuous records. (c) Taking and Discharging of Cooling Water: Users of cooling water shall meet both the Objectives for temperature outlined above and the "Procedures for the Taking and Discharge of Cooling Water" as outlined in the MOEE publication Deriving Receiving-Water Based, Point-Source Effluent Requirements for Ontario Waters(1994).
(8)	Suspended matter should not be added to surface water in concentrations that will change the natural Secchi disc reading by more than 10 percent.
(9)	If hardness as CaCO3 < 75 mg/L, PWQO = 11 µg/L; if hardness as CaCO3 > 75 mg/L, PWQO = 1100 µg/L.
(10)	See Section 1.2.3. of PWQO. This Interim PWQO was set for emergency purposes based on the best information readily available. Employ due caution when applying this value.
(11)	An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.
(12)	PWQO values exist for Cr(III) and Cr(VI)
(13)	If alkalinity as CaCO3 < 20 mg/L, PWQO = 5 µg/L; if alkalinity as CaCO3 from 20 to 40 mg/L, PWQO = 10 µg/L; if alkalinity as CaCO3 from 40 to 80 mg/L, PWQO = 20 µg/L; if alkalinity as CaCO3 > 80 mg/L, PWQO = 25 ug/L. An Interim PWQO also exists for this parameter. See Section 1.10 of the PWQO - Where both a PWQO and an Interim PWQO exist.
(14)	See Section 1.2.2. of PWQO. This Interim PWQO is currently under development. The value is subject to change upon publication by MOEE.
(15)	Monitoring location was frozen during this sampling event. No sample was collected.
(16)	At pH 4.5 to 5.5 the Interim PWQO is 15 µg/L based on inorganic monomeric aluminum measure in clay-free samples; At pH > 5.5 to 6.5, no condition should be permitted which would increase the acid soluble inorganic aluminum concentration in clay-free samples to more than 10% above natural background concentrations for waters representative of that geological area of the Province that are unaffected by man-made inputs. At pH > 6.5 to 9.0, the Interim PWQO is 75 µg/L based on total aluminum measured in clay-free samples. If natural background aluminum concentrations in water bodies unaffected by man-made inputs are greater than the numerical Interim PWQO (above), no condition is permitted that would increase the aluminum concentration in clay-free samples by more than 10% of the natural background level. Note: pH values of < 6.5 and > 8.5 are outside the range considered acceptable by the PWQO for pH. See the Scientific Criteria Document for Development of Provincial Water Quality Objectives and Guidelines - Aluminum for a discussion of analytical procedures.
(17)	TKN < NH4: Both values fall within acceptable RPD limits for duplicates and are likely equivalent.
(18)	Monitoring location was not accessible.
(19)	No sample was collected due to unsafe conditions
(20)	No result(s) available.

Prior to 2016, data entered by Golder
Entered by: MM
Checked by: CH

Appendix E:
Laboratory Certificates of Analysis

CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-15082

Report To:

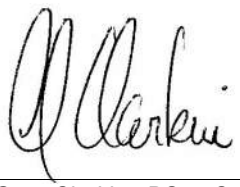
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-May-21
DATE REPORTED: 09-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW3	SW7	SW17	SW18
			Sample I.D.		B21-15082-1	B21-15082-2	B21-15082-3	B21-15082-4
			Date Collected		19-May-21	19-May-21	19-May-21	19-May-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	25-May-21/O	282	261	215	272
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	01-Jun-21/O	254	223	226	222
TDS(ion sum calc.)	mg/L	1	Calc.	02-Jun-21/O	369	352	222	358
Total Suspended Solids	mg/L	3	SM2540D	21-May-21/K	19	8	< 3	5
Turbidity	NTU	0.1	SM 2130	21-May-21/O	6.5	5.4	0.8	4.7
Chloride	mg/L	0.5	SM4110C	26-May-21/O	44.1	49.8	2.3	50.1
Nitrite (N)	mg/L	0.05	SM4110C	26-May-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	26-May-21/O	2.19	1.51	< 0.05	1.53
Sulphate	mg/L	1	SM4110C	26-May-21/O	42	49	2	50
Barium	mg/L	0.001	SM 3120	25-May-21/O	0.061	0.054	0.044	0.057
Beryllium	mg/L	0.002	SM 3120	25-May-21/O	< 0.002	< 0.002	< 0.002	< 0.002
Boron	mg/L	0.005	SM 3120	25-May-21/O	0.058	0.029	< 0.005	0.033
Cadmium	mg/L	0.000015	EPA 200.8	03-Jun-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	25-May-21/O	74.2	68.1	64.2	71.2
Chromium	mg/L	0.001	EPA 200.8	03-Jun-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0004	0.0003	0.0002	0.0002
Copper	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0108	0.0054	0.0018	0.0053
Iron	mg/L	0.005	SM 3120	25-May-21/O	0.045	0.043	0.080	0.046
Lead	mg/L	0.00002	EPA 200.8	03-Jun-21/O	0.00018	0.00023	0.00008	0.00022
Magnesium	mg/L	0.02	SM 3120	25-May-21/O	23.6	22.0	13.3	22.9
Manganese	mg/L	0.001	SM 3120	25-May-21/O	0.008	0.004	0.050	0.004
Molybdenum	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0027	0.0028	0.0001	0.0028
Nickel	mg/L	0.0002	EPA 200.8	03-Jun-21/O	0.0011	0.0008	0.0003	0.0007
Potassium	mg/L	0.1	SM 3120	25-May-21/O	4.5	2.3	1.7	2.4
Silicon	mg/L	0.01	SM 3120	25-May-21/O	0.70	0.12	3.69	0.16
Silver	mg/L	0.0001	EPA 200.8	03-Jun-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	25-May-21/O	28.2	27.0	2.9	28.3



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-15082

Report To:

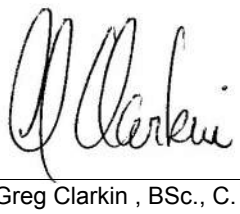
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-May-21
DATE REPORTED: 09-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW3	SW7	SW17	SW18
			Sample I.D.		B21-15082-1	B21-15082-2	B21-15082-3	B21-15082-4
			Date Collected		19-May-21	19-May-21	19-May-21	19-May-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	25-May-21/O	0.534	0.533	0.151	0.556
Thallium	mg/L	0.00005	EPA 200.8	03-Jun-21/O	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Tin	mg/L	0.05	SM 3120	25-May-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	25-May-21/O	< 0.005	< 0.005	< 0.005	< 0.005
Vanadium	mg/L	0.005	SM 3120	25-May-21/O	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	mg/L	0.005	SM 3120	25-May-21/O	0.014	0.012	0.013	0.017
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	03-Jun-21/K	0.07	0.06	0.03	0.06
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	04-Jun-21/K	0.9	0.9	0.5	0.9
Phosphorus-Total	mg/L	0.01	E3199A.1	04-Jun-21/K	0.08	0.06	0.05	0.07
BOD(5 day)	mg/L	3	SM 5210B	22-May-21/K	< 3	< 3	< 3	4
COD	mg/L	5	SM5220C	21-May-21/K	26	24	25	24
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	26-May-21/O	11.9	10.7	11.7	10.4
Anion Sum	meq/L		Calc.	02-Jun-21/O	7.34	6.98	4.61	7.00
Cation Sum	meq/L		Calc.	02-Jun-21/O	6.99	6.44	4.47	6.73
% Difference	%		Calc.	02-Jun-21/O	2.47	4.03	1.55	1.94
Ion Ratio	AS/CS		Calc.	02-Jun-21/O	1.05	1.08	1.03	1.04
Sodium Adsorption Ratio	-		Calc.	02-Jun-21/O	0.730	0.728	0.0851	0.746
Conductivity (calc.)	µmho/cm		Calc.	02-Jun-21/O	671	642	416	656
TDS(calc.)/EC(actual)	-		Calc.	02-Jun-21/O	0.554	0.551	0.538	0.559
EC(calc.)/EC(actual)	-		Calc.	02-Jun-21/O	1.01	1.01	1.01	1.03



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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Test methods may be modified from specified reference method unless indicated by an *
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Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-May-21
DATE REPORTED: 09-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		Duplicate			
			Sample I.D.		B21-15082-5			
			Date Collected		19-May-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	25-May-21/O	219			
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	01-Jun-21/O	229			
TDS(ion sum calc.)	mg/L	1	Calc.	02-Jun-21/O	225			
Total Suspended Solids	mg/L	3	SM2540D	21-May-21/K	< 3			
Turbidity	NTU	0.1	SM 2130	21-May-21/O	0.9			
Chloride	mg/L	0.5	SM4110C	26-May-21/O	2.4			
Nitrite (N)	mg/L	0.05	SM4110C	26-May-21/O	< 0.05			
Nitrate (N)	mg/L	0.05	SM4110C	26-May-21/O	< 0.05			
Sulphate	mg/L	1	SM4110C	26-May-21/O	2			
Barium	mg/L	0.001	SM 3120	25-May-21/O	0.045			
Beryllium	mg/L	0.002	SM 3120	25-May-21/O	< 0.002			
Boron	mg/L	0.005	SM 3120	25-May-21/O	< 0.005			
Cadmium	mg/L	0.000015	EPA 200.8	03-Jun-21/O	< 0.000015			
Calcium	mg/L	0.02	SM 3120	25-May-21/O	65.8			
Chromium	mg/L	0.001	EPA 200.8	03-Jun-21/O	< 0.001			
Cobalt	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0002			
Copper	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0032			
Iron	mg/L	0.005	SM 3120	25-May-21/O	0.082			
Lead	mg/L	0.00002	EPA 200.8	03-Jun-21/O	0.00014			
Magnesium	mg/L	0.02	SM 3120	25-May-21/O	13.3			
Manganese	mg/L	0.001	SM 3120	25-May-21/O	0.051			
Molybdenum	mg/L	0.0001	EPA 200.8	03-Jun-21/O	0.0001			
Nickel	mg/L	0.0002	EPA 200.8	03-Jun-21/O	0.0003			
Potassium	mg/L	0.1	SM 3120	25-May-21/O	1.7			
Silicon	mg/L	0.01	SM 3120	25-May-21/O	3.71			
Silver	mg/L	0.0001	EPA 200.8	03-Jun-21/O	< 0.0001			
Sodium	mg/L	0.2	SM 3120	25-May-21/O	2.9			

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-15082

Report To:

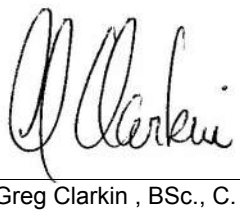
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 19-May-21
DATE REPORTED: 09-Jun-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		Duplicate			
			Sample I.D.		B21-15082-5			
			Date Collected		19-May-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	25-May-21/O	0.151			
Thallium	mg/L	0.00005	EPA 200.8	03-Jun-21/O	< 0.00005			
Tin	mg/L	0.05	SM 3120	25-May-21/O	< 0.05			
Titanium	mg/L	0.005	SM 3120	25-May-21/O	< 0.005			
Vanadium	mg/L	0.005	SM 3120	25-May-21/O	< 0.005			
Zinc	mg/L	0.005	SM 3120	25-May-21/O	0.010			
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	03-Jun-21/K	0.05			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	04-Jun-21/K	0.5			
Phosphorus-Total	mg/L	0.01	E3199A.1	04-Jun-21/K	0.06			
BOD(5 day)	mg/L	3	SM 5210B	22-May-21/K	< 3			
COD	mg/L	5	SM5220C	21-May-21/K	27			
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	26-May-21/O	12.3			
Anion Sum	meq/L		Calc.	02-Jun-21/O	4.68			
Cation Sum	meq/L		Calc.	02-Jun-21/O	4.55			
% Difference	%		Calc.	02-Jun-21/O	1.40			
Ion Ratio	AS/CS		Calc.	02-Jun-21/O	1.03			
Sodium Adsorption Ratio	-		Calc.	02-Jun-21/O	0.0847			
Conductivity (calc.)	µmho/cm		Calc.	02-Jun-21/O	423			
TDS(calc.)/EC(actual)	-		Calc.	02-Jun-21/O	0.550			
EC(calc.)/EC(actual)	-		Calc.	02-Jun-21/O	1.03			



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-34815

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 22-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW3	SW7	SW17	SW18
			Sample I.D.		B21-34815-1	B21-34815-2	B21-34815-3	B21-34815-4
			Date Collected		22-Oct-21	22-Oct-21	22-Oct-21	22-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	01-Nov-21/O	291	289	186	277
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	03-Nov-21/O	230	230	207	232
TDS(ion sum calc.)	mg/L	1	Calc.	04-Nov-21/O	394	395	206	388
Total Suspended Solids	mg/L	3	SM2540D	26-Oct-21/K	11	7	< 3	8
Turbidity	NTU	0.1	SM 2130	28-Oct-21/O	7.0	7.5	1.2	7.2
Chloride	mg/L	0.5	SM4110C	02-Nov-21/O	57.6	59.6	3.9	57.1
Nitrite (N)	mg/L	0.05	SM4110C	02-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Nitrate (N)	mg/L	0.05	SM4110C	02-Nov-21/O	5.58	5.57	< 0.05	5.51
Sulphate	mg/L	1	SM4110C	02-Nov-21/O	59	59	4	59
Barium	mg/L	0.001	SM 3120	01-Nov-21/O	0.075	0.074	0.041	0.071
Beryllium	µg/g	0.0002	EPA 6020	04-Nov-21/O	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Boron	mg/L	0.005	SM 3120	01-Nov-21/O	0.046	0.046	< 0.005	0.047
Cadmium	mg/L	).000015	EPA 200.8	04-Nov-21/O	< 0.000015	< 0.000015	< 0.000015	< 0.000015
Calcium	mg/L	0.02	SM 3120	01-Nov-21/O	79.5	78.9	51.7	75.8
Chromium	mg/L	0.001	EPA 200.8	04-Nov-21/O	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0002	0.0001	0.0002	0.0001
Copper	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0056	0.0039	0.0036	0.0013
Iron	mg/L	0.005	SM 3120	01-Nov-21/O	0.023	0.022	0.053	0.019
Lead	mg/L	0.00002	EPA 200.8	04-Nov-21/O	0.00016	0.00012	0.00012	0.00004
Magnesium	mg/L	0.02	SM 3120	01-Nov-21/O	22.5	22.4	13.8	21.3
Manganese	mg/L	0.001	SM 3120	01-Nov-21/O	0.011	0.010	0.180	0.009
Molybdenum	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0039	0.0038	0.0002	0.0034
Nickel	mg/L	0.0002	EPA 200.8	04-Nov-21/O	0.0011	0.0010	0.0006	0.0009
Potassium	mg/L	0.1	SM 3120	01-Nov-21/O	5.3	5.3	5.5	5.1
Silicon	mg/L	0.01	SM 3120	01-Nov-21/O	5.08	5.02	7.49	4.85
Silver	mg/L	0.0001	EPA 200.8	04-Nov-21/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Sodium	mg/L	0.2	SM 3120	01-Nov-21/O	32.1	32.1	2.1	30.4

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-34815

Report To:

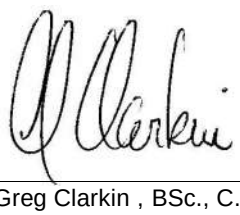
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 22-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		SW3	SW7	SW17	SW18
			Sample I.D.		B21-34815-1	B21-34815-2	B21-34815-3	B21-34815-4
			Date Collected		22-Oct-21	22-Oct-21	22-Oct-21	22-Oct-21
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	01-Nov-21/O	0.705	0.701	0.120	0.665
Thallium	mg/L	0.00005	EPA 200.8	04-Nov-21/O	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Vanadium	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0018	0.0017	0.0001	0.0015
Tin	mg/L	0.05	SM 3120	01-Nov-21/O	< 0.05	< 0.05	< 0.05	< 0.05
Titanium	mg/L	0.005	SM 3120	01-Nov-21/O	< 0.005	< 0.005	< 0.005	< 0.005
Zinc	mg/L	0.005	SM 3120	01-Nov-21/O	0.017	0.018	0.012	0.017
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	29-Oct-21/K	0.07	0.08	0.03	0.08
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	11-Nov-21/K	1.0	1.0	0.8	1.0
Phosphorus-Total	mg/L	0.01	E3199A.1	11-Nov-21/K	0.06	0.06	0.07	0.06
BOD(5 day)	mg/L	3	SM 5210B	27-Oct-21/K	< 3	< 3	< 3	< 3
COD	mg/L	5	SM5220C	29-Oct-21/K	21	18	37	21
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	10-Dec-21/O	6.5	6.7	14.9	6.9
Anion Sum	meq/L		Calc.	04-Nov-21/O	7.84	7.90	4.33	7.87
Cation Sum	meq/L		Calc.	04-Nov-21/O	7.35	7.31	3.96	7.00
% Difference	%		Calc.	04-Nov-21/O	3.23	3.88	4.50	5.88
Ion Ratio	AS/CS		Calc.	04-Nov-21/O	1.07	1.08	1.09	1.12
Sodium Adsorption Ratio	-		Calc.	04-Nov-21/O	0.818	0.822	0.0671	0.793
Conductivity (calc.)	µmho/cm		Calc.	04-Nov-21/O	712	714	384	697
TDS(calc.)/EC(actual)	-		Calc.	04-Nov-21/O	0.536	0.536	0.526	0.531
EC(calc.)/EC(actual)	-		Calc.	04-Nov-21/O	0.970	0.969	0.981	0.954



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-34815

Report To:

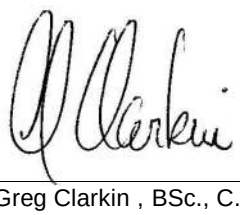
The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 22-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		Duplicate			
			Sample I.D.		B21-34815-5			
			Date Collected		22-Oct-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	01-Nov-21/O	271			
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	03-Nov-21/O	233			
TDS(ion sum calc.)	mg/L	1	Calc.	04-Nov-21/O	386			
Total Suspended Solids	mg/L	3	SM2540D	26-Oct-21/K	7			
Turbidity	NTU	0.1	SM 2130	28-Oct-21/O	9.7			
Chloride	mg/L	0.5	SM4110C	02-Nov-21/O	57.0			
Nitrite (N)	mg/L	0.05	SM4110C	02-Nov-21/O	< 0.05			
Nitrate (N)	mg/L	0.05	SM4110C	02-Nov-21/O	5.51			
Sulphate	mg/L	1	SM4110C	02-Nov-21/O	59			
Barium	mg/L	0.001	SM 3120	01-Nov-21/O	0.069			
Beryllium	µg/g	0.0002	EPA 6020	04-Nov-21/O	< 0.0002			
Boron	mg/L	0.005	SM 3120	01-Nov-21/O	0.047			
Cadmium	mg/L	).000015	EPA 200.8	04-Nov-21/O	< 0.000015			
Calcium	mg/L	0.02	SM 3120	01-Nov-21/O	73.9			
Chromium	mg/L	0.001	EPA 200.8	04-Nov-21/O	< 0.001			
Cobalt	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0001			
Copper	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0045			
Iron	mg/L	0.005	SM 3120	01-Nov-21/O	0.022			
Lead	mg/L	0.00002	EPA 200.8	04-Nov-21/O	0.00015			
Magnesium	mg/L	0.02	SM 3120	01-Nov-21/O	21.1			
Manganese	mg/L	0.001	SM 3120	01-Nov-21/O	0.008			
Molybdenum	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0035			
Nickel	mg/L	0.0002	EPA 200.8	04-Nov-21/O	0.0010			
Potassium	mg/L	0.1	SM 3120	01-Nov-21/O	5.0			
Silicon	mg/L	0.01	SM 3120	01-Nov-21/O	4.76			
Silver	mg/L	0.0001	EPA 200.8	04-Nov-21/O	< 0.0001			
Sodium	mg/L	0.2	SM 3120	01-Nov-21/O	29.8			



Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CADUCEON ENVIRONMENTAL LABORATORIES
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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-34815

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 22-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Surface Water

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		Duplicate			
			Sample I.D.		B21-34815-5			
			Date Collected		22-Oct-21			
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	01-Nov-21/O	0.654			
Thallium	mg/L	0.00005	EPA 200.8	04-Nov-21/O	< 0.00005			
Vanadium	mg/L	0.0001	EPA 200.8	04-Nov-21/O	0.0015			
Tin	mg/L	0.05	SM 3120	01-Nov-21/O	< 0.05			
Titanium	mg/L	0.005	SM 3120	01-Nov-21/O	< 0.005			
Zinc	mg/L	0.005	SM 3120	01-Nov-21/O	0.012			
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	29-Oct-21/K	0.07			
Total Kjeldahl Nitrogen	mg/L	0.1	E3199A.1	11-Nov-21/K	1.0			
Phosphorus-Total	mg/L	0.01	E3199A.1	11-Nov-21/K	0.06			
BOD(5 day)	mg/L	3	SM 5210B	27-Oct-21/K	< 3			
COD	mg/L	5	SM5220C	29-Oct-21/K	16			
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	10-Dec-21/O	6.8			
Anion Sum	meq/L		Calc.	04-Nov-21/O	7.90			
Cation Sum	meq/L		Calc.	04-Nov-21/O	6.85			
% Difference	%		Calc.	04-Nov-21/O	7.08			
Ion Ratio	AS/CS		Calc.	04-Nov-21/O	1.15			
Sodium Adsorption Ratio	-		Calc.	04-Nov-21/O	0.786			
Conductivity (calc.)	µmho/cm		Calc.	04-Nov-21/O	692			
TDS(calc.)/EC(actual)	-		Calc.	04-Nov-21/O	0.524			
EC(calc.)/EC(actual)	-		Calc.	04-Nov-21/O	0.939			

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

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CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-34820

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 22-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		G99-6	Duplicate		
			Sample I.D.		B21-34820-1	B21-34820-2		
			Date Collected		22-Oct-21	22-Oct-21		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Hardness (as CaCO3)	mg/L	1	SM 3120	28-Oct-21/O	1080	1080		
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	03-Nov-21/O	484	486		
TDS(ion sum calc.)	mg/L	1	Calc.	04-Nov-21/O	1342	1315		
Chloride	mg/L	0.5	SM4110C	02-Nov-21/O	8.1	8.2		
Nitrite (N)	mg/L	0.05	SM4110C	02-Nov-21/O	< 0.05	< 0.05		
Nitrate (N)	mg/L	0.05	SM4110C	02-Nov-21/O	< 0.05	< 0.05		
Sulphate	mg/L	1	SM4110C	03-Nov-21/O	610	582		
Bromide	mg/L	0.4	SM4110C	02-Nov-21/O	< 0.4	< 0.4		
Aluminum	mg/L	0.01	SM 3120	28-Oct-21/O	0.11	0.11		
Barium	mg/L	0.001	SM 3120	28-Oct-21/O	0.039	0.039		
Beryllium	mg/L	0.0001	EPA 200.8	02-Nov-21/O	< 0.0001	< 0.0001		
Boron	mg/L	0.005	SM 3120	28-Oct-21/O	0.706	0.706		
Cadmium	mg/L	).000015	EPA 200.8	02-Nov-21/O	0.000085	0.000084		
Calcium	mg/L	0.02	SM 3120	28-Oct-21/O	310	311		
Chromium	mg/L	0.001	EPA 200.8	02-Nov-21/O	< 0.001	< 0.001		
Cobalt	mg/L	0.0001	EPA 200.8	02-Nov-21/O	0.0003	0.0004		
Copper	mg/L	0.0001	EPA 200.8	02-Nov-21/O	0.0076	0.0024		
Iron	mg/L	0.005	SM 3120	28-Oct-21/O	0.083	0.081		
Lead	mg/L	0.00002	EPA 200.8	02-Nov-21/O	0.00019	0.00002		
Magnesium	mg/L	0.02	SM 3120	28-Oct-21/O	74.7	74.6		
Manganese	mg/L	0.001	SM 3120	28-Oct-21/O	0.249	0.250		
Molybdenum	mg/L	0.0001	EPA 200.8	02-Nov-21/O	0.0007	0.0007		
Nickel	mg/L	0.0002	EPA 200.8	02-Nov-21/O	0.0048	0.0049		
Potassium	mg/L	0.1	SM 3120	28-Oct-21/O	15.7	15.7		
Silicon	mg/L	0.01	SM 3120	28-Oct-21/O	8.46	8.40		
Silver	mg/L	0.0001	EPA 200.8	02-Nov-21/O	< 0.0001	< 0.0001		
Sodium	mg/L	0.2	SM 3120	28-Oct-21/O	32.1	32.0		

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: ---

REPORT No. B21-34820

Report To:

The Nation Municipality - Casselman
958 Route 500 West,
Casselman ON K0A 1M0
Attention: Daniel R. Desforges

Caduceon Environmental Laboratories
2378 Holly Lane
Ottawa Ontario K1V 7P1
Tel: 613-526-0123
Fax: 613-526-1244

DATE RECEIVED: 22-Oct-21
DATE REPORTED: 13-Dec-21
SAMPLE MATRIX: Groundwater

JOB/PROJECT NO.: Central Landfill Site
P.O. NUMBER:
WATERWORKS NO.

			Client I.D.		G99-6	Duplicate		
			Sample I.D.		B21-34820-1	B21-34820-2		
			Date Collected		22-Oct-21	22-Oct-21		
Parameter	**Units**	**R.L.**	**Reference Method**	**Date/Site Analyzed**				
Strontium	mg/L	0.001	SM 3120	28-Oct-21/O	1.15	1.14		
Thallium	mg/L	0.00005	EPA 200.8	02-Nov-21/O	< 0.00005	< 0.00005		
Tin	mg/L	0.05	SM 3120	28-Oct-21/O	< 0.05	< 0.05		
Titanium	mg/L	0.005	SM 3120	28-Oct-21/O	< 0.005	< 0.005		
Vanadium	mg/L	0.0001	EPA 200.8	02-Nov-21/O	0.0006	0.0006		
Zinc	mg/L	0.005	SM 3120	28-Oct-21/O	0.863	0.868		
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	29-Oct-21/K	0.02	0.04		
o-Phosphate (P)	mg/L	0.002	PE4500-S	29-Oct-21/K	0.005	0.006		
Phosphorus-Total	mg/L	0.01	E3199A.1	11-Nov-21/K	0.03	0.04		
COD	mg/L	5	SM5220C	29-Oct-21/K	19	20		
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	10-Dec-21/O	8.9	8.8		
Anion Sum	meq/L		Calc.	04-Nov-21/O	22.6	22.0		
Cation Sum	meq/L		Calc.	04-Nov-21/O	23.4	23.5		
% Difference	%		Calc.	04-Nov-21/O	1.78	3.12		
Ion Ratio	AS/CS		Calc.	04-Nov-21/O	0.965	0.939		
Sodium Adsorption Ratio	-		Calc.	04-Nov-21/O	0.425	0.423		
Conductivity (calc.)	µmho/cm		Calc.	04-Nov-21/O	1846	1826		

R.L. = Reporting Limit
Test methods may be modified from specified reference method unless indicated by an *
Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Greg Clarkin , BSc., C. Chem
Lab Manager - Ottawa District

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from

Appendix F: Checklist

Appendix D-Monitoring and Screening Checklist
General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.
Instructions: A complete checklist consists of:
(a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
(b) completed contact information for the Competent Environmental Practitioner (CEP)
(c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
Definition of Surface water CEP:
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information	
Waste Disposal Site (WDS) Name	Central Landfill Site
Location (e.g. street address, lot, concession)	Lot 14, Concession 5
GPS Location (taken within the property boundary at front gate/ front entry)	490474E, 5018740 N (18T) (UTM)
Municipality	The Nation Municipality
Client and/or Site Owner	The Nation Municipality
Monitoring Period (Year)	2021
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	Certificate of Approval No. A471101
Director's Order No.:	
Provincial Officer's Order No.:	

Other:			
Report Submission Frequency	◯ **Annual** ◯ **Other**	Specify:	
The site is: **(Operation Status)**	◯ **Open** ◯ **Inactive** ◯ **Closed**		
Is there an active waste transfer station at the site?	◯ **Yes** ◯ **No**		
Does this WDS have a Closure Plan?	◯ **Not yet submitted** ◯ **Submitted and under review** ◯ **Submitted and approved**		
Total Approved Capacity	NA - Closed site	*Units*	Cubic Metres
Maximum Approved Fill Rate		*Units*	
Total Waste Received within Monitoring Period (Year)		*Units*	Cubic Metres
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*	NA - Closed site		
Estimated Remaining Capacity		*Units*	Cubic Metres
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*	NA - Closed site		
Estimated Remaining Capacity *Date Last Determined*	NA - Closed site		
Non-Hazardous Approved Waste Types	☐ Domestic ☐ Industrial, Commercial & Institutional (IC&I) ☐ Source Separated Organics (Green Bin) ☐ Tires	☐ Contaminated Soil ☐ Wood Waste ☐ Blue Box Material ☐ Processed Organics ☐ Leaf and Yard Waste	☐ Food Processing/Preparation Operations Waste ☐ Hauled Sewage Other: NA - Closed site
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*	NA - Closed site		

Year Site Opened *(enter the Calendar Year only)*		**Current ECA Issue Date**	1-December-2010
Is your Site required to submit Financial Assurance?		◯ **Yes** ◯ **No**	
Describe how your WDS is designed.		◯ Natural Attenuation only ◯ Fully engineered Facility ◯ Partially engineered Facility	
Does your Site have an approved Contaminant Attenuation Zone?		◯ **Yes** ◯ **No**	
If closed, specify ECA, control or authorizing document closure date:		1-August-2001	
Has the nature of the operations at the site changed during this monitoring period?	◯ **Yes** ◯ **No**		
If yes, provide details:			

Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)	◯ Yes ◯ No

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	◯ **Yes** ◯ **No**	Groundwater monitoring is limited at the site. Groundwater discharges to ravines prior to reaching any downgradient receivers.
2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/ control document(s):	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document.	◯ **Yes** ◯ **No** ◯ **Not Applicable**	
b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If no, list exceptions below or attach additional information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◯ **Yes** ◯ **No**	If no, specify:
Sampling and Monitoring Program Results/WDS Conditions and Assessment:		
5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/ or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	◯ **Yes** ◯ **No**	Overburden groundwater flow discharges to surface water (Ravines) and eventually to the South Nation River. Attenuation zone located cross gradient (east of site)
6) The site meets compliance and assessment criteria.	◯ **Yes** ◯ **No**	If no, list and explain exceptions:
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	◯ **Yes** ◯ **No**	If no, list exceptions and explain reason for increase/change:

1) Is one or more of the following risk reduction practices in place at the site: ***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	◯ **Yes** ◯ **No**	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☒ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	◯ **Yes** ◯ **No** ◯ **Not Applicable**		

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Select Date

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◯ **No changes to the monitoring program are recommended** ◯ **The following change(s) to the monitoring program is/ are recommended:**	
◯ **No Changes to site design and operation are recommended** ◯ **The following change(s) to the site design and operation is/are recommended:**	
Name:	Mark McCalla, P.Geo.
Seal:	Add Image

Signature:		**Date:**	
CEP Contact Information:	Mark McCalla, P.Geo.		
Company:	EXP Services Inc.		
Address:	100-2650 Queensview Drive, Ottawa, ON, K2B 8H6		
Telephone No.:	613-688-1899 ext 63243	Fax No. :	613-225-7337
E-mail Address:	mark.mccalla@exp.com		
Co-signers for additional expertise provided:			
Signature:		**Date:**	
Signature:		**Date:**	

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):	
Name (s)	South Nation River

Distance(s)	Adjacent along the northern property line

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	◯ **Yes** ◯ **No**	If no, identify issues:
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):	◯ **Yes** ◯ **No** ◯ **Not applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.	◯ **Yes** ◯ **No** ◯ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◯ **Yes** ◯ **No**	If no, specify:

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):	◯ **Yes** ◯ **No**

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. ECA limit, PWQO, background	e.g. X% above PWQO
Total Phosphorus	PWQO- at SW7, SW17, SW3, SW18	Spring : SW7 -300%, SW17 - 250%, SW3 - 400%, SW18 - 300% above PWQO Fall : SW3 - 300%, SW7 -300%, SW17 - 350%, SW18 - 300% above PWQO
Iron	PWQO- at SW7, SW17	Spring: None above PWQO Fall: None above PWQO
ammonia	PWQO- at SW3, SW18	Spring: None above PWQO Fall: None above PWQO
pH	PWQO- at SW17	Spring : None above PWQO Fall : SW17 14.2% above PWQO
6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	◯ **Yes** ◯ **No**	If yes, specify: phosphorous and iron are the result of upgradient impacts from the South Nation River. Ammonia impacts may be related from degraded vegetation (not regularly identified at the landfill)

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	◯ **Yes** ◯ **No**	
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	◯ Yes ◯ No ◯ Not Known ◯ Not Applicable	If yes, provide details and whether remedial measures are necessary: Aluminum, boron, phosphorous andzinc were observed to exceed the PWQO at G99-6 Boron is considered a leachate indicator parameter and could potentially impact the surface water in the future. No boron exceedances were noted within the surface water in 2021. However, there is the potential for some impact to the surface water.
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	◯ **Yes** ◯ **No** ◯ **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken:

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◯ **No Changes to the monitoring program are recommended** ◯ **The following change(s) to the monitoring program is/are recommended:**	
◯ **No changes to the site design and operation are recommended** ◯ **The following change(s) to the site design and operation is/ are recommended:**	Type Here

CEP Signature	
Relevant Discipline	P.Geo.
Date:	March 7, 2022
CEP Contact Information:	Mark McCalla, P.Geo.
Company:	EXP Services Inc.
Address:	100-2650 Queensview Drive, Ottawa, ON, K2B 8H6
Telephone No.:	613-688-1899 ext. 63243
Fax No. :	613-225-7337
E-mail Address:	mark.mccalla@exp.com

Save As		**Print Form**

SOCIÉTÉ PROFESSIONNELLE LACOMBE

Commissaire à l'intégrité pour la Municipalité de la Nation

Integrity Commissioner for the Nation Municipality

Telephone: **(613) 678-9124**

Courriel/email: **jjlc.integrity@gmail.com**

Le 23 mars 2022

Mme Josée Brizzard
Greffière de la Municipalité de
Nation

Compétence : Mme Josée Brizzard

Sujet : Rapport annuel du Commissaire à l'intégrité pour l'année 2021

Cher Mme Brizzard,

Conformément à mon entente de service avec votre municipalité et aux obligations qui me sont conférés en vertu de la *Loi de 2006 sur les Municipalités*, il me fait plaisir de vous faire rapport concernant ma première année d'activités.

a. Session d'éducation

Conformément à mon obligation, le 12 avril 2021, j'ai donné une session d'éducation virtuelle à votre conseil municipal. Cette session a également été suivie d'une période de questions.

b. Révision de votre réglementation

Au cours de cette première année, j'ai également révisé et proposé des amendements substantiels à votre réglementation concernant votre Code de Procédure ainsi que votre processus de plainte et votre code de déontologie.

Ces changements ont par la suite été dûment approuvés par votre conseil de sorte à ce que ces amendements font maintenant partie de votre réglementation.

c. Processus de plaintes

Aucune plainte n'a été déposée auprès de votre municipalité au cours de l'année 2021.

d. Demande d'avis de membres du conseil

Durant cette même année, aucune demande d'avis ne m'a été présentée par un membre de votre conseil.

Je tiens toutefois à vous rappeler que je suis à l'entière disponibilité de votre conseil pour répondre à des demandes d'avis par écrit concernant la *Loi Municipale sur les Conflits d'Intérêts* ou au sujet de votre code de déontologie.

Pour ce faire, les membres du conseil n'ont qu'à m'envoyer un courriel avec les faits pertinents et il me fera plaisir de leur répondre le plus rapidement possible. Je leur demanderais toutefois de m'aviser de la date de la réunion pour laquelle mon avis est requis et de m'accorder un délai d'au moins 48 heures afin d'y répondre.

Dernièrement, si vous ou votre conseil avez quelque question que ce soit au sujet de ce rapport annuel ou de tout autre sujet, n'hésitez surtout pas à communiquer avec le soussigné.

Espérant le tout conforme, je vous prie de vouloir agréer, chère Mme Brizzard, l'expression de mes sentiments les meilleurs,

Jean-Jacques LaCombe

CORPORATION OF THE NATION MUNICIPALITY

BY-LAW NO. 60-2022

BEING a By-Law for imposing fees and charges for municipal services and activities provided or done by or on the municipality's behalf.

WHEREAS, Part XII, Section 391 (1) of the Municipal Act, 2001 as amended, provides for municipalities to pass by-laws imposing fees and charges on any class of persons,

a) for services or activities provided or done by or on its behalf;
b) for costs payable by it for services or activities provided by or done by or on behalf of any other municipality or local board;
c) for the use of property including property under its control.

AND WHEREAS, Section 391 (2) of said Act provides that a fee or charge imposed under subsection (1) for capital costs related to sewage or water services or activities may be imposed on persons not receiving an immediate benefit from the services or activities but who will receive a benefit at some later point in time.

AND WHEREAS, Section 69, (1), (2), (3) of the Planning Act, R.S.O. 1990 as amended, provides for municipalities to establish a tariff of fees for the processing of applications made in respect of planning matters.

AND WHEREAS, Section 42(1) of the Planning Act, R.S.O. 1990 as amended states that as a condition of development or redevelopment of land, the council of a local municipality may, by by-law applicable to the whole municipality or to any defined area or areas thereof, require that land in an amount not exceeding, in the case of land proposed for development or redevelopment for commercial or industrial purposes, 2 per cent and in all other cases 5 per cent of the land be conveyed to the municipality for park or other public recreational purposes.

THEREFORE, the Council of the Corporation of The Nation Municipality enacts as follows:

1) Definitions

1.1 **"By-Law"** includes a resolution for the purpose of a local board.

1.2 **"Local Board"** includes any prescribed body performing a public function and a school board but, for the purpose of passing by-laws imposing fees and charges under Part XII of the Municipal Act, 2001, does not include a school board or hospital board.

1.3 **"Person"** includes a municipality and a local board and the Crown.

1.4 **"Municipality"** means the Corporation of The Nation Municipality.

1.5 **"Public Utility"** means charges for either capital costs or user costs for water and sewer services.

2) That fees and charges be imposed for certain services and activities as shown in the attached Schedule "A" attached to and forming part of this By-Law.

3) The fees and charges shall be invoiced to the person and shall be payable within 30 days of the date of the invoice. Interest at the rate of 1.25% per month shall be charged after the due date. The fees and charges imposed by the municipality on a person constitute a debt of the person to the municipality.

4) 4.1 The Treasurer is empowered to add any overdue fees and charges imposed by the municipality to the tax roll for any real property of the person responsible for paying the fees and charges and these shall be collected in like manner as municipal taxes.

4.2 In the case of fees and charges imposed for the supply of a public utility, the overdue amount shall be added to the tax roll for the property to which the public utility was supplied.

4.3 The Treasurer is empowered to impose fees and charges for capital costs related to sewage and water services or activities on persons not receiving an immediate benefit from the services or activities but who will receive a benefit at some point in time.

5) That By-Law No. 87-2018 be hereby rescinded

6) That this by-law shall come into force on the day of its passing.

READ A FIRST, SECOND AND THIRD TIME AND PASSED IN OPEN COUNCIL THIS 4th DAY OF APRIL, 2022.

_____ _____

Francois St. Amour, Mayor **Josée Brizard, Clerk**

SEAL

By-Law 60-2022 - Annexe “A”

Administration

Affidavits, commissaire à l’assermentation	15,00 $
Changement ou annulation d’un chèque postdaté, retirer un chèque postdaté ou placer un chèque en attente	5,00 $
Transmission de télécopie	2,00 $
Demande de document sous la liberté d’accès à l’information, par demande	5,00 $
Aussi le règlement sur le MFIPPA spécifie pour le temps de recherche, par 15 minutes	7,50 $
Carte de la municipalité	Coût + 10 % administration
Licence de mariage	140,00 $
Vente d’impôt municipal (Règlement 103-2013)*	
Chèque (insuffisance de fonds)	20,00 $
Photocopie, par page, noir & blanc (8 ½ x 11- x 14)	0,25 $
Photocopie, par page, couleur (8 ½ x 11 – X 14)	0,35 $
Photocopie, par page (11 x 17)	0,50 $
Recherche de dossiers, par heure	30,00 $
Courrier recommandé, par envoi	20,00 $
Location de la chambre du Conseil – selon la politique de location de petites salles de la récréation	
Réimpression / copie d’un reçu d’impôt ou des services publics, etc	15,00$
Certificat d’impôt	60,00$
Factures de services divers- frais d’administration de 10% sur le coût de base du service avant la taxe	

Autres municipalités frais d’administration

Projets d’infrastructures avec main d’œuvre partagée, équipement et gérance	2%
Projets d’infrastructure sans partage gérance, partage de main d’œuvre et équipement	5%
Projets d’infrastructure sans partage gérance, de main d’œuvre ou équipement	10%

Construction

Certificat de conformité du bâtiment	85,00$
Permis de construction (Frais)	Règlement 87-2012*
Poêle à bois extérieur	Règlement 37-2004*
Piscines et enclos	Règlement 80-2005*

Contrôle des animaux, fourrières et élimination

(Règlement 31-2021)*

Permis de chenil / élevage de pur race, par permis	100,00$
Fourrière & ramassage, par chien	50,00$

Élimination d’animaux	95,00$
Frais journalier de fourrière, par chien	30,00$

Département des règlements

Permis d’entreprises	Règlement 50-2005*
Clôtures	Règlement 45-2014*
Permis de feu et frais d’appel d’incendie	Règlement 84-2004*
Maison d’hébergement	Règlement 31-2004*
Permis de loterie	Règlement 50-2002*
Rapport de conformité aux normes de propriété	Règlement 133-1998*
Frais de service des normes foncières	Règlement 133-1998*
Véhicules de rafraîchissement et commerçants itinérants	Règlement 89-2010*
Enseignes	Règlement 22-2018*

Drainage

Inspections de drainage souterrain	100,00$

Arbitres de clôtures

Arbitres de clôtures – par visite d’arbitre plus le kilométrage	100,00$

Incendie

Rapport de confirmation d’incendie	Règlement 148-2015*
Borne fontaine	Règlement 86-2018*

Planification et zonage

Somme fixe aux fins de parc pour demande d’autorisation	1 750,00$
Contrôle du plan du site commercial ou industriel, argent comptant au lieu d’un parc, 2% de valeur des terres ou de transmettre 2% de la superficie brute	
Contrôle du Plan du site résidentiel, argent comptant au lieu d’un parc, 5% de valeur des terres ou de transmettre 5% de la superficie brute	
Lotissement résidentiel, argent comptant au lieu d’un parc, 5% de valeur des terres ou de transmettre 5% de la superficie brute	
Demande d’autorisation	700.00$
Frais de développement	Règlement 93-2015*
Dérogation mineure/permission	500,00$
Modification du plan officiel	1 500,00$
Inspection sur place pour les ententes de plan de site, par visite	75,00$
Contrôle des partis de lots - par demande avec un maximum de 3 lots	200,00$
Demande de fermeture de chemins avec solde inutilisé remboursable et facturation du montant excédent de dépense	5 000,00$
Entente du plan de site, frais d’administration non remboursable 500,00$ plus un dépôt de 2 000,00 avec solde inutilisé remboursable	
Entente de lotissement	2 500,00$
Conformité de zonage	40,00$

Modification du règlement de zonage	1 500,00$

Travaux publics

Poteau d'adresse 9-1-1	135,00$
Permis d'entrée, par demande, non remboursable	125,00$
Permis coupe de route et/ou de fossé, par demande, non remboursable plus dépôt selon le Règlement 48-2006*	125,00$

Environment

Collants pour les sacs de d'ordures, par étiquette (Règlement 131-2021)*	1,00$
Frais de collecte d'ordures et de recyclage	Règlement d'évaluation annuel
Frais de dépotoir	Règlement 131-2021*

Recréation

Publicité - panneaux à l'aréna St-Isidore	Selon la politique en vigueur
Publicité - panneaux à la patinoire St-Albert	Selon la politique en vigueur
Location de salle	Selon la politique en vigueur
Location de la glace à l'aréna	Selon la politique en vigueur
Location de salle pour les clubs d'âge d'or	Selon la politique en vigueur

Eau & Égouts

Permis de connexion (Règlement 49-2002)*

a) Par service	100,00$
b) Pour deux services sur le même cadastre	150,00$
Consommation d'eau Limoges	Selon règlement annuel en vigueur
Consommation d'eau St Isidore	Selon règlement annuel en vigueur
Utilisation des égouts Fournier, Limoges St-Albert, St-Bernardin, St-Isidore	Selon règlement annuel vigueur
Déconnexion (Règlement 53-2021)*	45,00$
Reconnexion	75,00$
Compteur d'eau (Règlement 53-2021)*	450,00$

THE CORPORATION OF THE NATION MUNICIPALITY

BY-LAW NO. 64-2022

Being a By-Law to dedicate land as a Public Highway.

WHEREAS the *Municipal Act, 2001, c. 25 s.5 (1)* provides that the powers of a municipal corporation are to be exercised by its council;

AND WHEREAS the *Municipal Act, 2001, c. 25 s.5 (3)* provides that the powers of every council are to be exercised by by-law;

AND WHEREAS the Corporation of The Nation Municipality desires to dedicate an unopened road allowance as an open road;

AND WHEREAS, the Municipal Act, Section 27 (1) states that, except as otherwise provided in the Act, a municipality may pass by-laws in respect of a highway only if it has jurisdiction over the highway;

AND WHEREAS the Municipal Act, Section 27 (2) states that if a highway is under the joint jurisdiction of two or more municipalities, a by-law in respect of the highway must be passed by all of the municipalities having jurisdiction over the highway;

AND WHEREAS, the boundary road at Concession 10 is under the joint jurisdiction of the Township of North Stormont and The Nation Municipality;

AND WHEREAS a By-Law must be registered on title to dedicate it as a public highway.

NOW THEREFORE the Council of the Corporation of The Nation Municipality enacts as follows:

1) That the Boundary Road Allowance from Lots 26, 25 and Pt. Lot 24 Concession 10, for a distance approximately 1,200 meters between the Township of North Stormont and The Nation Municipality (PIN 69017-0084), former Township of Cambridge, now The Nation Municipality in the United Counties of Prescott and Russell be accepted into the road system and dedicated as a public highway to be known as “Chemin Trail Road”.

2) That the map in Schedule “A” attached be hereto and forming part of this By-Law.

3) That this By-Law be registered on title.

READ A FIRST, SECOND AND THIRD TIME, PASSED, SIGNED AND SEALED THIS 4TH DAY OF APRIL, 2022.

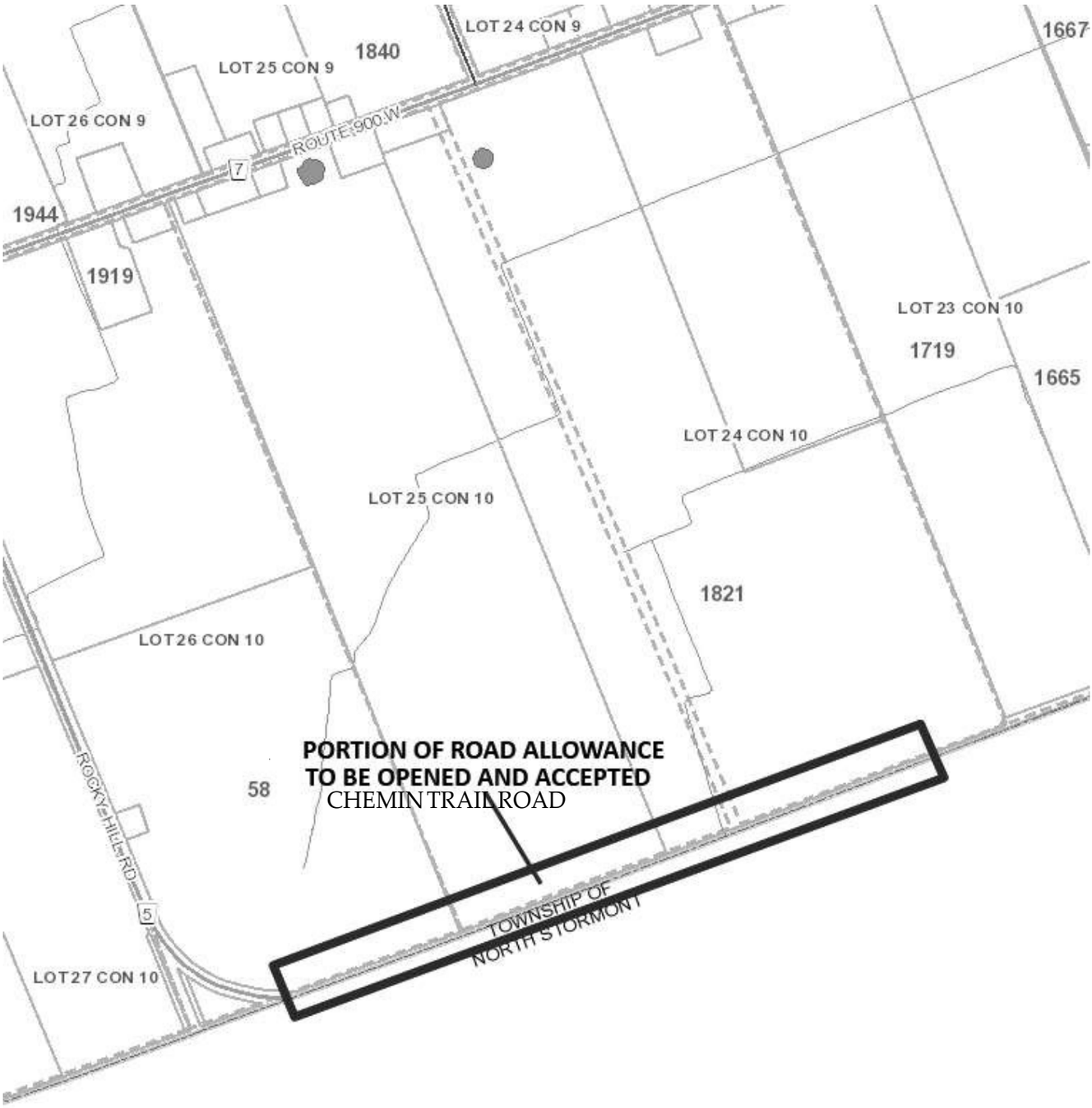
_____ _____

François St-Amour, Mayor Josée Brizard, CAO-Clerk

SEAL

Dedicate land as a Public Highway

SCHEDULE "A" to By-Law 64-2022



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Map generated by UCPR A la Carte web mapping application. The United Counties of Prescott and Russell disclaims all responsibility for errors, omissions or inaccuracies in this publication. Do not rely on it as being a precise indicator of routes or location of features.Produced by UCPR under Licence with the OMNR. © 2021 Queen's Printer for Ontario. © 2021 United Counties of Prescott and Russell, All rights reserved.

March 17, 2022
9:57:42 AM

Prescott Russell

The Nation Municipality/Municipalite de La Nation

Accounts Payable Cheque Register Report - Caisse Populaire Nouvel-horizon Inc.-603910

For The Date Range From 03/30/2022 To 04/05/2022

For All Vendors And For Outstanding, Cleared Cheques - Computer Generated, eCheque

Cheque # / eCheque ID	Type	Date	Vendor	Name	Amount	Status
12588	C	04/05/2022	270	LOISELLE SPORTS INC	$99.42	O
12589	C	04/05/2022	290	MINISTER OF FINANCE	$134,856.27	O
12590	C	04/05/2022	369	DELTA POWER EQUIPMENT	$3,458.28	O
12591	C	04/05/2022	424	RUSH TRUCK CENTRES OF CANADA LIMITED	$3,605.41	O
12592	C	04/05/2022	430	WINDSOR SALT LTD.	$7,170.87	O
12593	C	04/05/2022	435	THE PEPSI BOTTLING GROUP (CANADA) ULC	$439.60	O
12594	C	04/05/2022	444	TRAITEMENT D'EAU DESFORGES	$380.82	O
12595	C	04/05/2022	459	VICE & HUNTER LLP	$2,732.34	O
12596	C	04/05/2022	1200	LE COIN DU LIVRE	$5,342.62	O
12597	C	04/05/2022	1534	D/S MANUFACTURING	$1,073.50	O
12598	C	04/05/2022	1597	FORGUES, DANIK	$750.00	O
12599	C	04/05/2022	1860	BERTRAND SUPPLIES	$1,094.30	O
12600	C	04/05/2022	1925	MAIN INDUSTRIAL SALES LTD	$316.04	O
12601	C	04/05/2022	2305	LA CUISINE BENSON	$653.42	O
12602	C	04/05/2022	2449	MICHAEL PAQUET	$3,164.00	O
12603	C	04/05/2022	2761	FERME AVICOLE M.S. LEROUX LTEE	$643.78	O
12604	C	04/05/2022	2794	SANI GEAR INC.	$2,491.38	O
12605	C	04/05/2022	3090	RACINE STEPHANE	$1,000.00	O
12606	C	04/05/2022	3091	SOCIETE PROFESSIONNELLE LACOMBE	$5,650.00	O
63065	E	04/05/2022	30	AUTO PARTS EXTRA PIECES D'AUTO	$4,752.05	O
63067	E	04/05/2022	36	BDO DUNWOODY SRL/LLP	$7,859.15	O
63068	E	04/05/2022	65	BRAZEAU SANITATION INC	$406.80	O
63069	E	04/05/2022	66	BRENNTAG CANADA INC	$3,445.42	O
63070	E	04/05/2022	71	BYTOWN LUMBER	$691.55	O
63072	E	04/05/2022	75	CADUCEON ENTREPRISES INC	$2,271.27	O
63073	E	04/05/2022	76	CANAAN LOCK & SECURITY SYSTEMS	$158.20	O
63074	E	04/05/2022	80	MAXIBURO LTEE	$284.03	O
63075	E	04/05/2022	84	CARRIERE & POIRIER EQUIPMENT	$1,099.72	O
63076	E	04/05/2022	116	UNIAG COOPERATIVE	$903.01	O
63077	E	04/05/2022	117	COOPERATIVE AGRICOLE D'EMBRUN	$126.65	O
63078	E	04/05/2022	145	ELECTROTEK INC	$2,359.00	O
63079	E	04/05/2022	158	FERNAND DENIS INC	$5,802.55	O
63080	E	04/05/2022	169	LA FROMAGERIE COOPERATIVE ST-ALBERT INC.	$195.18	O
63081	E	04/05/2022	175	G.D.S HYDRAULIC INC	$672.33	O
63082	E	04/05/2022	202	J.B. MOBILE MECHANIC INC	$7,336.32	O

Accounts Payable Cheque Register Report - Caisse Populaire Nouvel-horizon Inc.-603910

For The Date Range From 03/30/2022 To 04/05/2022

For All Vendors And For Outstanding, Cleared Cheques - Computer Generated, eCheque

Cheque # / eCheque ID	Type	Date	Vendor	Name	Amount	Status
63083	E	04/05/2022	206	JEAN-CLAUDE CAYER ENTREPRISES	$1,381.97	O
63084	E	04/05/2022	216	KEMIRA WATER SOLUTIONS CANADA INC	$12,596.51	O
63085	E	04/05/2022	225	GFL ENVIRONMENTAL INC	$8,077.98	O
63086	E	04/05/2022	262	LES SERVICES EXP INC	$45,920.32	O
63087	E	04/05/2022	264	LEVAC PROPANE INC	$6,582.99	O
63088	E	04/05/2022	278	MATHIEU E. QUESNEL AVOCAT ET NOTAIRE	$918.38	O
63089	E	04/05/2022	323	PAPETERIE GERMAIN INC	$311.89	O
63090	E	04/05/2022	351	PNEU LANDRIAULT TIRE	$1,211.36	O
63091	E	04/05/2022	359	PUROLATOR COURRIER LTD	$348.02	O
63092	E	04/05/2022	449	UNIPRO ST-ISIDORE	$2,133.72	O
63093	E	04/05/2022	476	XPLORNET COMMUNICATIONS INC	$84.73	O
63094	E	04/05/2022	477	XYLEM CANADA LP	$384.29	O
63095	E	04/05/2022	533	SPUEHLER SHOP	$409.35	O
63096	E	04/05/2022	664	BEAUDIN MARTIN	$557.50	O
63097	E	04/05/2022	852	MICHELIN NORTH AMERICA (CANADA) INC	$10,344.15	O
63098	E	04/05/2022	1063	MALBEUF TECH SOLUTIONS	$3,216.42	O
63099	E	04/05/2022	1259	SSC Maintenance Services Inc	$2,662.16	O
63100	E	04/05/2022	1276	CAPITAL CONTROLS	$3,447.63	O
63101	E	04/05/2022	1308	AJ STONE COMPANY LTD	$4,046.30	O
63102	E	04/05/2022	1336	ON CALL CENTRE	$247.19	O
63103	E	04/05/2022	1375	ALIMPLUS INC	$2,736.56	O
63104	E	04/05/2022	1393	BEACON LITE (OTTAWA) LTD.	$4,781.03	O
63105	E	04/05/2022	1773	A.D.R. DISTRIBUTION	$380.00	O
63106	E	04/05/2022	1829	MAXI POWER ELECTRICAL SERVICES INC.	$152.55	O
63107	E	04/05/2022	1902	MATERIAUX PONT-MASSON RONA	$172.80	O
63108	E	04/05/2022	2389	INNOVATIVE SURFACE SOLUTIONS CANADA	$12,594.53	O
63109	E	04/05/2022	2423	W.O. STINSON & SON LTD.	$25,403.92	O
63110	E	04/05/2022	2550	BRANDT TRACTOR LTD	$252.67	O
63111	E	04/05/2022	2658	BDI A DIVISION OF BELL MOBILITY INC.	$273.62	O
63112	E	04/05/2022	2791	ERIC FONTAINE	$200.00	O
63113	E	04/05/2022	2797	RALIK	$165.53	O
63114	E	04/05/2022	2886	LAR-MEX INC	$689.30	O
63115	E	04/05/2022	2895	EASTERN WELDING 1377837 ONTARIO INC.	$11,522.64	O
63116	E	04/05/2022	3002	MCDONALD BROTHERS CONSTRUCTION INC.	$1,510,425.66	O
63117	E	04/05/2022	3086	2341969 ONTARIO INC.	$4,969.72	O

The Nation Municipality/Municipalite de La Nation

Accounts Payable Cheque Register Report - Caisse Populaire Nouvel-horizon Inc.-603910

For The Date Range From 03/30/2022 To 04/05/2022

For All Vendors And For Outstanding, Cleared Cheques - Computer Generated, eCheque

Cheque # / eCheque ID	Type	Date	Vendor	Name	Amount	Status
BELL CANADA	E	04/05/2022	46	BELL CANADA	$1,381.15	O
ENBRIDGE CONSUMER GAS	E	04/05/2022	146	ENBRIDGE CONSUMER GAS	$3,918.08	O
HYDRO ONE NETWORKS INC	E	04/05/2022	198	HYDRO ONE NETWORKS INC	$18,193.31	O
MINISTER OF FINANCE	E	04/05/2022	291	MINISTER OF FINANCE	$7,713.10	O
QUADIENT CANADA LTD.	E	04/05/2022	303	QUADIENT CANADA LTD.	$501.04	O
SHAW DIRECT	E	04/05/2022	1729	SHAW DIRECT	$91.02	O

TOTAL **$1,924,686.37**

Flambées en cours

Prenez note qu'une flambée est en cours dans les établissements suivants.

Format de la date : année-mois-jour

DATE: 2022-03-31

ÉTABLISSEMENT	LIEU	TYPE DE FLAMBÉE	ORGANISME IDENTIFIÉ	SIGNALÉ RAPPORTÉ	DATE DE LA FIN DE LA FLAMBÉE	DERNIÈRE MISE À JOUR
St-Jacques Nursing Home	Embrun	Respiratoire	Inconnu	2022-03-30		2022-03-30
Dundas Manor	Winchester	Entérique	Inconnu	2022-03-30		2022-03-30
Champlain Long Term Care	L'Orignal	COVID	COVID	2022-03-20		2022-03-20
Heritage Heights	Cornwall	Entérique	Inconnu	2022-03-14		2022-03-15
Community Living-Dominion St. Residence	Alexandria	Entérique	Inconnu	2022-03-10	2022-03-18	2022-03-18
Jardins Belle Rive	Rockland	COVID	COVID	2022-03-09	2022-03-23	2022-03-23
Caressant Care Nursing Home	Bourget	Respiratoire	Inconnu	2022-03-04	2022-03-21	2022-03-21
Rockland Manor	Rockland	COVID	COVID	2022-02-13	2022-03-25	2022-03-25

Définition d’une éclosion de COVID-19 dans un établissement

À partir du 7 avril 2021, la définition d’une éclosion de COVID-19 dans un établissement consiste de la présence d’au moins deux cas confirmés en laboratoire (résidents, personnel ou visiteurs), dans une période de 14 jours, lesquels sont reliés par un lien épidémiologique où il est raisonnable de croire qu’au moins une personne peut avoir contracté l’infection à l'établissement.

Activité grippale dans la région

Aucun cas d’influenza et flambées est signalé dans la région.

- Cliquer ici pour connaître l'activité grippale dans la province
- Cliquer ici pour connaître l'activité grippale au pays.

- Cliquez ici pour retourner à la page précédente.
- Cliquez ici pour retourner à la page d’accueil.

From: AMO Communications
To: Aimée Roy
Subject: AMO Watchfile - March 31, 2022
Date: March 31, 2022 10:05:18 AM

AMO Watchfile not displaying correctly? View the online version
Add Communicate@amo.on.ca to your safe list

March 31, 2022

In This Issue

- PJ Marshall Awards - Call for submissions for 2022 now open.
- ROMA Board seeking member input on Attainable Housing in Rural Ontario.
- AMO 2022 important information - Room block release and registration launch
- Canoe vendor spotlight: Gradall.
- Road & Sidewalk Assessment info sessions.
- Don't miss Canoe's final spring webinars.
- ONE Investment Spring 2022 webinar: Why Proxy Votes Are Important for ESG.
- Register to vote in the 2022 Ontario Municipal and School Board Elections.
- Careers.

AMO Matters

Every year at the AMO Conference the PJ Marshall Awards recognize municipal excellence and innovation in capital projects, operating efficiencies, and new approaches to service delivery. If you have something you are proud to share, the deadline for 2022 submissions is May 27, 2022.

ROMA Matters

The ROMA Board has established a Rural Attainable Housing Task Force to develop policy solutions and strategies that consider the realities of rural Ontario and to implement the housing recommendations found in the *Opportunities for Rural Ontario in a Post-Covid World* action plan. The Board is asking members to take 5 minutes to complete a survey that will provide valuable information to support the work of the Task Force.

Eye on Events

AMO's first in-person conference in two years officially launches next week! Book your hotel rooms in the beautiful City of Ottawa April 4 at 10 am and take advantage of early bird registration on April 11 at 10 am. Questions? Contact events@amo.on.ca.

LAS

We're pleased to welcome Gradall to the Canoe Procurement Group. This contract offers hydro vac, sewer jet, industrial vacuums, and combination jet & vac machines.

With over 200 contracts, Canoe makes buying what you need quicker and cheaper. Contact Simon to learn more.

The LAS Road & Sidewalk Assessment Service brings modern technology and intelligent asset management to your streets and sidewalks. Join us on April 21 to learn how this program helps you save money while improving your infrastructure. Register Here.

Join us for the last 2 Canoe Procurement Group webinars before summer. On April 6 we'll hear from Johnson Controls, provider of security systems, fire alarms, building automation, and many more technologies. Register here. On April 20 the Canoe legal team will provide an update to make sure your purchases are done in full compliance with laws and trade agreements. Register here.

ONE Investment
ONE Investment is hosting a Spring webinar on April 12, collaborating with our external portfolio manager Guardian Capital to discuss "Why Proxy Votes Are Important for ESG Principles (Environmental, Social and Governance)." To register and know what will be covered in the webinar, click here.

Municipal Wire*
The upcoming year will be a busy one for Ontario voters, with the Ontario Provincial Election and Municipal and School Board Elections happening just a few months apart. Make sure you are on the list to vote in the 2022 Municipal and School Board Elections on October 24. Register at voterlookup.ca. Download Toolkit.

Careers
Regional Program Manager - The Ministry of Labour, Training and Skills Development. The Ministry is looking for 3 strong transformational leaders (Central, East, West) to take on the role to lead the Employment Service Transformation implementation and delivery. Apply online by April 6.

Planner - Township of Douro-Dummer. Provides planning services to address the corporate strategic objectives and guide growth and development. Apply to hr@dourodummer.on.ca by April 22.

Treasurer - Haldimand County. The incumbent will execute the statutory duties of the position, ensure the Corporation adheres to all acts, regulations, policies and procedures in carrying out its financial responsibility. Apply online by April 18.

Chief Administrative Officer - Township of Adjala-Tosorontio. Responsible for the strategic leadership and efficient delivery of all the municipality's administrative and operational services. Apply to careers@waterhousesearch.ca by April 15.

Chief Administrative Officer - Municipality of Chatham-Kent. Develops and implements operational plans and ensures the coordination of services which align to and support strategic priorities. Apply to careers@waterhousesearch.ca by April 22.

Director of Finance - South Nation Conservation. The South Nation Conservation is seeking an experienced professional, with the knowledge, skills, and abilities to

provide financial leadership and risk management. Apply to careers@nation.on.ca by April 19.

Advisor Continuous Improvement - Region of Peel. Provides expertise supporting the capability and effectiveness of the Human Services processes, including analysis, interpretation and development. Apply online by April 13.

Grants Specialist & Treasury Administration - Town of Wasaga Beach. Responsible for researching and coordinating applications in pursuit of grant opportunities at the Federal. Apply online by April 19.

About AMO

AMO is a non-profit organization representing almost all of Ontario's 444 municipal governments. AMO supports strong and effective municipal government in Ontario and promotes the value of municipal government as a vital and essential component of Ontario's and Canada's political system. Follow @AMOPolicy on Twitter!

AMO Contacts

AMO Watchfile Tel: 416.971.9856
Conferences/Events
Policy and Funding Programs
LAS Local Authority Services
MEPCO Municipal Employer Pension Centre of Ontario
ONE Investment
Media Inquiries
Municipal Wire, Career/Employment and Council Resolution Distributions

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AMO's Partners

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Association of Municipalities of Ontario
200 University Ave. Suite 801,Toronto ON Canada M5H 3C6
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PORT COLBORNE

March 22, 2022

Moved by Councillor E. Beauregard
Seconded by Councillor A. Desmarais

WHEREAS the **Year of the Garden 2022** celebrates the Centennial of Canada's horticulture sector; and

WHEREAS gardens and gardening contribute to the quality of life of our municipality and create safe and healthy places where people can come together; and

WHEREAS the **Year of the Garden 2022** will highlight and celebrate the important contribution of gardeners, our local gardening organizations, horticultural professionals and local horticultural businesses which contribute to garden culture and the experience garden of our municipality; and

WHEREAS gardens and gardening have helped us face the challenges of the COVID pandemic; and

WHEREAS Communities in Bloom in collaboration with the Canadian Garden Council, invites all municipalities to celebrate the Year of the Garden; and

NOW THEREFORE I, Mayor William C. Steele, do hereby proclaim 2022 as the **Year of the Garden**, in the City of Port Colborne. In celebration of the contribution of gardens and gardening to the development of our country, our municipality and the lives of our citizens in terms of health, quality of life and environmental challenges; and

THAT the Saturday before Father's Day, June 18 in 2022, be recognized as Garden Day in the City of Port Colborne as a legacy of Canada's Year of the Garden 2022; and

THAT the City of Port Colborne is committed to be a Garden Friendly City supporting the development of its garden culture; and

THAT all municipalities across Canada be invited to proclaim 2022 to be the **Year of the Garden** in their respective municipalities, and that a copy of this resolution be provided to all municipalities of Ontario, for that purpose.

William C. Steele
Mayor

March 23, 2022

Hon. Steve Clark
Minister of Municipal Affairs and Housing
College Park, 17th Floor
777 Bay St.
Toronto, ON M7A 2J3

RE: Resolution from the City of Waterloo passed March 21st, 2022 re: Ontario Must Build it Right the First Time

---

Dear Minister Clark,

Please be advised that the Council of the Corporation of the City of Waterloo at its Council meeting held on Monday, March 21st, 2022 resolved as follows:

> WHEREAS the Province of Ontario adopted greenhouse gas reduction targets of 30% by 2030, and emissions from buildings represented 22% of the province's 2017 emissions,
>
> WHEREAS all Waterloo Region municipalities, including the City of Waterloo, adopted greenhouse gas reduction targets of 80% below 2012 levels by 2050 and endorsed in principle a 50% reduction by 2030 interim target that requires the support of bold and immediate provincial and federal actions,
>
> WHEREAS greenhouse gas emissions from buildings represent 45% of all emissions in Waterloo Region, and an important strategy in the TransformWR community climate action strategy, adopted by all Councils in Waterloo Region, targets new buildings to be net-zero carbon or able to transition to net-zero carbon using region-wide building standards and building capacity and expertise of building operators, property managers, and in the design and construction sector,
>
> WHEREAS the City of Waterloo recently adopted a net-zero carbon policy for new local government buildings and endorsed a corporate greenhouse gas and energy roadmap to achieve a 50% emissions reduction by 2030 for existing local government buildings and net-zero emissions by 2050 (provided the provincial electricity grid is also net-zero emissions),
>
> WHEREAS the draft National Model Building Code proposes energy performance tiers for new buildings and a pathway to requiring net zero ready construction in new buildings, allowing the building industry, skilled trades, and suppliers to adapt on a predictable and reasonable timeline while encouraging innovation;

WHEREAS the Ministry of Municipal Affairs and Housing is consulting on changes for the next edition of the Ontario Building Code (ERO #: 019-4974) that generally aligns with the draft National Model Building Code except it does not propose adopting energy performance tiers, it does not propose timelines for increasing minimum energy performance standards step-by-step to the highest energy performance tier, and, according to Efficiency Canada and The Atmospheric Fund, it proposes adopting minimum energy performance standards that do not materially improve on the requirements in the current Ontario Building code;

WHEREAS buildings with better energy performance provide owners and occupants with lower energy bills, improved building comfort, and resilience from power disruptions that are expected to be more common in a changing climate, tackling both inequality and energy poverty;

WHEREAS municipalities are already leading the way in adopting or developing energy performance tiers as part of Green Development Standards, including Toronto and Whitby with adopted standards and Ottawa, Pickering, and others with standards in development;

WHEREAS the City of Waterloo is finalizing Green Development Standards for its west side employment lands and actively pursuing Green Development Standards in partnership with the Region of Waterloo, the Cities of Kitchener and Cambridge, and all local electricity and gas utilities through WR Community Energy;

WHEREAS while expensive retrofits of the current building stock to achieve future net zero requirements could be aligned with end-of-life replacement cycles to be more cost-efficient, new buildings that are not constructed to be net zero ready will require substantial retrofits before end-of-life replacement cycles at significantly more cost, making it more cost-efficient to build it right the first time.

THEREFORE BE IT RESOLVED THAT Council request the Province of Ontario to include energy performance tiers and timelines for increasing minimum energy performance standards step-by-step to the highest energy performance tier in the next edition of the Ontario Building Code, consistent with the intent of the draft National Model Building Code and the necessity of bold and immediate provincial action on climate change;

THAT Council request the Province of Ontario to adopt a more ambitious energy performance tier of the draft National Model Building Code as the minimum requirement for the next edition of the Ontario Building Code than those currently proposed;

THAT Council request the Province of Ontario provide authority to municipalities to adopt a specific higher energy performance tier than the Ontario Building Code, which would provide more consistency for developers and homebuilders than the emerging patchwork of municipal Green Development Standards;

THAT Council request the Province of Ontario to facilitate capacity, education and training in the implementation of the National Model Building Code for municipal planning and building inspection staff, developers, and homebuilders to help build capacity; and

THAT this resolution be provided to the Minister of Municipal Affairs and Housing, to area MPPs, and to all Ontario Municipalities.

Please accept this letter for information purposes only.

If you have any questions or require additional information, please contact me.

Sincerely,

Julie Scott
City Clerk, City of Waterloo

CC (by email):

Catherine Fife, M.P.P (Waterloo)
Laura Mae Lindo, M.P.P (Kitchener Centre)
Belinda C. Karahalios, M.P.P (Cambridge)
Amy Fee, M.P.P (Kitchener-South Hespeler)
Mike Harris, M.P.P (Kitchener-Conestoga)

From: Johanna Echlin <johanna.echlin@gmail.com>
Date: March 28, 2022 at 4:18:56 PM EDT
Subject: Information on how to send a letter to CNSC re: CNL's proposal for radioactive waste facility 1 km from Ottawa River

Dear Mayors of United Counties of Prescott and Russell,

I am sending you all the information you need on how to send your letter/intervention to the Canadian Nuclear Safety Commission regarding CNL's proposal for a radioactive waste facility one kilometre from the Ottawa River.

We are now down to the wire. Please get involved. This is hugely important for the future of the Ottawa River. Share this information with others!

Best wishes,
Johanna Echlin
Old Fort William Cottagers' Association

May 31st final licensing hearing for giant Chalk River radioactive waste mound

Interventions by Indigenous Nations and communities, the public and other stakeholders will be made to the commissioners of the Canadian Nuclear Safety Commission beginning on May 31. These commissioners will make the final decision. The hearings will continue for several days depending on the number of intervenors.

We urge you to take a stand and tell commissioners why CNL's (Canadian Nuclear Laboratories) giant radioactive waste mound must not be approved and constructed. This will be the final opportunity for the public to comment on this flawed proposal that will endanger the Ottawa River when this mound leaks and disintegrates, which the proponent's own studies show is inevitable.

You do not need to have any scientific or technical expertise to intervene. Your intervention/submission/letter can be short or more substantial. What is important is that your opinion matters. It is vital that the CNSC commissioners hear your opinions and objections to this proposal.

How to intervene

April 11 is the deadline to request to intervene

Your request must include:

- Your written submission to be presented to the Commission
- Whether you wish to intervene with your written submission only or if you would also like to make an oral presentation during the hearings (oral presentations limited to 10 minutes)
- Your name, address and telephone number (essential

To Send: two options ~ send by email or use on-line form (link just below):

1. Send via email to CNSC: interventions@cnsc-ccsn.gc.ca

To identify your request, write in the subject line and as a heading:

May 31 Public Commission Hearing - Canadian Nuclear Laboratories Near Surface Disposal Facility

OR

2. Use on-line CNSC Request Form

Date: May 31 Licensee: Canadian Nuclear Laboratories (CNL)

Subject: Public Commission Hearing - Near Surface Disposal Facility

http://www.nuclearsafety.gc.ca/eng/the-commission/intervention/

What to expect: The Commission Registry will acknowledge receipt of your request to intervene and will later confirm if your intervention has been accepted by the Commission.

If your request is accepted, your intervention will be given a Commission member document (CMD) reference number and will be added to the public record. Submissions will be publicly available on the CNSC website.

Here is some information that might help you to write a letter/intervention

NEW information ~ A critical report

The case to approve the mound is deeply flawed. Ole Hendrickson, scientist and researcher with Concerned Citizens of Renfrew County and Area, says that CNSC "has failed to assess the project in an objective and scientifically credible manner" and that the staff report includes a number of "critical omissions" that he says "make it impossible for the commission to make a sound decision about whether or not to license the dump".

The critical report below was produced by Concerned Citizens of Renfrew County and Area, Old Fort William Cottagers' Association and Ralliement contre la pollution radioactive. It contains a great deal of information about why CNL's proposal should not be approved.

Critical Flaws, Errors and Omissions in CNSC staff's case to approve the Chalk River Mound

Défauts, erreurs et omissions critiques dans le dossier d'approbation du monticule de Chalk River

Media Release Feb. 22, 2022
On February 22nd, the day of Part 1 of CNSC Hearings, a media release was sent with a critique of CNSC's case to approve the giant radioactive waste mound. The critique was also sent to the CNSC president, federal ministers of Environment and Natural Resources, and others.

Nuclear regulator's case to approve giant nuclear waste mound is fraught with serious errors and omissions, citizens' groups say

Selon des groupes de citoyens, les arguments de l'autorité de réglementation nucléaire en faveur de l'autorisation d'un gigantesque monticule de déchets nucléaires sont truffés d'erreurs et d'omissions graves

Media Release: February 16, 2022
MPs and groups oppose hearings to license Canada's first permanent radioactive waste dump
The media release in English and in French.

The statement referred to in the media release was sent to Ms. Rumina Velshi, CNSC President, and to the federal ministers of Environment, Natural Resources, Indigenous Services and Crown Indigenous Relations.

OPEN LETTER To Prime Minister Justin Trudeau and members of the federal cabinet ~ Stop the Chalk River radioactive waste dump

LETTRE OUVERTE au premier ministre Justin Trudeau et au Conseil des ministres fédéral ~ ARRÊTEZ le dépotoir radioactif de Chalk River

Articles

Radioactive mega-dump = a MEGA problem
March 5, 2022 Editorial - Aidan Belanger | Pontiac Journal
https://pontiacjournal.com/radioactive-mega-dump-a-mega-problem/

New Radioactive Waste Plan Poses 'Millennia of Risk' for Ottawa River Communities
January 16, 2022 Ole Hendrickson | The Energy Mix
https://www.theenergymix.com/2022/01/16/new-radioactive-waste-plan-poses-millennia-of-risk-for-ottawa-river-communities/

Des députés et des militants s'opposent aux audiences d'autorisation sur le projet de décharge nucléaire -
le 17 février 2022 [CHIPFM 101,9]
http://chipfm.com/Des-deputes-et-des-militants-s-opposent-aux-audiences-d-autorisation-sur-le
Article includes audio of an interview with Monique Pauzé

Useful Links:

CNSC staff EA report and licensing CMD 22-H7
The Canadian Nuclear Safety Commission staff produced 590-page document that recommends approval of the radioactive waste mound
https://www.nuclearsafety.gc.ca/eng/the-commission/hearings/cmd/pdf/CMD22/CMD22-H7.pdf

Public Hearing Procedural Guidance for Intervenors
http://www.nuclearsafety.gc.ca/eng/the-commission/pdf/NoticeRev1-PublicHearing-CNL-NSDF-22-H7-e.pdf

The environmental assessment registry for NSDF
Includes Canadian Nuclear Laboratories final Environmental Impact Statement
https://iaac-aeic.gc.ca/050/evaluations/proj/80122

CNSC two-part public hearing on NSDF
http://www.nuclearsafety.gc.ca/eng/the-commission/pdf/Notice-PublicHearing-CNL-NSDF-22-H7-e.pdf

Ontario Provincial Police
Police provinciale de l'Ontario

Communications and Technology Services Bureau
Bureau de gestion de communication et technologie

Lincoln M. Alexander Building
777 Memorial Ave.
Orillia ON L3V 7V3

Edifice Lincoln M. Alexander
777, avenue Memorial
Orillia ON L3V 7V3

Telephone/Téléphone: (705) 329-6177
Facsimile/Télécopieur: (705) 329-6230

File Number/Référence: **GOV-SOL-6100**

March 21, 2022

MEMORANDUM TO:

OPP EAST REGION POLICE SERVICES BOARDS &
MUNICIPAL CHIEF ADMINISTRATIVE OFFICERS

Re: OPP Recorded Patrol for Safe Communities Project

The Ontario Provincial Police (OPP) Communications and Technology Services Bureau (CTSB) is pleased to announce that officers and vehicles in East Region will be receiving Body-Worn Cameras (BWCs) and In-Car Cameras (ICCs) with integrated Automated Licence Plate Recognition (ALPR) technology over the coming year, as part of the OPP Recorded Patrol for Safe Communities project.

Funded by the Ontario government, this project builds on the success of an evaluative study which began in spring 2021 involving the deployment of 100 cameras to particular officers in OPP West Region. BWCs and ICCs with integrated ALPR are tools that may produce better evidence, enhance accountability, and reduce public complaints, thereby increasing public trust. The OPP conducts full due diligence on all new technologies to make sure they are safe, fiscally-responsible, and effective. In addition, this deployment will be supported by robust standard operating procedures and officer training, to safeguard privacy and ensure the technology is used correctly. Adopting BWC and ICC/ALPR technology on a regional scale is a tangible example of the OPP's commitment to accountability, transparency, and professionalism among its frontline members.

BWC and ICC/ALPR technology are expected to be fully operational in East Region detachments and vehicles by the end of March 2023. For details regarding the rollout in specific areas, please contact your local OPP detachment commander for more information. On behalf of CTSB, thank you for your support of this technology modernization project which will enhance public safety in East Region.

K.A. (Karen) Meyer, Chief Superintendent
Bureau Commander
Communications and Technology Services Bureau

c: Deputy Commissioner Rose DiMarco, Provincial Commander, Traffic Safety and Operational Support
Deputy Commissioner Chris Harkins, Provincial Commander, Field Operations
Chief Superintendent Karl Thomas, Regional Commander, East Region
Superintendent Phil Whitton, Bureau Commander, Municipal Policing Bureau

From: Carolyn Lance [mailto:clance@georgina.ca]
Sent: Thursday, March 31, 2022 11:40 AM
Subject: Federal Government Sanctions imposed on Russia

Good morning.

Please find below a motion passed by Council of the Town of Georgina imposing limitations upon the purchase of goods that can easily be traced to have originated from Russia, and requesting support of this position by other Ontario municipalities;

RESOLUTION NO. C-2022-0081
Moved By Councillor Waddington
Seconded By Councillor Neeson

WHEREAS the country of Ukraine has experienced a premeditated and unprovoked invasion by Russia;

AND WHEREAS silence is complicity;

AND WHEREAS Canada imports hundreds of millions of dollars' worth of goods from Russia each year;

AND WHEREAS negative financial impacts upon a country can be used as a means to deter further conflict;

BE IT THEREFORE RESOLVED THAT the Town of Georgina unequivocally denounces Russia's unjustifiable war against Ukraine;

AND THAT the Town of Georgina supports the sanctions which the Federal government of Canada has thus far imposed on Russia;

AND THAT effective immediately and until a time when the sovereignty of Ukraine is once again unchallenged, the Town of Georgina will:

1) Not purchase any products (ie plywood, fertilizer, steel, furniture or machinery) which can be easily traced to have originated from Russia; and,

2) Insist that any future contracts for services for the Town of Georgina abide by these same limitations within our municipality;

AND THAT upon confirmation that the Belarusian military is engaged within Ukraine that the Town of Georgina apply these limitations upon goods from that country as well;

AND THAT this decision of Georgina Council be forwarded to all other municipalities within Ontario requesting they enact similar measures so that as a united front we can make a noticeable difference.

Carried Unanimously

Carolyn Lance
Council Services Coordinator
Clerk's Division | Town of Georgina
26557 Civic Centre Road, Keswick, ON | L4P 3G1
905-476-4301 Ext. 2219 | georgina.ca
Follow us on Twitter and Instagram, like us on Facebook

Please note that our office hours are Monday to Friday, 8:30am to 4:30pm