



Municipality of Greenstone

**2016, 2017 and 2018 Environmental Quality
Monitoring Report
Nakina Landfill
Municipality of Greenstone, Ontario**

Type of Document:
Final

Project Number:
THB-00011119-GE

EXP Services Inc.
1142 Roland Street
Thunder Bay, ON, P7B 5M4
Canada
T: + 1.807.623.9495
F: + 1.807.623.8070
www.exp.com

Date:
April 18, 2019

Legal Notification

This report was prepared by EXP Services Inc. for the account of and for use by the Municipality of Greenstone. This report may also be used by the Ministry of Environment, Conservation and Parks (MECP) to assess compliance with the conditions of the applicable Certificate of Approval (CofA) and other Ministry directives as outlined herein.

Any use which any other third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this project.

Table of Contents

Legal Notification	i
1 Introduction.....	1
1.1 Background	2
2 Site Setting and Geology	4
3 Site Hydrogeology	5
4 Monitoring/Reporting Requirements.....	7
5 Operational Information	8
5.1 Volume of Landfill Waste	8
5.2 Remaining Life Expectancy	9
5.3 Operational Problems and Complaints.....	9
5.4 Waste Types and Waste Diversion	10
6 Field Procedures.....	11
6.1 Monitoring Well Condition	11
6.2 Sampling Protocol.....	11
7 Results and Discussion	12
7.1 Background Conditions (MW4)	12
7.2 Source Well Conditions (MW1)	12
7.3 Proximate Wells (MW2, MW3, MW5).....	13
7.4 2018 Monitoring Well Results Summary	13
7.5 Durov Plots.....	15
7.6 Time Series Charts.....	15
7.7 Reasonable Use Assessment.....	15
7.8 Surface Water Quality Results	16
7.9 QA/QC.....	17
7.9.1 Cation/Anion Balances.....	17
7.9.2 Duplicates and Blanks	17
7.9.3 Hold Times	18
7.9.4 Internal QA/QC	18
8 Contingency Plan	19
8.1 Trigger Levels.....	19
8.1.1 Groundwater Protection	19
8.1.2 Surface Water Protection	20
8.1.3 Landfill Gas.....	20

8.2	Contingency Plan Measures	20
9	Summary and Conclusions.....	22
10	Recommendations.....	24
11	Closing Comments	25

APPENDIX A – Regulatory Documentation and Correspondence

APPENDIX B – Figures

APPENDIX C – Borehole Logs and Grain Size Curves

APPENDIX D – Summary Tables

APPENDIX E – Laboratory Reports of Analysis

APPENDIX F – Durov Plots

APPENDIX G – Time Series Graphs

1 Introduction

EXP Services Inc. (EXP) was commissioned by the Municipality of Greenstone to prepare an environmental quality monitoring report (for the years 2016, 2017 and 2018) for the Nakina Landfill site, in general compliance with requirements contained in the document *Monitoring and Report for Waste Disposal Sites, Groundwater and Surface Water, Technical Guidance Document, Ministry of the Environment, Operations Division* (November 2010). The site is located about 2 km southwest of the community of Nakina on the south side of Highway 584, in the Municipality of Greenstone, as shown on Figure 1 in Appendix B. The GPS coordinates at the approximate centre of the site are NAD 83 16 U 517696E 5558646N.

The site is currently operating under Provisional Certificate of Approval (now termed an Environmental Compliance Approval or ECA) No. A591901, dated January 8, 1990 (see Appendix A). The ECA does not contain any environmental monitoring or reporting requirements. In order to bring the site into compliance with current Ministry of the Environment, Conservation and Parks (MECP) requirements for waste disposal sites, the Municipality intends to submit an application to amend the ECA. EXP has been engaged to provide assistance in this regard, including preparation of supporting documentation. Supporting documentation that has been prepared to date includes a Design and Operations Plan¹ and an Initial Hydrogeological Evaluation report². Approval to proceed with the monitoring program as outlined in the Initial Hydrogeological Evaluation report was received from the MECP (formerly named Ministry of the Environment and Climate Change [MOECC]) via email on October 17, 2016; refer to Appendix A. On March 15, 2019, via email, the MECP indicated that they were also in general agreement with the draft D&O Plan and recommended that the Municipality proceed with an application to amend the ECA. Note that the Initial Hydrogeological Evaluation report recommended that the tri-annual monitoring report be submitted by April 2018 for the 2015, 2016 and 2017 sampling events; however, since MECP approval to proceed with sampling was received in the fall of 2016, the MECP agreed, via email on February 15, 2017, that the initial groundwater monitoring report due date be changed to April 2019, and include sampling events from 2016, 2017 and 2018 (refer to Appendix A).

This report represents the initial monitoring report for the site and provides results of the 2016 (fall only), 2017 and 2018 monitoring program in the context of available historical results (September 2014) and applicable criteria. Analytical results for groundwater are compared to the MECP's Ontario Drinking Water Standards (ODWS, from *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines*, June 2003), as well as to MECP Guideline B-7 (which incorporates the Reasonable Use concept into MECP groundwater management activities) and the MECP's Aquatic Protection Values (APV's, from Appendix B2 of *Rationale for the Development of Soil and Groundwater Standards for Use at*

¹ EXP Services Inc. (2015). Draft *Design and Operations Plan, Beardmore Landfill, Municipality of Greenstone, Ontario*. Project No. THB-00011119-CE - 100, April 22, 2015.

² EXP Services Inc. (2015). *Initial Hydrogeological Evaluation, Nakina, Landfill, Nakina, Ontario*. Project No. THB-00011119-CE - 500, March 16, 2015.

Contaminated Sites in Ontario, April 2011). Analytical results for the surface water are compared to the MECP's 1994 Provincial Water Quality Objectives (PWQO), updated in 1999.

1.1 Background

It is believed that the site began receiving waste in late 1962, based on an initial Land Use Permit (No. 1289-35) understood to have been issued for the period November 30, 1962 to November 29, 1963. The site was not formally approved until April 11, 1973, under Provisional Certificate of Approval (C of A) No. 591901 (expired November 15, 1973 and subsequently renewed), issued for a Landfill Site with no other details or conditions indicated. However, in a review of the application, the MECP's Regional Engineer recommended that a Provisional C of A be issued with the following conditions:

1. The site should be properly signed.
2. Existing mounds of refuse must be properly covered.
3. The municipality should investigate the feasibility of operating a trench type landfill.

Supporting information submitted with the application indicates a 4-acre waste disposal footprint within a total site area of 5 acres. This is consistent with the MNR Land Use Permit for a 5-acre (2 ha) site, in effect until it was updated on January 1, 1990 to reflect a 19.3 ha site. An amended C of A (No. A591901) for a 5-ha landfilling site within a total site area of 20 ha was issued on January 8, 1990, with no expiry date.

According to the C of A, the site is approved for disposal of the following categories of waste: domestic, non-hazardous solid waste and other (sewage sludge). Also, a buffer zone is required, extending 100 meters in all directions from the working area boundaries. Copies of the current C of A and any related documentation are found in Appendix A.

On August 14, 2014, on behalf of the Municipality of Greenstone, EXP submitted a Determination of Theoretical Approved Capacity letter for the Nakina Landfill to the MECP. Following review, the MECP issued a letter, dated October 20, 2016, indicating approval of a theoretical capacity of 118,600 m³ for the site. The MECP letter is included in Appendix A.

Most recently, the MECP provided review comments (memorandum dated October 11, 2018 – see Appendix A) on the environmental monitoring aspects of the afore-referenced D&O Plan. The MECP memorandum indicated/recommended the following (with EXP's responses in **bold** font):

- It is recommended that the consultant preparing the groundwater and surface water monitoring report due in April 2019, references the following document during the report preparation: *Monitoring and Report for Waste Disposal Sites, Groundwater and Surface Water, Technical Guidance Document, Ministry of the Environment, Operations Division* (November 2010). **The current report is prepared in general accordance with the above referenced document.**

- The inclusion of a small (un-named) lake within the proposed contaminant attenuation zone is a concern with respect to potential impacts on surface water quality. Monitoring well MW5 (located ~ 40 m up-gradient from the small lake) recorded exceedances of the calculated B-7 criteria for TDS, DOC, alkalinity, manganese and mercury in September 2014. Groundwater seepage/flow at the site was estimated at ~1 m/day. Based on this information and the remaining lifespan of the site (~75 years), it is recommended that the surface water monitoring program for the small lake is reviewed by a MECP Surface Water Specialist. **EXP is awaiting the MECP Surface Water Specialist's review.**
- Considering the limited groundwater elevation data for the site and the proximity of the small (un-named) lake, it is recommended that additional down-gradient monitoring wells are installed northwest and northeast of the small lake; between MW3 and MW5, and MW4 and MW5, respectively. **EXP is in agreement.**

For a more detailed site history, refer to the draft D&O Plan report, previously referenced.

2 Site Setting and Geology

As stated above, the Nakina Landfill (the site) is located about 2 km southwest of the community of Nakina on the south side of Highway 584, in the Municipality of Greenstone, as shown on Figures 1 and 2 in Appendix B.

Based on a review of geological mapping, the underlying native soil conditions at the site consist of bedrock knob with a subordinate landform consisting of sand and gravel kame, kame field, kame terrace, and kame moraine deposits. Local relief is mainly moderate, knobby, hummocky and with predominately dry surface conditions.

Surrounding features are also indicated on Figure 2. The nearest residence and nearest potable well are located within the Nakina townsite, about 1.5 km east of the site. The nearest waterbody is a small (apparently un-named) lake immediately south of the site. However, there is a marshy area along the treeline at the west edge of the waste footprint. Two more small lakes are located about 700 m north of the site, which immediately discharge to a larger lake (Balkam Lake).

Most of the area of the site itself is relatively flat. However, there is a slope toward a marshy area bordering the west part of the historical waste footprint, and a sand hill (source of cover and berm material) in the south-central part. Topographic surveys were conducted in both 2012 and 2014 and are discussed later in this report.

Locally, surface drainage generally flows to the north towards Highway 584, to the south towards the un-named lake and to the west towards the marshy area at the west part of the site. There is no interceptor ditching at the site, and off-site surface drainage follows the topography in the area, which generally directs flow towards the lakes that surround the site.

3 Site Hydrogeology

There are five monitoring wells on site: MW1, MW2, MW3, MW4 and MW5 (see Figures 3 & 4 in Appendix B). MW2 to MW5 were installed in September 2014, as part of the Initial Hydrogeological Evaluation (previously referenced), and MW1 was historically installed by others (unable to locate the borehole log, and the installation date is unknown). The Borehole Logs are found in Appendix C. Note that consideration of local topography and locations of nearby surface water bodies did not favour a particular groundwater flow direction; therefore, the decision was made to locate the four newer wells (MW2 to MW5) at the approximate cardinal compass points near the approved site boundaries.

In September 2014, an additional borehole (BH4A) was initially advanced about 120 m west of MW4 at the eastern property edge; however, BH4A was terminated due to auger refusal at about 16.8 m below ground surface as well as due to insufficient groundwater, and was ultimately replaced by MW4.

Groundwater levels in the wells, measured during the current reporting period and historically, are summarized in Table 1 (Appendix D).

MW2 is located at the north part of the site and was dry during the well installation in 2014 and during all subsequent sampling events except May 2018. MW2 was advanced to refusal, at about 2.7 m depth or 335.0 m elevation. No other dry wells were encountered on the site.

The groundwater elevation contours were generated for the site using the May 2018 results (only event where a groundwater level was observed at MW2) and are presented on Figure 4. Similar to the Initial Hydrogeological Evaluation in 2014, the groundwater flow on site is generally to the southwest at a gradient of about 0.015 m/m (MW4 to MW5).

The soil conditions encountered on site generally consist of uniformly graded medium to fine grained sand. Some layers of sandy silt or sandy gravel were noted within the sand. Groundwater was encountered at depths ranging between about 5.2 m and 16.6 m below ground surface.

Mechanical sieve analyses were performed on two samples (MW3-S5 and MW5-S7) for soil classification purposes and to allow for determination of the particle size corresponding to the 10% finer than fraction (D_{10}), which is used in the Hazen empirical estimation of hydraulic conductivity (K). The grain size results from the Initial Hydrogeological Evaluation included in Appendix C (Borehole Logs and Grain Size Distributions).

The Hazen method of estimating hydraulic conductivity, where $K \text{ (cm/s)} = [D_{10} \text{ (mm)}]^2$, was originally determined for uniformly graded sands but it can provide a reasonable approximation of K for most cohesionless (non-plastic) soils. The calculated K values are provided in the table, below.

Saturated Coefficient of Permeability (k) Estimated from Grain Size Analysis				
Well No.	Sample No.	Depth (m)	Soil Classification (USCS)	k (cm/s)
MW3	S5	10.9	Sand, trace gravel, trace silt, medium to fine grained	2.0×10^{-2}
MW5	S7	9.5	Sand, trace gravel, trace silt, medium grained	3.2×10^{-2}

The geometric mean hydraulic conductivity / permeability based on the results of the grain size analyses is about 2.5×10^{-2} cm/s or 21.6 metres per day.

Based on an average hydraulic gradient of 0.015 m/m and an assumed soil porosity of 0.3, the groundwater seepage/flow velocity may be calculated using Darcy's Law, $V = K i / n$, where in this case:

$$\begin{aligned}
 K \text{ (hydraulic conductivity)} &= 2.5 \times 10^{-2} \text{ cm/s} \\
 i \text{ (hydraulic gradient)} &= 0.015 \text{ m/m} \\
 n \text{ (effective porosity)} &= 0.3 \text{ (assumed)}.
 \end{aligned}$$

Based on the above values, the estimated groundwater seepage/flow velocity is (V) = 1.1 m/day.

4 Monitoring/Reporting Requirements

As indicated in the Initial Hydrogeological Evaluation, and based on correspondence with the MECP, as well as on EXP's experience with other ECAs for natural attenuation landfills, the following information is included in the present report:

- a summary of the type and quantity of incoming waste accepted during the reporting period;
- discussion indicating the landfill capacity, current fill volume, volume filled in the last year, and the status of any control measures such as interim, final or progressive cover;
- a summary of the site's operation procedure and compliance as per the Design and Operations Plan;
- a summary of recycling operations;
- an accurately-scaled site plan illustrating the location of all buried wastes, the site boundaries, monitoring well locations, the location of the suggested contaminant attenuation zone, and any other significant site features;
- an accurately-scaled location map illustrating topography and the site relative to nearby potentially sensitive groundwater/surface water features (i.e., lakes, streams, wells), or any other potentially significant receptors;
- a section describing the field monitoring and sampling program including QA/QC measure and any variance from normal sampling procedures and/or conditions;
- a water table contour map based on current date;
- stratigraphic cross-sections which clearly illustrate the subsurface distribution of geological materials;
- borehole and monitoring well logs for all monitoring wells;
- tables presenting historical water chemistry and water level data, and graphs illustrating quality trends with time for key parameters at all monitoring locations;
- discussion and assessment of groundwater flow direction and velocities, estimates of leachate generation/impacts, effectiveness of mitigation measures, and compliance with the Reasonable Use Policy;
- recommendations as required for future mitigation, monitoring and site characterization activities;
- recommendations for trigger levels as related to contingency plans, considering the Reasonable Use Policy.

As previously indicated, the initial tri-annual report is due April 2019, and every three years thereafter, with the next report due April 2022.

Note that other issues regarding site operations are discussed in detail in the draft Design and Operations (D & O) Plan (referenced above). It is understood that any additional operational information and not included in the present report will be provided to the MECP by the Municipality of Greenstone.

5 Operational Information

5.1 Volume of Landfill Waste

Due to the dearth of historical records, and the fact that both the trench and area methods of waste placement have been utilized at the site, estimates of current waste volumes include considerable uncertainty. A maximum (worst case) estimate of the current waste volume can be arrived at by assuming that waste is buried to a depth of 7 m (the maximum historical waste depth according to the Municipality) across the entire 3.8 ha waste footprint utilized to date. This would result in a waste (and interim cover) volume of 266,000 m³. (i.e., well in excess of the approved theoretical capacity). However, a more realistic (and in EXP's opinion, more defensible) estimate would be based on estimated annual waste deposition rates (i.e., annual volume increases). The site first began receiving waste in or around late 1962. However, the site was not formally approved until April 1973. Assuming the site did begin operating in 1962, it has been receiving waste for about 53 years.

As noted, a topographic survey of the site was conducted on May 28, 2012. The survey was repeated on June 26, 2014 (see Figures 3 and 4). Based on elevation differences (i.e., areas of both cut and fill) between the May 2012 and June 2014 surveys, Delta Survey determined that the increase in volume (waste and interim cover) associated with filling of the "open pit" is 1,188 m³. This averages to some 570 m³/yr.

Note that Delta also measured a decrease of some 3,500 m³ in the volume of a "sand hill" in the south-central part of the landfill. The Municipality has confirmed that this material was taken off-site in late 2012 and used to resurface Twin Lake Road in Nakina. This was done without proper authorization, and the Municipality was fined and required to pay the Crown for the cost of the sand/gravel. In addition, Delta determined that the volume of wood and demolition debris in a pile in the southeast part of the site decreased by some 500 m³ between the 2012 and 2014 surveys. The Municipality has stated that none of this material was taken off site or burned. The apparent decrease may at least partly be attributable to compaction. In any event, the decreases in wood and sand/gravel volumes were not considered in the above determination of the waste volume increase between May 2012 and June 2014.

The Municipality provided EXP with the following estimates of annual waste volumes (uncompacted) received at the site since 2012:

- 2012: 1,213 m³
- 2013: 1,584 m³
- 2014: 1,597 m³
- 2015: 1,250 m³
- 2016: 1,138 m³
- 2017: 1,208 m³
- 2018: 1,291 m³

The estimated annual waste volumes are generally consistent from 2012 to 2018, and relatively more consistent for the current reporting period. However, the Municipality's estimates are considerably greater than the 570 m³/yr obtained from the volume survey (which also includes interim cover material). The Municipality's figures, which are not based on measured quantities, appear to be high. It is also possible that the surveyed quantities err on the low side, although this seems less likely. Considering all available information and allowing for a compaction ratio of 3:1 to 4:1, plus the addition of interim cover material, the estimated waste appears to be conservative. EXP suggests that an average annual *in situ* volume increase (waste and interim cover) of 1,000 m³ going forward would represent a reasonable estimate.

Regarding historical waste volumes, Nakina was originally established as a railway town in the early 1900's, and was the site of a radar base during WW-II. The 1972 C of A application gives a "population served" of 674, while the application for the current C of A, dated March 1989, gives a figure of 650. The population has since decreased considerably to the current figure of about 400. However, the population was double that in the later 1970's when a paper mill was operating. Tourism is important to the local economy, and this industry results in increased volumes of waste requiring disposal, especially during the summer months.

EXP suggests that utilizing an average annual increase of 1,000 m³ (compacted waste and interim cover) since the site first began receiving waste in about 1962 should provide a reasonable estimate of current landfill volume. This figure amounts to some 56,000 m³. This is perhaps again a conservative estimate since garbage was historically burned on site (as recently as 1998 based on a historical MECP inspection letter).

Stratigraphic sections (based on Delta Survey plans June 2014) are given in Figures 5A and 5B.

5.2 Remaining Life Expectancy

As indicated above, as of December 2018, the waste volume, including interim cover, on site is estimated to be about 56,000 m³, which represents about 47% of the approved 118,600 m³ theoretical capacity. Based on an estimated annual waste and cover material volume deposition rate of 1,000 m³/yr. (current quantities to be confirmed – see below), it is estimated that the landfill will reach capacity in about 63 years (2081).

The next updated contour survey will be provided with the Environmental Quality Monitoring Tri-Annual Report for the years 2019, 2020, and 2021 (due April 2022).

5.3 Operational Problems and Complaints

Municipality of Greenstone personnel advised that there were no operational problems or public complaints regarding the Nakina Landfill during the current reporting period.

5.4 Waste Types and Waste Diversion

The landfill only accepts solid non-hazardous municipal waste, including wood, as well as certain recyclable materials (see below).

It was recommended in the Design and Operations Plan (referenced above) that a recycling depot (i.e., for standard recyclables such as glass, plastic, metal containers [steel and aluminum], tetra packs, paper and cardboard) be established at the site. It is understood that no action has yet been taken on this matter. However, the following recyclable materials are accepted at the site: used tires, scrap metal, batteries, electronic waste, fluorescent bulbs, refrigerators/freezers (tagged).

In the D&O Plan, a household hazardous waste (HHW) depot was also recommended. Approval should be obtained from MECP. It is noted however, that residents in the Nakina area are directed to use the HHW events at the Geraldton and Longlac Landfills.

Additional details concerning operation of the landfill are provided in the previously referenced D&O Plan.

6 Field Procedures

6.1 Monitoring Well Condition

As indicated, EXP was commissioned to conduct one round of sampling in 2016 (fall) and two rounds of sampling (spring and fall) annually in 2017 and 2018.

At the time of monitoring, above-ground well components were inspected for compliance with O.Reg. 903. All monitoring wells were in compliance as of the fall 2018 sampling event.

6.2 Sampling Protocol

EXP personnel collected water samples on November 2, 2016; May 17-18 and September 27, 2017; and May 16 and October 15, 2018. The fieldwork was to include collection of groundwater samples from all five monitoring wells, and one surface water location (un-named lake south of site) during all sampling events. However, MW2 was dry during every event except May 2018, and very little groundwater was noted at MW4 during the September 2017 and May 2018 events which resulted in partial chemical testing.

Prior to purging, static water levels were measured in each sampled well using an electronic water level indicator. Between measurements, the stainless-steel probe of the indicator was rinsed with distilled water in order to prevent cross contamination of the wells. Each well was then purged (minimum 3 well volumes or to dryness) using the dedicated Waterra® sampling equipment and generally allowed to recover to at least 80% of static level prior to sampling (excludes low/insufficient water levels at MW4). Upon reaching at least 80% recovery, field measurements of pH, electrical conductivity and temperature were recorded for the groundwater samples. Groundwater samples were then collected directly from the dedicated Waterra sampling equipment into bottles provided precleaned and with appropriate preservatives by the laboratory. Surface water samples were collected directly from the water body using the unpreserved bottles supplied by the laboratory. Sample bottles containing preservatives were then filled from unpreserved sampling bottles.

Groundwater samples for metals, including mercury, were filtered in the field at the time of sample collection using in-line 0.45-micron filter cartridges. In accordance with standard MECP protocol, no field filtering was conducted on the surface water samples, except for mercury.

The samples were placed in an insulated cooler for transport to EXP's offices in Thunder Bay. They were then repackaged in insulated containers and shipped under chain of custody via courier to a Canadian Association for Laboratory Accreditation Inc. (CALA) certified laboratory (Maxxam Analytics Inc. in Mississauga, Ontario) for analysis of the required parameters.

7 Results and Discussion

The laboratory reports containing the groundwater and surface water analytical results for 2016, 2017 and 2018, are provided in Appendix E. The approved monitoring program consists of twice-annual (spring and fall) sampling of all wells and surface water locations. Samples are to be analyzed for the MECP's Landfill Standards Guideline (Schedule 5 – rev. 2010) “comprehensive” parameter list during each event.

Summary tables of the 2018 results, along with the limited available historical results, are given in Appendix D (Table 3), where they are compared to criteria given in the MECP's *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines* (ODWS, June 2003). The ODWS criteria can be either standards (**Maximum Acceptable Concentrations** and **Interim Maximum Acceptable Concentrations**) or objectives (**Aesthetic Objectives** and **Operational Guidelines**). Because some groundwater flowing through the waste disposal site likely eventually discharges to the unnamed lake located about 40 m south of the site, the analytical results for MW5 (furthest south well) are also compared to the MECP's **Aquatic Protection Values** (APVs). Surface water results are compared to the PWQOs. Analytical results in excess of criteria are highlighted in the summary tables. Graphs of concentrations versus time for selected parameters are found in Appendix G.

The results are discussed below in the context of MECP (mainly ODWS) criteria, with emphasis on the most recent (2018) results.

7.1 Background Conditions (MW4)

Monitoring well MW4 (screened from 4.0 to 8.5 m depth in sand to sandy silt, terminating on possible bedrock) is immediately upgradient of the identified waste footprint. As previously indicated, insufficient water was noted during the fall 2017 and spring 2018 events at this well, resulting in partial/limited chemical analyses results. In 2018, only organic nitrogen exceeded the ODWS criterion (0.3 mg/L versus 0.15 mg/L ODWS), which is similar to 2016 and 2017 results. This indicates that groundwater on and in the vicinity of the site can be naturally high in organic nitrogen.

In 2014, ODWS exceedances were noted for dissolved organic carbon (DOC) and manganese; however, based on the available results for the current reporting period, these parameters were below ODWS criteria, suggesting that the 2014 exceedances were likely attributable to well construction effects (groundwater samples were collected one to two days following well installations).

7.2 Source Well Conditions (MW1)

Monitoring well MW1 (installed prior to 2014 - no borehole log information, including well screen depths, is available but the well extends about 7.8 m below ground surface) is located north and downgradient of the eastern waste footprint. Similar to historical results, the 2018

results revealed exceedances of ODWS criteria for total dissolved solids (TDS), DOC, organic nitrogen, alkalinity, iron and manganese. Mercury levels exceeded the ODWS criterion in 2014; however, results have since been below applicable criteria and below laboratory detection limits, suggesting the 2014 mercury levels were attributable to well construction effects.

7.3 Proximate Wells (MW2, MW3, MW5)

Well MW2 (screened from 1.2 to 2.7 m depth in sand to sandy silt, terminating on possible bedrock) is located due north of the waste footprint. This well was dry at the time of installation in 2014, and during all other sampling events, except for May 2018 (i.e., groundwater data are available for only one event). Only DOC exceeded the ODWS criterion (5.9 mg/L versus 5.0 mg/L ODWS).

Well MW3 (screened from 8.1 to 12.6 m depth in sand) is located at the west part of the site and south of Highway 584. In 2018, ODWS exceedances were noted for TDS, sodium (spring only) and chloride. The 2018 exceedances are similar to the 2014, 2016 and 2017 results (note that no sampling was conducted in 2015); however, organic nitrogen exceeded the ODWS criterion during all sampling events prior to 2018. Conductivity values at MW3 are higher than at any of the other wells. The ODWS exceedances at MW3 (excluding organic nitrogen), as well as the high conductivity levels, suggest that these concentrations are largely attributable to salting of the highway, rather than landfill leachate.

Well MW5 (screened from 7.5 to 10.5 m depth generally in sand) is located at the south part of the site, roughly 100 m from the waste footprint, and is about 40 m upgradient (north) of the small un-named lake. ODWS exceedances in 2018 included: TDS, DOC, organic nitrogen, alkalinity, manganese and vinyl chloride. The 2018 exceedances are similar to the 2014, 2016 and 2017 results. In addition, due to its proximity to a surface water body, the MW5 results were also compared with APV criteria; copper exceeded the APV during all sampling events. In general, parameter levels at MW5 were similar to or higher than the “source well” MW1 (see table below).

7.4 2018 Monitoring Well Results Summary

The table below summarizes the average 2018 concentrations at all wells, and highlights (in **bold**) the highest concentrations on site.

Parameter Levels in Monitoring Wells – 2018 Averages

Parameter (Concentration Units)	MW4 (Background)	MW1 ("Source Well")	MW2	MW3	MW5
Conductivity (µS/cm)	365	1,100	240	1,850	1,600
COD (mg/L)	7	81	15	7.5	35
TDS (mg/L)	165	614	130	975	908
DOC (mg/L)	2.5	8.2	5.9	2.0	11
Organic Nitrogen (mg/L)	0.3	1.13	<0.05	0.08	0.43
Calcium	60	220	38	125	245
Sodium	2.4	5.8	1.3	205	53
Chloride (mg/L)	1.2	7.1	1.3	400	64
Nitrate (mg/L)	0.24	1.66	<0.1	0.53	0.13
Sulphate (mg/L)	2.6	<1.0	<1.0	9.5	41
Alkalinity (mg/L)	195	630	130	275	815
Barium (mg/L)	0.014	0.067	0.0043	0.046	0.079
Boron (mg/L)	<0.01	0.057	<0.01	0.009	0.48
Copper	0.002	0.0067	0.0015	0.0042	0.015
Iron (mg/L)	<0.1	1.48	<0.1	<0.1	<0.1
Manganese (mg/L)	<0.002	3.08	<0.002	<0.002	1.4

As shown above, concentrations at MW5 (south of site, near un-named lake) are generally higher than in the other wells, including "source well" MW1. MW3 has the highest concentrations for salt parameters (conductivity, TDS, sodium and chloride), with MW5 containing the second highest levels for these parameters. As is expected, background well MW4 did not have the highest concentrations for any parameters listed above.

7.5 Durov Plots

Durov plots of the major ion chemistry were prepared and are included in Appendix F. The results indicate that groundwater on the site is generally dominated by calcium bicarbonate (typical of Northern Ontario groundwater), except for MW3 which is dominated by sodium chloride (likely from road salting).

7.6 Time Series Charts

Time Series graphs depicting concentrations over the monitoring period have been prepared for selected parameters of interest (alkalinity, chloride, conductivity, copper, DOC, iron, organic nitrogen, manganese and TDS), and are included in Appendix G. Insufficient data are available (generally only four years) to confirm any possible trends; additional monitoring is required. However, levels of DOC, iron and organic nitrogen at the “source well” MW1 appear to have decreased since 2016.

7.7 Reasonable Use Assessment

The MECP’s Guideline B-7, which incorporates the Reasonable Use Policy (RUP) into the Ministry’s groundwater management activities, allows off-site impacts from waste disposal sites within established guidelines based on ODWS criteria in order to allow for attenuation of impacts while protecting existing and potential downgradient groundwater users. The guideline allows for increases in concentrations up to 25 and 50 percent of the difference between background and ODWS concentrations for health-related and non-health-related parameters, respectively. The guideline applies only to groundwater at or beyond the attenuation zone boundary.

A recommended attenuation zone boundary expansion by 21.7 ha was included in the Initial Hydrogeological Evaluation (2014), and is shown on Figure 6 in Appendix B.

RUP criteria for 2018 were calculated using the arithmetic mean of the most recent three years’ results for background well MW4 (which is hydraulically upgradient of the waste footprint and has the highest groundwater elevation of any of the wells). The assessment is provided for all wells on Table 2 in Appendix D. The attenuation zone, by definition, is intended to allow for contaminant concentrations to decrease to Guideline B-7 levels as the groundwater migrates toward the attenuation boundary. Exceedances of RUP criteria are normal and not unexpected within an attenuation zone. Note, however, that an expanded attenuation zone for the Nakina Landfill has not yet been formally approved. Wells MW3 and MW5 are located furthest downgradient of the site and at/near the limits of the current site boundary; therefore, RUP criteria are considered most applicable to the results for these wells. Exceedances of the calculated criteria in 2018 are summarized in the following table.

Parameters Exceeding Guideline B-7 (RUP) Criteria in 2018	
Monitoring Well	Exceedance(s)
	2018
MW1	TDS, DOC, organic nitrogen, nitrate, alkalinity, iron, manganese.
MW2	DOC
MW3	TDS, sodium, chloride,
MW4	Organic nitrogen
MW5	TDS, DOC, organic nitrogen, alkalinity, manganese, vinyl chloride.

Note: **Bold** indicates wells furthest downgradient of waste footprint (i.e., RUP criteria are potentially applicable).

Results for the wells furthest downgradient of the waste footprint (i.e., MW3 and MW5) indicated a number of B-7 (RUP) criteria exceedances. As previously indicated, impact at MW3 is likely attributed to road salting activities on Highway 584 and not landfill leachate, as only salt-related parameters exceed criteria. Unlike MW3, exceedances of B-7 criteria at MW5 appear to be from landfill leachate, and include TDS, DOC, organic nitrogen, alkalinity, manganese and vinyl chloride. As previously discussed, MW5 is located between 50 to 150 m downgradient (south) of the waste footprint, and concentrations at MW5 are generally higher than at “source well” MW1. However, it should be noted that well MW5 is located about 325 m from the 2014 recommended attenuation zone boundary, and B-7 criteria would not typically apply to this well.

7.8 Surface Water Quality Results

Results from SW1 (un-named lake south of site), indicated PWQO exceedances for phenols and iron during the fall 2018 sampling event only. No exceedances were observed at SW1 between the fall 2016 and spring 2018 events. Given that both phenols and iron have been generally undetectable at MW5, leachate impact is unlikely to be responsible for the fall 2018 exceedances at SW1. It is more likely that these results are anomalous; additional monitoring is indicated.

7.9 QA/QC

7.9.1 Cation/Anion Balances

In general, a cation/anion balance difference of up to 10% is considered acceptable. However, since the chemistry of groundwater affected by landfills can be quite complex and may not be balanced by the method indicated, the anion-cation balances of background monitoring wells are considered to be a better indicator of the reliability of results.

Reported ion balances in the current reporting period were all below 10%, which is considered acceptable.

7.9.2 Duplicates and Blanks

In the current reporting period, one blind duplicate sample (i.e., a duplicate sample collected in the field and labelled with a different but logical sample number) was submitted to the laboratory for each of the sampling events. The blind duplicate samples were all collected from MW1 and labelled as MW6.

The relative percent difference (RPD) between the results for the sample and the field duplicate sample for each analysed parameter was calculated as the absolute value of the following excluding organic nitrogen (obtained by difference):

$$\text{RPD} = \frac{(\text{Sample Result} - \text{Duplicate Result}) \times 100}{(\text{Sample Result} + \text{Duplicate Result}) / 2}$$

The RPD calculation is not considered valid for parameters reported to be present in very low concentrations (i.e., where the average of the two duplicates is <5 times the laboratory detection limit). EXP has generally considered that RPD's of up to 40% are acceptable for blind duplicate samples. However, for the purposes of O.Reg. 153/04 (Records of Site Condition), the maximum RPD that the MECP considers acceptable for most of the parameters reported in this study is 20%³, with the notable exception of the following:

- Electrical conductivity – 10%
- pH – 0.3 pH units

For the current reporting period results (2016 to 2018), the following elevated RPD's (above 40%) were noted:

- Chloride (October 2018) = 43%
- Nitrite (October 2018) = 125%
- Copper (October 2018) 105%

³ MECP (2011). *Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*, July 1, 2011.

The suggestion is that the October 2018 samples may not have been true field duplicates, for reasons unknown. However, notwithstanding the elevated RPDs, both sets of results for these parameters are all well below applicable ODWS criteria, and the differences do not affect the conclusions or recommendations of this report.

7.9.3 **Hold Times**

The samples were received by the laboratory within three days of collection. Based on the analysis dates reported by the laboratory, the MECP's recommended hold times appear to have been generally met.

7.9.4 **Internal QA/QC**

Internal quality control results (for blanks, spiked samples and lab duplicates) reported by the laboratory appear to be acceptable.

8 Contingency Plan

In accordance with the MECP's review of the Initial Hydrogeological Evaluation (email dated October 17, 2016, included in Appendix A), a contingency plan and trigger mechanisms relative to groundwater and surface water quality are required for the site.

8.1 Trigger Levels

Trigger levels for implementation of one or more aspects of a groundwater and surface water Contingency Plan would consist of predicted or actual exceedances of applicable criteria at or beyond the attenuation zone boundaries. The applicable criteria for groundwater at the west and south recommended 2014 attenuation zone boundaries are Reasonable Use Policy (RUP) criteria calculated according to Guideline B-7.

8.1.1 Groundwater Protection

Although the predominant groundwater flow direction beneath the waste footprint is to the southwest (see Figure 4), there are only a limited number of wells on the site and no wells are located beyond the property boundary in the direction of groundwater flow. Monitoring wells MW3 and MW5 are the most downgradient wells at this site. MW3 is located near the west boundary of the 2014 recommended attenuation zone, while MW5 is located about 325 m from the south boundary of the 2014 recommended attenuation zone. Trigger levels at these two wells are parameter concentrations that are predicted to have the potential to result in exceedances of Reasonable Use Policy (RUP) Guideline B-7 criteria at the downgradient recommended attenuation zone boundaries, assuming a linear decrease in concentration with distance from the landfill. However, as discussed above, it should be noted that concentrations at MW5 were generally higher than "source well" MW1.

The calculated 2018 trigger levels for protection of groundwater quality are presented in Table 4 in Appendix D.

The results of the trigger calculations indicated that concentrations of parameters at the "source well" (MW1) were generally below the B-7 criteria, resulting in a number of non-calculable trigger levels. This is likely due to the fact that the "source well" is located generally north of the waste footprint and is more cross-gradient than downgradient, in terms of groundwater flow direction. Regardless, based on the available analytical results, at the west boundary (MW3), only TDS has the potential to exceed the B-7 criterion; however, as previously discussed, salt parameters at this well location are elevated compared to the remaining wells on site (i.e., the high TDS results are likely attributed to road salting of the highway rather than leachate from the waste footprint). Concerning trigger calculation results at the south boundary (MW5), concentrations at MW5 were generally higher than the "source well" MW1 (MW5 is located roughly 100 m south and downgradient of the waste footprint while MW1 is generally cross-gradient of the waste footprint). Based on the calculated trigger levels, concentrations of TDS, DOC and alkalinity have the potential to exceed B-7 criteria at the 2014 recommended south attenuation zone boundary.

The trigger exceedances at MW5 appear to be attributable to landfill leachate; however, MW5 could be considered a “source well” based on its location relative to the waste footprint and also considering that concentrations in this well were generally higher than MW1 (“source well”). Results for a well located downgradient of MW5 would likely provide more realistic trigger values.

8.1.2 Surface Water Protection

Actual or predicted exceedances of APVs in any monitoring wells adjacent to water bodies could be used as trigger levels for protection of surface water quality.

As previously noted, a small unnamed lake is present immediately south of the current site boundary, but within the proposed expanded attenuation zone. The lake does not appear to have a permanent outflow, and is not utilized recreationally. No current leachate impacts to the lake are apparent from the available monitoring data. However, exceedances of APVs at MW5 could suggest the potential for impact. As discussed, copper levels in MW5 have regularly exceeded the APV. However, copper levels in the lake itself are much lower (generally non-detectable) and are well below the PWQO. Therefore, at the present time, there appears to be no cause to implement contingency measures (see below) to protect surface water quality, but ongoing monitoring is indicated.

8.1.3 Landfill Gas

Landfill gas has not been identified as an issue of concern at this site, and no monitoring for downwell methane levels has been conducted. There are no permanent enclosed structures on or in the immediate vicinity of the site that are considered to have the potential to accumulate landfill gases to potentially hazardous levels. Therefore, a contingency plan for landfill gas should not be required at this time.

8.2 Contingency Plan Measures

Based on the 2014 recommended attenuation zone boundaries, some trigger level exceedances were noted. As a consequence, a further expansion of the proposed attenuation zone is recommended, as shown on Figure 6. New monitoring wells are proposed at the west and south boundaries of the revised attenuation zone, and new trigger wells are also proposed.

Should future monitoring results indicate or predict exceedances of applicable criteria indicating possible unacceptable current or future impact beyond the (proposed) attenuation zone boundary, the data would first be scrutinized to ensure that they are valid and representative of actual conditions. It might be appropriate to require additional monitoring data before any decisions on remedial actions are made. If it is determined that an unacceptable risk of criteria exceedances downgradient of the landfill is present, the following measures could be undertaken to reduce leachate volumes and/or strength:

- The groundwater table beneath the waste pile could be lowered through ditching to intercept upgradient surface water and possible shallow groundwater inflow, and/or through other site drainage improvements.
- Landfill waste possibly buried below the groundwater table in some areas could be excavated and deposited above the water table, or alternatively moved to a different approved location.
- The amount and frequency of cover material applications could be increased.
- Lower permeability cover material could be used.
- Volumes of waste deposited in the landfill could be restricted and/or reduced through increased recycling efforts.
- If necessary, active leachate control (e.g., interception via a “French drain” system and redirection or capture for recirculation or treatment) could be implemented.

If the above measures are not successful, as a last recourse, the landfill could require premature capping and closure.

Additional details on contingency measures which would enable the particular nature of the potential impact to be assessed and properly addressed are found in the Design and Operations Plan.

9 Summary and Conclusions

The 2016 to 2018 monitoring results confirm that leachate with concentrations of several potential indicator parameters exceeding ODWS criteria is being generated at the site.

The groundwater flow direction on the site appears to be southwest, and the “source well” MW1, is located north of the waste footprint, and appears to be more cross-gradient than downgradient of the waste footprint. Monitoring well MW5, located roughly 100 m south and downgradient of the waste footprint, generally had the highest concentrations of parameters, with the exception of salt indicators (conductivity, TDS, sodium, chloride) which were highest at MW3 (attributable to salting of Highway 584).

Based on the current property boundary, wells MW3 and MW5 are located at/near the west and south boundaries, respectively, and RUP criteria are currently most applicable to results for these wells. RUP criteria exceedances at MW3 included TDS, sodium and chloride, all of which are likely attributable to road salting and not landfill leachate. RUP criteria exceedances at MW5 appear to be from landfill leachate and include TDS, DOC, organic nitrogen, alkalinity, manganese and vinyl chloride. However, it should be noted that well MW5 is located about 325 m from the recommended expanded attenuation zone boundary, and, as such, RUP criteria would no longer be applicable to this well in future.

Surface water results from SW1 (small un-named lake south of landfill), indicated PWQO exceedances for phenols and iron during the fall 2018 sampling event only, but no PWQO exceedances were observed at this location between the fall 2016 and spring 2018 events; additional monitoring is indicated.

Groundwater concentrations at MW5 were also compared to APV criteria, with copper exceeding the APV criterion during all sampling events; no other exceedances were noted.

The results of the trigger calculations indicated potential exceedances of RUP criteria at the west and south boundaries of the 2014 recommended attenuation zone (note that the 2014 recommended attenuation zone has not been officially approved by the MECP). The trigger exceedances at MW5, which include TDS, DOC and alkalinity, appear to be attributed to landfill leachate; however, the location of MW5, in EXP's opinion, could be considered a “source well” based on it's location relative to the waste footprint (roughly 100 m south and downgradient) and also considering that concentrations at this well were generally higher than MW1 (“source well”). A well further downgradient of MW5 would likely provide more realistic trigger levels. The trigger exceedance for TDS at MW3 is attributed to highway salting rather than landfill leachate.

The total estimated waste volume (uncompacted) received at the Beardmore Landfill in the current reporting period (2016 to 2018) was 3,637 m³, which is greater than the average annual historical waste (and interim cover) volumes (compacted) of approximately 3,000 m³ (or 1,000 m³ per year) based on landfill volume survey data. However, considering typical compaction ratio of 3:1 to 4:1, plus the addition of interim cover material, the estimated waste

volume appears to be conservative. Using an average annual waste volume and interim cover of 1,000 m³ per year (or 3,000 m³ per reporting period), the estimated volume on site as of December 31, 2018 is about 56,000 m³, which represents about 47% of the approved 118,600 m³. Based on an estimated annual waste and cover material volume deposition rate of 1,000 m³/yr. (quantities to be confirmed – see below), it is estimated that the landfill will reach capacity in about 63 years (2081). The next updated contour survey will be provided with the Environmental Quality Monitoring Tri-Annual Report for the years 2019, 2020, and 2021 (due April 2022).

10 Recommendations

- Following its review of the draft Design and Operations Plan, and Initial Hydrogeological Evaluation report, the MECP has recommended that the Municipality proceed with the submission of an application to amend the ECA. The current report should be included as supporting documentation.
- Upon approval from the MECP regarding the revised (2018) attenuation zone boundaries (see Figure 6), where the Municipality does not own lands within the attenuation zone, these lands should either be purchased from the current owner(s) (e.g., MNR, private) or written authorization to use the lands as attenuation lands should be obtained.
- In general, the analytical program should be continued in 2019 to 2021, with the next report due April 2022.
- A total of six (6) new monitoring wells are recommended, two of which were recommended by the MECP. The new monitoring wells include one new source well (MW7), one proximate well located northeast of the small un-named lake (MW6), two trigger wells (MW8 and MW9), and two wells located at the 2018 revised recommended attenuation zone south and west boundaries (MW10 and MW11). The proposed locations of the wells are shown on Figure 6.
- The Municipality should increase waste diversion and recycling activities to the extent possible/practical.
- The Municipality should seek MECP approval to operate an annual (summer) HHW depot at the site.
- Considering that the latest topographic survey was conducted in June 2014, an updated topographic survey, including ground surface and top of pipe elevations at the monitoring wells (including the new wells) should be conducted near the end of the next monitoring period (i.e., summer/fall 2021).

11 Closing Comments

This report has been prepared for and is intended for the use of the client (Municipality of Greenstone) and the MECP (for compliance assessment). The contents of this report may not be reproduced in whole or in part, or used or relied upon in whole or in part by any other party for any purpose whatsoever without the expressed written consent of EXP. Any use which a third party makes of this report, or any reliance on or decision made based on it, is the sole responsibility of such third party and EXP accepts no responsibility for any damages of any kind or nature whatsoever, suffered by any other third party as a result of decisions made or actions based upon this report. The findings are relevant for the date(s) of the investigation and should not be relied upon to represent conditions of other dates.

This report provides certain information concerning the results of the 2016 to 2018 groundwater and surface water monitoring program at the Nakina Landfill, as described herein. It is based on an authorized scope of work. Professional judgement was exercised in gathering and interpreting the information obtained and in the formulation of conclusions.

Conclusions regarding site conditions are based on observations of current and historical conditions and the results of limited chemical analyses. The groundwater and surface water results are only directly applicable to the actual locations sampled, and conditions could differ in areas not tested. Substances could also exist in forms not indicated by the limited analytical testing conducted. Additionally, the scope of work was based, in part, on rules and regulations that we understand to be current or expected at the time of the work. Changes in regulations, interpretations and/or enforcement policies may occur in the future. Such changes could be reflected in the degree of remediation actually required, if any, at the time of the action.

If additional relevant information becomes available concerning this site, such information should be provided to EXP so that our report may be reviewed and modified as necessary. EXP accepts no responsibility for the consequential effects of this factual report on the real or perceived value of this site, or on the ability to sell, finance or insure the property.

All reports, field data, notes, laboratory test data, calculations, estimates and other documents which are communicated by EXP to the client or third parties, are instruments of service and will be retained by EXP. These records will be stored in our files for a period of 10 years following submission of the final report, during which time they will be made available to the client, at all reasonable times, for review.

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

We trust that this report is satisfactory for your present requirements. Should you have any questions, please contact the undersigned at your convenience.

Yours truly,
EXP Services Inc.



Ahileas Mitsopoulos, P.Eng.
Project Engineer



Robert J. Rinne, M.Sc., QEP
Senior Scientist



Demetri N. Georgiou, MAsC., P.Eng.
Principal Engineer/Branch Manager

APPENDIX A –

Regulatory Documentation and Correspondence

Ahileas Mitsopoulos

From: Holenstein, Monika (MECP) <Monika.Holenstein@ontario.ca>
Sent: Friday, March 15, 2019 12:12 PM
To: Ahileas Mitsopoulos
Cc: Brian Aaltonen; Voca, Bryce (MECP)
Subject: Nakina WDS Design and Operations Plan

Ahileas

I apologize for the delay in responding to your request for comments on the April 2015 Draft Design and Operations Plan for the Nakina Landfill.

I have reviewed the Draft Design and Operations Plan and generally concur with the information as submitted. It will be a positive step for the Municipality to receive an amended ECA and have an operations plan that will ensure the orderly and efficient use of the site for many years. I have compared the Draft Design and Operations Plan to standard conditions on updated ECA's for Greenstone's other waste site. Based on this, I offer the following comments on the Draft Design and Operations Plan as well as more generally on the ECA amendment applications:

- It is my understanding that the theoretical capacity determination and ground/surface water monitoring plans have been accepted by the MECP through separate submissions and will be included in the ECA application plan;
- Please ensure that the "area of service" in the application and in the operating plan allows for the Municipality to accept waste from nearby indigenous communities (i.e. Aroland) as well as from surrounding areas such as Ring of Fire associated developments (eg road development in unorganized areas, exploration camps, etc).
- Please ensure the Design and Operations Plan includes the requirement clearly define the boundaries of the limit of waste by installing permanent markers that can be visible year-round as well as markers which clearly define the boundaries of the fill area to be used for waste disposal over the following year by installing markers visible to Site operators. If any of the development is to go above grade, markers indicating maximum height should be installed
- The annual report should include confirmation that required groundwater/surface water sampling programs have been completed as required by the ECA.
- The Design and Operations report should include requirements for initial and ongoing training for operators with respect to the following: the Approval and conditions attached to the Approval, conceptual design and operations; 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 preventing of off-site impacts.
- I suggest the working area of the trench be minimized, to minimize the area requiring weekly cover. The Design and Operations Plan should provide guidance on this - for example, a 20 m section of the trench would be flagged so that waste is deposited in that section only. Consideration could be given to only opening up a smaller area of trench as needed. The 40 m trench presents an overly large working area with greater risk of windblown litter and wasted capacity due to requirement for weekly cover.
- The Design and Operations Plan should explicitly require compaction prior to cover to ensure maximum waste capacity. Waste shall be deposited in a manner that minimizes the area of exposed waste at the working face and shall be compacted before cover material is applied.

- The Design and Operations Plan should recommend more specific actions to control litter (eg. all practical steps should be taken to prevent the escape of litter from the Site. Periodic pick-up of litter at the Site and along roads in the vicinity of the Site shall be carried out as required, or every two weeks as a minimum. Property adjacent to the Site shall be inspected weekly and litter shall be collected if necessary, with permission of access from the property owner. Litter fencing shall be erected around the working area of the landfill. Etc).
- The "Burning of Solid Waste" section should include the requirement that if the clean wood/brush pile is to be burned, attendants must ensure that only brush and unpainted/untreated wood can be placed in that area. Previous inspections have identified issues with other waste types being deposited in the wood pile (mattresses, shingles, painted wood, etc). Prior to burning, any non clean wood waste must be removed.
- There should be a section on signage including entrance gate sign (with owner's name; Operator's name; Approval Number; Applicable Municipal By-Laws; The hours of operation; and Municipal government contact telephone number to call with complaints or in the event of an emergency) as well as signage for various waste deposition/disposal area (household waste, tires, batteries, recycling, scrap metal, clean wood waste, etc).
- Greenstone should give consideration to installing and maintaining an electric fence around the perimeter of the active disposal area to eliminate access for bears.

Please do not hesitate to contact me if you have any questions regarding the above comments or the path forward to amend the ECA. It is the MECP's expectation that you will proceed with the application to amend the ECA as soon as possible.

Monika

*Monika Holenstein
Sr. Environmental Officer
Thunder Bay District
Ministry of the Environment, Conservation and Parks
435 James St. S., Suite 331
Thunder Bay, Ontario
P7E 6S7
(807)475-1699
E-mail: Monika.Holenstein@ontario.ca*

**Ministry of the
Environment,
Conservation and Parks**

435 James Street South
Suite 331
Thunder Bay ON P7E 6S7
Tel.: (807) 475-1546
Fax: (807) 475-1754

**Ministère de l'Environnement,
de la Protection de la nature
et des Parcs**

435, rue James sud
Bureau 331
Thunder Bay ON P7E 6S7
Tél. : (807) 475-1546
Télec.: (807) 475-1754



October 11, 2018

M E M O R A N D U M

TO: Mike Landers
Senior Environmental Officer
Drinking Water and Environmental Compliance Division
Thunder Bay District Office

FROM: Shannon Heggie
Hydrogeologist
Technical Support Section
Drinking Water and Environmental Compliance Division
Thunder Bay Northern Region Office

RE: 2015 Design and Operations Plan
Nakina Landfill
Nakina, Municipality of Greenstone, Ontario
ECA #A591901

Introduction and Purpose

As requested, I have reviewed the groundwater-related portions of the report prepared by exp Services Inc. (the consultant), entitled: *Municipality of Greenstone, Design and Operations Plan, Nakina Landfill, Municipality of Greenstone, Ontario*, dated April 22, 2015.

The following resources were referenced for background site information:

- Exp letter: *Re: Certificate of Approval No. A591901, Nakina Waste Disposal Site, Municipality of Greenstone, District of Thunder Bay, EXP Ref. No. THB-00011119-FE*, prepared by Ahileas Mitsopoulos (Project Engineer) and Demetri Georgiou

(Principal Engineer/Branch Manager), sent to Mohsen Keyvani (Ministry of the Environment, Environmental Approvals Branch), dated January 3, 2018;

- Ministry of the Environment and Climate Change e-mail: *Nakina Landfill – Initial Hydrogeological Evaluation*, prepared by Simon Haslam (Regional Hydrogeologist), sent to Monika Holenstein (Senior Environmental Officer), dated September 22, 2016 4:24pm; and
- *Municipality of Greenstone, Initial Hydrogeological Evaluation, Nakina Landfill, Nakina, Ontario*, prepared by exp Services Inc., dated March 16, 2015.

Due to the inclusion of Small Lake in the proposed contaminant attenuation zone, and the proposed surface water monitoring station, I have forwarded this review to the Surface Water Team Leader for surface water review.

Background

The Nakina municipal landfill (the site) is located ~100 m south of Highway 584, and ~2 km south of the town of Nakina, in the Municipality of Greenstone, Ontario. The site began operations in ~1962. The site has an approved fill area of 5 ha within a total site area of 19.3 ha. In 2014, the fill area was ~3.8 ha. The current Environmental Compliance Approval for the site (ECA #A 591901) authorizes disposal of domestic, non-hazardous solid waste and sewage sludge. In 2015, based on the estimated landfill capacity (128 550 m³), the remaining site life span was estimated at ~75 years.

Topography in the vicinity of the site is rolling, with an abrupt rise at the eastern end of the site. The nearest surface water resource is Small Lake, located ~150 m south of the active fill area. Surface drainage is anticipated towards the west and a marshy area, and south towards Small Lake. Interpreted drainage from Small Lake is towards the west and a lake/wetland area, located ~750 m west of Small Lake. Subsurface soils are composed of sandy overburden on bedrock. Bedrock occurs at depths of 3 m along the north property limit to 17 m along the east property limit. Groundwater occurs at depths of 4.25-16.6 m. Groundwater flow is bedrock controlled and is interpreted as towards the southwest. Ministry data sources indicate that there are no registered active private water supply wells within 1 km of the site.

Discussion and Recommendations

Monitoring Program

The consultant proposed a bi-annual (spring and fall) groundwater and surface water monitoring program, with analyses for the Comprehensive parameters listed in Schedule 5 of the Landfill Standards Guideline. Groundwater monitoring locations include five (5) monitoring wells: MW1, MW2, MW3, MW4 and MW5.

It is my understanding that a monitoring report presenting and interpreting the available historical and current data will be prepared and submitted to the Ministry every three (3) years, with the first report due by April 30, 2019.

- It is recommended that the consultant preparing the groundwater and surface water monitoring report due in April 2019, references the following document during the report preparation: *Monitoring and Reporting for Waste Disposal Sites, Groundwater and Surface Water, Technical Guidance Document, Ministry of the Environment, Operations Division, November 2010*. I have sent a PDF copy of this document to Mike Landers (Senior Environmental Officer) for distribution.

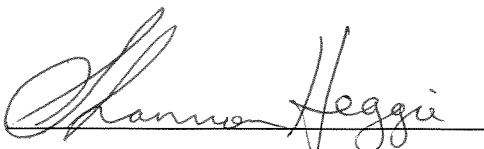
Contaminant Attenuation Zone

The consultant proposed a contaminant attenuation zone, expanding the site area to ~41 ha. The contaminant attenuation zone would extend south of the current property boundaries and includes Small Lake.

- The inclusion of Small Lake within the proposed contaminant attenuation zone is a concern with respect to potential impacts on surface water quality. Monitoring well MW5 (located ~40 m up-gradient from Small Lake) recorded exceedances of the calculated B-7 criteria for TDS, DOC, alkalinity, manganese and mercury in September 2014. Groundwater seepage/flow at the site was estimated at ~1 m/day. Based on this information and the remaining lifespan of the site (~75 years), it is recommended that the surface water monitoring program for Small Lake is reviewed by a MECP Surface Water Specialist.
- Considering the limited groundwater elevation data for the site and the proximity of Small Lake, it is recommended that additional down-gradient monitoring wells are installed northwest and northeast of Small Lake; between MW3 and MW5, and MW4 and MW5, respectively.

Closure

If you have any questions regarding the above comments and recommendations, do not hesitate to contact me. The purpose of the preceding review is to provide advice to the Ministry of the Environment, Conservation and Parks regarding groundwater and subsurface soil conditions based on the information provided in the above referenced documents. The conclusions, opinions and recommendations of the reviewer are based on information provided by others, except where otherwise specifically noted. The Ministry cannot guarantee that the information that has been provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.



Shannon Heggie, M.Sc., P.Geo.
Hydrogeologist

c: Todd Kondrat (Surface Water Team Leader, MECP Northern Region)
Shannon Innis, Water Resources Supervisor, MECP Northern Region

File: SI TB NA H643 610, NAKINA, ZONE 16 M AP 42L2, NAKINA TW P OF,
A591901, DOMESTIC

(U:\3_Landfills\Nakina_Municipal_Landfill\2015_Nakina_Municipal_Landfill_Design_&_Ops_Report_GW_
Review_111018_SH_FINAL.doc)



January 3, 2018

Ministry of the Environment and Climate Change
Environmental Approvals Branch
135 St. Clair Avenue West, Floor 1
Toronto, ON M4V 1P5

Attention: Mohsen Keyvani, P.Eng.

Via e-mail: historicaleca@ontario.ca

**Re: Certificate of Approval No. A591901
Nakina Waste Disposal Site
Municipality of Greenstone, District of Thunder Bay
EXP Ref. No. THB-00011119-FE**

Dear Mr. Keyvani:

On behalf of the Municipality of Greenstone, EXP Services Inc. (EXP) has prepared the following letter in response to the Ontario Ministry of the Environment and Climate Change (MOECC) inquiry letter, dated December 18, 2017 (attached), regarding the status of the waste facility and/or works regulated under the above noted Certificate of Approval. The following information was requested, and responses are provided:

1. Confirmation of the status of the facility / works (e.g., in operation, closed, decommissioned, etc.):
 - *The site is currently operating as a waste disposal site, and has been operating as such since the 1970s.*
 - *A draft Design and Operations Plan (D&O Plan) for the site, prepared by EXP and dated April 22, 2015, was submitted to the MOECC for review on April 24, 2015. No review comments from the MOECC have been received to date. As you are aware, a D&O Plan is required in connection with an application to amend the C of A (now called an Environmental Compliance Approval or ECA) to reflect current conditions and requirements, in general conformity to the MOE(CC)'s Landfill Standards publication. Upon receipt of comments, EXP and the Municipality of Greenstone will initiate the ECA application submission.*
 - *Prior to submitting the D&O Plan, EXP, on behalf of the Municipality of Greenstone, prepared an Initial Hydrogeological Evaluation of the Nakina Landfill, dated March*

16, 2015, which outlined a proposed monitoring program. Review comments were received via email from the MOECC's Regional Hydrogeologist (Simon Haslam, MASC., P.Eng.) on October 17, 2016, confirming MOECC's acceptance of the proposed monitoring program. The groundwater and surface water monitoring program was initiated in the fall of 2016.

2. Confirmation of the current name and address of the owner / operator of the facility / works:

- Municipality of Greenstone
P.O. Box 70
1800 Main Street
Geraldton, ON P0T 1M0

Tel: 1.807.854.1100

3. A name, phone number, and email address of the primary point of contact representing the owner / operator of the facility / works:

- Mr. Brian Aaltonen
Director of Public Services
Municipality of Greenstone
1800 Main Street.
P.O. Box 70
Geraldton, ON P0T 1M0

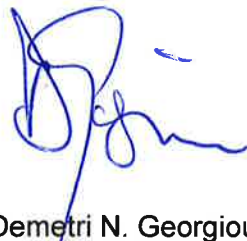
Tel: 1.807.854.1100 ext. 2060

We trust the above information satisfies your current requirements.

Sincerely,
EXP Services Inc.



Ahileas Mitsopoulos, P.Eng.
Project Engineer



Demetri N. Georgiou, MASC., P.Eng
Principal Engineer / Branch Manager

Attach: MOECC Letter Re: Certificate of Approval No. A591901

- c: Mike Landers, MOECC Thunder Bay (Mike.Landers@ontario.ca)
Brian Aaltonen, Municipality of Greenstone (Brian.Aaltonen@greenstone.ca)

Ministry of the Environment
and Climate Change

Environmental Approvals
Branch

135 St. Clair Avenue West
1st Floor
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax: 416 314-8452

Ministère de l'Environnement et de
l'Action en matière de changement
climatique

Direction des autorisations
environnementales

135, avenue St. Clair Ouest
Rez-de-chaussée
Toronto ON M4V 1P5
Tél : 416 314-8001
Téléc. : 416 314-8452



December 18, 2017

The Corporation Of The Township Of Nakina
PO Box 210
Nakina, ON P0T 1W0

Dear Owner/Operator:

RE: Certificate of Approval #A591901

The Ontario Ministry of the Environment and Climate Change (MOECC) is seeking confirmation on the status of the waste facility and/or works regulated under the above-noted Certificate of Approval. It is requested that you provide the following information related to the above-noted Certificate of Approval by January 15, 2018:

1. Confirmation of the status of the facility / works (e.g. in operation, closed, decommissioned, etc.);
2. Confirmation of the current name and address of the owner/operator of the facility / works;
3. A name, phone number, and email address of the primary point of contact representing the owner/operator of the facility / works;

Please provide the above-noted information by email to historicaleca@ontario.ca, or by regular mail.

Sincerely,

Mohsen Keyvani, P.Eng.
Supervisor, Approval Services Unit, Team 5

c. MOECC Thunder Bay District Office

Ahileas Mitsopoulos

From: Holenstein, Monika (MOECC) <Monika.Holenstein@ontario.ca>
Sent: Wednesday, February 15, 2017 10:40 AM
To: Ahileas Mitsopoulos; brian.aaltonen@greenstone.ca
Subject: FW: Nakina Landfill - Initial Hydrogeological Evaluation

Ahileas, Brian

Thanks for bringing to my attention that my email below did not address the sampling timing for the Nakina waste disposal site, which was the request in the original email! My apologies.

In the Initial Hydrogeological Evaluation for the Nakina site, you had recommended that the monitoring report be submitted after three years of sampling (i.e. six sampling events) with the first sampling event being conducted in the spring of 2015, as such the report would be submitted by April 2018. Since the first round of sampling was conducted in the fall 2016, you have requested that the first monitoring report be submitted by April 2019. This would allow 2.5 years of sampling (5 sampling events) rather than 1.5 years of sampling (3 sampling events) if the report is due April 2018 (originally proposed date).

The MOECC concurs with this approach and agrees that the first monitoring report should be submitted by April, 2019.

I will provide a letter from the District Manager regarding the monitoring changes at all of the sites in the next few months.

Please contact me if you have any concerns.

Monika

*Monika Holenstein
Sr. Environmental Officer
Thunder Bay District
Ministry of the Environment and Climate Change
435 James St. S., Suite 331
Thunder Bay, Ontario
P7E 6S7
(807)475-1699
E-mail: Monika.Holenstein@ontario.ca*

From: Holenstein, Monika (MOECC)
Sent: December 08, 2016 5:43 PM
To: Ahileas Mitsopoulos
Cc: brian.aaltonen@greenstone.ca; Stajkowski, Drew (MOECC)
Subject: RE: Nakina Landfill - Initial Hydrogeological Evaluation

Hi Ahileas – you’ve been very patient! Sorry for the delays – crazy busy!

On the Geraldton site - I did get a verbal ok from our hydrogeologist and we concur the intent is for every 3 year reporting – next one due in 2019. I can give you something more formal on that from the District Manager in the New Year.

I have had a quick look at the Beardmore D and O plan and generally, it looks reasonable. A few specific comments:

- The service area should be specified. I assume the Municipality of Greenstone, but may want to include some additional surrounding townships?
- Should have a section on signage.
- The Plan does not contain too much detail on operating areas – just south pit to be filled (estimated by January 2017), then north pit, then site closed.
- The operating plan should note that waste fill boundaries and final contours will be clearly marked and updated on an annual basis as needed.
- Litter Control section should outline what measures to be taken (i.e. snow fencing around working area, regular litter pick up, etc).
- Record Keeping section only requires records of industrial/commercial loads – should also have residential loads.
- Should include more detailed information on operator training – what will be included in the training (can get this from Longlac/Geraldton C of A's).
- In the burning of waste section – operating plan should require an area be established for brush and clean waste only (no painted or treated wood) and signed to ensure only appropriate woodwaste is burned.
- The notes on Figures 7 and 8 (grading and waste placement) should make it into the text of the report in the appropriate sections as they provided detail on how the development/closure will occur.
- The last inspection noted: *At the time of inspection, it was suggested to the municipality that this area could be better organized - with signs clearly indicating where drained fridges/freezers were to be kept versus those still to be drained.* Perhaps the Operating Plan should provide information on how the fridge/freezer area could be set up?
- The MOECC hydrogeologist had previously commented: *I concur with the consultant's recommendations regarding the size and location of the CAZ, as well as the recommendations for the monitoring program. The contingency plan provides a reasonable selection of contingency measures, but needs to be more specific on how contingency measures might be triggered. Specifically, a plan which references the monitoring program and applicable assessment criteria to establish trigger criteria for actions should be developed. With respect to the consultant's recommendations regarding cover for the final closure, the prescribed design may be warranted with respect to the current understanding of potential leachate impacts. However, a contingency which provides for a low permeability cap is needed if at closure (or beyond) the leachate concentrations increase to levels that are indicative of off-site*

impacts. It is recommended that the closure plan will need to be reviewed and details updated closer to the actual closure of the site."

I suggest you proceed with the ESR to increase the capacity. The current Certificate of Approval is clearly not appropriate for the current use at site and must be updated. Once in the ECA amendment process is underway, an updated D and O plan could be submitted and any final comments could be made at that time.

Please note as you proceed with ESR for improved capacity, that recent discussions with BZA (Rocky Bay) and the Department of Indigenous and Northern Affairs indicated that there is some interest in BZA to bring waste from that community to the Beardmore site.

Again, sorry for the delay,

Monika

*Monika Holenstein
Sr. Environmental Officer
Thunder Bay District
Ministry of the Environment and Climate Change
435 James St. S., Suite 331
Thunder Bay, Ontario
P7E 6S7
(807)475-1699
E-mail: Monika.Holenstein@ontario.ca*

From: Ahileas Mitsopoulos [<mailto:ahileas.mitsopoulos@exp.com>]
Sent: December 08, 2016 11:44 AM
To: Holenstein, Monika (MOECC)
Subject: RE: Nakina Landfill - Initial Hydrogeological Evaluation

Hi Monika,

Just wanted to follow-up again about this, as well as the clarification/issues at the Geraldton LF and Beardmore LF.

As a reminder,

Geraldton LF - ECA indicates report due in March 2017 but we provided a report in March/April 2016 for a three year period (2013, 2014 and 2015). We suspect the ECA intended March 2016. Please confirm that the next monitoring report for the Geraldton LF is due March 2019 (for the years 2016, 2017 and 2018).

Beardmore LF – The Beardmore LF likely reached 90% capacity in mid 2016. As such, a Closure Plan needs to be started but we discussed that **exp** would prepare an Environmental Screening Report to increase the capacity of the landfill to 100,000 m3. To do this we are still waiting for comments on the revised draft D&O Plan which was submitted in February 2016.

Thank you,

Ahileas Mitsopoulos, P.Eng. | exp
Project Engineer

exp Services Inc.
t: +1.807.623.9495 x223 | m: +1.807.620.6306 | e: Ahileas.Mitsopoulos@exp.com
1142 Roland Street
Thunder Bay, ON P7B 5M4
CANADA

exp.com | legal disclaimer

keep it green, read from the screen

From: Ahileas Mitsopoulos

Sent: Monday, November 28, 2016 10:20 AM

To: 'Holenstein, Monika (MOECC)' <Monika.Holenstein@ontario.ca>

Cc: 'Stajkowski, Drew (MOECC)' <Drew.Stajkowski@ontario.ca>; 'Brian Aaltonen' <brian.aaltonen@greenstone.ca>;
Demetri Georgiou <demetri.georgiou@exp.com>; Rob Rinne <Rob.Rinne@exp.com>; 'Katherine Alton'
<katherine.alton@greenstone.ca>

Subject: RE: Nakina Landfill - Initial Hydrogeological Evaluation

Hi Monika,

Just wanted to follow-up on this. Any word?

Thank you,

Ahileas Mitsopoulos, P.Eng. | exp

Project Engineer

exp Services Inc.

t: +1.807.623.9495 x223 | m: +1.807.620.6306 | e: Ahileas.Mitsopoulos@exp.com

1142 Roland Street

Thunder Bay, ON P7B 5M4

CANADA

exp.com | legal disclaimer

keep it green read from the screen

From: Ahileas Mitsopoulos

Sent: Monday, November 14, 2016 11:58 AM

To: 'Holenstein, Monika (MOECC)' <Monika.Holenstein@ontario.ca>

Cc: Stajkowski, Drew (MOECC) <Drew.Stajkowski@ontario.ca>; Brian Aaltonen <brian.aaltonen@greenstone.ca>;
Demetri Georgiou <demetri.georgiou@exp.com>; Rob Rinne <Rob.Rinne@exp.com>; 'Katherine Alton'
<katherine.alton@greenstone.ca>

Subject: RE: Nakina Landfill - Initial Hydrogeological Evaluation

Importance: High

Hi Monika,

Based on the comments below regarding the Initial Hydrogeological Evaluation of the Nakina Landfill, we conducted our first sampling event this fall at the landfill.

In the Initial Hydrogeological Evaluation, we recommended that the monitoring report be submitted after three years of sampling (i.e. six sampling events) with the first sampling event being conducted in the spring of 2015, as such the report would be submitted by April 2018. Since the first round of sampling was conducted in the fall 2016, we request that the first monitoring report be submitted by April 2019. This would allow 2.5 years of sampling (5 sampling events) rather than 1.5 years of sampling (3 sampling events) if the report is due April 2018 (originally proposed date).

Please advise if the first monitoring report submitted by April 2019 is acceptable.

Thank you,

Ahileas Mitsopoulos, P.Eng. | exp

Project Engineer

exp Services Inc.

t: +1.807.623.9495 x223 | m: +1.807.620.6306 | e: Ahileas.Mitsopoulos@exp.com

1142 Roland Street

Thunder Bay, ON P7B 5M4

CANADA

exp.com | legal disclaimer

keep it green, read from the screen

From: Holenstein, Monika (MOECC) [<mailto:Monika.Holenstein@ontario.ca>]

Sent: Monday, October 17, 2016 2:12 PM

To: Brian Aaltonen <brian.aaltonen@greenstone.ca>; Ahileas Mitsopoulos <ahileas.mitsopoulos@exp.com>

Cc: Stajkowski, Drew (MOECC) <Drew.Stajkowski@ontario.ca>

Subject: FW: Nakina Landfill - Initial Hydrogeological Evaluation

Brian, Ahileas

Below find the comments from the MOECC Hydrogeologist regarding the Initial Hydrogeological Evaluation – Nakina Landfill. No comments yet from MOECC Approvals Branch on the theoretical capacity work, but hopefully the application to amend ECA can move ahead....

Monika

Monika Holenstein

Sr. Environmental Officer

Thunder Bay District

Ministry of the Environment and Climate Change

435 James St. S., Suite 331

Thunder Bay, Ontario

P7E 6S7

(807)475-1699

E-mail: Monika.Holenstein@ontario.ca

From: Haslam, Simon (MOECC)

Sent: September 22, 2016 4:25 PM

To: Holenstein, Monika (MOECC)

Subject: Nakina Landfill - Initial Hydrogeological Evaluation

Ms. Holenstein,

I have completed a preliminary review of the groundwater-related portions of the report prepared by exp Services Inc., "Municipality of Greenstone – Initial Hydrogeological Evaluation – Nakina Landfill – Nakina, Ontario," dated March 16, 2015. In general the report is reasonable and I am in agreement with the proposed actions moving forward. It is apparent that the site is not currently in compliance with Guideline B-7 ("Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities", dated April 1994, as amended). However, the consultant has made recommendations to attempt to bring the site into compliance, which involves expansion of the contaminant attenuation zone (CAZ). Based on the initial evaluation, the consultant has provided the following recommendations.

1. Consideration of installation of an additional monitoring well in the future should monitoring results suggest the need.
2. Establishment of a surface water sampling location in the unnamed lake within the proposed CAZ.

3. Twice annual sampling of 5 monitoring wells and the surface water location with analyses for the Schedule 5 comprehensive list of parameters.
4. Submission of a monitoring report to the Ministry of the Environment and Climate Change (MOECC) once every 3 (three) years, with the first report due by April 30, 2018.
5. Reassessment of the monitoring program after 3 (three) full years of data have been obtained.
6. Future reports should include an assessment of compliance with Guideline B-7.

I concur with all of these recommendations. I note that since there is a surface water receiver within the proposed CAZ, it will be necessary to assess impacts to surface water using appropriate guidelines. Such an assessment, with appropriate guidelines, should be provided in future monitoring reports.

The proposed contingency plan appears reasonable. The consultant notes that the plan will be updated as additional monitoring results are collected and analysed. This method is reasonable and I suggest that a revised contingency plan be provided and assessed in the next monitoring report.

In summary:

- The site is not currently in compliance with Guideline B-7.
- The consultant has recommended actions to bring the site into compliance, including a proposed CAZ expansion.
- I provide the following recommendations related to groundwater:
 - The proposed CAZ expansion should be pursued and finalized as soon as is reasonable to attempt to bring the site into compliance with Guideline B-7.
 - The recommendations proposed by the consultant shall be implemented as soon as is reasonable, including twice annual monitoring and reporting once every 3 (three) years, with the first report due to the MOECC by April 30, 2018.
 - Appropriate guidelines shall be included in all future monitoring reports to assess potential impacts to the surface water receiver within the proposed CAZ expansion.
 - A revised contingency plan shall be provided and assessed in the next monitoring report.

If you have any questions regarding the above comments and recommendations, do not hesitate to contact the undersigned. The purpose of the preceding review is to provide advice to the MOECC regarding groundwater conditions based on the information provided in the above referenced documents. The conclusions, opinions and recommendations of the reviewer are based on the information provided by others, except where otherwise specifically noted. The MOECC cannot guarantee that the information that has been provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.

Sincerely,
Simon

Simon R. Haslam, MASC, P.Eng. | Regional Hydrogeologist | 807.475.1428 | Ontario Ministry of the Environment and Climate Change | Northern Region Technical Support

Ministry of the Environment and
Climate Change
1st Floor, 135 St Clair Ave W
Toronto, ON
M4V 1P5
Telephone:

Ministère de l'Environnement et de
l'Action en matière de changement
climatique
1er étage, 135 av St. Clair O
Toronto, ON
M4V 1P5
Téléphone :



October 20, 2016

Brian Aaltonen, Director of Public Services
The Corporation of the Municipality of Greenstone
Post Office Box, No. 210
Nakina, Ontario
P0T 2H0

Dear Sir/Madam:

**Re: Application for Approval
Notice to ECA # A591901 - Determination of Theoretical Approved Capacity
Greenstone Municipality, District of Thunder Bay
Reference Number 1344-9N8GXC**

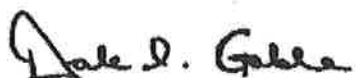
Your application dated August 14, 2014 regarding the theoretical approved capacity of Nakina Landfill Site, ECA NO. A591901 has been reviewed. The ministry is in agreement with the approach taken (using the Ministry's 1993 Landfill Determination document) which resulted in a volume calculation of 118,600 m³. The existing waste in place can not be added to the calculation. Therefore, the ministry acknowledges the site has a theoretical capacity of 118,600 m³.

An amendment to the ECA is not required at this time to accept this theoretical value and this application is now cancelled with the understanding that an application for amendment will soon be submitted to address the other concerns on record with the District Office.

We also emphasize that under section 20.2 of Part II.1 of the Environmental Protection Act, (Act) you are required to obtain an approval under section 20.3 of Part II.1 of the Act before construction, alteration, extension, replacement or change of use of a waste disposal site, including change of the type of waste handled at an approved site.

If you have any questions regarding the above, please contact Ben Hendry, Senior Waste Engineer at 416.314.7993.

Yours truly,



Dale Gable, P.Eng.

Director

appointed for the purposes of Part II.1 of the *Environmental Protection Act*

BH/

c: District Manager, MOECC Thunder Bay - District
Robert J. Rinne/ Ahileas Mitsopoulos, Exp. Services Inc.

Ahileas Mitsopoulos

From: Holenstein, Monika (MOECC) <Monika.Holenstein@ontario.ca>
Sent: Monday, October 17, 2016 2:12 PM
To: Brian Aaltonen; Ahileas Mitsopoulos
Cc: Stajkowski, Drew (MOECC)
Subject: FW: Nakina Landfill - Initial Hydrogeological Evaluation

Brian, Ahileas

Below find the comments from the MOECC Hydrogeologist regarding the Initial Hydrogeological Evaluation – Nakina Landfill. No comments yet from MOECC Approvals Branch on the theoretical capacity work, but hopefully the application to amend ECA can move ahead....

Monika

*Monika Holenstein
Sr. Environmental Officer
Thunder Bay District
Ministry of the Environment and Climate Change
435 James St. S., Suite 331
Thunder Bay, Ontario
P7E 6S7
(807)475-1699
E-mail: Monika.Holenstein@ontario.ca*

From: Haslam, Simon (MOECC)
Sent: September 22, 2016 4:25 PM
To: Holenstein, Monika (MOECC)
Subject: Nakina Landfill - Initial Hydrogeological Evaluation

Ms. Holenstein,

I have completed a preliminary review of the groundwater-related portions of the report prepared by exp Services Inc., "Municipality of Greenstone – Initial Hydrogeological Evaluation – Nakina Landfill – Nakina, Ontario," dated March 16, 2015. In general the report is reasonable and I am in agreement with the proposed actions moving forward. It is apparent that the site is not currently in compliance with Guideline B-7 ("*Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities*", dated April 1994, as amended). However, the consultant has made recommendations to attempt to bring the site into compliance, which involves expansion of the contaminant attenuation zone (CAZ). Based on the initial evaluation, the consultant has provided the following recommendations.

1. Consideration of installation of an additional monitoring well in the future should monitoring results suggest the need.
2. Establishment of a surface water sampling location in the unnamed lake within the proposed CAZ.
3. Twice annual sampling of 5 monitoring wells and the surface water location with analyses for the Schedule 5 comprehensive list of parameters.
4. Submission of a monitoring report to the Ministry of the Environment and Climate Change (MOECC) once every 3 (three) years, with the first report due by April 30, 2018.
5. Reassessment of the monitoring program after 3 (three) full years of data have been obtained.
6. Future reports should include an assessment of compliance with Guideline B-7.

I concur with all of these recommendations. I note that since there is a surface water receiver within the proposed CAZ, it will be necessary to assess impacts to surface water using appropriate guidelines. Such an assessment, with appropriate guidelines, should be provided in future monitoring reports.

The proposed contingency plan appears reasonable. The consultant notes that the plan will be updated as additional monitoring results are collected and analysed. This method is reasonable and I suggest that a revised contingency plan be provided and assessed in the next monitoring report.

In summary:

- The site is not currently in compliance with Guideline B-7.
- The consultant has recommended actions to bring the site into compliance, including a proposed CAZ expansion.
- I provide the following recommendations related to groundwater:
 - The proposed CAZ expansion should be pursued and finalized as soon as is reasonable to attempt to bring the site into compliance with Guideline B-7.
 - The recommendations proposed by the consultant shall be implemented as soon as is reasonable, including twice annual monitoring and reporting once every 3 (three) years, with the first report due to the MOECC by April 30, 2018.
 - Appropriate guidelines shall be included in all future monitoring reports to assess potential impacts to the surface water receiver within the proposed CAZ expansion.
 - A revised contingency plan shall be provided and assessed in the next monitoring report.

If you have any questions regarding the above comments and recommendations, do not hesitate to contact the undersigned. The purpose of the preceding review is to provide advice to the MOECC regarding groundwater conditions based on the information provided in the above referenced documents. The conclusions, opinions and recommendations of the reviewer are based on the information provided by others, except where otherwise specifically noted. The MOECC cannot guarantee that the information that has been provided by others is accurate or complete. A lack of specific comment by the reviewer is not to be construed as endorsing the content or views expressed in the reviewed material.

Sincerely,
Simon

Simon R. Haslam, MAsC, P.Eng. | Regional Hydrogeologist | 807.475.1428 | Ontario Ministry of the Environment and Climate Change | Northern Region Technical Support

Ministry of the Environment

Northern Region
Thunder Bay District Office
Thunder Bay Area Office
331-435 James St S
Thunder Bay ON P7E 6S7
Fax: (807)475-1754
Tel: (807) 475-1699

Ministère de l'Environnement

Direction régionale du Nord
Bureau du district de Thunder Bay
Bureau du secteur de Thunder Bay
Bureau du district de Thunder Bay
331-435 rue James S
Thunder Bay ON P7E 6S7
Télécopieur: (807)475-1754
Tél:(807) 475-1699



RECEIVED

JAN 10 2011

**Corporation of the
Municipality of Greenstone**

January 4, 2011

The Corporation of the Municipality of Greenstone
301 East St
Geraldton, Ontario. P0T 1M0
Canada
ATTN: Vance Czerwinski, Director of Public Services

Dear Mr. Czerwinski

RE: Inspection of Nakina Waste Disposal Site
Reference Number 2537-8BVL.PZ

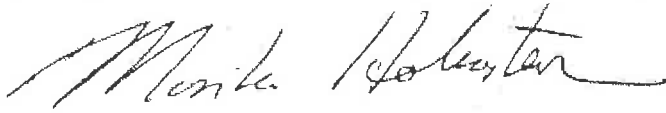
On October 20, 2010, I inspected the Nakina Ward Waste Disposal Site. A copy of the inspection report is enclosed. I recommend you share the reports with any public works staff involved with the operation of the waste disposal site. Please review the inspection and ensure that any of the required actions are completed on the dates provided.

The Inspection Report contains the following required actions:

- By February 15, 2011, provide a report to the District Manager, Thunder Bay District on the whether or not the site has exceeded the approved fill area. If this report identifies that the site exceeds the approved site area, it must contain the municipality's plans achieve compliance with Ministry legislation (eg site closure, site expansion, establishment of an alternate site, etc).
- By February 15, 2011, provide a report to the District Manager, Thunder Bay District, as to the status of the Land Use Permit which was to be obtained by December 31, 1989 and confirmation a buffer zone exists and extends 100 meters in all directions from the working area boundaries.
- By May 15, 2011, ensure that the fill area and site boundaries are clearly marked with permanent markers.

If you have any questions with the inspection report, please do not hesitate to contact me at the above number.

Yours truly,

A handwritten signature in black ink, reading "Monika Holenstein". The signature is fluid and cursive, with the first name "Monika" and last name "Holenstein" clearly distinguishable. It is positioned above a horizontal line.

Monika Holenstein
Senior Environmental Officer
Thunder Bay District Office

File Storage Number: TB NA H643 610



Solid Non-Hazardous Waste Disposal Site Inspection Report

Client:	The Corporation of the Municipality of Greenstone Mailing Address: 301 East St, Post Office Box, 70, Geraldton, Ontario, Canada, P0T 1M0 Physical Address: 301 East St, Greenstone, Municipality, District of Thunder Bay, Ontario, Canada, P0T 1M0 Telephone: (807)854-1100, FAX: (807)854-1468, email: administration@greenstone.ca Client #: 0380-4TKQAV, Client Type: Municipal Government		
Inspection Site Address:	Nakina Waste Disposal Site Address: Highway 643 2km west of the Town of Nakina, Greenstone, Municipality, District of Thunder Bay District Office: Thunder Bay - District GeoReference:		
Contact Name:	Jean Noel Chaine	Title:	Operations Working Foreman - Nakina
Contact Telephone:	(807)329-8599 ext	Contact Fax:	
Last Inspection Date:	2009/09/15		
Inspection Start Date:	2010/10/20	Inspection Finish Date:	2010/12/23
Region:	Northern		

1.0 INTRODUCTION

The purpose of this inspection was to assess compliance with Ministry of Environment legislation, specifically Regulation 347 and the waste management provisions of the Environmental Protection Act. The inspection consisted of a review of files and reports, as well as a site visit on October 20, 2010 and a discussion with Jean Noel Chaine at the public works yard.

The Nakina Waste Disposal Site is owned and operated by the Municipality of Greenstone and serves the community of Nakina with population of less than 400 people. The site is located on the south side of Hwy 584 approximately 3 km west of the Nakina townsite.

In the last few years, the municipality has begun to accept waste from the "Ring of Fire" mineral exploration camps which are located north of Nakina. A local scrap dealer is bringing the wastes in drums from the airport to the site and emptying the drums. The drums are being recycled. Accepting waste from outside of the municipal boundaries may having a significant impact on the site capacity.

The site appears to have been initially approved in 1972 and is currently operating under a Certificate of Approval A591901 dated January 8, 1990.

The site was last inspected in the fall of 2009 and there were a number of actions required as a result of that inspection. The purpose of this inspection was to evaluate the progress on addressing the issues identified last year.

2.0 INSPECTION OBSERVATIONS

Certificate of Approval Number(s):

The site appears to have been initially approved in 1972 and is currently operating under a Certificate of Approval A591901 dated January 8, 1990. The Certificate of Approval requires that a new Land Use Permit be obtained by December 31, 1989 and that a buffer zone exists and extends 100 meters in all directions from the working area boundaries. It remains unclear whether the

municipality complied with either of these two conditions.

2.1 FINANCIAL ASSURANCE:

There is no requirement for Financial Assurance for municipal waste disposal sites.

2.2 APPROVED AREA OF THE SITE:

The Certificate of Approval is for the use and operation of a 5 hectare landfilling site within a total site area of 20 hectares. Vance Czerwinski indicated that the site was recently surveyed but he had not received a report. At the time of inspection the footprint did not appear to be flagged. The need to identify and flag the footprint has been identified by the Ministry many times.

2.3 APPROVED CAPACITY:

The Nakina Waste Disposal site does not have a listed capacity, only a size restriction of 5 hectare fill area. In 1998, a letter from Ray Boivin with the MOE to the Clerk-Treasurer of the Town of Nakina indicates that the town had informed the MOE that the landfill would be at capacity within the next five years. The letter outlines the process to expand the existing waste disposal site, or to site a new landfill. It is the MOE's understanding that the site has now been surveyed and a report on capacity will be forthcoming early in the new year.

2.4 ACCESS CONTROL:

The site access is controlled by fences and a locked gate. The site is only open when attendants are on duty. The previous inspection required that the Municipality improve signage at the site, and a new sign has been installed.



2.5 COVER MATERIAL:

The wastes was adequately covered at the time of inspection. At the time of inspection a municipal employee was in the process of compacting and covering the current working area. The segregated wood area had not yet been covered.

2.6 WASTE BURNING:

There was no evidence of waste burning at the site at the time of inspection.

2.7 GROUNDWATER/SURFACEWATER IMPACT:

There was no evidence of groundwater/surface water impact at the time of inspection. Groundwater monitoring has not been required at this site.

2.8 LEACHATE CONTROL SYSTEM:

The site is considered naturally attenuating and there is no leachate control system.

2.9 METHANE GAS CONTROL SYSTEM:

There is no requirement for a methane gas control system at this site.

2.10 OTHER WASTES:

Metals are segregated and regularly removed by a local scrap metal company.

There is a segregated wood pile. Currently, the municipality plans to cover the segregated wood pile, which seems contrary to the intent of segregating materials. The Municipality could investigate the possibility of better segregation and burning untreated wood.

The municipality is accepting waste from the "Ring of Fire" mineral exploration camps which are located north of Nakina. Ring of Fires exploration camps waste is brought by air in steel drums, transferred to the Nakina site by a local scrap metal dealer and emptied. The empty drums are recycled. If the site is at or exceeding capacity, excepting wastes from outside of the municipal boundaries may not be acceptable.

3.0 REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES

The previous inspections contained the following findings:

- Fill area and site boundaries have not been identified. According to information on the site files, it is likely that there is fill beyond approved limits at this site.
- There is currently no way to ascertain whether the fill area complies with the Certificate of Approval and whether or not a buffer zone exists as required by the Certificate of Approval.
- When the gate is closed there is no information about who to contact if there is a problem (eg fire) at the site.
- At the time of inspection, the segregated wood pile included a significant amount of non-wood items such as insulation, mattresses, shingles(see attached photos). The attendant appears to be allowing non wood items to be deposited in this area. If the municipality wishes to burn untreated wood products, there must be careful segregation of these materials. The municipal employee gave the impression that the material in the segregated wood area would eventually be covered, which seems contrary to the intent of segregating materials.

The previous inspection contained the following required actions:

By June 30, 2010, the landfilling area and site boundaries shall be clearly marked with permanent markers. **The site was surveyed in December 2010, and the site boundaries were marked, but the fill area was not flagged.**

By August 30, 2010, provide a report to the District Manager, Thunder Bay District on the whether or not the site has exceeded the approved fill area. If this report identifies that the site exceeds the approved site area, it must contain the municipalities plans achieve compliance with Ministry legislation (eg site closure, site expansion, establishment of an alternate site, etc). **This report has not been provided.**

Immediately ensure that only untreated wood is deposited in the segregated wood area. **It appeared that mostly wood was being deposited in the segregated wood area, and that in any case, the wood was being disposed of by burying in the site.**

By March 30, installed and maintained a sign at the main entrance/exit to the Site on which is legibly displayed the following information:

- (a) the name of the Site and Owner;
- (b) the number of the Certificate;
- (c) the name of the Operator;
- (d) the normal hours of operation;
- (e) the allowable and prohibited waste types;
- (f) the telephone number to which complaints may be directed;
- (g) a warning against unauthorized access;
- (h) a twenty-four (24) hour emergency telephone number (if different from above); and
- (i) a warning against dumping outside the Site.

A new sign has been installed.

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: Fill area has not been identified. According to information on the site files, it is likely that there is fill beyond approved limits at this site. A report on the results of surveying and an evaluation of site capacity has not been provided.

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material ?
Yes

Specifics: There is currently no way to ascertain whether the fill area complies with the Certificate of Approval and whether or not a buffer zone exists as required by the Certificate of Approval.

Was there any indication of minor administrative non-compliance?
Yes

Specifics:

5.0 ACTION(S) REQUIRED


By February 15, 2011, provide a report to the District Manager, Thunder Bay District on the whether or not the site has exceeded the approved fill area. If this report identifies that the site exceeds the approved site area, it must contain the municipality's plans achieve compliance with Ministry legislation (eg site closure, site expansion, establishment of an alternate site, etc).

By February 15, 2011, provide a report to the District Manager, Thunder Bay District, as to the status of the Land Use Permit which was to be obtained by December 31, 1989 and confirmation a buffer zone exists and extends 100 meters in all directions from the working area boundaries.

By May 15, 2011, ensure that the fill area and site boundaries are clearly marked with permanent markers.

6.0 OTHER INSPECTION FINDINGS

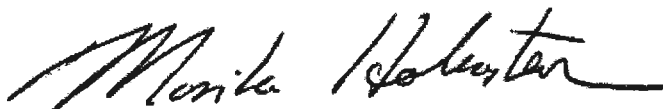
7.0 INCIDENT REPORT

Applicable
2241-7YCJME 

8.0 ATTACHMENTS

PREPARED BY:
Environmental Officer:

Name: Monika Holenstein
District Office: Thunder Bay District Office
Date: 2010/12/23
Signature



**REVIEWED BY:
District Supervisor:**

Name: Scott Sheriff
District Office: Thunder Bay District Office
Date: 2010/12/30

Signature:



File Storage Number: TB NA H643 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"

Use shaded areas for corrections.

Name of Applicant/Permittee (Insert Corporate Name if Applicant is "Limited" or "Incorporated")

Municipality of Greenstone

Area Code

Telephone No.

As Trustee for:

Postal Address of Applicant/Permittee

P.O. Box 70

City, Town or Village

Geraldton

Prov./State

Ontario

Country

Canada

Postal Code

P0T 1M0

Location of Land

Lot

Concession/Block No.

Geographic Township

NAKINA

Municipality

U.T.M. Grid

Zone 16 E. 518000

N. 5558000

Geographic Location

Township of Nakina

Area in ha

19.30

As per sketch and description which is attached to the original permit for this site and forms part of this permit. A copy of this sketch and description is on file at the District Office and available for inspection by the applicant at any time during normal business hours

Land Required for the Purpose of

FILLED LAND

GST I.D. Number

R124668666

Fee(s) and Period of Land Use

Amount Due

\$545.79

Annual Fee (subject to adjustment)

\$483.00 + \$62.79 (HST)

Permit Effective Date

Jan 1, 2011

Permit Termination Date

Dec 31, 2015

Note: Terms and Conditions applicable to all Land Use Permits are on the reverse side of this form.

Terms and Conditions applicable to this permit

Nakina Ward

NAK landfill

Purpose

Waste Disposal Site

Sub-Purpose

Landfill

Applicant's certification

I certify that the information given herein is true and complete, and that I have read, fully understand, and agree to comply with all of the terms and conditions set out in this permit and that I am of the age of majority.

I agree that this is the complete agreement between the parties hereto

Signature of Applicant (if not Corporation Official)

Date Signed

Dec. 13, 2010

Corporation Use Only

I have authority to bind the herein-named Corporation

Initials and Surname of Corporation Official (Please Print)

Signature of Corporation Official

Position

Ministry Approval

Under authority of the Regulations under the Public Lands Act, this Land Use Permit is hereby issued to the above applicant, subject to all terms and conditions contained herein and no other, and these shall be the exclusive terms and conditions applicable to the use of this land.

Signature of MNR Official

Date Signed

Cash Register Validation or Receipt No.

Amount Paid

Personal information on this form is collected under authority of the Public Lands Act and will be used for the administration of that Act. Questions about this information should be directed to the local MNR Office, whose address and telephone number appear in the Ontario Government Telephone Directory.

The Corporation of the Township of Nakina

P.O. BOX 119 - NAKINA, ONTARIO - P0T 2H0

Phone 329 - 5361

OPERATION PLAN

NAKINA W.D.S.

METHOD OF OPERATION

TRENCH METHOD

- Excavated material will be used for final cover for the filled trench.
- Trench size will be approximately 12' x 18' x 25'.
- Movable barriers will be utilized to vary the location where the public may deposit waste.
- New trenches to be constructed spring and fall.

DAILY OPERATIONS

- Site will be open seven days a week from 8am to 6pm.
- Segregation of materials will be allocated for degradable goods, vehicles to be located at northwest corner.
- Litter will be controlled with fence if required.
- Signs to be posted stating the times the site will be open.

SITE CLOSURE

- This will include grading, compacting, and covering of waste with a minimum of 100 cm of coverage.



Ontario

of the
Environment

de

l'Environnement

Waste Disposal Site

**Certificat d'autorisation provisoire
de décharge**

Provisional Certificate of Approval No. **A 591901**
Certificat d'autorisation provisoire no

Page **1** of **2**
page de

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

Aux termes de la Loi sur la protection de l'environnement et des règlements y afférents et sous réserve des restrictions qui s'y appliquent, ce Certificat provisoire d'autorisation est délivré à:

**The Corporation of the Township of Nakina
P. O. Box 210
Nakina, Ontario
POT 2N0**

for use and operation of a 5 hectare landfilling site within a total site area of 20 hectares.

All in accordance with the following plans and specifications:

1. Application for a Certificate of Approval for waste disposal site (landfill) and supporting information.

**LOCATED: 2 miles west of Nakina townsite
South of Highway 584
Zone 16
Nakina Map 42L2
U.T.M. Coordinates N5558430 E517620
District of Thunder Bay**

which includes the use of the site only for disposal of the following categories of waste. (Note: Use of the site for additional categories of waste requires a new application and amendments to the Provisional Certificate of Approval.)

Domestic, Non-Hazardous Solid Waste and other (sewage sludge)

and subject to the following categories:

1. Except as otherwise provided by these conditions, the waste disposal site shall be operated in accordance with the application dated March 17, 1989 and with the supporting information, plans and specifications submitted therein.
2. That a new Land Use Permit be obtained by December 31, 1989.
3. That a buffer zone exists and extends 100 meters in all directions from the working area boundaries.

Dated this
Fait le

8th

day of
jour de

January 19 90

Wayne J. D.
Director, Section 38
Environmental Protection Act
Directeur, Section 38
Loi sur la protection de l'environnement



**Certificat d'autorisation provisoire
de décharge**

The following conditions are additional to the conditions shown on Provisional Certificate
Les conditions ci-dessous s'ajoutent à celles indiquées dans le Certificat d'autorisation
of Approval Number **K 591501** dated
provisoire n° fait le

4. This Provisional Certificate of Approval revokes all of the old previously issued Provisional Certificates of Approval issued under Part V of the Environmental Protection Act for this site. The approval given herein, including the terms and conditions set out, replace all previously issued approval and related terms and conditions under Part V of the act for this site.

TO: The Corporation of the Township of Nakina
P. O. Box 210
Nakina, Ontario
POT 2H0

You are hereby notified that Provisional Certificate of Approval No. A591901 has been issued to you subject to the conditions outlined therein.

The reasons for the imposition of these conditions are as follows:

1. The reason for condition 1 is to ensure that this waste disposal site is operated in accordance with the application submitted for the Provisional Certificate of Approval and not on a basis which the Director has not been asked to consider.
2. The reason for condition 2 is to ensure that the necessary land approval is obtained.
3. The reason for condition 3 is to ensure a buffer zone exists between the landfill area and other land uses.
4. The reason for condition 4 is to clearly set out and consolidate the current provision of the approval covering the operations of the site including the terms and conditions for this approval. By amending and re-issuing this Provisional Certificate of Approval in this manner, all interested parties are aware of the rights and obligations imposed by this approval.

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.


This Notice should be served upon:

The Secretary
Environmental Appeal Board
112 St. Clair Ave. West
Suite 502
Toronto, Ontario
M4V 1N3

AND

The Director
Section 38
Ministry of the Environment
Northwestern Region
435 James Street South
Thunder Bay, Ontario
P7C 5G6

DATED at THUNDER BAY this 8th day of January, 1970.


Director
Section 38
Ministry of the Environment



Ministry of
Natural
Resources

Land Use Permit

Permit No.
LUP 22-00 674

Public Lands Act

Use shaded areas for corrections.

Name of Applicant/Permittee (Insert Corporate Name if Applicant is "Limited" or "Incorporated")		Area Code	Telephone No.
The Corporation of the Township of Nakina		807	329-5361
As Trustee for			
Postal Address of Applicant/Permittee			
P. O. Box 210, Nakina, Ontario POT 2H0			
City, Town or Village			
Corporation of the Township of Nakina		Prov./State	Country
		Ontario	Canada
		POT	2H0
Location of Land			
Lot		Municipality	
Township of Nakina			
U.T.M. Grid		Geographic Location	
Section 16 E. 518000 N. 5558000		Area in hectares	
		19.3±	
As per sketch and description which is attached to the original permit for this site and forms part of this permit. A copy of this sketch and description is on file at the District Office and available for inspection by the applicant at any time during normal business hours.			
Land Required for the Purpose of			
Disposal Grounds			
Fee(s) and Period of Land Use			
Current Fee (Subject to adjust.)	Annual Fee Due	Permit Effective Date	Permit Termination Date
\$ 483.00	\$ 483.00	January 1, 1990	December 31, 1990

Note: Terms and Conditions applicable to all Land Use Permits are on the reverse side of this form.

Additional Terms and Conditions applicable to this permit

- All accumulated slash and debris caused by the site expansion is to be piled for burning and any burning is to be carried out between the months of October and April or when the weather is sufficiently wet.
- Ensure regular maintenance and cleanup of the site to prevent the accumulation of flammable debris to the point where it could be considered a fire hazard.
- As new disposal trenches are developed, the area around the trench is to be cleared of flammable debris and cleared down to mineral soil for a distance of thirty metres. The Geraldton Fire Operations Headquarters is to be contacted in order that an inspection may be carried out by an M.N.R. Fire Officer.

Applicant's Certification

I certify that the information given herein is true and complete, and that I have read, fully understand, and agree to comply with all of the terms and conditions set out in this permit and that I am of the age of majority. I agree that this is the complete agreement between the parties hereto.

Signature of Applicant (incl. Corporation Official) Date signed
DEC. 31, 1989

Corporation Use Only

I have authority to bind the herein-named Corporation.

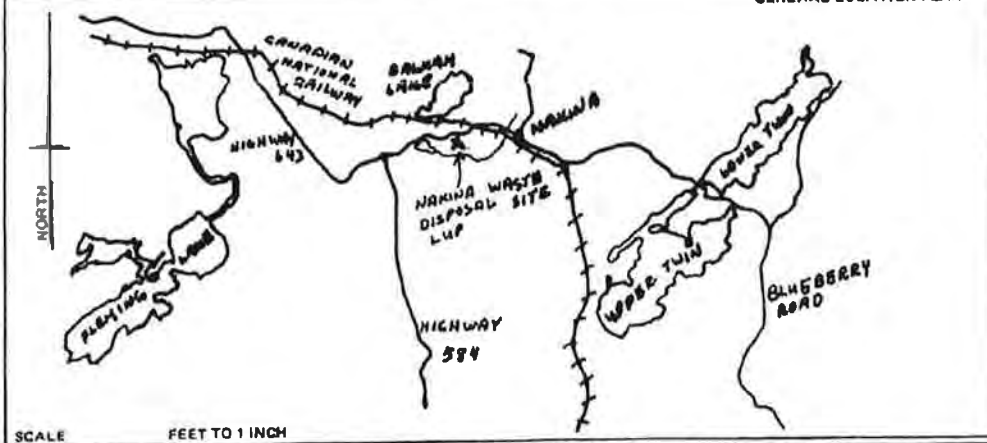
Initials and Surname of Corporation Official (Please print) Signature of Corporation Official Position
DIB HIEWKIOISIKI Clerk - Treasurer

Ministry Approval

Under authority of the Regulations under the Public Lands Act, this Land Use Permit is hereby issued to the above applicant, subject to all terms and conditions contained herein and no other, and these shall be the exclusive terms and conditions applicable to the use of this land.

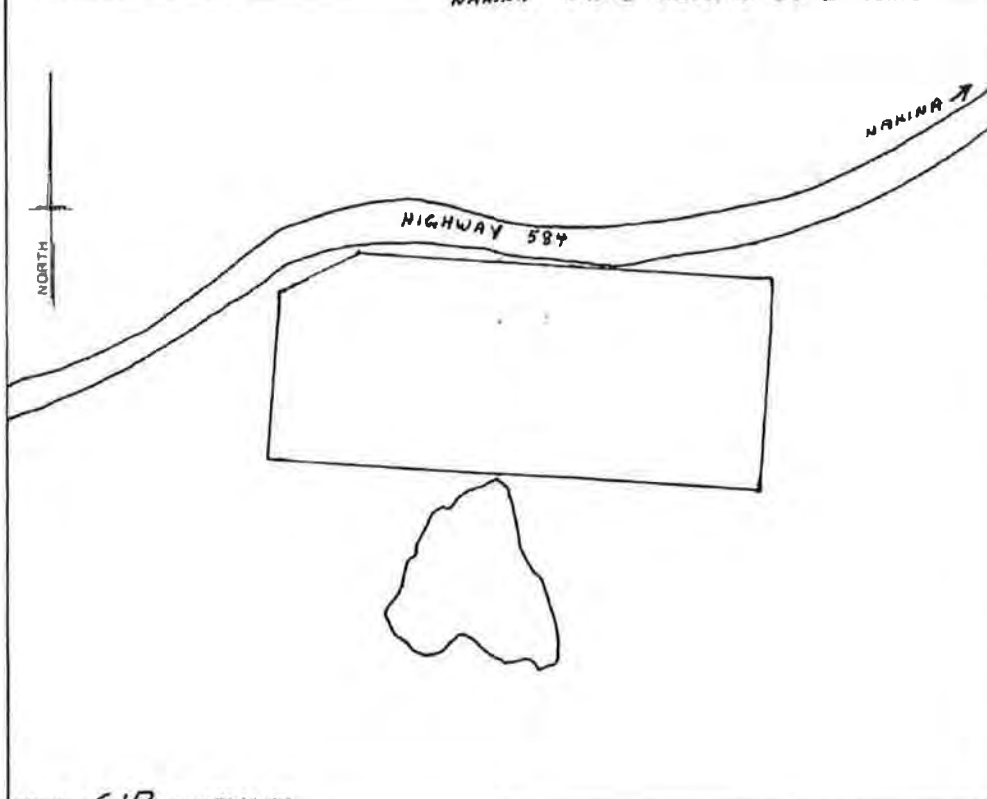
Amount Paid Cash Register validation or Receipt No. Signature of District Manager Date signed
\$ 483.00 Kenneth J. Hume 90/01/02

GENERAL LOCATION PLAN



SCALE FEET TO 1 INCH

NAKINA WASTE DISPOSAL SITE DETAIL PLAN



SCALE 617 FEET TO 1 INCH

PRIVATE USE ☐ COMMERCIAL USE ☐ SPECIAL USE ☐

LOT NO. OF PRELIMINARY SUBDIVISION ☐

INDIVIDUAL LOCATION ☐

LEVEL OF LAKE CONTROLLED BY A DAM YES ☐ NO ☐

BOUNDARIES COMPLETELY CUT OUT
PARTIALLY

PRELIMINARY SURVEY BY M. DAVIS

DATE OF PRELIMINARY SURVEY DECEMBER 7 1981

NAME OF APPLICANT TOWNSHIP OF NAKINA

ADDRESS PO BOX 10 NAKINA, ONT. P0T 1W0

REMARKS WASTE DISPOSAL SITE PER

M.A.E. GUIDELINES 19.3.10.2

MINISTRY OF NATURAL RESOURCES

GERALTON DISTRICT OFFICE

ONTARIO PROVINCIAL GOVERNMENT

M.N.R. DATED DECEMBER 7 1981

TOWNSHIP OF NAKINA

LOT CONCESSION

APPROVED _____
District Manager



for a Waste Disposal Site (Landfill)

Demande de certificat d'autorisation d'un lieu d'élimination des déchets (enfouissement)

A591901

Important Note:

If this application is for notification of changes in use, operations, or ownership, specify the MOE number on your certificate and fill in only the data which are being revised.

Remarque importante: Si cette demande n'est utilisée que pour signifier des changements d'utilisation, d'exploitation ou de propriétaire, spécifier le numéro m. de l'E. de votre certificat et n'inscrire sur cette formule que les renseignements modifiés.

1. Applicant Demandeur

☒ Municipal ☐ Provincial ☐ Other

Name
Nom
THE CORPORATION OF THE TOWNSHIP OF NAKINA
Address
Adresse
BOX 210
City/Prov.
Ville/prov.
NAKINA ONTARIO

Tel.
Tél.
(807) 329-5361
Postal Code
Code postal
POT 2H0

If applicant not
Municipal or
Provincial:

Si le demandeur
ne fait pas partie
des catégories
"municipal" ou
"provincial":

☐ Proprietorship
Entreprise à
propriétaire unique
☐ Corporation
Compagnie
☐ Partnership
Société en nom collectif

Proprietor's Name if Different from Applicant's
Nom, si différent de celui du demandeur

President's Name
Nom du président

Name All Partners
Citer tous les associés

2. Land Owner Propriétaire du terrain

Name
Nom
CROWN LAND
Address
Adresse

3. Lessee Locataire

Name
Nom
TOWNSHIP OF NAKINA (land use permit)
Address
Adresse
P.O. BOX 210 NAKINA, ONTARIO POT 2H0

4. Site Operator Exploitant du lieu

Name
Nom
TOWNSHIP OF NAKINA
Address
Adresse

Title
Titre

5. Site Location Emplacement du lieu

☐ City
Cité ☐ Town
Ville ☐ Other (specify)
Autre (préciser)
☐ Village
Village ☒ Township
Canton

site location noted on attached map

Name (City, Town, etc.)
Nom (cité, ville, etc.)

see L.U.P. # 22-00258

Concession
Concession

Lot
Lot n°

Part of Lot
Partie de lot

Street Address
Adresse

Include a copy of the plan of survey of any lands on which the site is to be located.
Joindre une copie du levé de tous les terrains sur lesquels le lieu sera situé.

**Application for Certificate of Approval
Demande de certificat d'autorisation**

6. Site Characteristics and Waste Categories
Caractéristiques du lieu et catégorie de déchets

A. Present Land Use
Utilisation actuelle du terrain **MUNICIPAL DISPOSAL SITE**

B. Present Official Plan Designation of Site
Désignation actuelle du lieu sur le plan officiel **CROWN LAND**

C. Present Zoning Category
Catégorie de zonage actuelle **CROWN LAND**

D. Provide details of present land use of all adjoining properties on the location map.
Indiquer sur la carte l'utilisation actuelle des terres de toutes les propriétés adjacentes.

(See note below)
(Voir remarque ci-dessous)

E. Rate at Which Site Can Receive Wastes Per Day
Rythme de déversement possible des déchets quotidiennement

Waste Category
Ord. ménagères

☒ Domestic
Domestiques

Quantity (Tonnes, Cubic Metres, Litres)
Quantité (tonnes, mètres cubes, litres)

525 TONNES

☒ Commercial
Commerciales

275 TONNES

If any of the following are to be received at the site, attach a description of each including source.
Si des déchets des catégories suivantes doivent normalement être déversés dans le lieu d'élimination des déchets, joindre une description de chacune des catégories, y compris la provenance.

☐ Liquid Industrial
Industriels liquides

Quantity
Quantité

☐ Solid Hazardous
Déchets solides dangereux

☐ Non-Hazardous
Solid Industrial
Industriels solides
non dangereux

☐ Other
Autres

F. No. of Days/Yr. Site Open

Nombre de jours/année d'ouverture du lieu **365 days**

G. Population Served

Population desservie **650**

H. Municipalities/Major Industries Served

Noms de toutes les municipalités/grandes entreprises devant être desservies par le lieu

TOWNSHIP OF NAKINA

I. Total Area of Site
Superficie totale du lieu

20

☒ Hectares
Hectares

☐ Acres
Acres

J. Total Area to be Filled
Superficie totale à combler

5

☒ Hectares
Hectares

☐ Acres
Acres

K. Estimated Site Capacity
Capacité estimative du lieu

12,000

☒ Tonnes
Tonnes

☐ Cubic Metres
Mètres cubes

Express rate per
day and capacity
in same
measurement.

Utiliser les mêmes
unités pour indiquer
le taux par jour et
la capacité
estimative.

7. Site Enlargement Changes Only

En cas d'agrandissement de lieu seulement

A. Additional Life Expectancy
Durée d'utilisation supplémentaire **10** Years
années

B. Additional Area Applied for
Superficie supplémentaire demandée **8** Hectares
hectares

C. New Total Area of Site
Nouvelle superficie totale du lieu **20** Hectares
hectares

D. New Potential Municipalities Served
Noms des nouvelles municipalités pouvant être desservies

**Application for Certificate of Approval
Demande de certificat d'autorisation**

**3. Control System
Système de contrôle**

**A. Monitoring for
Contrôle des**

Gas Gaz	<input type="checkbox"/> Yes Oui	<input type="checkbox"/> No Non
Ground Water Eaux souterraines	<input type="checkbox"/> Yes Oui	<input checked="" type="checkbox"/> No Non
Surface Water Eaux de surface	<input type="checkbox"/> Yes Oui	<input checked="" type="checkbox"/> No Non

**B. Control System for
Système de contrôle**

Gas Gaz	<input type="checkbox"/> Yes Oui	<input checked="" type="checkbox"/> No Non
Gas Utilization Utilisation des gaz	<input type="checkbox"/> Yes Oui	<input checked="" type="checkbox"/> No Non
Leachate Lixiviation	<input type="checkbox"/> Yes Oui	<input checked="" type="checkbox"/> No Non

**3. Documentation
Documents**

List all supporting documents submitted with this Application.
Indiquer tous les documents d'appui accompagnant la présente demande

MINISTRY OF NATURAL RESOURCES land use permit # 22-00258

MAP OF SITE LOCATION

SITE PLAN

AREA MAP 1:50,000

OPERATING PLAN

**10. Signature
Signature**

Applicant's Name - Printed
Nom du demandeur (lettres majuscules)

DAVID LEWIS

Title
Titre

CLERK - TREASURER

Signature
Signature



Date
Date

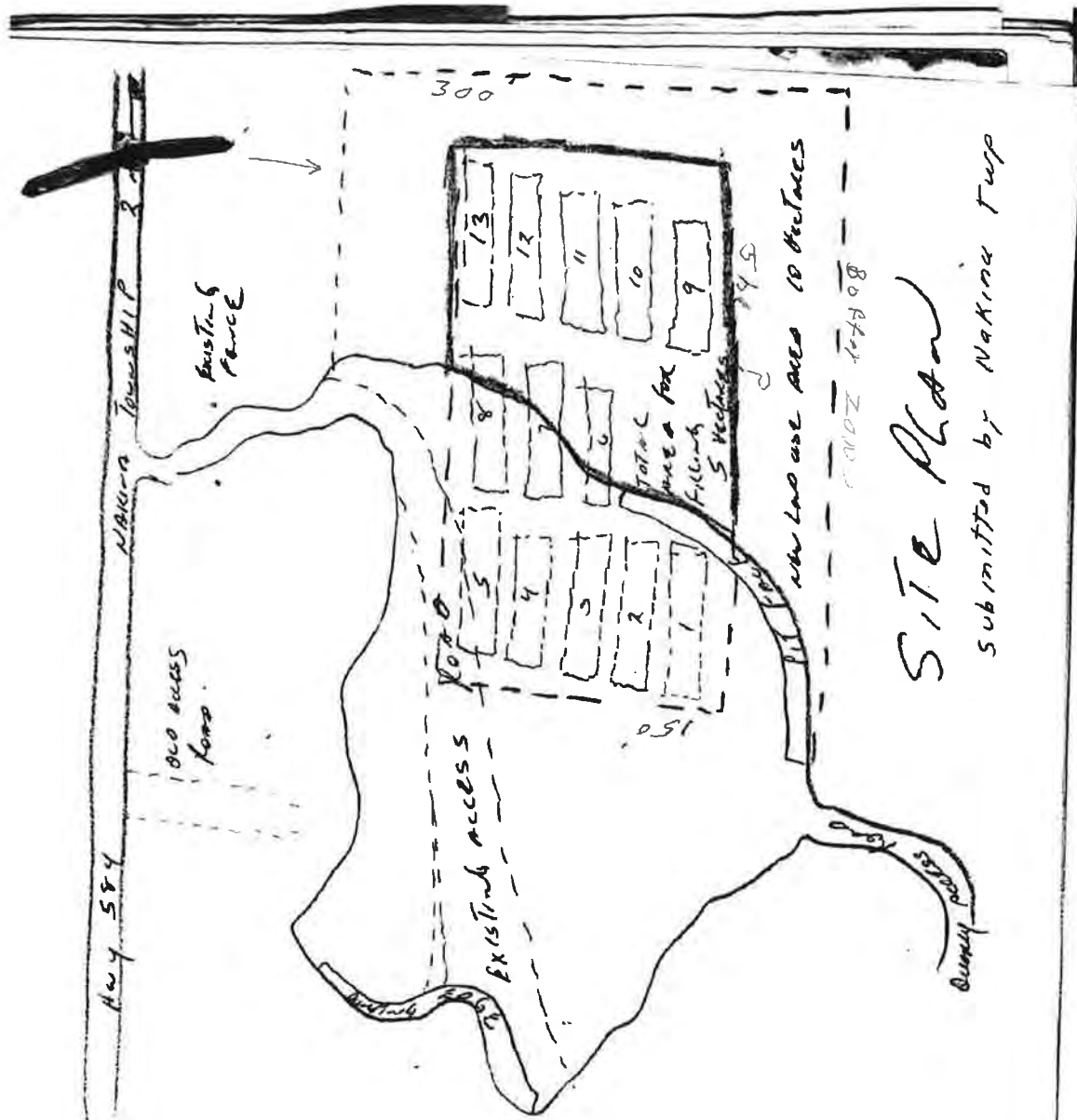
MARCH 17/89

Company Seal
(if applicable)

Seal of the company



DATE OF PRELIMINARY SURVEY Nov. 29, 1962
 NAME OF APPLICANT Imp. Dist. of Nakina
 ADDRESS NAKINA, Or
 REMARKS for dispos. grounds





Ministry of the Environment

PROVISIONAL CERTIFICATE OF APPROVAL FOR A WASTE DISPOSAL SITE

Provisional Certificate No. **591901**

Under The Environmental Protection Act, 1971 and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to.....

Improvement District of Nakina

Nakina, Ontario.

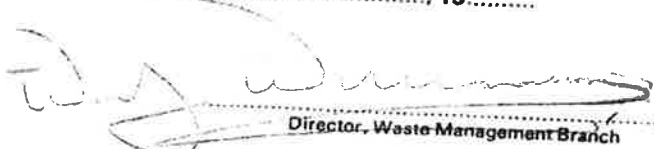
for the **Landfill**

located **2 miles west of Townsite of Nakina and 1000 feet south of Highway 504** Site

subject to the following conditions.....

This Provisional Certificate expires on the **15th** day of **November**, 19 **78**

Dated this **11th** day of **April**, 19 **73**


Director, Waste Management Branch

Townsite and 1000 feet south
of highway 584, Nakina Township
5 acres

By, H. F. Wright,
Senior Inspector, Northern Region,
Waste Management Branch,
Ministry of the Environment,
1111 Victoria Avenue,
Thunder Bay "P", Ontario.

File No. A-5919-01

March 5th, 1973.

This site was inspected on Tuesday, August 15th, 1972 by the writer.

The site is on a land use permit originally issued in 1962. The Improvement District of Nakina rents the land at an annual fee of five dollars.

The site serves six hundred and seventy-four people of the townsite and possibly a few scattered settlers in the immediate area.

PHYSIOGRAPHY:

The site is located on the edge of a sand depression with hills ranging from twenty feet to sixty feet high surrounding the site with the exception of one narrow gap at the northwest end.

There seems to be no major rock outcroppings. The hills south of the site are heavily wooded. The land between the site and highway 584 is covered with light scrub bush.

There is a small swampy area at the base of the dumping area. This swamp seems self contained with no visible outlet. The water may be a perched water table.

SOILS:

The basic soil is fine sand with some gravel deposits. This soil should be suitable for trenching and cover material.

SITE MANAGEMENT:

The municipality has in the past dug a trench. The main operation, however, seems to be dumping refuse over the bank into the swamp. Periodic bulldozing of the site and covering the refuse with sand have taken place. The municipality has also bulldozed the refuse in large irregular shaped mounds to clear space for dumping.

Our Branch has received information that the municipality has cleared some of the bush and constructed a new road to the site. The Ministry of Natural Resources has brought this to our attention but our Branch has not personally inspected the site.

The site is operated as a dump with most of the on site work completed in the summer months. For a small municipality this operation is fair. There are no signs on the site. The municipality does clean up blowing papers, but there is no set programme.

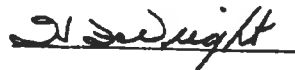
The site is burned frequently, normally in the low fire hazard time in the Spring and Fall.

MUNICIPAL OFFICIALS:

The writer contacted Mr. E. N. Barvie, Secretary-Treasurer for the municipality and discussed the possible conversion of the site to a landfill operation. Trenches could be dug of sufficient size to serve the municipality. Mr. Barvie stated that the area was isolated and that the municipality on many occasions has tried to contract equipment for site maintenance but was unable to find any available.

RECOMMENDATIONS:

1. The municipality properly sign the site.
2. A trench type landfill operation should be investigated by the municipality.
3. Existing mounds of refuse should be bulldozed into the lower areas of the site and properly covered.



H. F. Wright

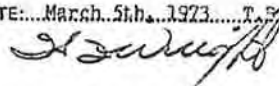
HPW/cjn

RECOMMENDATION OF REGIONAL ENGINEER

ISSUE	
RE-ISSUE	
UP-GRADE	

NOTE: This form shall be submitted by the Regional Engineer to Head Office along with the application form and all supporting information.

FIRST ISSUE

APPLICANT:.....The Corporation of the Improvement District of Nakina.....			
FOR THE WASTE DISPOSAL SITE <input checked="" type="checkbox"/>		WASTE MANAGEMENT SYSTEM <input type="checkbox"/>	
LOCATED AT Parcel of Land 2 miles west of Nakina Townsite, 1000 feet south of hwy. 584		SERVING	
DATE APPLICATION RECEIVED:.....August 11th, 1972.....T.B.....File: A591901			
ISSUE: <input type="checkbox"/>	Certificate of Approval	<input checked="" type="checkbox"/>	Provisional Certificate of Approval
			Provisional Certificate to Expire On.....November 15th, 1973.....
CONDITIONS:			
1.....The site should be properly signed.....			
2.....Existing mounds of refuse must be properly covered.....			
3.....The municipality should investigate the feasibility of.....			
operating a trench type landfill.....			
CIRCULATE TO:			
REASONS FOR CIRCULATING:			
REFUSE APPLICATION: <input type="checkbox"/>			
REVOKE <input type="checkbox"/>	SUSPEND <input type="checkbox"/>	REFUSE TO RE-ISSUE <input type="checkbox"/>	(Cert. No.....)
REASONS:			
DATE: March 5th, 1973.....T.B.....			
		SIGNED:..... Regional Engineer NORTHERN.....Region	

**TO AN
APPLICATION FOR APPROVAL
OF A
LANDFILL DISPOSAL SITE**

A-5919

APPLICANT TO COMPLETE ITEMS 1-4 INCLUSIVE

1. SITE DETAILS

Applicant Improvement District of Nakina

Site Location 2 miles west of Nakina Townsite
and 1000' south of Highway 584

Total area of Site 5 Acres
Total usable area for waste disposal 4 Acres
Anticipated Lifetime 2 Years
Distance to nearest watercourse 2 miles
Distance to nearest potable well water supply 1/4 mi.
Depth of well noted above 14 ft.
Distance to dwelling 2 miles
Distance to public road measured from working area 1000 ft.
Distance to cemetery 1/2 mi.
Depth from original surface to bottom of waste 14 ft.
Depth from original surface to top of fill 10 ft.
Ground conditions encountered measured from original surface

Sand From To
From To
From To
From To
Depth to watertable below surface ft.
on 197
General description of site
(location, topography etc.)

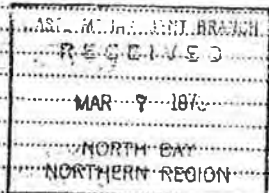
Proposed use of land after site fully utilized

2. Wastes to be Disposed of Comprise

Domestic 100 %
Commercial %
Industrial Waste %
Hauled Liquid Industrial Waste %
Agricultural Waste %
Hazardous Waste %
Hauled Sewage %
* Other %
100%

* Describe

Origin and Composition of Principal Components of Waste
(other than domestic and commercial)



FOR REGIONAL USE

Authorities Consulted:

Health Unit	<input type="checkbox"/> Objection	<input type="checkbox"/> No Objection
O.W.R.C.	<input type="checkbox"/> Objection	<input type="checkbox"/> No Objection
A.M.B.	<input type="checkbox"/> Objection	<input type="checkbox"/> No Objection
Municipality	<input type="checkbox"/> Objection	<input type="checkbox"/> No Objection
Conservation Authority	<input type="checkbox"/> Objection	<input type="checkbox"/> No Objection

Other

Inspection Record Forms Attached

Yes ☐ No ☐

Number of Forms

Regional Engineer's Report Attached ☐

Ground water monitoring Yes ☐ No ☐

Surface water monitoring Yes ☐ No ☐

3. Quantities

Total Tons per Day 1/2
Total Gallons per Day
Estimated ☒ or Measured ☐
Site operated days from 677
Population served
Names of Municipalities served Nakina

Official Plan ☒ Zoning Bylaw ☐

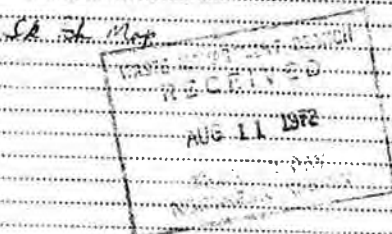
Site land zoned No

Adjacent land zoned No

Equipment Owned ☒ Rented ☐

4. The Following Documents are Attached

Copy land use permit, Department of
Lands & Forests.



Prepared by

L.H. Simons
Assistant Secretary-Treasurer
Corporation of the Improvement District
of Nakina

DATED

Signature of Owner (Applicant)

for SECRETARY TREASURER

No Carbon Paper Required

9 1972

L.V.P.?

Ridge cut down where new
road passes through
Few small trees cut

HWY. 584

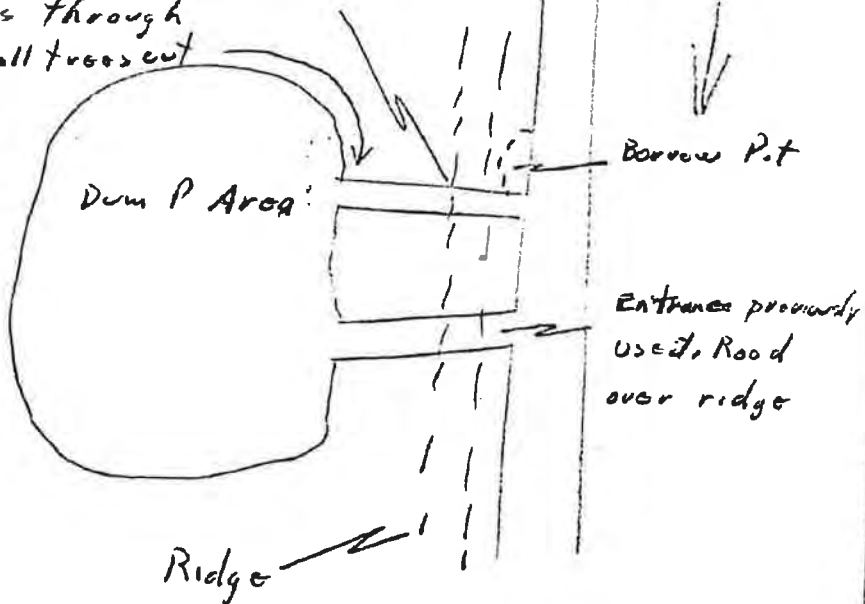
NAKINA

Borrow P.t

Dum P Area

Entrance previously
used, Road
over ridge

Ridge





APPLICATION FOR A CERTIFICATE OF APPROVAL FOR A WASTE DISPOSAL SITE

IMPORTANT NOTE

THIS FORM MUST BE SUBMITTED
THROUGH THE OFFICE OF
THE REGIONAL WASTE MANAGEMENT ENGINEER

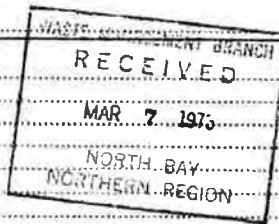
Waste Management Branch

1111 Victoria Avenue

THUNDER BAY, "F" ONT.

(SEE SECOND SHEET FOR INSTRUCTIONS FOR COMPLETING THIS FORM)

A-5919

1. Owner (Applicant)	Under the Environmental Protection Act and the Regulations, this application is made by:—	THE CORPORATION OF THE IMPROVEMENT DISTRICT OF NAKINA (Name) NAKINA, ONTARIO (Address)
2. Type of disposal site	For the Reissue ^{Issue} of a Certificate of Approval for a	Sanitary Landfill Site
3. Site location	Located	2 miles west of Nakina Townsite and 1000' south of Highway 584.
IF APPLICATION IS FOR REISSUE, COMPLETE SECTIONS 4 AND 5 (A OR B)		
4. Previous Certificate details	Certificate of Approval:— Provisional Certificate for this site was issued on:—	No. 197
5. Changes.	(A) The following changes in use, operation or ownership (have occurred since the date of the original application) OR (are proposed)	
	(B) No change in use, operation or ownership of the site has occurred since the date of the original application.	
IF APPLICATION IS FOR ISSUE, COMPLETE SECTIONS 6, 7-8 AND 9		
6. Operator.	The site will be operated in conformity with the Environmental Protection Act and the regulations by:—	Improvement District of Nakina (Name) Nakina, Ont. (Address)
7. Publication of Notice.	Notice of this application has been published in the _____ on the following dates _____ and a copy of the notice is attached.	N.A. (Name of Newspaper)
8. Municipal Certificate (Non-municipal applicants only)	A certificate, that the site does not contravene any of the by-laws of the _____ Signed by is attached.	N.A. (Municipality) (Name) (Position)
9. Additional information	The required supporting information to this application is attached.	<input checked="" type="checkbox"/>

Dated this ninth day of August 19 72

Signature of Owner-Applicant
SECRETARY MEASURED



ONTARIO

DEPARTMENT OF LANDS AND FORESTS

LAND USE PERMIT

Authority is granted to Improvement District of Nakina
for the purpose of NAKINA, Ontario.
municipal refuse dump

to enter upon, occupy, and use,

for the period from November 30, 1970 to November 29, 1971

That parcel, or tract of land, or building, described as follows:
(Give full description and area)

Parcel 2 miles west of the Nakina Townsite and 1000' south of Highway 584, Nakina Township - 5 acres.

This authority is granted under the following conditions:

RESERVING all trees of whatsoever kind standing, growing, or being upon the said land, with the right to timber licenses, if any, in the course of lumbering operations, to cut and remove same;

RESERVING also all gold, silver, and other minerals and all sand, gravel, and similar materials which are or shall be hereafter found in, on, or under the said land;

SUBJECT to the payment to the Treasurer of the Province of Ontario, or authorized agent, of the sum of \$ 5.00 of lawful money of Canada, payable prior to issuance of this permit.

IT IS UNDERSTOOD AND AGREED that the acceptance of this permit, by the within-named permittee and the payment by the said permittee of the amount of money stated herein is for the period shown above (or part thereof) not in excess of one year; that a new permit must be obtained at the expiry or cancellation of this permit if continued use of the land is permitted and that this permit may be revoked or cancelled at any time by the Minister of Lands and Forests, or authorized agent, when it shall be deemed in the public interest so to do.

PROVIDED that if and when it is considered a survey of land described in this permit is necessary, it shall be done at the expense of the permittee;

PROVIDED that all buildings erected and all works constructed on said lands shall be made to the satisfaction of the Minister of Lands and Forests, or authorized agent, and shall be kept in clean and sanitary condition and that the permittee shall exercise all reasonable care and precaution against the outbreak of fire;

PROVIDED that this permit is granted upon the condition that the land described herein shall be used for the purposes only as hereinbefore described. Violation of this provision cancels permit automatically;

PROVIDED that this permit shall not be assigned or transferred;

PROVIDED that a sworn statement shall be submitted to the Minister of Lands and Forests at such times as may be demanded by him during the currency of this permit describing any operations thereunder and the condition of the buildings thereon;

PROVIDED that the following special conditions are complied with:

The permittee must comply with the Forest Fire Prevention Act.

PAYMENT COVERED BY
RECEIPT No. 0094264
BLOTTER PAGE No. CB1510

ORIGINAL PERMIT
No. 1289-35 19 62 -19 63

RENEWAL FOR PERMIT
No. 2083-28 19 69 -19 70

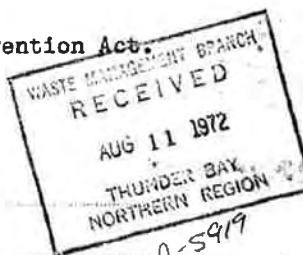
SURCHARGE

RENTAL \$5.00

TOTAL

\$ 5.00

W.K. Fullerton
W.K. Fullerton, District Forester.

Place GERALDTON, Ontario.Date November 3, 1971.PERMIT No 2229-30

3205

GENERAL LOCATION PLAN

A-5919

WASTE MANAGEMENT
RECEIVED

AUG 11 1972

THE
MATERIAL

SCALE FEET TO 1 INCH

DETAIL PLAN - (Position of shore line taken from most recent information available)



SCALE 40 CHS. FEET TO 1 INCH

PRIVATE USE ☐ COMMERCIAL USE ☐ SPECIAL USE ☐
LOT NO. OF PRELIMINARY SUBDIVISION ☐
INDIVIDUAL LOCATION ☐
LEVEL OF LAKE CONTROLLED BY A DAM YES ☐ NO ☐

BOUNDARIES COMPLETELY CUT OUT
PARTIALLY

PRELIMINARY SURVEY BY J.A. Murphy

DATE OF PRELIMINARY SURVEY April 24 19 72

NAME OF APPLICANT Environment Dept.

ADDRESS of Nakina

REMARKS

To be used by District Offices in submitting applications for summer resort locations and locations for special use.

DEPARTMENT OF LANDS AND FORESTS

Geraldton DISTRICT OFFICE

ONTARIO PROVINCIAL GOVERNMENT

Nov. 30 DATED 1972

TOWNSHIP OF

LOT CONFESSION

APPROVED
District For. Sur.

APPENDIX B –

Figures

LIST OF FIGURES

Figure 1: Site Location Plan

Figure 2: Site and Surrounding Features

Figure 3: Monitoring Well Location Plan


Figure 4: Groundwater Contour Plan – May 2018

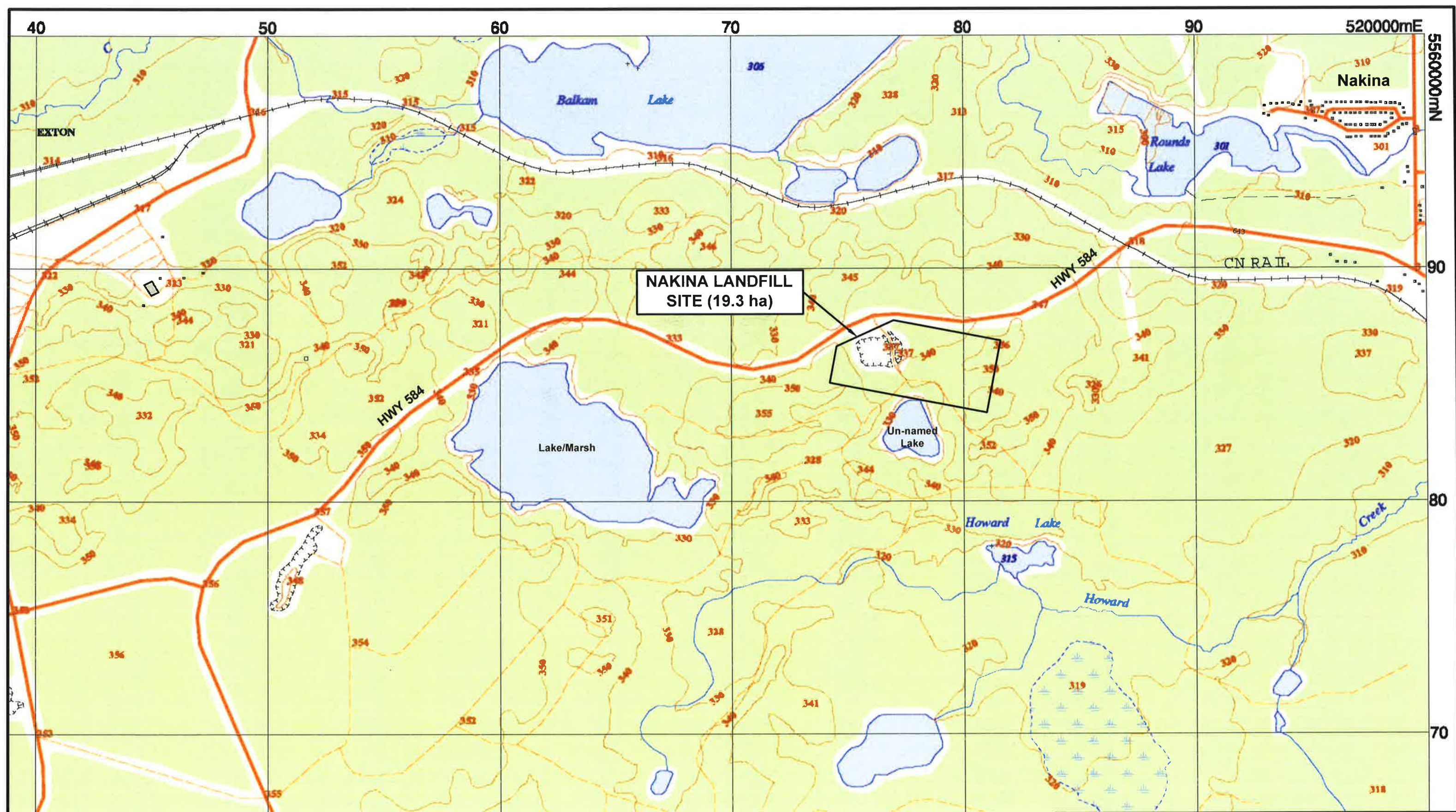
Figure 5A: Stratigraphic Profile A-A

Figure 5B: Stratigraphic Profile B-B

Figure 6: Recommended Attenuation Zone



	Thunder Bay, Ontario		FIGURE 1
	SITE LOCATION PLAN		
	2016, 2017 and 2018 Groundwater Monitoring Nakina Landfill, Nakina, Ontario Municipality of Greenstone		
	PROJECT NO.:	THB-00011119-GE	
	SCALE:	AS SHOWN	
	DRAWN BY:	KK	
	CHECKED BY:	AM	
	DATE:	April 3, 2019	



150 0 150 300
IN METRES

NOTES:
1) REFERENCE: MINISTRY OF NATURAL RESOURCES ONTARIO BASE
MAP NO. 20 16 5100 55500. NORTH AMERICAN DATUM 1983.



exp.

SITE & SURROUNDING FEATURES

2016, 2017 and 2018 Groundwater Monitoring
Nakina Landfill, Nakina, Ontario
Municipality of Greenstone

Thunder Bay, Ontario

PROJECT NO.: THB-00011119-GE

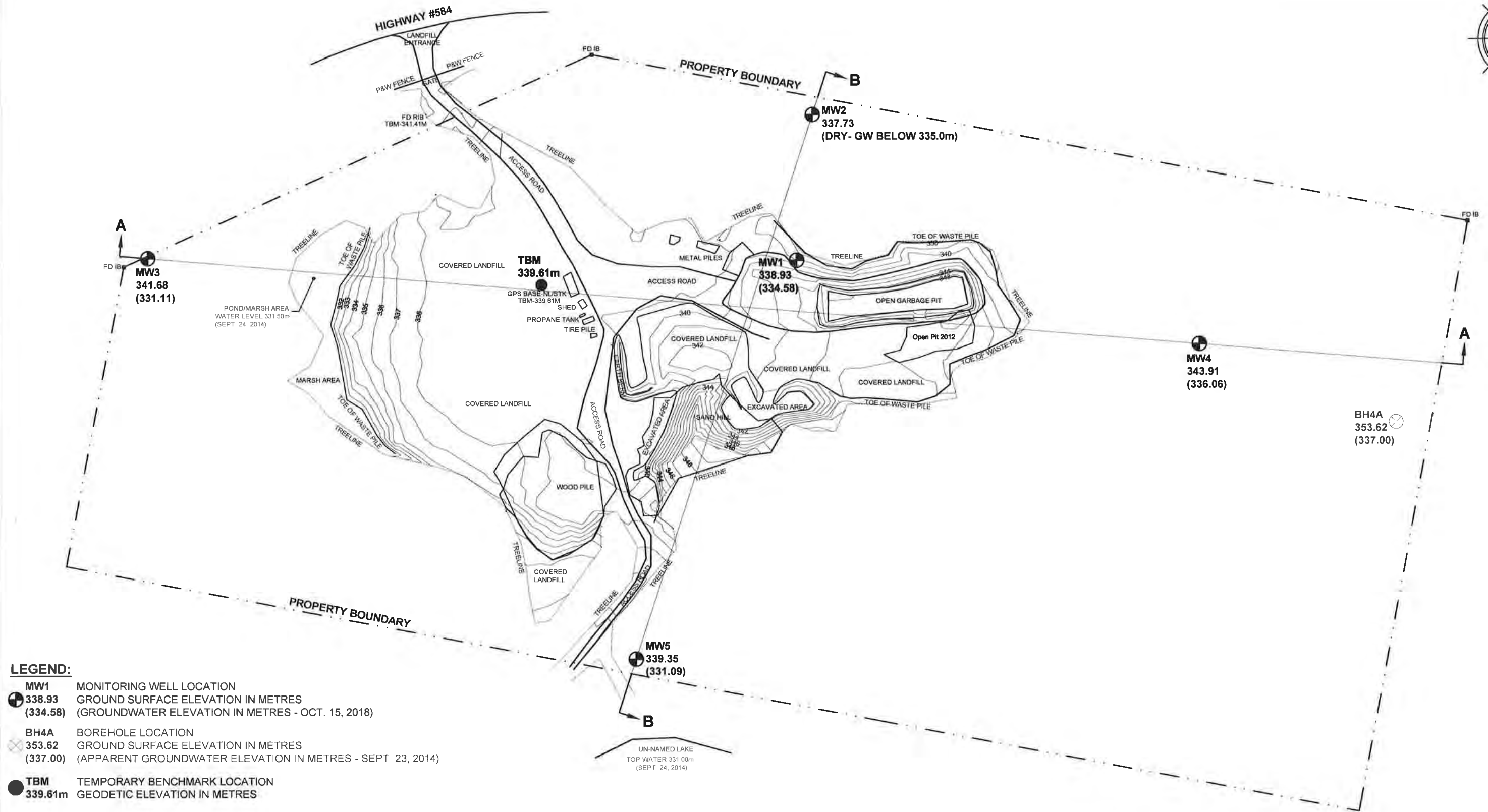
SCALE: 1:15,000

DRAWN BY: KK

CHECKED BY: AM

DATE: April 5, 2019

FIGURE
2



- LEGEND:**
- MW1** MONITORING WELL LOCATION
● **338.93** GROUND SURFACE ELEVATION IN METRES
(**334.58**) (GROUNDWATER ELEVATION IN METRES - OCT. 15, 2018)
 - BH4A** BOREHOLE LOCATION
⊗ **353.62** GROUND SURFACE ELEVATION IN METRES
(**337.00**) (APPARENT GROUNDWATER ELEVATION IN METRES - SEPT 23, 2014)
 - TBM** TEMPORARY BENCHMARK LOCATION
● **339.61m** GEODETIC ELEVATION IN METRES

- NOTES:**
1. REFERENCE: TOPOGRAPHIC SURVEY PLAN BY DELTA SURVEY INC. (JUNE 26, 2014)
 2. GROUND SURFACE AND TOP OF PIPE ELEVATIONS AT MW2, MW3, MW4, MW5, AND BH4A, TOP OF WATER LEVELS AT SMALL LAKE AND THE POND/MARSH WERE SURVEYED BY EXP PERSONNEL ON SEPT. 24, 2014. THE ELEVATIONS WERE TIED INTO TOP OF PIPE ELEVATION AT MW1 (339.86m) WHICH WAS PROVIDED IN THE DELTA SURVEY, DATED JUNE 26, 2014
 3. TEMPORARY BENCHMARK: STAKE IN GROUND LOCATED BEHIND LANDFILL SHACK.



Thunder Bay, Ontario

FIGURE
3

MONITORING WELL LOCATION PLAN

2016, 2017 and 2018 Groundwater Monitoring
Nakina Landfill, Nakina, ON
Municipality of Greenstone

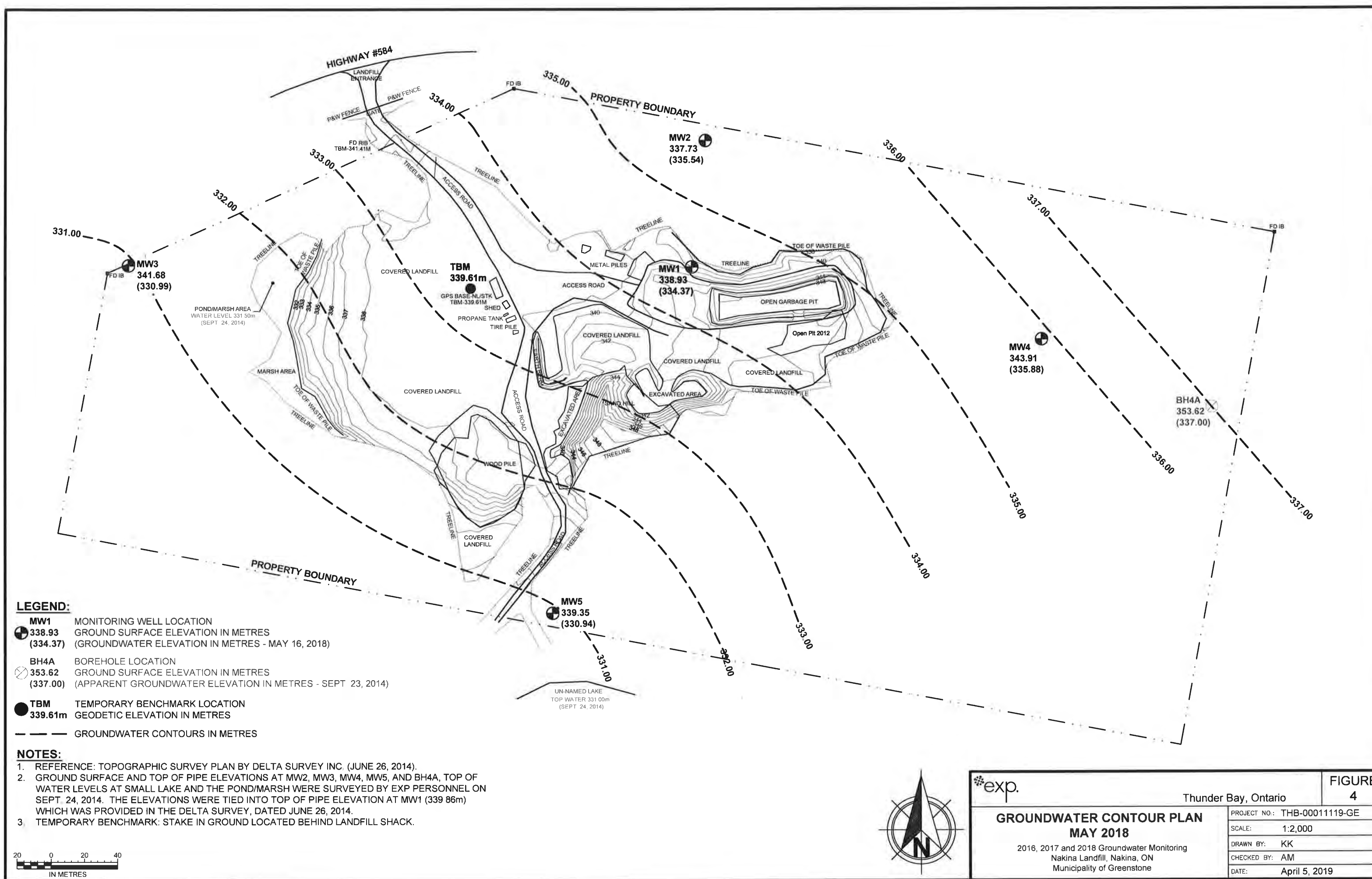
PROJECT NO.: THB-00011119-GE

SCALE: 1:2,000

DRAWN BY: KK

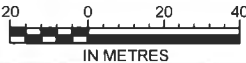
CHECKED BY: AM

DATE: April 5, 2019



- LEGEND:**
- MW1** MONITORING WELL LOCATION
338.93 GROUND SURFACE ELEVATION IN METRES
(334.37) (GROUNDWATER ELEVATION IN METRES - MAY 16, 2018)
 - BH4A** BOREHOLE LOCATION
353.62 GROUND SURFACE ELEVATION IN METRES
(337.00) (APPARENT GROUNDWATER ELEVATION IN METRES - SEPT 23, 2014)
 - TBM** TEMPORARY BENCHMARK LOCATION
339.61m GEODETIC ELEVATION IN METRES
 - — — GROUNDWATER CONTOURS IN METRES

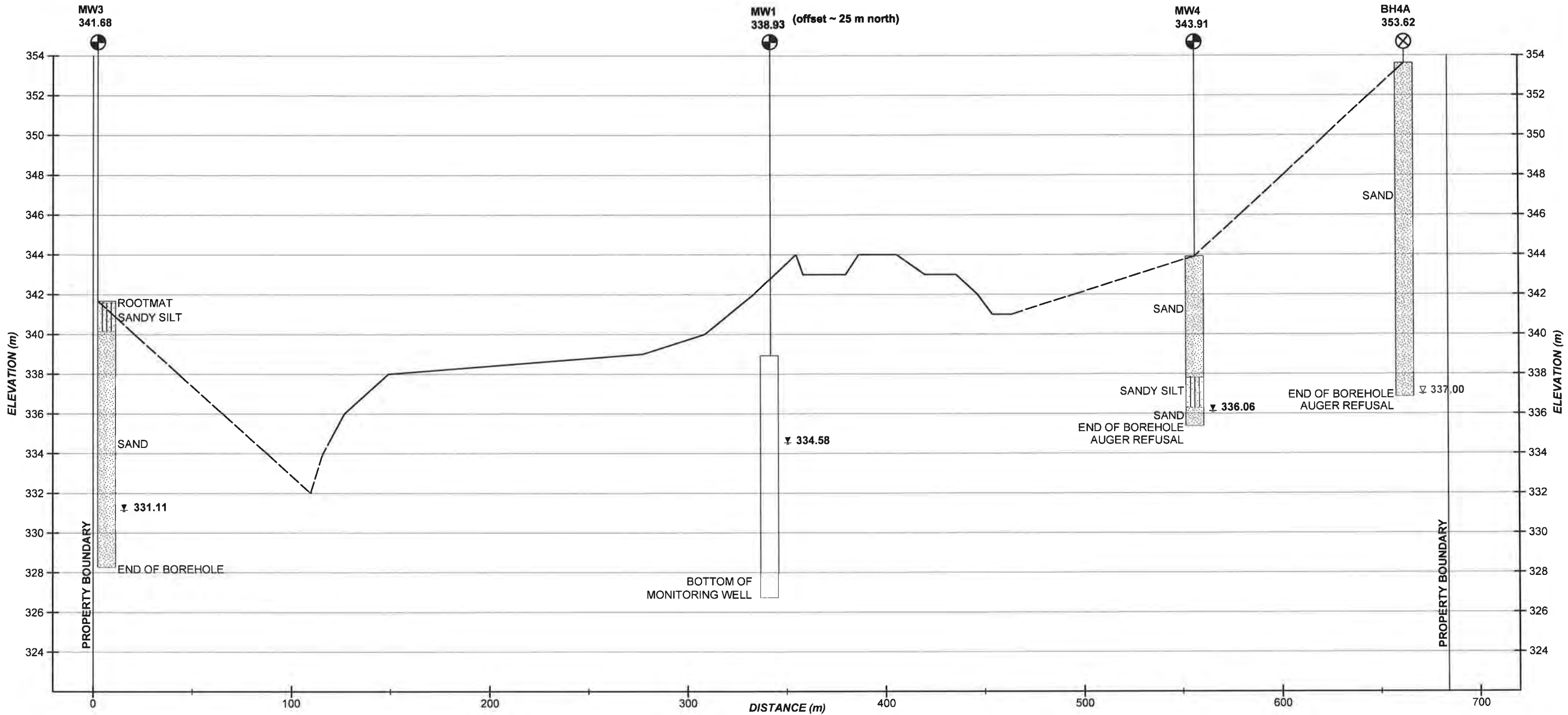
- NOTES:**
1. REFERENCE: TOPOGRAPHIC SURVEY PLAN BY DELTA SURVEY INC. (JUNE 26, 2014).
 2. GROUND SURFACE AND TOP OF PIPE ELEVATIONS AT MW2, MW3, MW4, MW5, AND BH4A, TOP OF WATER LEVELS AT SMALL LAKE AND THE POND/MARSH WERE SURVEYED BY EXP PERSONNEL ON SEPT. 24, 2014. THE ELEVATIONS WERE TIED INTO TOP OF PIPE ELEVATION AT MW1 (339.86m) WHICH WAS PROVIDED IN THE DELTA SURVEY, DATED JUNE 26, 2014.
 3. TEMPORARY BENCHMARK: STAKE IN GROUND LOCATED BEHIND LANDFILL SHACK.



exp.		Thunder Bay, Ontario	FIGURE 4
GROUNDWATER CONTOUR PLAN		PROJECT NO.: THB-00011119-GE	
MAY 2018		SCALE: 1:2,000	
2016, 2017 and 2018 Groundwater Monitoring		DRAWN BY: KK	
Nakina Landfill, Nakina, ON		CHECKED BY: AM	
Municipality of Greenstone		DATE: April 5, 2019	

WEST

EAST



SECTION A-A

- NOTES:**
1. REFERENCE: TOPOGRAPHIC SURVEY PLAN BY DELTA SURVEY INC. (JUNE 26, 2014).
 2. REFER TO FIGURE 3 FOR SECTION LINE LOCATION.
 3. GROUND SURFACE AND TOP OF PIPE ELEVATIONS AT MW2, MW3, MW4, MW5, AND BH4A, TOP OF WATER LEVELS AT SMALL LAKE AND THE POND/MARSH WERE SURVEYED BY EXP PERSONNEL ON SEPT. 24, 2014. THE ELEVATIONS WERE TIED INTO TOP OF PIPE ELEVATION AT MW1 (339.86m) WHICH WAS PROVIDED IN THE DELTA SURVEY, DATED JUNE 26, 2014.
 4. TEMPORARY BENCHMARK: STAKE IN GROUND LOCATED BEHIND LANDFILL SHACK.
 5. NO BOREHOLE LOG AVAILABLE FOR MW1.
 6. ALL UNITS IN METRES.

- LEGEND:**
- MW1 338.93 MONITORING WELL LOCATION
 - ⊗ BH4A 353.62 BOREHOLE LOCATION
 - ▽ 334.68 GROUND SURFACE ELEVATION IN METRES
 - ▽ 337.00 MEASURED GROUNDWATER ELEVATION IN METRES (OCTOBER 15, 2018)
 - ▽ 337.00 APPARENT GROUNDWATER ELEVATION IN METRES (SEPTEMBER 23, 2014)

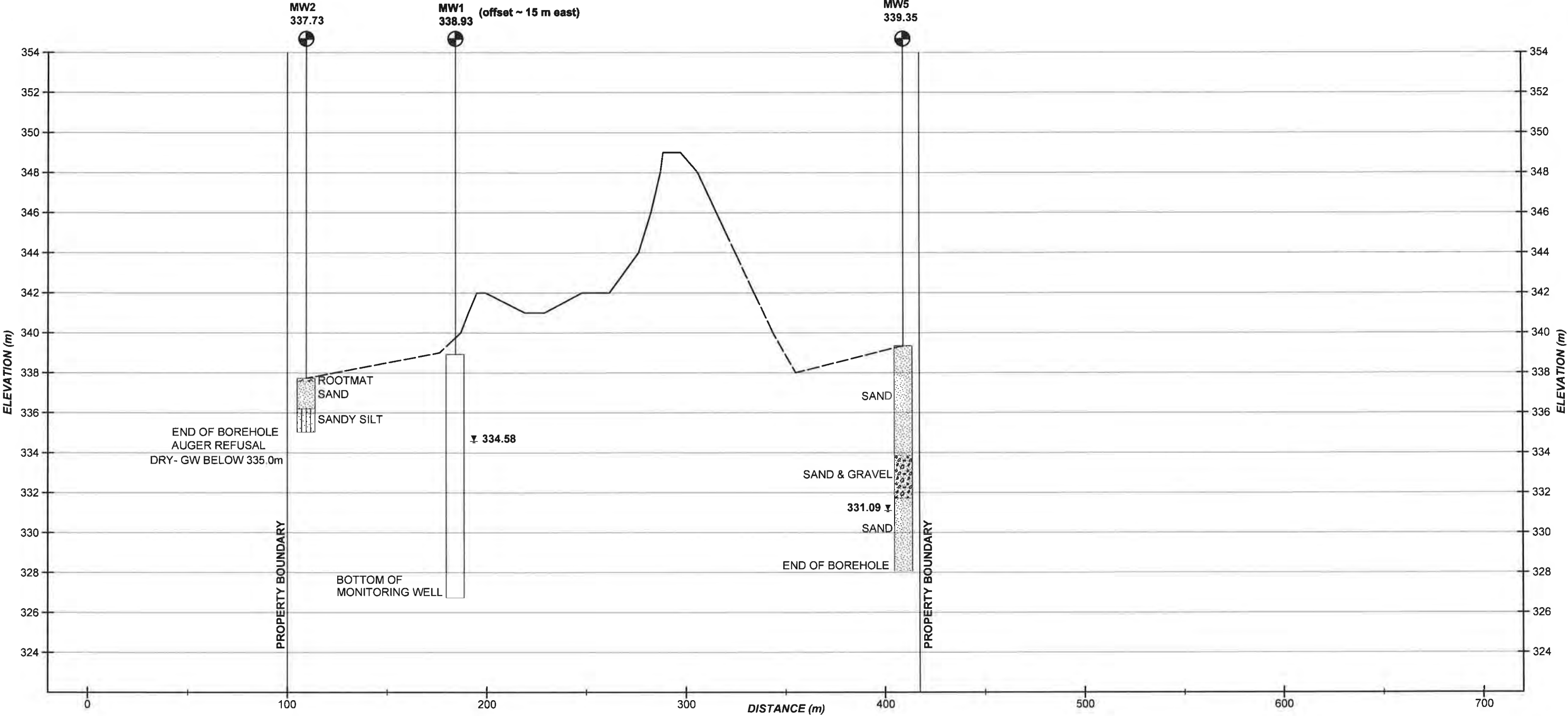
	Thunder Bay, Ontario		FIGURE 5A
	PROJECT NO.: THB-00011119-GE		
	SCALE: 1:2,000		
	DRAWN BY: KK		
	CHECKED BY: AM		
DATE: April 3, 2019			

STRATIGRAPHIC PROFILE A-A

2016, 2017 and 2018 Groundwater Monitoring
Nakina Landfill, Nakina, ON
Municipality of Greenstone

NORTH

SOUTH



SECTION B-B

NOTES:

1. REFERENCE: TOPOGRAPHIC SURVEY PLAN BY DELTA SURVEY INC. (JUNE 26, 2014).
2. REFER TO FIGURE 3 FOR SECTION LINE LOCATION.
3. GROUND SURFACE AND TOP OF PIPE ELEVATIONS AT MW2, MW3, MW4, MW5, AND BH4A, TOP OF WATER LEVELS AT SMALL LAKE AND THE POND/MARSH WERE SURVEYED BY exp PERSONNEL ON SEPT. 24, 2014. THE ELEVATIONS WERE TIED INTO TOP OF PIPE ELEVATION AT MW1 (339.86m) WHICH WAS PROVIDED IN THE DELTA SURVEY, DATED JUNE 26, 2014.
4. TEMPORARY BENCHMARK: STAKE IN GROUND LOCATED BEHIND LANDFILL SHACK.
5. NO BOREHOLE LOG AVAILABLE FOR MW1.
6. ALL UNITS IN METRES.

LEGEND:

- MW1 338.93 MONITORING WELL LOCATION
GROUND SURFACE ELEVATION IN METRES
- 334.68 MEASURED GROUNDWATER ELEVATION IN METRES
(OCTOBER 15, 2018)



Thunder Bay, Ontario

FIGURE
5B

STRATIGRAPHIC PROFILE B-B

2016, 2017 and 2018 Groundwater Monitoring
Nakina Landfill, Nakina, ON
Municipality of Greenstone

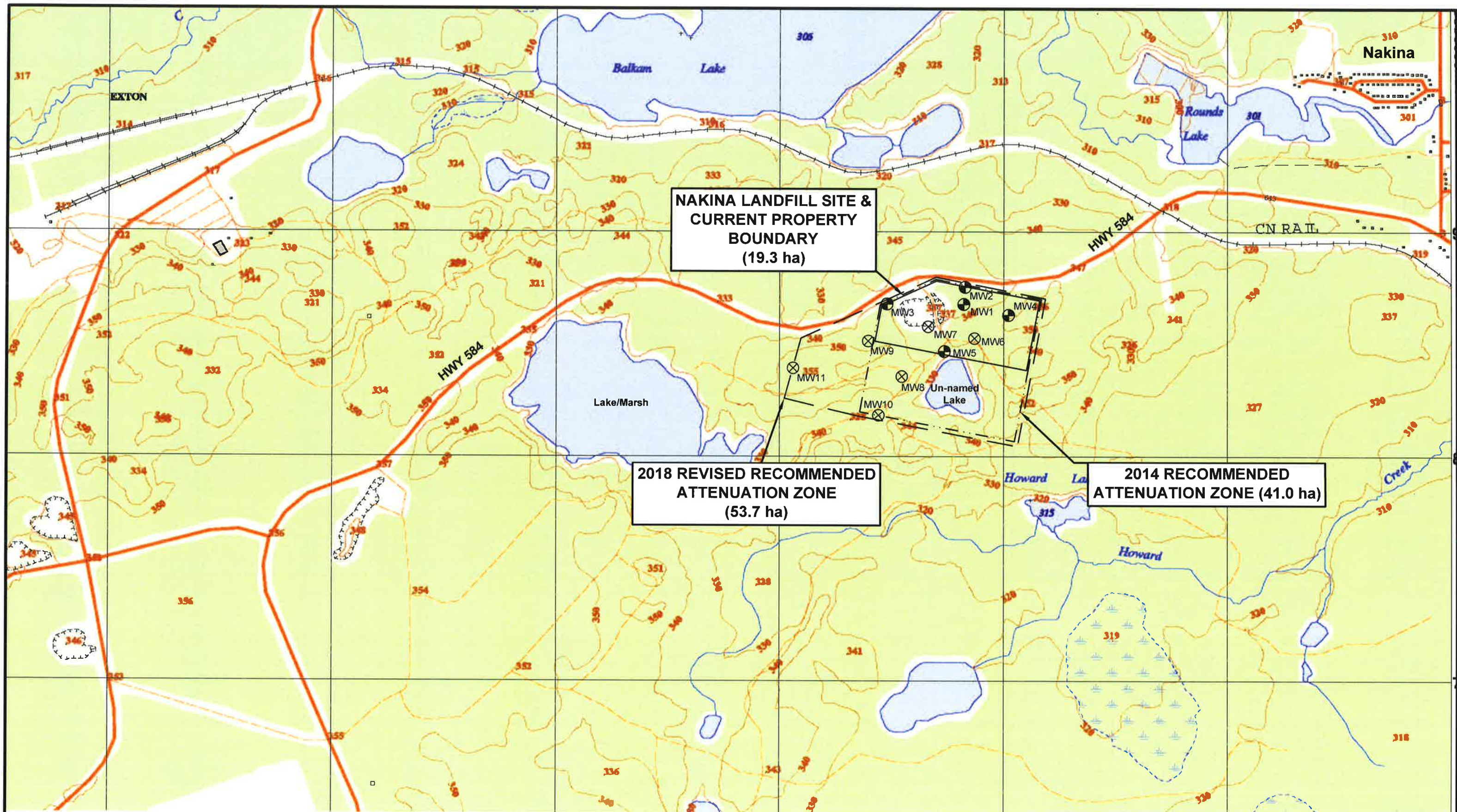
PROJECT NO.: THB-00011119-GE

SCALE: 1:2,000

DRAWN BY: KK

CHECKED BY: AM

DATE: April 3, 2019

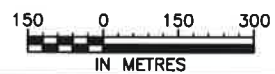



LEGEND:

- MW1 MONITORING WELL LOCATION
- MW6 PROPOSED MONITORING WELL LOCATIONS

NOTES:

1) REFERENCE: MINISTRY OF NATURAL RESOURCES ONTARIO BASE MAP NO. 20 16 5100 55500. NORTH AMERICAN DATUM 1983.



 RECOMMENDED ATTENTION ZONE EXPANSION 2016, 2017 and 2018 Groundwater Monitoring Nakina Landfill, Nakina, Ontario Municipality of Greenstone	Thunder Bay, Ontario	FIGURE 6
	PROJECT NO.: THB-00011119-GE	
	SCALE: 1:15,000	
	DRAWN BY: KK	
	CHECKED BY: AM	
	DATE: April 8, 2019	

APPENDIX C –

Borehole Logs and Grain Size Curves

BOREHOLE LOG

MW2

Sheet 1 of 1

PROJECT Initial Hydrogeological Evaluation - Nakina Landfill Site, Nakina, ON PROJECT NO. THB-00011119-CE
 CLIENT Municipality of Greenstone DATUM Geodetic
 DRILL TYPE/METHOD CME 850 Tracked / HSA DATES: Boring Sept. 22, 2014 Water Level _____

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				OTHER TESTS	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm) or (%)	N VALUE (blows) or RQD (%)		+ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane 40 80 kPa Atterberg Limits and Moisture W _P W W _L ● SPT N Value × Dynamic Cone 20 40 60 80	
0	337.73	ROOTMAT									
1	337.58	SAND - loose, brown, damp, trace gravel, occasional cobbles, fine grained			AS	S1					
2	336.21	SANDY SILT - loose, brown, moist to wet, trace gravel			SS	S2	300	9			
3	335.04	End of Borehole- refusal to auger									
4		- no groundwater encountered									
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											

NOTES

- 1) For definition of symbols & terms used on logs, see sheets prior to logs.
- 2) 50 mm PVC monitoring well installed upon completion, screened from about 1.2 m to 2.7 m below ground surface.
- 3) Top of pipe elevation is 338.48 m.
- 4) GPS coordinates in UTM NAD 83 16 U 517815 E 558746 N.

SAMPLE LEGEND

- ☒ AS Auger Sample ☒ SS Split Spoon ☒ ST Shelby Tube
☒ Rock Core (eg. BQ, NQ, etc.) ☒ VN Vane Sample

OTHER TESTS

- G Specific Gravity C Consolidation
 H Hydrometer CD Consolidated Drained Triaxial
 S Sieve Analysis CU Consolidated Undrained Triaxial
 γ Unit Weight UU Unconsolidated Undrained Triaxial
 P Field Permeability UC Unconfined Compression
 K Lab Permeability DS Direct Shear

WATER LEVELS

- ☒ Apparent ☒ Measured ☒ Artesian (see Notes)

BOREHOLE LOG

MW3

Sheet 1 of 1

PROJECT Initial Hydrogeological Evaluation - Nakina Landfill Site, Nakina, ON PROJECT NO. THB-00011119-CE
 CLIENT Municipality of Greenstone DATUM Geodetic
 DRILL TYPE/METHOD CME 850 Tracked / HSA DATES: Boring Sept. 23, 2014 Water Level Sept. 25/14

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				OTHER TESTS	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm) or (%)	N VALUE (blows) or RQD (%)		◆ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane 40 80 kPa Atterberg Limits and Moisture W _P W W _L ● SPT N Value 20 40 × Dynamic Cone 60 80	
0	341.68	ROOTMAT									
0	341.58	SANDY SILT - loose, brown, damp, some gravel, occasional cobbles			AS	S1					
1											
2	340.16	SAND - loose, brown, damp, trace gravel, trace silt, fine grained			SS	S2	300	5			
3											
4											
5		- becoming damp to moist at about 4.6 m depth			SS	S3	250	8			
6											
7											
8		- becoming compact at about 7.6 m depth			SS	S4	250	16			
9											
10											
11		- becoming dense, wet at about 10.7 m depth			SS	S5	460	33	S		
12		- about 460 mm of blowup at about 12.2 m depth - becoming compact at about 12.2 m depth			SS	S6	410	17			
13											
14	328.27	End of Borehole									

NOTES

- 1) For definition of symbols & terms used on logs, see sheets prior to logs.
- 2) 50 mm PVC monitoring well installed upon completion, screened from about 8.1 m to 12.6 m below ground surface.
- 3) Top of pipe elevation is 342.40 m.
- 4) GPS coordinates in UTM NAD83 16 U 517466 E 5558671 N.

SAMPLE LEGEND

AS Auger Sample SS Split Spoon ST Shelby Tube
 Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity C Consolidation
 H Hydrometer CD Consolidated Drained Triaxial
 S Sieve Analysis CU Consolidated Undrained Triaxial
 γ Unit Weight UU Unconsolidated Undrained Triaxial
 P Field Permeability UC Unconfined Compression
 K Lab Permeability DS Direct Shear

WATER LEVELS

▽ Apparent ▼ Measured ▲ Artesian (see Notes)

BOREHOLE LOG

MW4

Sheet 1 of 1

PROJECT Initial Hydrogeological Evaluation - Nakina Landfill Site, Nakina, ON PROJECT NO. THB-00011119-CE
 CLIENT Municipality of Greenstone DATUM Geodetic
 DRILL TYPE/METHOD CME 850 Tracked / HSA DATES: Boring Sept. 23, 2014 Water Level Sept. 24/14

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				OTHER TESTS	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm) or (%)	N VALUE (blows) or RQD (%)		◆ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane 40 80 kPa Atterberg Limits and Moisture W _p W W _L ● SPT N Value 20 40 × Dynamic Cone 60 80	
0	343.91	SAND - compact, brown, damp, trace gravel, fine grained			AS	S1					
1					SS	S2	360	16			
2					SS	S3	380	16			
3											
4											
5											
6	337.81	SANDY SILT - compact, brown, wet			SS	S4	410	14			
7											
8	336.29	SAND - compact, brown, wet, some gravel, some silt, coarse grained			SS	S5	280	22			
9	335.38	End of Borehole - refusal to auger									
10											
11											
12											
13											
14											

NOTES

- 1) For definition of symbols & terms used on logs, see sheets prior to logs.
- 2) 50 mm PVC monitoring well installed upon completion, screened from 4.0 m to 8.5 m below ground surface.
- 3) Top of pipe elevation is 344.64 m.
- 2) GPS coordinates in UTM NAD83 16 U 518018 E 5558626 N.

SAMPLE LEGEND

- ☒ AS Auger Sample ☒ SS Split Spoon ■ ST Shelby Tube
 ☐ Rock Core (eg. BQ, NQ, etc.) ☐ VN Vane Sample

OTHER TESTS

- G Specific Gravity C Consolidation
 H Hydrometer CD Consolidated Drained Triaxial
 S Sieve Analysis CU Consolidated Undrained Triaxial
 γ Unit Weight UU Unconsolidated Undrained Triaxial
 P Field Permeability UC Unconfined Compression
 K Lab Permeability DS Direct Shear

WATER LEVELS

- ∇ Apparent ▼ Measured ▲ Artesian (see Notes)

BOREHOLE LOG

MW5

Sheet 1 of 1

PROJECT Initial Hydrogeological Evaluation - Nakina Landfill Site, Nakina, ON PROJECT NO. THB-00011119-CE
 CLIENT Municipality of Greenstone DATUM Geodetic
 DRILL TYPE/METHOD CME 850 Tracked / HSA DATES: Boring Sept. 22, 2014 Water Level Sept. 24/14

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				OTHER TESTS	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm) or (%)	N VALUE (blows) or RQD (%)		+ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane 40 80 kPa Atterberg Limits and Moisture W _p W W _L ● SPT N Value 20 40 X Dynamic Cone 60 80	
0	339.35	SAND - compact, brown, moist, trace gravel, occasional cobbles, trace roots in upper 0.6 m, fine grained			AS	S1					
1					SS	S2	360	11			
2		-becoming damp at about 1.5 m depth			SS	S3	380	8			
3					SS	S4	300	11			
4					SS	S5	150	23			
5	333.86	SAND & GRAVEL - compact, brown, damp			SS	S6	360	25			
6					SS	S7	360	26	S		
7	331.73	SAND - compact, brown, moist, trace gravel			SS	S8	410	4			
8		- becoming wet, some gravel, trace silt, coarse grained at about 9.1 m depth									
9											
10		- becoming loose to very loose at about 10.7 m depth									
11	328.07	End of Borehole									
12											
13											
14											

NOTES

- 1) For definition of symbols & terms used on logs, see sheets prior to logs.
- 2) 50 mm PVC monitoring well installed upon completion, screened from about 7.5 m to 10.5 m below ground surface.
- 3) Top of pipe elevation is 340.09 m.
- 4) GPS coordinates in UTM NAD83 16 U 517722 E 5558461 N.

SAMPLE LEGEND

☒ AS Auger Sample ☒ SS Split Spoon ☒ ST Shelby Tube
☒ Rock Core (eg. BQ, NQ, etc.) ☒ VN Vane Sample

OTHER TESTS

G Specific Gravity C Consolidation
 H Hydrometer CD Consolidated Drained Triaxial
 S Sieve Analysis CU Consolidated Undrained Triaxial
 γ Unit Weight UU Unconsolidated Undrained Triaxial
 P Field Permeability UC Unconfined Compression
 K Lab Permeability DS Direct Shear

WATER LEVELS

☒ Apparent ☒ Measured ☒ Artesian (see Notes)

BOREHOLE LOG

BH4A

Sheet 1 of 2

PROJECT Initial Hydrogeological Evaluation - Nakina Landfill Site, Nakina, ON PROJECT NO. THB-00011119-CE

CLIENT Municipality of Greenstone DATUM Geodetic

DRILL TYPE/METHOD CME 850 Tracked / HSA DATES: Boring Sept. 22, 2014 Water Level Sept. 23/14

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				OTHER TESTS	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm) or (%)	N VALUE (blows) or RQD (%)		+ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane 40 80 kPa Atterberg Limits and Moisture W _P W W _L ● SPT N Value 20 40 × Dynamic Cone 60 80	
0	353.62	SAND - loose, brown, moist, trace gravel, some silt, some roots in about upper 1.5 m			AS	S1					
1					AS	S2					
2		- becoming damp, fine grained at about 1.5 m depth			SS	S3	150	6			
3											
4		- becoming compact, trace silt at about 3.1 m depth			SS	S4	410	14			
5					SS	S5	430	18			
6					SS	S6	410	16			
7											
8					SS	S7	460	17			
9											
10					SS	S8	430	15			
11					SS	S9	460	22			
12											
13											
14		- becoming dense at about 13.7 m depth									

Continued Next Page

NOTES

1) For definition of symbols & terms used on logs, see sheets prior to logs.

2) GPS coordinates in UTM NAD83 16 U 518121 E 5558585 N.

SAMPLE LEGEND

AS Auger Sample SS Split Spoon ST Shelby Tube
Rock Core (eg. BQ, NQ, etc.) VN Vane Sample

OTHER TESTS

G Specific Gravity C Consolidation
H Hydrometer CD Consolidated Drained Triaxial
S Sieve Analysis CU Consolidated Undrained Triaxial
γ Unit Weight UU Unconsolidated Undrained Triaxial
P Field Permeability UC Unconfined Compression
K Lab Permeability DS Direct Shear

WATER LEVELS

▽ Apparent ▼ Measured ▲ Artesian (see Notes)

BOREHOLE LOG

BH4A

Sheet 2 of 2

PROJECT Initial Hydrogeological Evaluation - Nakina Landfill Site, Nakina, ON PROJECT NO. THB-00011119-CE
 CLIENT Municipality of Greenstone DATUM Geodetic
 DRILL TYPE/METHOD CME 850 Tracked / HSA DATES: Boring Sept. 22, 2014 Water Level Sept. 23/14

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WELL LOG	SAMPLES				OTHER TESTS	SHEAR STRENGTH	
					TYPE	NUMBER	RECOVERY (mm) or (%)	N VALUE (blows) or RQD (%)		+ S Field Vane Test (#=Sensitivity) ▲ Penetrometer ■ Torvane 40 80 kPa Atterberg Limits and Moisture W _P W W _L ● SPT N Value 20 40 60 80 × Dynamic Cone	
14		SAND continued			SS	S10	480	31			
15											
16											
17	336.86	End of Borehole- refusal to auger									
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											

NOTES

- For definition of symbols & terms used on logs, see sheets prior to logs.
- GPS coordinates in UTM NAD83 16 U 518121 E 5558585 N.

SAMPLE LEGEND

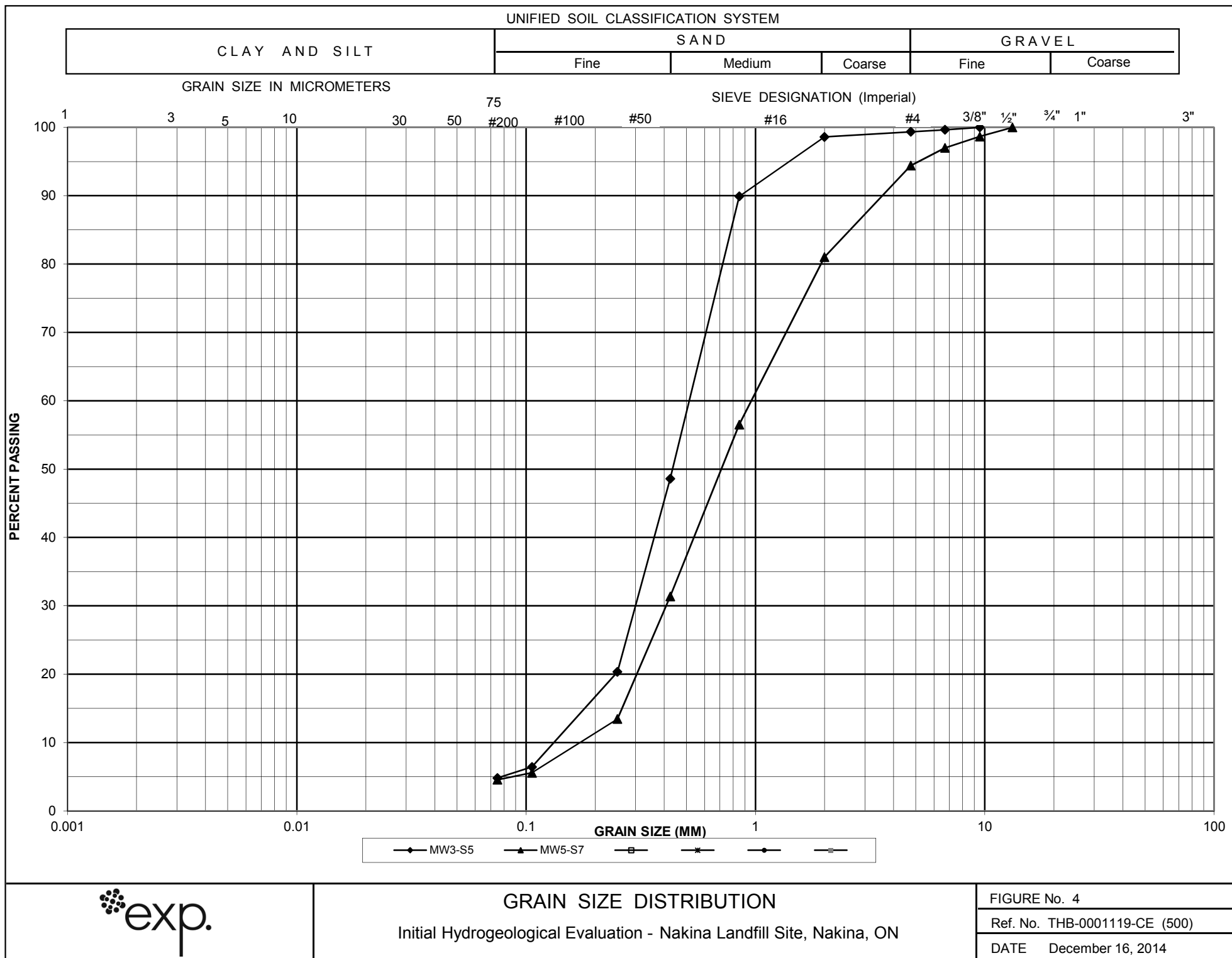
- ☒ AS Auger Sample ☒ SS Split Spoon ☒ ST Shelby Tube
☒ Rock Core (eg. BQ, NQ, etc.) ☒ VN Vane Sample

OTHER TESTS

- G Specific Gravity C Consolidation
 H Hydrometer CD Consolidated Drained Triaxial
 S Sieve Analysis CU Consolidated Undrained Triaxial
 γ Unit Weight UU Unconsolidated Undrained Triaxial
 P Field Permeability UC Unconfined Compression
 K Lab Permeability DS Direct Shear

WATER LEVELS

- ☒ Apparent ☒ Measured ☒ Artesian (see Notes)



GRAIN SIZE DISTRIBUTION
Initial Hydrogeological Evaluation - Nakina Landfill Site, Nakina, ON

FIGURE No. 4
Ref. No. THB-0001119-CE (500)
DATE December 16, 2014

APPENDIX D – Summary Tables

LIST OF TABLES

Table 1: Groundwater Elevation Data

Table 2: Groundwater Data

Table 3: Calculation of Alert Criteria

Table 1: Groundwater Elevation Data														
Monitoring Well No.	Ground Surface Elevation ²	Top of Pipe Elevation ²	Depth to Groundwater and Elevation											
			Sep. 27, 2014		Nov. 11, 2016		May 17, 2017		Sep. 27, 2017		May 16, 2018		Oct. 15, 2018	
MW1	338.93	339.86	5.18 ³	334.68	5.97	333.89	5.55	334.31	5.48	334.38	5.49	334.37	5.28	334.58
MW2	337.73	338.48	Dry	-- ⁴	Dry	--	Dry	--	Dry	--	2.94	335.54	Dry	--
MW3	341.68	342.40	11.26	331.14	11.71	330.69	11.42	330.98	11.39	331.01	11.41	330.99	11.29	331.11
MW4	343.91	344.64	8.52	336.12	8.98	335.66	8.89	335.75	8.90	335.74	8.76	335.88	8.58	336.06
MW5	339.35	340.09	8.99	331.10	9.45	330.64	9.23	330.86	9.17	330.92	9.15	330.94	9.00	331.09
Notes:														
1) All units in meters.														
2) Ground surface and top of pipe elevations were surveyed by EXP on September 24, 2014; all elevations are geodetic. The reference elevations were the top of pipe at MW1 and a stake in the ground behind the landfill shack, which served as a temporary benchmark. The elevations of MW1 and the ground stake were provided by Delta Survey Inc. The temporary benchmark had an elevation of 339.61 m.														
3) All depths are relative to top of pipe.														
4) -- denotes no groundwater elevation due to dry well.														

Table 2: Groundwater Data MW1															
Parameter	ODWS ²	Background ³	B-7 Criteria ⁴	Sep-14	Sep-14	Nov-16	Nov-16	May-17	May-17	Sep-17	Sep-17	May-18	May-18	Oct-18	Oct-18
General	(Blind Dup.)			(Blind Dup.)			(Blind Dup.)			(Blind Dup.)			(Blind Dup.)		
pH	6.5 to 8.5	8.13	--	7.18	7.18	7.32	7.28	7.18	7.37	7.19	7.2	7.16	7.13	7.27	7.17
Field pH	--	7.66	--	--	--	6.79	--	6.78	--	7	--	7.29	7.29	7.41	--
Conductivity (uS/cm)	--	367.5	--	1,600	1600	1,700	1,700	1,100	1,100	1,400	1,400	1,000	1,000	1,200	1,200
Field Conductivity (uS/cm)	--	463	--	--	--	1,573	--	1,048	--	1,237	--	884	884	1,140	--
Field Temperature (°C)	--	5.33	--	--	--	8.2	--	4	--	8.8	--	6.3	6.3	2.1	--
Total Dissolved Solids	500	215	358	1,180	1,190	1,010	1,100	624	644	875	855	<u>550</u>	<u>560</u>	<u>695</u>	<u>650</u>
Total Suspended Solids	--	0	--	1,100	1200	--	--	--	--	--	--	--	--	--	--
Organics															
Dissolved Organic Carbon (DOC)	5	2.7	3.85	40	37	32	32	5.7	5.7	14	14	<u>5.8</u>	<u>5.8</u>	<u>11</u>	<u>10</u>
Total Chemical Oxygen Demand (COD)	--	29.67	--	240	240	710	750	100	110	69	63	38	44	110	130
Phenols	--	0	--	0.034	0.026	0.0064	0.0054	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001
Total Kjeldahl Nitrogen (TKN)	--	0.49	--	13	11	8	8.5	1.2	1.3	1.1	1.2	0.88	0.86	2.2	2.1
Ammonia-N	--	0.09	--	0.35	0.36	1	1.1	0.26	0.26	0.27	0.27	0.24	0.25	0.51	0.52
Organic Nitrogen	0.15	0.43	0.29*	12.65	10.64	7	7.4	0.94	1.04	0.83	0.93	<u>0.64</u>	<u>0.61</u>	<u>1.69</u>	<u>1.58</u>
Cations (mg/L)															
Calcium	--	59.25	--	270	280	300	290	220	220	280	280	200	200	240	240
Magnesium	--	8.88	--	30	31	28	28	13	13	19	19	13	13	17	16
Potassium	--	8.2	--	4.3	4.3	7.3	7.2	2.8	2.8	4.2	4.2	2.8	2.8	4.4	4.2
Sodium	200	1.95	101	39	41	65	64	2.3	2.3	19	19	2.7	2.7	9	8.6
Anions (mg/L)															
Chloride	250	1.65	126	34	27	34	34	3.1	2	15	15	2	1.8	15	9.7
Nitrate	10	0.14	2.61	<0.1	<0.1	<0.1	<0.1	0.59	0.58	<0.1	<0.1	<u>2.95</u>	<u>3.18</u>	0.28	0.22
Nitrite	1	0.005	0.25	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.048	0.011
Total Phosphorus	--	2.58	--	1.7	1.8	14	16	2.1	2.2	0.35	0.35	1.6	1.9	2.6	2.4
Sulphate	500	2.45	251	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Alkalinity as CaCO ₃	30-500	195	348	880	850	1,000	1,000	630	630	810	810	<u>570</u>	<u>580</u>	<u>690</u>	<u>680</u>
Ion Balance	--		--	2.2	1.8	0.85	2.16	1.94	1.83	0.29	0.48	2.95	2.95	2.95	2.95
Metals (mg/L) - Dissolved															
Arsenic	0.025	0.0005	0.0066	0.0096	0.0097	0.0041	0.004	<0.001	<0.001	0.0017	0.0013	0.0011	0.001	0.0017	0.0016
Barium	1	0.025	0.27	0.07	0.069	0.13	0.13	0.065	0.066	0.09	0.092	0.056	0.054	0.08	0.077
Boron	5	0.0039	1.25	0.14	0.14	0.52	0.51	0.025	0.023	0.11	0.11	0.048	0.046	0.067	0.065
Cadmium	0.005	0.0001	0.00129	<0.0001	<0.0001	0.00019	0.00014	<0.0001	<0.0001	0.00013	0.00012	0.0001	0.0001	<0.0001	<0.0001
Chromium	0.05	0.0025	0.0144	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	1	0.0024	0.5	0.0092	0.0099	0.013	0.012	0.005	0.0049	0.0086	0.008	0.006	0.0051	0.012	0.0037
Iron	0.3	0.05	0.175	4	4	9.3	9.2	0.84	0.82	2.6	2.6	<u>0.51</u>	<u>0.5</u>	<u>2.5</u>	<u>2.4</u>
Lead	0.01	0.0003	0.0027	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Manganese	0.05	0.0016	0.026	7.1	7.1	6.1	6.1	1.9	1.9	5.3	5.3	<u>2.1</u>	<u>2.1</u>	<u>4.1</u>	<u>4</u>
Mercury	0.001	0.0001	0.000288	0.0037	0.0031	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	5	0.0033	2.5	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005
VOCs (mg/L)															
Benzene	0.005	0.0001	0.00129	0.00055	0.0005	0.0024	0.0024	<0.0001	<0.0001	0.00065	0.0007	<0.0001	<0.0001	<0.0005	0.00016
1,4-Dichlorobenzene	0.005	0.0001	0.00133	<0.001	<0.001	<0.001	<0.001	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.001	<0.00020
Dichloromethane	0.05	0.0003	0.0127	<0.0025	<0.0025	<0.0025	<0.0025	<0.0005	<0.0005	<0.0013	<0.0005	<0.0005	<0.0005	<0.0025	<0.00050
Toluene	0.024	0.0001	0.0121	0.0032	0.0031	<0.001	0.001	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.001	<0.00020
Vinyl Chloride	0.002	0.0001	0.00058	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.001	<0.00020
Notes:															
1. Concentrations are presented in mg/L (ppm).															
2. ODWS: MECP Ontario Drinking Water Standards, from <i>Technical Support Document for Ontario Drinking Water Standard, Objectives and Guidelines</i> , June 2003. Exceedances are indicated in bold .															
3. Background = Based on mean results (most recent three years) from upgradient well MW4.															
4. MECP Guideline B-7, Incorporation of Reasonable Use Concept into MECP Groundwater Managemnet Activities (1994). <u>Underlining</u> indicates exceedance.															
Asterisk (*) indicates that background exceeds ODWS; therefore B-7 criterion = background.															

Table 2: Groundwater Data									
MW2									
Parameter	ODWS ²	Background ³	B-7 Criteria ⁴	Sep-14	Nov-16	May-17	Sep-17	May-18	18-Oct
General									
pH	6.5 to 8.5	8.13	--	No	No	No	No	7.94	No
Field pH	--	7.66	--	Groundwater	Groundwater	Groundwater	Groundwater	7.7	Groundwater
Conductivity (uS/cm)	--	367.5	--	Encountered	Encountered	Encountered	Encountered	240	Encountered
Field Conductivity (uS/cm)	--	463	--	--	--	--	--	293	--
Field Temperature (°C)	--	5.33	--	--	--	--	--	3.8	--
Total Dissolved Solids	500	215	358	--	--	--	--	130	--
Total Suspended Solids	--	0	--	--	--	--	--	--	--
Organics				--	--	--	--	--	--
Dissolved Organic Carbon (DOC)	5	2.7	3.85	--	--	--	--	<u>5.9</u>	--
Total Chemical Oxygen Demand (COD)	--	29.67	--	--	--	--	--	15	--
Phenols	--	0	--	--	--	--	--	<0.0010	--
Total Kjeldahl Nitrogen (TKN)	--	0.49	--	--	--	--	--	<0.10	--
Ammonia-N	--	0.09	--	--	--	--	--	0.091	--
Organic Nitrogen	0.15	0.43	0.29*	--	--	--	--	<0.05	--
Cations (mg/L)				--	--	--	--	--	--
Calcium	--	59.25	--	--	--	--	--	38	--
Magnesium	--	8.88	--	--	--	--	--	6.2	--
Potassium	--	8.2	--	--	--	--	--	0.33	--
Sodium	200	1.95	101	--	--	--	--	1.3	--
Anions (mg/L)				--	--	--	--	--	--
Chloride	250	1.65	126	--	--	--	--	1.3	--
Nitrate	10	0.14	2.61	--	--	--	--	<0.10	--
Nitrite	1	0.005	0.25	--	--	--	--	<0.010	--
Total Phosphorus	--	2.58	--	--	--	--	--	1.1	--
Sulphate	500	2.45	251	--	--	--	--	<1.0	--
Alkalinity as CaCO ₃	30-500	195	348	--	--	--	--	130	--
Ion Balance	--		--	--	--	--	--	NC	--
Metals (mg/L) - Dissolved				--	--	--	--	--	--
Arsenic	0.025	0.0005	0.0066	--	--	--	--	<0.001	--
Barium	1	0.025	0.27	--	--	--	--	0.0043	--
Boron	5	0.0039	1.25	--	--	--	--	<0.01	--
Cadmium	0.005	0.0001	0.00129	--	--	--	--	<0.0001	--
Chromium	0.05	0.0025	0.0144	--	--	--	--	<0.005	--
Copper	1	0.0024	0.5	--	--	--	--	0.0015	--
Iron	0.3	0.05	0.175	--	--	--	--	<0.1	--
Lead	0.01	0.0003	0.0027	--	--	--	--	<0.0005	--
Manganese	0.05	0.0016	0.026	--	--	--	--	<0.002	--
Mercury	0.001	0.0001	0.000288	--	--	--	--	<0.0001	--
Zinc	5	0.0033	2.5	--	--	--	--	<0.005	--
VOCs (mg/L)				--	--	--	--	--	--
Benzene	0.005	0.0001	0.00129	--	--	--	--	<0.0001	--
1,4-Dichlorobenzene	0.005	0.0001	0.00133	--	--	--	--	<0.0002	--
Dichloromethane	0.05	0.0003	0.0127	--	--	--	--	<0.0005	--
Toluene	0.024	0.0001	0.0121	--	--	--	--	<0.0002	--
Vinyl Chloride	0.002	0.0001	0.00058	--	--	--	--	<0.0002	--
Notes:									
1. Concentrations are presented in mg/L (ppm).									
2. ODWS: MECP Ontario Drinking Water Standards, from <i>Technical Support Document for Ontario Drinking Water Standard, Objectives and Guidelines</i> , June 2003. Exceedances are indicated in bold .									
3. Background = Based on mean results (most recent three years) from upgradient well MW4.									
4. MECP Guideline B-7, Incorporation of Reasonable Use Concept into MECP Groundwater Management Activities (1994). <u>Underlining</u> indicates exceedance.									
Asterisk (*) indicates that background exceeds ODWS; therefore B-7 criterion = background.									

Table 2: Groundwater Data

MW3									
Parameter	ODWS ²	Background ³	B-7 Criteria ⁴	Sep-14	Nov-16	May-17	Sep-17	May-18	18-Oct
General									
pH	6.5 to 8.5	8.13	--	7.8	7.93	7.87	7.91	7.92	7.83
Field pH	--	7.66	--	--	7.32	7.45	7.26	7.29	8.23
Conductivity (uS/cm)	--	367.5	--	2,100	1,900	2,300	2,100	1,800	1,900
Field Conductivity (uS/cm)	--	463	--	--	1,838	1,935	1,704	1,475	1,650
Field Temperature (°C)	--	5.33	--	--	6.5	4	5.5	4.8	2.4
Total Dissolved Solids	500	215	358	1,190	1,160	1,150	1,040	920	1,030
Total Suspended Solids	--	0	--	1,800	--	--	--	--	--
Organics									
Dissolved Organic Carbon (DOC)	5	2.7	3.85	2.3	2.5	2	2.1	1.8	2.1
Total Chemical Oxygen Demand (COD)	--	29.67	--	<4	14	9.2	8	6.6	8.3
Phenols	--	0	--	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010
Total Kjeldahl Nitrogen (TKN)	--	0.49	--	1.1	0.29	0.62	0.26	<0.10	0.19
Ammonia-N	--	0.09	--	<0.05	<0.05	<0.05	<0.05	0.050	0.062
Organic Nitrogen	0.15	0.43	0.29*	1.075	0.265	0.595	0.235	<0.05	0.128
Cations (mg/L)									
Calcium	--	59.25	--	120	140	120	110	110	140
Magnesium	--	8.88	--	15	17	14	13	13	17
Potassium	--	8.2	--	2.4	2.3	2.4	2.2	2	2.1
Sodium	200	1.95	101	270	250	330	270	230	180
Anions (mg/L)									
Chloride	250	1.65	126	450	420	460	430	370	430
Nitrate	10	0.14	2.61	1.11	0.85	1.4	0.9	0.52	0.53
Nitrite	1	0.005	0.25	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010
Total Phosphorus	--	2.58	--	0.26	1.1	0.3	0.27	0.21	0.18
Sulphate	500	2.45	251	14	13	15	13	9.8	9.2
Alkalinity as CaCO ₃	30-500	195	348	290	290	310	300	290	260
Ion Balance	--	--	--	3.7	3.98	4.2	0.21	0.440	NC
Metals (mg/L) - Dissolved									
Arsenic	0.025	0.0005	0.0066	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	1	0.025	0.27	0.051	0.054	0.053	0.046	0.042	0.05
Boron	5	0.0039	1.25	<0.01	0.011	<0.01	<0.01	<0.01	0.012
Cadmium	0.005	0.0001	0.00129	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010
Chromium	0.05	0.0025	0.0144	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	1	0.0024	0.5	0.0015	0.0015	0.0014	0.0014	0.0065	0.0019
Iron	0.3	0.05	0.175	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lead	0.01	0.0003	0.0027	<0.0005	<0.0005	<0.0005	<0.0005	0.001	<0.0005
Manganese	0.05	0.0016	0.026	0.031	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	0.001	0.0001	0.000288	0.00012	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	5	0.0033	2.5	<0.005	<0.005	<0.005	<0.005	0.017	<0.005
VOCs (mg/L)									
Benzene	0.005	0.0001	0.00129	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
1,4-Dichlorobenzene	0.005	0.0001	0.00133	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Dichloromethane	0.05	0.0003	0.0127	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	0.024	0.0001	0.0121	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Vinyl Chloride	0.002	0.0001	0.00058	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Notes:

- Concentrations are presented in mg/L (ppm).
- ODWS: MECP Ontario Drinking Water Standards, from *Technical Support Document for Ontario Drinking Water Standard, Objectives and Guidelines*, June 2003. Exceedances are indicated in **bold**.
- Background = Based on mean results (most recent three years) from upgradient well MW4.
- MECP Guideline B-7, Incorporation of Reasonable Use Concept into MECP Groundwater Management Activities (1994). Underlining indicates exceedance. Asterisk (*) indicates that background exceeds ODWS; therefore B-7 criterion = background.

Table 2: Groundwater Data									
MW4									
Parameter	ODWS ²	Background ³	B-7 Criteria ⁴	Sep-14	Nov-16	May-17	17-Sep	May-18 ⁵	Oct-18 ⁵
General	Insufficient Water Insufficient Water								
pH	6.5 to 8.5	8.13	--	7.88	8.2	8.11	--	8.15	8.07
Field pH	--	7.66	--	--	7.86	7.51	7.6	--	--
Conductivity (uS/cm)	--	367.5	--	470	350	390	--	380	350
Field Conductivity (uS/cm)	--	463	--	--	634	387	368	--	--
Field Temperature (°C)	--	5.33	--	--	6.1	2.6	7.3	--	--
Total Dissolved Solids	500	215	358	328	249	232	--	--	165
Total Suspended Solids	--	0	--	34,000	--	--	--	--	--
Organics									
Dissolved Organic Carbon (DOC)	5	2.7	3.85	7.1	--	2.9	--	--	2.5
Total Chemical Oxygen Demand (COD)	--	29.67	--	47	70	12	--	--	7
Phenols	--	0	--	0.0011	<0.001	<0.001	--	--	<0.001
Total Kjeldahl Nitrogen (TKN)	--	0.49	--	<2	0.41	0.57	--	--	0.48
Ammonia-N	--	0.09	--	0.1	<0.05	0.052	--	--	0.18
Organic Nitrogen	0.15	0.43	0.29*	--	0.385	0.518	--	--	0.3
Cations (mg/L)									
Calcium	--	59.25	--	68	58	60	59	--	60
Magnesium	--	8.88	--	12	8.6	9	9	--	8.9
Potassium	--	8.2	--	4.2	4.3	6.3	21	--	1.2
Sodium	200	1.95	101	4.5	1.7	1.8	1.9	--	2.4
Anions (mg/L)									
Chloride	250	1.65	126	8	3.7	<1	--	1.4	1
Nitrate	10	0.14	2.61	0.11	<0.1	<0.1	--	0.18	0.29
Nitrite	1	0.005	0.25	<0.01	<0.01	<0.01	--	<0.01	<0.01
Total Phosphorus	--	2.58	--	3.5	1.3	0.75	--	--	5.7
Sulphate	500	2.45	251	43	3.3	1.4	--	4	1.1
Alkalinity as CaCO ₃	30-500	195	348	180	190	200	--	200	190
Ion Balance	--		--	3.3	2.15	0.46	--	--	0.44
Metals (mg/L) - Dissolved									
Arsenic	0.025	0.0005	0.0066	<0.001	<0.001	<0.001	<0.001	--	<0.001
Barium	1	0.025	0.27	0.023	0.029	0.038	0.019	--	0.014
Boron	5	0.0039	1.25	0.027	<0.01	<0.01	<0.001	--	<0.01
Cadmium	0.005	0.0001	0.00129	<0.0001	<0.0001	<0.0001	<0.0001	--	<0.0001
Chromium	0.05	0.0025	0.0144	<0.005	<0.005	<0.005	<0.005	--	<0.005
Copper	1	0.0024	0.5	0.0038	0.0028	0.0018	0.0028	--	0.002
Iron	0.3	0.05	0.175	<0.1	<0.1	<0.1	<0.1	--	<0.1
Lead	0.01	0.0003	0.0027	<0.0005	<0.0005	<0.0005	<0.0005	--	<0.0005
Manganese	0.05	0.0016	0.026	0.58	<0.002	0.0023	0.0021	--	<0.002
Mercury	0.001	0.0001	0.000288	0.00028	<0.0001	<0.0001	<0.0001	--	<0.0001
Zinc	5	0.0033	2.5	0.0067	0.0055	<0.005	<0.005	--	<0.005
VOCs (mg/L)									
Benzene	0.005	0.0001	0.00129	0.00029	<0.0001	<0.0001	--	--	<0.0001
1,4-Dichlorobenzene	0.005	0.0001	0.00133	<0.0002	<0.0002	<0.0002	--	--	<0.0002
Dichloromethane	0.05	0.0003	0.0127	<0.0005	<0.0005	<0.0005	--	--	<0.0005
Toluene	0.024	0.0001	0.0121	0.00041	<0.0002	<0.0002	--	--	<0.0002
Vinyl Chloride	0.002	0.0001	0.00058	<0.0002	<0.0002	<0.0002	--	--	<0.0002
Notes:									
1. Concentrations are presented in mg/L (ppm).									
2. ODWS: MECP Ontario Drinking Water Standards, from <i>Technical Support Document for Ontario Drinking Water Standard, Objectives and Guidelines</i> , June 2003. Exceedances are indicated in bold .									
3. Background = Based on mean results (most recent three years) from upgradient well MW4.									
4. MECP Guideline B-7, Incorporation of Reasonable Use Concept into MECP Groundwater Management Activities (1994). <u>Underlining</u> indicates exceedance.									
Asterisk (*) indicates that background exceeds ODWS; therefore B-7 criterion = background.									
5. Field parameters were not measured due to insufficient water.									

Table 2: Groundwater Data										
MW5										
Parameter	ODWS ²	APV ³	Background ⁴	B-7 Criteria ⁵	Sep-14	Nov-16	May-17	Sep-17	May-18	Oct-18 ⁶
General										
pH	6.5 to 8.5	--	8.13	--	7.2	7.57	7.25	7.28	7.19	7.16
Field pH	--	--	7.66	--	--	6.95	6.81	6.83	6.82	--
Conductivity (uS/cm)	--	--	367.5	--	1,600	1,600	1,700	1,600	1,600	1,600
Field Conductivity (uS/cm)	--	--	463	--	--	1,477	1,535	1,376	1,297	--
Field Temperature (°C)	--	--	5.33	--	--	7.8	6.6	8.5	5.8	--
Total Dissolved Solids	500	--	215	358	986	1,070	1,070	1,030	910	905
Total Suspended Solids	--	--	0	--	2,100	--	--	--	--	--
Organics										
Dissolved Organic Carbon (DOC)	5	--	2.7	3.85	11	12	12	12	11	11
Total Chemical Oxygen Demand (COD)	--	--	29.67	--	20	27	40	35	31	39
Phenols	--	0.961	0	--	<0.001	<0.001	<0.001	<0.001	0.0013	<0.0010
Total Kjeldahl Nitrogen (TKN)	--	--	0.49	--	2	0.54	0.98	0.56	0.39	0.59
Ammonia-N	--	--	0.09	--	0.055	<0.05	<0.05	<0.05	0.059	0.071
Organic Nitrogen	0.15	--	0.43	0.29*	1.945	0.515	0.955	0.535	0.331	0.519
Cations (mg/L)										
Calcium	--	--	59.25	--	250	270	270	260	250	240
Magnesium	--	--	8.88	--	46	44	45	43	42	42
Potassium	--	--	8.2	--	2.9	2.8	2.8	2.8	2.9	2.9
Sodium	200	180	1.95	101	47	42	49	50	53	53
Anions (mg/L)										
Chloride	250	180	1.65	126	66	40	60	56	66	62
Nitrate	10	--	0.14	2.61	<0.1	0.24	<0.1	0.15	0.14	0.11
Nitrite	1	--	0.005	0.25	<0.01	<0.01	<0.01	<0.01	<0.010	<0.010
Total Phosphorus	--	--	2.58	--	1.6	0.56	0.45	0.24	0.26	0.18
Sulphate	500	--	2.45	251	17	160	85	95	42	39
Alkalinity as CaCO ₃	30-500	--	195	348	790	730	820	780	840	790
Ion Balance	--	--	--	--	2.1	0.31	1.32	1.63	3.24	3.24
Metals (mg/L) - Dissolved										
Arsenic	0.025	0.15	0.0005	0.0066	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	1	2.3	0.025	0.27	0.082	0.081	0.08	0.079	0.075	0.083
Boron	5	3.55	0.0039	1.25	0.32	0.61	0.58	0.61	0.49	0.47
Cadmium	0.005	0.00021	0.0001	0.00129	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	0.05	0.064	0.0025	0.0144	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	1	0.0069	0.0024	0.5	0.012	0.011	0.014	0.013	0.014	0.015
Iron	0.3	--	0.05	0.175	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Lead	0.01	0.002	0.0003	0.0027	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Manganese	0.05	--	0.0016	0.026	2.3	1.5	1.8	1.3	1.4	1.4
Mercury	0.001	0.00077	0.0001	0.000288	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	5	0.089	0.0033	2.5	0.0068	<0.005	<0.005	<0.005	0.0053	<0.005
VOCs (mg/L)										
Benzene	0.005	0.46	0.0001	0.00129	0.0012	0.00078	0.0012	0.00098	0.0012	0.0012
1,4-Dichlorobenzene	0.005	0.763	0.0001	0.00133	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005
Dichloromethane	0.05	--	0.0003	0.0127	<0.0005	<0.0013	<0.0005	<0.0013	<0.0005	<0.0013
Toluene	0.024	1.4	0.0001	0.0121	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005
Vinyl Chloride	0.002	35.6	0.0001	0.00058	0.0013	0.0017	0.0035	0.0041	0.0046	0.0041
Notes:										
1. Concentrations are presented in mg/L (ppm).										
2. ODWS: MECP Ontario Drinking Water Standards, from <i>Technical Support Document for Ontario Drinking Water Standard, Objectives and Guidelines</i> , June 2003. Exceedances are indicated in bold .										
3. APV: Aquatic Protection Values, from Table 3.1 of <i>Rationale for the Development of Soil and Groundwater Standards for Use at Contaminated Sites in Ontario</i> (MECP, April 2011). Exceedances for APV are indicated by a dark border.										
4. Background = Based on mean results (most recent three years) from upgradient well MW4.										
5. MECP Guideline B-7, Incorporation of Reasonable Use Concept into MECP Groundwater Management Activities (1994). <u>Underlining</u> indicates exceedance.										
Asterisk (*) indicates that background exceeds ODWS; therefore B-7 criterion = background.										
6. Field parameters were not recorded due to Hanna instrument malfunctioning.										

Table 3: Surface Water Data						
SW1						
Parameter	PWQO ²	Nov-16	May-17	Sep-17	May-18	Oct-18 ³
General						
pH	6.5 to 8.5	7.81	7.84	7.94	7.9	7.67
Field pH	--	8.22	7.88	8.28	7.41	--
Conductivity (uS/cm)	--	220	180	180	210	--
Field Conductivity (uS/cm)	--	244	189	191	240	210
Field Temperature (°C)	--	8.1	7.7	12.8	10.4	--
Total Dissolved Solids	--	212	90	160	100	85
Total Suspended Solids	--	20	2	3	5	48
Organics						
Total Biochemical Oxygen Demand (BOD)		<2	<2	<2	2	<2
Total Chemical Oxygen Demand (COD)	--	46	26	30	22	76
Phenols	0.001	<0.001	<0.001	<0.001	<0.0010	0.0013
Total Kjeldahl Nitrogen (TKN)	--	0.75	0.65	0.66	0.63	0.64
Ammonia-N	--	0.096	0.17	0.72	0.31	0.099
Organic Nitrogen	--	0.654	0.48	<0.05	0.32	0.541
Anions (mg/L)						
Chloride	--	3.4	2.7	3.1	2.6	3.6
Nitrate	--	<0.1	<0.1	<0.1	<0.10	<0.10
Nitrite	--	<0.01	<0.01	<0.01	<0.010	<0.010
Total Phosphorus	--	0.044	0.008	0.006	0.013	0.19
Sulphate	--	7.7	5.2	6.1	5	6.6
Alkalinity as CaCO ₃	--	100	86	83	100	100
Metals (mg/L) - Dissolved						
Arsenic	0.1 (0.005)	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	--	0.011	0.0072	0.0092	0.0084	0.016
Boron	0.2	0.033	0.026	0.033	0.026	0.036
Cadmium	0.0002 (0.0001)	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010
Chromium	0.001	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	0.005	<0.001	<0.001	<0.001	<0.001	0.0014
Iron	0.3	0.24	<0.1	<0.1	<0.1	0.78
Lead	0.01 (0.003)	0.0009	<0.0005	<0.0005	<0.0005	<0.0005
Mercury	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Zinc	0.03 (0.02)	<0.005	<0.005	<0.005	<0.005	0.007
Notes:						
1. Concentrations are presented in mg/L (ppm).						
2. PWQO: MECP Provincial Water Quality Objectives, 1994 (updated 1999). Interim PWQO criteria are bracketed. Exceedances are indicated in bold .						
3. Field parameters were not recorded due to Hanna instrument malfunctioning.						

Table 4: Calculation of Alert Criteria							
Groundwater Impact							
Parameter	Source Concentration (MW1)	Background Concentration (MW4)	B-7 Criteria	MW3 Tigger Levels	MW3 Maximum 2018 Concentration	MW5 Tigger Levels	MW5 Maximum 2018 Concentration
Total Dissolved Solids	614	215	358	359	1,030 (>source, >B-7)+	504	910 (>source, >B-7)
Dissolved Organic Carbon (DOC)	8.15	2.70	3.85	3.9	2.1	6.3	11 (>source, >B-7)
Organic Nitrogen	1.13	0.43	0.29	0.295	0.128	0.771	0.519 (>B-7)
Sodium	5.75	1.95	101	n/a	230 (>source, >B-7)+	n/a	53 (>source)
Chloride	7.13	1.65	126	n/a	430 (>source, >B-7)+	n/a	66 (>source)
Nitrate	1.66	0.14	2.61	n/a	0.53	n/a	0.14
Nitrite	0.023	0.005	0.250	n/a	<0.01	n/a	<0.01
Sulphate	0.5	2.45	251	n/a	9.8 (>source)	n/a	42 (>source)
Alkalinity as CaCO3	630	195	348	350	290	509	840 (>source, >B-7)
Arsenic	0.00135	0.0005	0.0066	n/a	<0.001	n/a	<0.001
Barium	0.067	0.025	0.27	n/a	0.05	n/a	0.083 (>source)
Boron	0.057	0.0039	1.25	n/a	0.012	n/a	0.49 (>source)
Cadmium	0.000075	0.00010	0.00129	n/a	<0.0001	n/a	<0.0001
Chromium	0.0025	0.0025	0.0144	n/a	<0.005	n/a	<0.005
Copper	0.0067	0.0024	0.50	n/a	0.0065	n/a	0.015 (>source)
Iron	1.48	0.050	0.175	0.183	<0.1	0.921	<0.1
Lead	0.00025	0.00030	0.0027	n/a	0.001 (>source)	n/a	<0.0005
Manganese	3.08	0.0016	0.026	0.044	<0.002	1.77	1.4 (>B-7)
Mercury	0.00005	0.00010	0.00029	n/a	<0.0001	n/a	<0.0001
Zinc	0.0044	0.0033	2.50	n/a	0.017 (>source)	n/a	0.0053 (>source)
Benzene	0.00013	0.00010	0.00129	n/a	<0.0001	n/a	0.0012 (>source)
1,4-Dichlorobenzene	0.0002	0.00010	0.00133	n/a	<0.0002	n/a	<0.0005
Dichloromethane	0.0005	0.00030	0.0127	n/a	<0.0005	n/a	<0.0013
Toluene	0.0002	0.00010	0.0121	n/a	<0.0002	n/a	<0.0005
Vinyl Chloride	0.0002	0.00010	0.00058	n/a	<0.0002	n/a	0.0046 (>source, >B-7)
Distance from "source well" MW1 to trigger well MW3 (m)				340			
Distance from "source well" MW1 to 2014 recommended west attenuation zone boundary (m)				342			
Distance from "source well" MW1 to trigger well MW5 (m)						250	
Distance from "source well" MW1 to 2014 recommended south attenuation zone boundary (m)						585	
Notes: 1. Source and background concentrations are the arithmetic means of 2018 results for the respective wells. 2. Non-detectable background concentrations have been assumed to be one-half of the detection limit. 3. Where background exceeds the ODWS, the B-7 criterion defaults to background (i.e., no further deterioration of groundwater quality is acceptable). 4. Where the source concentration is lower than or equal to the B-7 criterion, a trigger level is not applicable (n/a). 5. Concentrations exceeding trigger values are in bold . 6. Value exceeds source concentration and additional source implicated is indicated by a +. 7. All concentrations expressed in milligrams per litre (mg/L).							

Appendix E – Laboratory Reports of Analysis

Your Project #: THB-00011119-EE
Site Location: NAKINA LANDFILL
Your C.O.C. #: 583832-01-01

Attention: Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2018/03/07
Report #: R5032428
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6N9955

Received: 2016/11/04, 09:34

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	1	N/A	2016/11/08	CAM SOP-00448	SM 23 2320 B m
Alkalinity	5	N/A	2016/11/09	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	1	2016/11/06	2016/11/11	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	6	N/A	2016/11/08	CAM SOP-00463	EPA 325.2 m
Chemical Oxygen Demand	6	N/A	2016/11/09	CAM SOP-00416	SM 23 5220 D m
Conductivity	1	N/A	2016/11/08	CAM SOP-00414	SM 23 2510 m
Conductivity	5	N/A	2016/11/09	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	4	N/A	2016/11/07	CAM SOP-00446	SM 23 5310 B m
Mercury in Water by CVAA	1	2016/11/09	2016/11/09	CAM SOP-00453	EPA 7470A m
Mercury in Water by CVAA	5	2016/11/10	2016/11/10	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	5	N/A	2016/11/09	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2016/11/10	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	5	N/A	2018/03/06		
Total Ammonia-N	6	N/A	2016/11/10	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	6	N/A	2016/11/10	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	1	N/A	2016/11/08	CAM SOP-00413	SM 4500H+ B m
pH	5	N/A	2016/11/09	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	6	N/A	2016/11/10	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	6	N/A	2016/11/08	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	5	2016/11/07	2016/11/09	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	1	2016/11/09	2016/11/09	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	6	2016/11/08	2016/11/10	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2016/11/08	2016/11/08	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	3	2016/11/08	2016/11/08	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	2	2016/11/08	2016/11/09	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	1	2016/11/07	2016/11/09	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	5	N/A	2016/11/09	CAM SOP-00226	EPA 8260C m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted,

Your Project #: THB-00011119-EE
Site Location: NAKINA LANDFILL
Your C.O.C. #: 583832-01-01

Attention: Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2018/03/07
Report #: R5032428
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B6N9955

Received: 2016/11/04, 09:34

procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Sara Singh, B.Sc, Senior Project Manager

Email: sarasingh@maxxam.ca

Phone# (905)817-5730

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		DJT489			DJT489		
Sampling Date							
COC Number		583832-01-01			583832-01-01		
	UNITS	MW1	RDL	QC Batch	MW1 Lab-Dup	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	1.0	0.050	4738464			
Total Chemical Oxygen Demand (COD)	mg/L	710	40	4738366			
Conductivity	umho/cm	1700	1.0	4736745			
Total Dissolved Solids	mg/L	1010	10	4736936			
Total Kjeldahl Nitrogen (TKN)	mg/L	8.0	2.0	4738715			
Dissolved Organic Carbon	mg/L	32	0.20	4735820			
pH	pH	7.32		4736746			
Phenols-4AAP	mg/L	0.0064	0.0010	4736663	0.0071	0.0010	4736663
Total Phosphorus	mg/L	14	5.0	4738808			
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	4737198			
Alkalinity (Total as CaCO3)	mg/L	1000	1.0	4736743			
Dissolved Chloride (Cl)	mg/L	34	1.0	4737190			
Nitrite (N)	mg/L	<0.010	0.010	4737163			
Nitrate (N)	mg/L	<0.10	0.10	4737163			
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	4737163			
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	4742245			
Dissolved Arsenic (As)	ug/L	4.1	1.0	4740305			
Dissolved Barium (Ba)	ug/L	130	2.0	4740305			
Dissolved Boron (B)	ug/L	520	10	4740305			
Dissolved Cadmium (Cd)	ug/L	0.19	0.10	4740305			
Dissolved Calcium (Ca)	ug/L	300000	200	4740305			
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	4740305			
Dissolved Copper (Cu)	ug/L	13	1.0	4740305			
Dissolved Iron (Fe)	ug/L	9300	100	4740305			
Dissolved Lead (Pb)	ug/L	<0.50	0.50	4740305			
Dissolved Magnesium (Mg)	ug/L	28000	50	4740305			
Dissolved Manganese (Mn)	ug/L	6100	2.0	4740305			
Dissolved Potassium (K)	ug/L	7300	200	4740305			
Dissolved Sodium (Na)	ug/L	65000	100	4740305			
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	4740305			
Volatile Organics							
Benzene	ug/L	2.4	0.50	4736253			
1,4-Dichlorobenzene	ug/L	<1.0	1.0	4736253			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		DJT489			DJT489		
Sampling Date							
COC Number		583832-01-01			583832-01-01		
	UNITS	MW1	RDL	QC Batch	MW1 Lab-Dup	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<2.5	2.5	4736253			
Toluene	ug/L	<1.0	1.0	4736253			
Vinyl Chloride	ug/L	<1.0	1.0	4736253			
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	100		4736253			
D4-1,2-Dichloroethane	%	108		4736253			
D8-Toluene	%	95		4736253			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		DJT490			DJT490			DJT491		
Sampling Date										
COC Number		583832-01-01			583832-01-01			583832-01-01		
	UNITS	MW3	RDL	QC Batch	MW3 Lab-Dup	RDL	QC Batch	MW4	RDL	QC Batch
Inorganics										
Total Ammonia-N	mg/L	<0.050	0.050	4738464				<0.050	0.050	4738464
Total Chemical Oxygen Demand (COD)	mg/L	14	4.0	4738366				70	4.0	4738366
Conductivity	umho/cm	1900	1.0	4736745				350	1.0	4737402
Total Dissolved Solids	mg/L	1160	10	4736936				249	20	4740987
Total Kjeldahl Nitrogen (TKN)	mg/L	0.29	0.10	4738715				0.41	0.10	4738354
Dissolved Organic Carbon	mg/L	2.5	0.20	4735820						
pH	pH	7.93		4736746				8.20		4737403
Phenols-4AAP	mg/L	<0.0010	0.0010	4736663				<0.0010	0.0010	4736663
Total Phosphorus	mg/L	1.1	0.20	4738808				1.3	0.20	4738808
Dissolved Sulphate (SO4)	mg/L	13	1.0	4737198				3.3	1.0	4737182
Alkalinity (Total as CaCO3)	mg/L	290	1.0	4736743				190	1.0	4737395
Dissolved Chloride (Cl)	mg/L	420	4.0	4737190				3.7	1.0	4737179
Nitrite (N)	mg/L	<0.010	0.010	4737163				<0.010	0.010	4737163
Nitrate (N)	mg/L	0.85	0.10	4737163				<0.10	0.10	4737163
Nitrate + Nitrite (N)	mg/L	0.85	0.10	4737163				<0.10	0.10	4737163
Metals										
Mercury (Hg)	mg/L	<0.0001	0.0001	4742245				<0.0001	0.0001	4740585
Dissolved Arsenic (As)	ug/L	<1.0	1.0	4740357	<1.0	1.0	4740357	<1.0	1.0	4740357
Dissolved Barium (Ba)	ug/L	54	2.0	4740357	54	2.0	4740357	29	2.0	4740357
Dissolved Boron (B)	ug/L	11	10	4740357	11	10	4740357	<10	10	4740357
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	4740357	<0.10	0.10	4740357	<0.10	0.10	4740357
Dissolved Calcium (Ca)	ug/L	140000	200	4740357	140000	200	4740357	58000	200	4740357
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	4740357	<5.0	5.0	4740357	<5.0	5.0	4740357
Dissolved Copper (Cu)	ug/L	1.5	1.0	4740357	1.5	1.0	4740357	2.8	1.0	4740357
Dissolved Iron (Fe)	ug/L	<100	100	4740357	<100	100	4740357	<100	100	4740357
Dissolved Lead (Pb)	ug/L	<0.50	0.50	4740357	<0.50	0.50	4740357	<0.50	0.50	4740357
Dissolved Magnesium (Mg)	ug/L	17000	50	4740357	17000	50	4740357	8600	50	4740357
Dissolved Manganese (Mn)	ug/L	<2.0	2.0	4740357	<2.0	2.0	4740357	<2.0	2.0	4740357
Dissolved Potassium (K)	ug/L	2300	200	4740357	2200	200	4740357	4300	200	4740357
Dissolved Sodium (Na)	ug/L	250000	100	4740357	260000	100	4740357	1700	100	4740357
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	4740357	<5.0	5.0	4740357	5.5	5.0	4740357
Volatile Organics										
Benzene	ug/L	<0.10	0.10	4736253				<0.10	0.10	4736253
1,4-Dichlorobenzene	ug/L	<0.20	0.20	4736253				<0.20	0.20	4736253
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate										

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		DJT490			DJT490			DJT491		
Sampling Date										
COC Number		583832-01-01			583832-01-01			583832-01-01		
	UNITS	MW3	RDL	QC Batch	MW3 Lab-Dup	RDL	QC Batch	MW4	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<0.50	0.50	4736253				<0.50	0.50	4736253
Toluene	ug/L	<0.20	0.20	4736253				<0.20	0.20	4736253
Vinyl Chloride	ug/L	<0.20	0.20	4736253				<0.20	0.20	4736253
Surrogate Recovery (%)										
4-Bromofluorobenzene	%	99		4736253				103		4736253
D4-1,2-Dichloroethane	%	109		4736253				111		4736253
D8-Toluene	%	96		4736253				96		4736253
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate										

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		DJT492			DJT492			DJT493		
Sampling Date										
COC Number		583832-01-01			583832-01-01			583832-01-01		
	UNITS	MW5	RDL	QC Batch	MW5 Lab-Dup	RDL	QC Batch	MW6	RDL	QC Batch
Inorganics										
Total Ammonia-N	mg/L	<0.050	0.050	4738464				1.1	0.050	4738464
Total Chemical Oxygen Demand (COD)	mg/L	27	4.0	4738366				750	40	4738366
Conductivity	umho/cm	1600	1.0	4736745				1700	1.0	4736745
Total Dissolved Solids	mg/L	1070	10	4736936				1100	10	4736936
Total Kjeldahl Nitrogen (TKN)	mg/L	0.54	0.10	4738715	0.58	0.10	4738715	8.5	2.0	4738715
Dissolved Organic Carbon	mg/L	12	0.20	4735820				32	0.20	4735820
pH	pH	7.57		4736746				7.28		4736746
Phenols-4AAP	mg/L	<0.0010	0.0010	4736663				0.0054	0.0010	4736663
Total Phosphorus	mg/L	0.56	0.20	4738808				16	5.0	4738808
Dissolved Sulphate (SO4)	mg/L	160	1.0	4737198				<1.0	1.0	4737198
Alkalinity (Total as CaCO3)	mg/L	730	1.0	4736743				1000	1.0	4736743
Dissolved Chloride (Cl)	mg/L	40	1.0	4737190				34	1.0	4737190
Nitrite (N)	mg/L	<0.010	0.010	4737163				<0.010	0.010	4737163
Nitrate (N)	mg/L	0.24	0.10	4737163				<0.10	0.10	4737163
Nitrate + Nitrite (N)	mg/L	0.24	0.10	4737163				<0.10	0.10	4737163
Metals										
Mercury (Hg)	mg/L	<0.0001	0.0001	4742245				<0.0001	0.0001	4742245
Dissolved Arsenic (As)	ug/L	<1.0	1.0	4740305				4.0	1.0	4740357
Dissolved Barium (Ba)	ug/L	81	2.0	4740305				130	2.0	4740357
Dissolved Boron (B)	ug/L	610	10	4740305				510	10	4740357
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	4740305				0.14	0.10	4740357
Dissolved Calcium (Ca)	ug/L	270000	200	4740305				290000	200	4740357
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	4740305				<5.0	5.0	4740357
Dissolved Copper (Cu)	ug/L	11	1.0	4740305				12	1.0	4740357
Dissolved Iron (Fe)	ug/L	<100	100	4740305				9200	100	4740357
Dissolved Lead (Pb)	ug/L	<0.50	0.50	4740305				<0.50	0.50	4740357
Dissolved Magnesium (Mg)	ug/L	44000	50	4740305				28000	50	4740357
Dissolved Manganese (Mn)	ug/L	1500	2.0	4740305				6100	2.0	4740357
Dissolved Potassium (K)	ug/L	2800	200	4740305				7200	200	4740357
Dissolved Sodium (Na)	ug/L	42000	100	4740305				64000	100	4740357
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	4740305				<5.0	5.0	4740357
Volatile Organics										
Benzene	ug/L	0.78	0.25	4736253				2.4	0.50	4736253
1,4-Dichlorobenzene	ug/L	<0.50	0.50	4736253				<1.0	1.0	4736253
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate										

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		DJT492			DJT492			DJT493		
Sampling Date										
COC Number		583832-01-01			583832-01-01			583832-01-01		
	UNITS	MW5	RDL	QC Batch	MW5 Lab-Dup	RDL	QC Batch	MW6	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<1.3	1.3	4736253				<2.5	2.5	4736253
Toluene	ug/L	<0.50	0.50	4736253				1.0	1.0	4736253
Vinyl Chloride	ug/L	1.7	0.50	4736253				<1.0	1.0	4736253
Surrogate Recovery (%)										
4-Bromofluorobenzene	%	101		4736253				102		4736253
D4-1,2-Dichloroethane	%	111		4736253				110		4736253
D8-Toluene	%	96		4736253				96		4736253
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate										

LANDFILL STANDARDS SCH 5 - SW COMP. LIST (WATER)

Maxxam ID		DJT494			DJT494		
Sampling Date							
COC Number		583832-01-01			583832-01-01		
	UNITS	SW1	RDL	QC Batch	SW1 Lab-Dup	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.096	0.050	4738464			
Total BOD	mg/L	<2	2	4736055			
Total Chemical Oxygen Demand (COD)	mg/L	46	4.0	4738366			
Conductivity	umho/cm	220	1.0	4736745			
Total Dissolved Solids	mg/L	212	10	4736936			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.75	0.10	4738354			
pH	pH	7.81		4736746			
Phenols-4AAP	mg/L	<0.0010	0.0010	4736663			
Total Phosphorus	mg/L	0.044	0.004	4738127			
Total Suspended Solids	mg/L	20	1	4736893			
Dissolved Sulphate (SO ₄)	mg/L	7.7	1.0	4737198	7.6	1.0	4737198
Alkalinity (Total as CaCO ₃)	mg/L	100	1.0	4736743			
Dissolved Chloride (Cl)	mg/L	3.4	1.0	4737190	3.3	1.0	4737190
Nitrite (N)	mg/L	<0.010	0.010	4737163			
Nitrate (N)	mg/L	<0.10	0.10	4737163			
Nitrate + Nitrite (N)	mg/L	<0.10	0.10	4737163			
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	4742245			
Total Arsenic (As)	ug/L	<1.0	1.0	4740250			
Total Barium (Ba)	ug/L	11	2.0	4740250			
Total Boron (B)	ug/L	33	10	4740250			
Total Cadmium (Cd)	ug/L	<0.10	0.10	4740250			
Total Chromium (Cr)	ug/L	<5.0	5.0	4740250			
Total Copper (Cu)	ug/L	<1.0	1.0	4740250			
Total Iron (Fe)	ug/L	240	100	4740250			
Total Lead (Pb)	ug/L	0.90	0.50	4740250			
Total Zinc (Zn)	ug/L	<5.0	5.0	4740250			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							

RESULTS OF ANALYSES OF WATER

Maxxam ID		DJT489	DJT490	DJT491	DJT492	DJT493	
Sampling Date							
COC Number		583832-01-01	583832-01-01	583832-01-01	583832-01-01	583832-01-01	
	UNITS	MW1	MW3	MW4	MW5	MW6	QC Batch
Calculated Parameters							
Ion Balance (% Difference)	%	0.850	3.98	2.15	0.310	2.16	5427107
QC Batch = Quality Control Batch							

TEST SUMMARY

Maxxam ID: DJT489
Sample ID: MW1
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4736743	N/A	2016/11/09	Surinder Rai
Chloride by Automated Colourimetry	KONE	4737190	N/A	2016/11/08	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	4738366	N/A	2016/11/09	Viorica Rotaru
Conductivity	AT	4736745	N/A	2016/11/09	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4735820	N/A	2016/11/07	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	4742245	2016/11/10	2016/11/10	Magdalena Carlos
Dissolved Metals by ICPMS	ICP/MS	4740305	N/A	2016/11/09	Cristina Petran
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4738464	N/A	2016/11/10	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4737163	N/A	2016/11/10	Chandra Nandlal
pH	AT	4736746	N/A	2016/11/09	Surinder Rai
Phenols (4AAP)	TECH/PHEN	4736663	N/A	2016/11/10	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	4737198	N/A	2016/11/08	Deonarine Ramnarine
Total Dissolved Solids	BAL	4736936	2016/11/07	2016/11/09	Bansari Ray
Total Kjeldahl Nitrogen in Water	SKAL	4738715	2016/11/08	2016/11/10	Amarinder Sawhney
Total Phosphorus (Colourimetric)	LACH/P	4738808	2016/11/08	2016/11/08	Sarabjit Raina
Volatile Organic Compounds in Water	P&T/MS	4736253	N/A	2016/11/09	Blair Gannon

Maxxam ID: DJT489 Dup
Sample ID: MW1
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	4736663	N/A	2016/11/10	Bramdeo Motiram

Maxxam ID: DJT490
Sample ID: MW3
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4736743	N/A	2016/11/09	Surinder Rai
Chloride by Automated Colourimetry	KONE	4737190	N/A	2016/11/08	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	4738366	N/A	2016/11/09	Viorica Rotaru
Conductivity	AT	4736745	N/A	2016/11/09	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4735820	N/A	2016/11/07	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	4742245	2016/11/10	2016/11/10	Magdalena Carlos
Dissolved Metals by ICPMS	ICP/MS	4740357	N/A	2016/11/09	Cristina Petran
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4738464	N/A	2016/11/10	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4737163	N/A	2016/11/10	Chandra Nandlal
pH	AT	4736746	N/A	2016/11/09	Surinder Rai
Phenols (4AAP)	TECH/PHEN	4736663	N/A	2016/11/10	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	4737198	N/A	2016/11/08	Deonarine Ramnarine
Total Dissolved Solids	BAL	4736936	2016/11/07	2016/11/09	Bansari Ray
Total Kjeldahl Nitrogen in Water	SKAL	4738715	2016/11/08	2016/11/10	Amarinder Sawhney

TEST SUMMARY

Maxxam ID: DJT490
Sample ID: MW3
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Phosphorus (Colourimetric)	LACH/P	4738808	2016/11/08	2016/11/08	Sarabjit Raina
Volatile Organic Compounds in Water	P&T/MS	4736253	N/A	2016/11/09	Blair Gannon

Maxxam ID: DJT490 Dup
Sample ID: MW3
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Dissolved Metals by ICPMS	ICP/MS	4740357	N/A	2016/11/09	Cristina Petran

Maxxam ID: DJT491
Sample ID: MW4
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4737395	N/A	2016/11/08	Surinder Rai
Chloride by Automated Colourimetry	KONE	4737179	N/A	2016/11/08	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	4738366	N/A	2016/11/09	Viorica Rotaru
Conductivity	AT	4737402	N/A	2016/11/08	Surinder Rai
Mercury in Water by CVAA	CV/AA	4740585	2016/11/09	2016/11/09	Magdalena Carlos
Dissolved Metals by ICPMS	ICP/MS	4740357	N/A	2016/11/09	Cristina Petran
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4738464	N/A	2016/11/10	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4737163	N/A	2016/11/10	Chandra Nandlal
pH	AT	4737403	N/A	2016/11/08	Surinder Rai
Phenols (4AAP)	TECH/PHEN	4736663	N/A	2016/11/10	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	4737182	N/A	2016/11/08	Deonarine Ramnarine
Total Dissolved Solids	BAL	4740987	2016/11/09	2016/11/09	Zahid Soikot
Total Kjeldahl Nitrogen in Water	SKAL	4738354	2016/11/08	2016/11/10	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	4738808	2016/11/08	2016/11/08	Sarabjit Raina
Volatile Organic Compounds in Water	P&T/MS	4736253	N/A	2016/11/09	Blair Gannon

Maxxam ID: DJT492
Sample ID: MW5
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4736743	N/A	2016/11/09	Surinder Rai
Chloride by Automated Colourimetry	KONE	4737190	N/A	2016/11/08	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	4738366	N/A	2016/11/09	Viorica Rotaru
Conductivity	AT	4736745	N/A	2016/11/09	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4735820	N/A	2016/11/07	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	4742245	2016/11/10	2016/11/10	Magdalena Carlos
Dissolved Metals by ICPMS	ICP/MS	4740305	N/A	2016/11/09	Cristina Petran
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman

TEST SUMMARY

Maxxam ID: DJT492
Sample ID: MW5
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	4738464	N/A	2016/11/10	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4737163	N/A	2016/11/10	Chandra Nandlal
pH	AT	4736746	N/A	2016/11/09	Surinder Rai
Phenols (4AAP)	TECH/PHEN	4736663	N/A	2016/11/10	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	4737198	N/A	2016/11/08	Deonarine Ramnarine
Total Dissolved Solids	BAL	4736936	2016/11/07	2016/11/09	Bansari Ray
Total Kjeldahl Nitrogen in Water	SKAL	4738715	2016/11/08	2016/11/10	Amarinder Sawhney
Total Phosphorus (Colourimetric)	LACH/P	4738808	2016/11/08	2016/11/09	Sarabjit Raina
Volatile Organic Compounds in Water	P&T/MS	4736253	N/A	2016/11/09	Blair Gannon

Maxxam ID: DJT492 Dup
Sample ID: MW5
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen in Water	SKAL	4738715	2016/11/08	2016/11/10	Amarinder Sawhney

Maxxam ID: DJT493
Sample ID: MW6
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4736743	N/A	2016/11/09	Surinder Rai
Chloride by Automated Colourimetry	KONE	4737190	N/A	2016/11/08	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	4738366	N/A	2016/11/09	Viorica Rotaru
Conductivity	AT	4736745	N/A	2016/11/09	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4735820	N/A	2016/11/07	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	4742245	2016/11/10	2016/11/10	Magdalena Carlos
Dissolved Metals by ICPMS	ICP/MS	4740357	N/A	2016/11/09	Cristina Petran
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4738464	N/A	2016/11/10	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4737163	N/A	2016/11/10	Chandra Nandlal
pH	AT	4736746	N/A	2016/11/09	Surinder Rai
Phenols (4AAP)	TECH/PHEN	4736663	N/A	2016/11/10	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	4737198	N/A	2016/11/08	Deonarine Ramnarine
Total Dissolved Solids	BAL	4736936	2016/11/07	2016/11/09	Bansari Ray
Total Kjeldahl Nitrogen in Water	SKAL	4738715	2016/11/08	2016/11/10	Amarinder Sawhney
Total Phosphorus (Colourimetric)	LACH/P	4738808	2016/11/08	2016/11/09	Sarabjit Raina
Volatile Organic Compounds in Water	P&T/MS	4736253	N/A	2016/11/09	Blair Gannon

Maxxam Job #: B6N9955
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-EE
Site Location: NAKINA LANDFILL

TEST SUMMARY

Maxxam ID: DJT494
Sample ID: SW1
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4736743	N/A	2016/11/09	Surinder Rai
Biochemical Oxygen Demand (BOD)	DO	4736055	2016/11/06	2016/11/11	Prakash Piya
Chloride by Automated Colourimetry	KONE	4737190	N/A	2016/11/08	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	4738366	N/A	2016/11/09	Viorica Rotaru
Conductivity	AT	4736745	N/A	2016/11/09	Surinder Rai
Mercury in Water by CVAA	CV/AA	4742245	2016/11/10	2016/11/10	Magdalena Carlos
Total Metals Analysis by ICPMS	ICP/MS	4740250	N/A	2016/11/10	John Bowman
Total Ammonia-N	LACH/NH4	4738464	N/A	2016/11/10	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4737163	N/A	2016/11/10	Chandra Nandlal
pH	AT	4736746	N/A	2016/11/09	Surinder Rai
Phenols (4AAP)	TECH/PHEN	4736663	N/A	2016/11/10	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	4737198	N/A	2016/11/08	Deonarine Ramnarine
Total Dissolved Solids	BAL	4736936	2016/11/07	2016/11/09	Bansari Ray
Total Kjeldahl Nitrogen in Water	SKAL	4738354	2016/11/08	2016/11/10	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	4738127	2016/11/08	2016/11/08	Sarabjit Raina
Low Level Total Suspended Solids	BAL	4736893	2016/11/07	2016/11/09	Zahid Soikot

Maxxam ID: DJT494 Dup
Sample ID: SW1
Matrix: Water

Collected:
Shipped:
Received: 2016/11/04

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	4737190	N/A	2016/11/08	Deonarine Ramnarine
Sulphate by Automated Colourimetry	KONE	4737198	N/A	2016/11/08	Deonarine Ramnarine

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.0°C
Package 2	5.3°C

Revised Report (2018/03/07): Ion Balance analysis has been included in this report.

Sample DJT489 [MW1] : VOC Water Analysis: Due to foaming, sample required dilution. The detection limits were adjusted accordingly.

Sample DJT492 [MW5] : VOC Water Analysis: Due to foaming, sample required dilution. The detection limits were adjusted accordingly.

Sample DJT493 [MW6] : VOC Water Analysis: Due to foaming, sample required dilution. The detection limits were adjusted accordingly.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: THB-00011119-EE
Site Location: NAKINA LANDFILL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4736253	4-Bromofluorobenzene	2016/11/08	101	70 - 130	100	70 - 130	97	%				
4736253	D4-1,2-Dichloroethane	2016/11/08	109	70 - 130	106	70 - 130	109	%				
4736253	D8-Toluene	2016/11/08	96	70 - 130	97	70 - 130	96	%				
4735820	Dissolved Organic Carbon	2016/11/07	NC	80 - 120	102	80 - 120	0.23, RDL=0.20	mg/L	0.95	20		
4736055	Total BOD	2016/11/11					<2	mg/L	NC	30	93	80 - 120
4736253	1,4-Dichlorobenzene	2016/11/09	89	70 - 130	95	70 - 130	<0.20	ug/L	NC	30		
4736253	Benzene	2016/11/09	92	70 - 130	94	70 - 130	<0.10	ug/L	3.1	30		
4736253	Methylene Chloride(Dichloromethane)	2016/11/09	96	70 - 130	96	70 - 130	<0.50	ug/L	NC	30		
4736253	Toluene	2016/11/09	85	70 - 130	91	70 - 130	<0.20	ug/L	NC	30		
4736253	Vinyl Chloride	2016/11/09	90	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
4736663	Phenols-4AAP	2016/11/10	93	80 - 120	101	80 - 120	<0.0010	mg/L	10	20		
4736743	Alkalinity (Total as CaCO3)	2016/11/09			97	85 - 115	<1.0	mg/L	0.47	20		
4736745	Conductivity	2016/11/09			101	85 - 115	<1.0	umho/cm	0	25		
4736746	pH	2016/11/09			102	98 - 103			0.38	N/A		
4736893	Total Suspended Solids	2016/11/09					<1	mg/L	10	25	100	85 - 115
4736936	Total Dissolved Solids	2016/11/09					<10	mg/L	5.1	25	101	90 - 110
4737163	Nitrate (N)	2016/11/10	104	80 - 120	103	80 - 120	<0.10	mg/L	NC	20		
4737163	Nitrite (N)	2016/11/10	103	80 - 120	102	80 - 120	<0.010	mg/L	NC	20		
4737179	Dissolved Chloride (Cl)	2016/11/08	NC	80 - 120	103	80 - 120	<1.0	mg/L	0.69	20		
4737182	Dissolved Sulphate (SO4)	2016/11/08	NC	75 - 125	104	80 - 120	<1.0	mg/L	1.1	20		
4737190	Dissolved Chloride (Cl)	2016/11/08	108	80 - 120	102	80 - 120	<1.0	mg/L	2.0	20		
4737198	Dissolved Sulphate (SO4)	2016/11/08	113	75 - 125	103	80 - 120	<1.0	mg/L	0.43	20		
4737395	Alkalinity (Total as CaCO3)	2016/11/08			96	85 - 115	<1.0	mg/L	0.046	20		
4737402	Conductivity	2016/11/08			99	85 - 115	<1.0	umho/cm	0.36	25		
4737403	pH	2016/11/08			101	98 - 103			0.70	N/A		
4738127	Total Phosphorus	2016/11/08	99	80 - 120	99	80 - 120	<0.004	mg/L	NC	20	96	80 - 120
4738354	Total Kjeldahl Nitrogen (TKN)	2016/11/10	100	80 - 120	100	80 - 120	<0.10	mg/L	2.0	20	100	80 - 120
4738366	Total Chemical Oxygen Demand (COD)	2016/11/09	102	80 - 120	105	80 - 120	<4.0	mg/L	14	20		
4738464	Total Ammonia-N	2016/11/10	102	80 - 120	100	85 - 115	<0.050	mg/L	9.5	20		

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-EE
Site Location: NAKINA LANDFILL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4738715	Total Kjeldahl Nitrogen (TKN)	2016/11/10	110	80 - 120	99	80 - 120	<0.10	mg/L	6.6	20	98	80 - 120
4738808	Total Phosphorus	2016/11/08	96	80 - 120	95	80 - 120	<0.020	mg/L	6.5	20	97	80 - 120
4740250	Total Arsenic (As)	2016/11/10	101	80 - 120	99	80 - 120	<1.0	ug/L				
4740250	Total Barium (Ba)	2016/11/10	98	80 - 120	97	80 - 120	<2.0	ug/L				
4740250	Total Boron (B)	2016/11/10	91	80 - 120	85	80 - 120	<10	ug/L				
4740250	Total Cadmium (Cd)	2016/11/10	101	80 - 120	100	80 - 120	<0.10	ug/L				
4740250	Total Chromium (Cr)	2016/11/10	103	80 - 120	98	80 - 120	<5.0	ug/L				
4740250	Total Copper (Cu)	2016/11/10	103	80 - 120	98	80 - 120	<1.0	ug/L				
4740250	Total Iron (Fe)	2016/11/10	100	80 - 120	98	80 - 120	<100	ug/L				
4740250	Total Lead (Pb)	2016/11/10	101	80 - 120	101	80 - 120	<0.50	ug/L				
4740250	Total Zinc (Zn)	2016/11/10	100	80 - 120	100	80 - 120	<5.0	ug/L	2.0	20		
4740305	Dissolved Arsenic (As)	2016/11/09	100	80 - 120	98	80 - 120	<1.0	ug/L				
4740305	Dissolved Barium (Ba)	2016/11/09	101	80 - 120	101	80 - 120	<2.0	ug/L				
4740305	Dissolved Boron (B)	2016/11/09	95	80 - 120	100	80 - 120	<10	ug/L				
4740305	Dissolved Cadmium (Cd)	2016/11/09	102	80 - 120	99	80 - 120	<0.10	ug/L				
4740305	Dissolved Calcium (Ca)	2016/11/09	NC	80 - 120	97	80 - 120	<200	ug/L	1.4	20		
4740305	Dissolved Chromium (Cr)	2016/11/09	99	80 - 120	98	80 - 120	<5.0	ug/L				
4740305	Dissolved Copper (Cu)	2016/11/09	99	80 - 120	98	80 - 120	<1.0	ug/L				
4740305	Dissolved Iron (Fe)	2016/11/09	99	80 - 120	98	80 - 120	<100	ug/L				
4740305	Dissolved Lead (Pb)	2016/11/09	96	80 - 120	97	80 - 120	<0.50	ug/L				
4740305	Dissolved Magnesium (Mg)	2016/11/09	NC	80 - 120	97	80 - 120	<50	ug/L	1.4	20		
4740305	Dissolved Manganese (Mn)	2016/11/09	99	80 - 120	98	80 - 120	<2.0	ug/L				
4740305	Dissolved Potassium (K)	2016/11/09	99	80 - 120	98	80 - 120	<200	ug/L				
4740305	Dissolved Sodium (Na)	2016/11/09	NC	80 - 120	98	80 - 120	<100	ug/L				
4740305	Dissolved Zinc (Zn)	2016/11/09	98	80 - 120	95	80 - 120	<5.0	ug/L				
4740357	Dissolved Arsenic (As)	2016/11/09	96	80 - 120	97	80 - 120	<1.0	ug/L	NC	20		
4740357	Dissolved Barium (Ba)	2016/11/09	99	80 - 120	99	80 - 120	<2.0	ug/L	0.77	20		
4740357	Dissolved Boron (B)	2016/11/09	96	80 - 120	97	80 - 120	<10	ug/L	1.8	20		
4740357	Dissolved Cadmium (Cd)	2016/11/09	98	80 - 120	98	80 - 120	<0.10	ug/L	NC	20		
4740357	Dissolved Calcium (Ca)	2016/11/09	NC	80 - 120	96	80 - 120	<200	ug/L	0.57	20		
4740357	Dissolved Chromium (Cr)	2016/11/09	96	80 - 120	97	80 - 120	<5.0	ug/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-EE
Site Location: NAKINA LANDFILL

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4740357	Dissolved Copper (Cu)	2016/11/09	98	80 - 120	97	80 - 120	<1.0	ug/L	6.1	20		
4740357	Dissolved Iron (Fe)	2016/11/09	96	80 - 120	97	80 - 120	<100	ug/L	NC	20		
4740357	Dissolved Lead (Pb)	2016/11/09	93	80 - 120	94	80 - 120	<0.50	ug/L	NC	20		
4740357	Dissolved Magnesium (Mg)	2016/11/09	NC	80 - 120	96	80 - 120	<50	ug/L	1.8	20		
4740357	Dissolved Manganese (Mn)	2016/11/09	96	80 - 120	97	80 - 120	<2.0	ug/L	NC	20		
4740357	Dissolved Potassium (K)	2016/11/09	97	80 - 120	97	80 - 120	<200	ug/L	0.75	20		
4740357	Dissolved Sodium (Na)	2016/11/09	NC	80 - 120	97	80 - 120	<100	ug/L	1.3	20		
4740357	Dissolved Zinc (Zn)	2016/11/09	94	80 - 120	97	80 - 120	<5.0	ug/L	NC	20		
4740585	Mercury (Hg)	2016/11/09	107	75 - 125	95	80 - 120	<0.0001	mg/L	NC	20		
4740987	Total Dissolved Solids	2016/11/09					<10	mg/L	0	25	99	90 - 110
4742245	Mercury (Hg)	2016/11/10	106	75 - 125	103	80 - 120	<0.0001	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Service Specialist



Cristina Carriere, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

<div style="display: flex; justify-content: space-between;"> <div> <div> Maxxam Analytics International Corporation c/o Maxxam Analytics 10 Campbell Road, Mississauga, Ontario Canada L5N 2L8 Tel: (905) 817-5700 Toll-free 800-563-6265 Fax: (905) 817-5777 www.maxxam.ca </div> </div> <div> CHAIN OF CUSTODY RECORD <div style="text-align: right;">Page <u>1</u> of <u>1</u></div> </div> </div>											
INVOICE TO:			REPORT TO:			PROJECT INFORMATION:			Laboratory Use Only:		
Company Name: #17501 exp Services Inc Attention: AHILEAS MITSOPOULOS / Jay Zhang Address: 1142 Roland St Thunder Bay ON P7B 5M4 Tel: (807) 623-9495 Fax: (807) 623-8070 Email: thunderbay@exp.com; Karen.Burke@exp.com			Company Name: Ahileas Mitsopoulos/Michael S / Jay Zhang Attention: Ahileas Mitsopoulos/Michael S / Jay Zhang Address: Tel: Fax: Jay.Zhang@exp.com Email: ahileas.mitsopoulos@exp.com; michael.suslyk@exp.com			Quotation #: B57354 P.O. #: Project: THB-00011119-EE Project Name: Nakina Landfill Site #: FF Sampled By: FF			Maxxam Job #: Bottle Order #: 583832 COC #: Project Manager: Sara Singh C#583832-01-01		
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY						ANALYSIS REQUESTED (PLEASE BE SPECIFIC)					
Regulation 153 (2011) <input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Medium/Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> For RSC <input type="checkbox"/> Table 			Other Regulations <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> Reg 558 <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> MISA <input type="checkbox"/> Municipality <input checked="" type="checkbox"/> PW/QO <input checked="" type="checkbox"/> Other ODWS			Special Instructions 			Field Filtered (please circle): Metals (Hg / Cr / V) Landfill Standards Sol 5 - GW Comp Landfill Standards Sol 5 - SW Comp		
Include Criteria on Certificate of Analysis (Y/N)? <u>N</u>						Regular (Standard) TAT: (will be applied if Rush TAT is not specified): <input checked="" type="checkbox"/> Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details. Job Specific Rush TAT (if applies to entire submission) Date Required: Time Required: Rush Confirmation Number: (call lab for #)					
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix							
1	MW1	16/11/02	11:15am	GW	Y	X					10
2	MW3	16/11/02	09:05am	GW	Y	X					10
3	MW4	16/11/02	2:30pm	GW	Y	X					8
4	MW5	16/11/02	11:50am	GW	Y	X					10
5	MW6	16/11/02	12:45pm	GW	Y	X					10
6	SW1	16/11/02	12:15pm	SW	Y		X				8
7											
8											
9											
10											
* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	# Jars used and not submitted	Laboratory Use Only Time Sensitive: Temperature (°C) on Receipt: 6/6/15 6/8/2 Custody Seal: Yes: <input checked="" type="checkbox"/> No: <input type="checkbox"/> Present: <input checked="" type="checkbox"/> Intact: <input checked="" type="checkbox"/> White: Maxxam Yellow: Client		
* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.											

Maxxam Analytics International Corporation c/o Maxxam Analytics

Your Project #: THB-00011119-FE
Site Location: Nakina Landfill - Spring Sampling Event
Your C.O.C. #: 607909-01-01

Attention: Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2018/03/07
Report #: R5032429
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7A3682

Received: 2017/05/20, 15:54

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	4	N/A	2017/05/25	CAM SOP-00448	SM 23 2320 B m
Alkalinity	2	N/A	2017/05/26	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	1	2017/05/20	2017/05/25	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	5	N/A	2017/05/24	CAM SOP-00463	EPA 325.2 m
Chloride by Automated Colourimetry	1	N/A	2017/05/25	CAM SOP-00463	EPA 325.2 m
Chemical Oxygen Demand	6	N/A	2017/05/26	CAM SOP-00416	SM 23 5220 D m
Conductivity	4	N/A	2017/05/25	CAM SOP-00414	SM 23 2510 m
Conductivity	2	N/A	2017/05/26	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	3	N/A	2017/05/24	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (1)	2	N/A	2017/05/25	CAM SOP-00446	SM 23 5310 B m
Mercury in Water by CVAA	6	2017/05/26	2017/05/29	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	5	N/A	2017/05/26	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2017/05/26	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	5	N/A	2018/03/06		
Total Ammonia-N	6	N/A	2017/05/29	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	6	N/A	2017/05/29	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	4	N/A	2017/05/25	CAM SOP-00413	SM 4500H+ B m
pH	2	N/A	2017/05/26	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	4	N/A	2017/05/26	CAM SOP-00444	OMOE E3179 m
Phenols (4AAP)	2	N/A	2017/05/28	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	5	N/A	2017/05/24	CAM SOP-00464	EPA 375.4 m
Sulphate by Automated Colourimetry	1	N/A	2017/05/25	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	1	2017/05/23	2017/05/24	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	2	2017/05/23	2017/05/26	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	2	2017/05/24	2017/05/25	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	1	2017/05/26	2017/05/26	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	2	2017/05/26	2017/05/29	CAM SOP-00938	OMOE E3516 m
Total Kjeldahl Nitrogen in Water	4	2017/05/26	2017/05/30	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2017/05/26	2017/05/26	CAM SOP-00407	SM 23 4500 P B H m

Your Project #: THB-00011119-FE
Site Location: Nakina Landfill - Spring Sampling Event
Your C.O.C. #: 607909-01-01

Attention: Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2018/03/07
Report #: R5032429
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7A3682

Received: 2017/05/20, 15:54

Sample Matrix: Water
Samples Received: 6

Analyses	Date		Date Analyzed	Laboratory Method	Reference
	Quantity	Extracted			
Total Phosphorus (Colourimetric)	5	2017/05/25	2017/05/26	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	1	2017/05/24	2017/05/24	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	5	N/A	2017/05/25	CAM SOP-00226	EPA 8260C m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Your Project #: THB-00011119-FE
Site Location: Nakina Landfill - Spring Sampling Event
Your C.O.C. #: 607909-01-01

Attention: Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2018/03/07
Report #: R5032429
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7A3682
Received: 2017/05/20, 15:54

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Alison Cameron, Project Manager
Email: ACameron@maxxam.ca
Phone# (905) 817-5700

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		EKM843			EKM844		
Sampling Date		2017/05/18 08:50			2017/05/18 11:00		
COC Number		607909-01-01			607909-01-01		
	UNITS	MW1	RDL	QC Batch	MW3	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.26	0.050	4999344	<0.050	0.050	4999344
Total Chemical Oxygen Demand (COD)	mg/L	100	4.0	5000536	9.2	4.0	5000543
Conductivity	umho/cm	1100	1.0	4995445	2300	1.0	4995445
Total Dissolved Solids	mg/L	624	10	4997189	1150	10	4997189
Total Kjeldahl Nitrogen (TKN)	mg/L	1.2	0.10	5000435	0.62	0.10	5000439
Dissolved Organic Carbon	mg/L	5.7	0.20	4996651	2.0	0.20	4996651
pH	pH	7.18		4995446	7.87		4995446
Phenols-4AAP	mg/L	<0.0010	0.0010	5000981	<0.0010	0.0010	5001018
Total Phosphorus	mg/L	2.1	0.10	4998894	0.30	0.040	4998894
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	4996390	15	1.0	4995493
Alkalinity (Total as CaCO3)	mg/L	630	1.0	4995443	310	1.0	4995443
Dissolved Chloride (Cl)	mg/L	3.1	1.0	4996376	460	5.0	4995485
Nitrite (N)	mg/L	<0.010	0.010	4996809	<0.010	0.010	4996811
Nitrate (N)	mg/L	0.59	0.10	4996809	1.40	0.10	4996811
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5000195	<0.0001	0.0001	5000240
Dissolved Arsenic (As)	ug/L	<1.0	1.0	4997103	<1.0	1.0	4997103
Dissolved Barium (Ba)	ug/L	65	2.0	4997103	53	2.0	4997103
Dissolved Boron (B)	ug/L	25	10	4997103	<10	10	4997103
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	4997103	<0.10	0.10	4997103
Dissolved Calcium (Ca)	ug/L	220000	200	4997103	120000	200	4997103
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	4997103	<5.0	5.0	4997103
Dissolved Copper (Cu)	ug/L	5.0	1.0	4997103	1.4	1.0	4997103
Dissolved Iron (Fe)	ug/L	840	100	4997103	<100	100	4997103
Dissolved Lead (Pb)	ug/L	<0.50	0.50	4997103	<0.50	0.50	4997103
Dissolved Magnesium (Mg)	ug/L	13000	50	4997103	14000	50	4997103
Dissolved Manganese (Mn)	ug/L	1900	2.0	4997103	<2.0	2.0	4997103
Dissolved Potassium (K)	ug/L	2800	200	4997103	2400	200	4997103
Dissolved Sodium (Na)	ug/L	2300	100	4997103	330000	100	4997103
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	4997103	<5.0	5.0	4997103
Volatile Organics							
Benzene	ug/L	<0.10	0.10	4995864	<0.10	0.10	4995864
1,4-Dichlorobenzene	ug/L	<0.20	0.20	4995864	<0.20	0.20	4995864
Methylene Chloride(Dichloromethane)	ug/L	<0.50	0.50	4995864	<0.50	0.50	4995864
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		EKM843			EKM844		
Sampling Date		2017/05/18 08:50			2017/05/18 11:00		
COC Number		607909-01-01			607909-01-01		
	UNITS	MW1	RDL	QC Batch	MW3	RDL	QC Batch
Toluene	ug/L	<0.20	0.20	4995864	<0.20	0.20	4995864
Vinyl Chloride	ug/L	<0.20	0.20	4995864	<0.20	0.20	4995864
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	100		4995864	97		4995864
D4-1,2-Dichloroethane	%	96		4995864	99		4995864
D8-Toluene	%	98		4995864	99		4995864
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		EKM844			EKM845		EKM846		
Sampling Date		2017/05/18 11:00			2017/05/18 09:15		2017/05/18 10:35		
COC Number		607909-01-01			607909-01-01		607909-01-01		
	UNITS	MW3 Lab-Dup	RDL	QC Batch	MW4	QC Batch	MW5	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L				0.052	4999344	<0.050	0.050	4999344
Total Chemical Oxygen Demand (COD)	mg/L				12	5000543	40	4.0	5000543
Conductivity	umho/cm				390	4995445	1700	1.0	4995445
Total Dissolved Solids	mg/L				232	5000102	1070	10	4994863
Total Kjeldahl Nitrogen (TKN)	mg/L				0.57	5000439	0.98	0.20	5000439
Dissolved Organic Carbon	mg/L				2.9	4996651	12	0.20	4996651
pH	pH				8.11	4995446	7.25		4995446
Phenols-4AAP	mg/L	<0.0010	0.0010	5001018	<0.0010	5000981	<0.0010	0.0010	5000981
Total Phosphorus	mg/L				0.75	4998894	0.45	0.040	4998894
Dissolved Sulphate (SO4)	mg/L				1.4	4995498	85	1.0	4995498
Alkalinity (Total as CaCO3)	mg/L				200	4995443	820	1.0	4995443
Dissolved Chloride (Cl)	mg/L				<1.0	4995494	60	1.0	4995494
Nitrite (N)	mg/L				<0.010	4996809	<0.010	0.010	4996811
Nitrate (N)	mg/L				<0.10	4996809	<0.10	0.10	4996811
Metals									
Mercury (Hg)	mg/L				<0.0001	5000195	<0.0001	0.0001	5000195
Dissolved Arsenic (As)	ug/L				<1.0	4997103	<1.0	1.0	4997103
Dissolved Barium (Ba)	ug/L				38	4997103	80	2.0	4997103
Dissolved Boron (B)	ug/L				<10	4997103	580	10	4997103
Dissolved Cadmium (Cd)	ug/L				<0.10	4997103	<0.10	0.10	4997103
Dissolved Calcium (Ca)	ug/L				60000	4997103	270000	200	4997103
Dissolved Chromium (Cr)	ug/L				<5.0	4997103	<5.0	5.0	4997103
Dissolved Copper (Cu)	ug/L				1.8	4997103	14	1.0	4997103
Dissolved Iron (Fe)	ug/L				<100	4997103	<100	100	4997103
Dissolved Lead (Pb)	ug/L				<0.50	4997103	<0.50	0.50	4997103
Dissolved Magnesium (Mg)	ug/L				9000	4997103	45000	50	4997103
Dissolved Manganese (Mn)	ug/L				2.3	4997103	1800	2.0	4997103
Dissolved Potassium (K)	ug/L				6300	4997103	2800	200	4997103
Dissolved Sodium (Na)	ug/L				1800	4997103	49000	100	4997103
Dissolved Zinc (Zn)	ug/L				<5.0	4997103	<5.0	5.0	4997103
Volatile Organics									
Benzene	ug/L				<0.10	4995864	1.2	0.10	4995864
1,4-Dichlorobenzene	ug/L				<0.20	4995864	<0.20	0.20	4995864
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									
Lab-Dup = Laboratory Initiated Duplicate									

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		EKM844			EKM845		EKM846		
Sampling Date		2017/05/18 11:00			2017/05/18 09:15		2017/05/18 10:35		
COC Number		607909-01-01			607909-01-01		607909-01-01		
	UNITS	MW3 Lab-Dup	RDL	QC Batch	MW4	QC Batch	MW5	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L				<0.50	4995864	<0.50	0.50	4995864
Toluene	ug/L				<0.20	4995864	<0.20	0.20	4995864
Vinyl Chloride	ug/L				<0.20	4995864	3.5	0.20	4995864
Surrogate Recovery (%)									
4-Bromofluorobenzene	%				96	4995864	98		4995864
D4-1,2-Dichloroethane	%				98	4995864	99		4995864
D8-Toluene	%				97	4995864	98		4995864
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate									

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		EKM847		
Sampling Date		2017/05/18 08:10		
COC Number		607909-01-01		
	UNITS	MW6	RDL	QC Batch
Inorganics				
Total Ammonia-N	mg/L	0.26	0.050	4999344
Total Chemical Oxygen Demand (COD)	mg/L	110	4.0	5000543
Conductivity	umho/cm	1100	1.0	4996835
Total Dissolved Solids	mg/L	644	10	4994863
Total Kjeldahl Nitrogen (TKN)	mg/L	1.3	0.20	5000439
Dissolved Organic Carbon	mg/L	5.7	0.20	4996651
pH	pH	7.37		4996836
Phenols-4AAP	mg/L	<0.0010	0.0010	5001018
Total Phosphorus	mg/L	2.2	0.10	4998894
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	4995498
Alkalinity (Total as CaCO3)	mg/L	630	1.0	4996833
Dissolved Chloride (Cl)	mg/L	2.0	1.0	4995494
Nitrite (N)	mg/L	<0.010	0.010	4996811
Nitrate (N)	mg/L	0.58	0.10	4996811
Metals				
Mercury (Hg)	mg/L	<0.0001	0.0001	5000195
Dissolved Arsenic (As)	ug/L	<1.0	1.0	4997103
Dissolved Barium (Ba)	ug/L	66	2.0	4997103
Dissolved Boron (B)	ug/L	23	10	4997103
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	4997103
Dissolved Calcium (Ca)	ug/L	220000	200	4997103
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	4997103
Dissolved Copper (Cu)	ug/L	4.9	1.0	4997103
Dissolved Iron (Fe)	ug/L	820	100	4997103
Dissolved Lead (Pb)	ug/L	<0.50	0.50	4997103
Dissolved Magnesium (Mg)	ug/L	13000	50	4997103
Dissolved Manganese (Mn)	ug/L	1900	2.0	4997103
Dissolved Potassium (K)	ug/L	2800	200	4997103
Dissolved Sodium (Na)	ug/L	2300	100	4997103
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	4997103
Volatile Organics				
Benzene	ug/L	<0.10	0.10	4995864
1,4-Dichlorobenzene	ug/L	<0.20	0.20	4995864
Methylene Chloride(Dichloromethane)	ug/L	<0.50	0.50	4995864
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		EKM847		
Sampling Date		2017/05/18 08:10		
COC Number		607909-01-01		
	UNITS	MW6	RDL	QC Batch
Toluene	ug/L	<0.20	0.20	4995864
Vinyl Chloride	ug/L	<0.20	0.20	4995864
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	97		4995864
D4-1,2-Dichloroethane	%	97		4995864
D8-Toluene	%	99		4995864
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

LANDFILL STANDARDS SCH 5 - SW COMP. LIST (WATER)

Maxxam ID		EKM848			EKM848		
Sampling Date		2017/05/18 10:15			2017/05/18 10:15		
COC Number		607909-01-01			607909-01-01		
	UNITS	SW1	RDL	QC Batch	SW1 Lab-Dup	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.17	0.050	4999344			
Total BOD	mg/L	<2	2	4993359			
Total Chemical Oxygen Demand (COD)	mg/L	26	4.0	5000543	22	4.0	5000543
Conductivity	umho/cm	180	1.0	4996835			
Total Dissolved Solids	mg/L	90	10	4994865			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.65	0.10	5000439	0.66	0.10	5000439
pH	pH	7.84		4996836			
Phenols-4AAP	mg/L	<0.0010	0.0010	5000981			
Total Phosphorus	mg/L	0.008	0.004	5000013			
Total Suspended Solids	mg/L	2	1	4996274			
Dissolved Sulphate (SO4)	mg/L	5.2	1.0	4995498			
Alkalinity (Total as CaCO3)	mg/L	86	1.0	4996833			
Dissolved Chloride (Cl)	mg/L	2.7	1.0	4995494			
Nitrite (N)	mg/L	<0.010	0.010	4996811			
Nitrate (N)	mg/L	<0.10	0.10	4996811			
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5000195	<0.0001	0.0001	5000195
Total Arsenic (As)	ug/L	<1.0	1.0	5000162			
Total Barium (Ba)	ug/L	7.2	2.0	5000162			
Total Boron (B)	ug/L	26	10	5000162			
Total Cadmium (Cd)	ug/L	<0.10	0.10	5000162			
Total Chromium (Cr)	ug/L	<5.0	5.0	5000162			
Total Copper (Cu)	ug/L	<1.0	1.0	5000162			
Total Iron (Fe)	ug/L	<100	100	5000162			
Total Lead (Pb)	ug/L	<0.50	0.50	5000162			
Total Zinc (Zn)	ug/L	<5.0	5.0	5000162			
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
Lab-Dup = Laboratory Initiated Duplicate							

RESULTS OF ANALYSES OF WATER

Maxxam ID		EKM843	EKM844	EKM845	EKM846	EKM847	
Sampling Date		2017/05/18 08:50	2017/05/18 11:00	2017/05/18 09:15	2017/05/18 10:35	2017/05/18 08:10	
COC Number		607909-01-01	607909-01-01	607909-01-01	607909-01-01	607909-01-01	
	UNITS	MW1	MW3	MW4	MW5	MW6	QC Batch
Calculated Parameters							
Ion Balance (% Difference)	%	1.94	4.20	0.460	1.32	1.83	5427107
QC Batch = Quality Control Batch							

TEST SUMMARY

Maxxam ID: EKM843
Sample ID: MW1
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4995443	N/A	2017/05/25	Surinder Rai
Chloride by Automated Colourimetry	KONE	4996376	N/A	2017/05/25	Alina Dobreanu
Chemical Oxygen Demand	SPEC	5000536	N/A	2017/05/26	Yogesh Patel
Conductivity	AT	4995445	N/A	2017/05/25	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4996651	N/A	2017/05/25	Azadeh Shahbazi
Mercury in Water by CVAA	CV/AA	5000195	2017/05/26	2017/05/29	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	4997103	N/A	2017/05/26	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4999344	N/A	2017/05/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4996809	N/A	2017/05/29	Chandra Nandlal
pH	AT	4995446	N/A	2017/05/25	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5000981	N/A	2017/05/26	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	4996390	N/A	2017/05/25	Alina Dobreanu
Total Dissolved Solids	BAL	4997189	2017/05/24	2017/05/25	Lu Wang(Alice)
Total Kjeldahl Nitrogen in Water	SKAL	5000435	2017/05/26	2017/05/30	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	4998894	2017/05/25	2017/05/26	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	4995864	N/A	2017/05/25	Juan Pangilinan

Maxxam ID: EKM844
Sample ID: MW3
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4995443	N/A	2017/05/25	Surinder Rai
Chloride by Automated Colourimetry	KONE	4995485	N/A	2017/05/24	Alina Dobreanu
Chemical Oxygen Demand	SPEC	5000543	N/A	2017/05/26	Yogesh Patel
Conductivity	AT	4995445	N/A	2017/05/25	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4996651	N/A	2017/05/25	Azadeh Shahbazi
Mercury in Water by CVAA	CV/AA	5000240	2017/05/26	2017/05/29	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	4997103	N/A	2017/05/26	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4999344	N/A	2017/05/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4996811	N/A	2017/05/29	Chandra Nandlal
pH	AT	4995446	N/A	2017/05/25	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5001018	N/A	2017/05/28	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	4995493	N/A	2017/05/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	4997189	2017/05/24	2017/05/25	Lu Wang(Alice)
Total Kjeldahl Nitrogen in Water	SKAL	5000439	2017/05/26	2017/05/29	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	4998894	2017/05/25	2017/05/26	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	4995864	N/A	2017/05/25	Juan Pangilinan

TEST SUMMARY

Maxxam ID: EKM844 Dup
Sample ID: MW3
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	5001018	N/A	2017/05/28	Zahid Soikot

Maxxam ID: EKM845
Sample ID: MW4
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4995443	N/A	2017/05/25	Surinder Rai
Chloride by Automated Colourimetry	KONE	4995494	N/A	2017/05/24	Alina Doboreanu
Chemical Oxygen Demand	SPEC	5000543	N/A	2017/05/26	Yogesh Patel
Conductivity	AT	4995445	N/A	2017/05/25	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4996651	N/A	2017/05/24	Azadeh Shahbazi
Mercury in Water by CVAA	CV/AA	5000195	2017/05/26	2017/05/29	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	4997103	N/A	2017/05/26	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4999344	N/A	2017/05/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4996809	N/A	2017/05/29	Chandra Nandlal
pH	AT	4995446	N/A	2017/05/25	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5000981	N/A	2017/05/26	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	4995498	N/A	2017/05/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	5000102	2017/05/26	2017/05/26	Xue Zheng Li(Scott)
Total Kjeldahl Nitrogen in Water	SKAL	5000439	2017/05/26	2017/05/30	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	4998894	2017/05/25	2017/05/26	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	4995864	N/A	2017/05/25	Juan Pangilinan

Maxxam ID: EKM846
Sample ID: MW5
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4995443	N/A	2017/05/25	Surinder Rai
Chloride by Automated Colourimetry	KONE	4995494	N/A	2017/05/24	Alina Doboreanu
Chemical Oxygen Demand	SPEC	5000543	N/A	2017/05/26	Yogesh Patel
Conductivity	AT	4995445	N/A	2017/05/25	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4996651	N/A	2017/05/24	Azadeh Shahbazi
Mercury in Water by CVAA	CV/AA	5000195	2017/05/26	2017/05/29	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	4997103	N/A	2017/05/26	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4999344	N/A	2017/05/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4996811	N/A	2017/05/29	Chandra Nandlal
pH	AT	4995446	N/A	2017/05/25	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5000981	N/A	2017/05/26	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	4995498	N/A	2017/05/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	4994863	2017/05/23	2017/05/26	Lu Wang(Alice)
Total Kjeldahl Nitrogen in Water	SKAL	5000439	2017/05/26	2017/05/30	Rajni Tyagi

TEST SUMMARY

Maxxam ID: EKM846
Sample ID: MW5
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Phosphorus (Colourimetric)	LACH/P	4998894	2017/05/25	2017/05/26	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	4995864	N/A	2017/05/25	Juan Pangilinan

Maxxam ID: EKM847
Sample ID: MW6
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4996833	N/A	2017/05/26	Surinder Rai
Chloride by Automated Colourimetry	KONE	4995494	N/A	2017/05/24	Alina Dobreanu
Chemical Oxygen Demand	SPEC	5000543	N/A	2017/05/26	Yogesh Patel
Conductivity	AT	4996835	N/A	2017/05/26	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	4996651	N/A	2017/05/24	Azadeh Shahbazi
Mercury in Water by CVAA	CV/AA	5000195	2017/05/26	2017/05/29	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	4997103	N/A	2017/05/26	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	4999344	N/A	2017/05/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4996811	N/A	2017/05/29	Chandra Nandlal
pH	AT	4996836	N/A	2017/05/26	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5001018	N/A	2017/05/28	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	4995498	N/A	2017/05/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	4994863	2017/05/23	2017/05/26	Lu Wang(Alice)
Total Kjeldahl Nitrogen in Water	SKAL	5000439	2017/05/26	2017/05/30	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	4998894	2017/05/25	2017/05/26	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	4995864	N/A	2017/05/25	Juan Pangilinan

Maxxam ID: EKM848
Sample ID: SW1
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	4996833	N/A	2017/05/26	Surinder Rai
Biochemical Oxygen Demand (BOD)	DO	4993359	2017/05/20	2017/05/25	Frank Zhang
Chloride by Automated Colourimetry	KONE	4995494	N/A	2017/05/24	Alina Dobreanu
Chemical Oxygen Demand	SPEC	5000543	N/A	2017/05/26	Yogesh Patel
Conductivity	AT	4996835	N/A	2017/05/26	Surinder Rai
Mercury in Water by CVAA	CV/AA	5000195	2017/05/26	2017/05/29	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5000162	N/A	2017/05/26	Arefa Dabhad
Total Ammonia-N	LACH/NH4	4999344	N/A	2017/05/29	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	4996811	N/A	2017/05/29	Chandra Nandlal
pH	AT	4996836	N/A	2017/05/26	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5000981	N/A	2017/05/26	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	4995498	N/A	2017/05/24	Deonarine Ramnarine
Total Dissolved Solids	BAL	4994865	2017/05/23	2017/05/24	Arpan Shah
Total Kjeldahl Nitrogen in Water	SKAL	5000439	2017/05/26	2017/05/29	Rajni Tyagi

Maxxam Job #: B7A3682
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: Nakina Landfill - Spring Sampling Event

TEST SUMMARY

Maxxam ID: EKM848
Sample ID: SW1
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Phosphorus (Colourimetric)	LACH/P	5000013	2017/05/26	2017/05/26	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	4996274	2017/05/24	2017/05/24	Lu Wang(Alice)

Maxxam ID: EKM848 Dup
Sample ID: SW1
Matrix: Water

Collected: 2017/05/18
Shipped:
Received: 2017/05/20

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chemical Oxygen Demand	SPEC	5000543	N/A	2017/05/26	Yogesh Patel
Mercury in Water by CVAA	CV/AA	5000195	2017/05/26	2017/05/29	Ron Morrison
Total Kjeldahl Nitrogen in Water	SKAL	5000439	2017/05/26	2017/05/29	Rajni Tyagi

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.3°C
-----------	-------

Revised Report (2018/03/07): Ion Balance analysis has been included in this report.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: Nakina Landfill - Spring Sampling Event

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4995864	4-Bromofluorobenzene	2017/05/25	99	70 - 130	101	70 - 130	95	%				
4995864	D4-1,2-Dichloroethane	2017/05/25	90	70 - 130	93	70 - 130	97	%				
4995864	D8-Toluene	2017/05/25	103	70 - 130	101	70 - 130	98	%				
4993359	Total BOD	2017/05/25					<2	mg/L	13	30	96	80 - 120
4994863	Total Dissolved Solids	2017/05/26					<10	mg/L	0.98	25	98	90 - 110
4994865	Total Dissolved Solids	2017/05/24					<10	mg/L	3.2	25	97	90 - 110
4995443	Alkalinity (Total as CaCO ₃)	2017/05/25			96	85 - 115	<1.0	mg/L	0.65	20		
4995445	Conductivity	2017/05/25			101	85 - 115	<1.0	umho/cm	0.51	25		
4995446	pH	2017/05/25			102	98 - 103			0.11	N/A		
4995485	Dissolved Chloride (Cl)	2017/05/24	NC	80 - 120	103	80 - 120	<1.0	mg/L	2.4	20		
4995493	Dissolved Sulphate (SO ₄)	2017/05/24	NC	75 - 125	103	80 - 120	<1.0	mg/L	3.6	20		
4995494	Dissolved Chloride (Cl)	2017/05/24	NC	80 - 120	103	80 - 120	<1.0	mg/L	1.1	20		
4995498	Dissolved Sulphate (SO ₄)	2017/05/24	109	75 - 125	102	80 - 120	<1.0	mg/L	1.5	20		
4995864	1,4-Dichlorobenzene	2017/05/25	105	70 - 130	102	70 - 130	<0.20	ug/L	NC	30		
4995864	Benzene	2017/05/25	94	70 - 130	93	70 - 130	<0.10	ug/L	NC	30		
4995864	Methylene Chloride(Dichloromethane)	2017/05/25	85	70 - 130	87	70 - 130	<0.50	ug/L	NC	30		
4995864	Toluene	2017/05/25	98	70 - 130	95	70 - 130	<0.20	ug/L	NC	30		
4995864	Vinyl Chloride	2017/05/25	95	70 - 130	92	70 - 130	<0.20	ug/L	NC	30		
4996274	Total Suspended Solids	2017/05/24					<1	mg/L	16	25	95	85 - 115
4996376	Dissolved Chloride (Cl)	2017/05/25	105	80 - 120	102	80 - 120	<1.0	mg/L	1.6	20		
4996390	Dissolved Sulphate (SO ₄)	2017/05/25	NC	75 - 125	105	80 - 120	<1.0	mg/L	0.53	20		
4996651	Dissolved Organic Carbon	2017/05/24	96	80 - 120	98	80 - 120	<0.20	mg/L	2.3	20		
4996809	Nitrate (N)	2017/05/29	105	80 - 120	104	80 - 120	<0.10	mg/L	NC	20		
4996809	Nitrite (N)	2017/05/29	99	80 - 120	98	80 - 120	<0.010	mg/L	NC	20		
4996811	Nitrate (N)	2017/05/29	112	80 - 120	103	80 - 120	<0.10	mg/L	NC	20		
4996811	Nitrite (N)	2017/05/29	103	80 - 120	98	80 - 120	<0.010	mg/L	NC	20		
4996833	Alkalinity (Total as CaCO ₃)	2017/05/26			95	85 - 115	<1.0	mg/L	0.11	20		
4996835	Conductivity	2017/05/26			100	85 - 115	<1.0	umho/cm	4.0	25		
4996836	pH	2017/05/26			102	98 - 103			0.79	N/A		
4997103	Dissolved Arsenic (As)	2017/05/26	91	80 - 120	97	80 - 120	<1.0	ug/L	NC	20		

Maxxam Job #: B7A3682
Report Date: 2018/03/07

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: Nakina Landfill - Spring Sampling Event

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
4997103	Dissolved Barium (Ba)	2017/05/26	90	80 - 120	98	80 - 120	<2.0	ug/L	1.3	20		
4997103	Dissolved Boron (B)	2017/05/26	90	80 - 120	95	80 - 120	<10	ug/L	0.61	20		
4997103	Dissolved Cadmium (Cd)	2017/05/26	91	80 - 120	98	80 - 120	<0.10	ug/L	NC	20		
4997103	Dissolved Calcium (Ca)	2017/05/26	NC	80 - 120	94	80 - 120	<200	ug/L	0.88	20		
4997103	Dissolved Chromium (Cr)	2017/05/26	89	80 - 120	95	80 - 120	<5.0	ug/L	NC	20		
4997103	Dissolved Copper (Cu)	2017/05/26	90	80 - 120	99	80 - 120	<1.0	ug/L	7.5	20		
4997103	Dissolved Iron (Fe)	2017/05/26	89	80 - 120	96	80 - 120	<100	ug/L	NC	20		
4997103	Dissolved Lead (Pb)	2017/05/26	87	80 - 120	96	80 - 120	<0.50	ug/L	NC	20		
4997103	Dissolved Magnesium (Mg)	2017/05/26	NC	80 - 120	95	80 - 120	<50	ug/L	0.23	20		
4997103	Dissolved Manganese (Mn)	2017/05/26	90	80 - 120	95	80 - 120	<2.0	ug/L	3.8	20		
4997103	Dissolved Potassium (K)	2017/05/26	88	80 - 120	95	80 - 120	<200	ug/L	0.30	20		
4997103	Dissolved Sodium (Na)	2017/05/26	88	80 - 120	94	80 - 120	<100	ug/L	0.44	20		
4997103	Dissolved Zinc (Zn)	2017/05/26	87	80 - 120	95	80 - 120	<5.0	ug/L	4.8	20		
4997189	Total Dissolved Solids	2017/05/25					<10	mg/L	3.2	25	98	90 - 110
4998894	Total Phosphorus	2017/05/26	101	80 - 120	103	80 - 120	<0.020	mg/L	3.7	20	100	80 - 120
4999344	Total Ammonia-N	2017/05/29	NC	80 - 120	98	85 - 115	<0.050	mg/L	0.085	20		
5000013	Total Phosphorus	2017/05/26	NC	80 - 120	102	80 - 120	<0.004	mg/L	0.83	20	94	80 - 120
5000102	Total Dissolved Solids	2017/05/26					<10	mg/L	1.1	25	99	90 - 110
5000162	Total Arsenic (As)	2017/05/26	100	80 - 120	99	80 - 120	<1.0	ug/L	NC	20		
5000162	Total Barium (Ba)	2017/05/26	98	80 - 120	99	80 - 120	<2.0	ug/L				
5000162	Total Boron (B)	2017/05/26	96	80 - 120	94	80 - 120	<10	ug/L				
5000162	Total Cadmium (Cd)	2017/05/26	100	80 - 120	100	80 - 120	<0.10	ug/L	NC	20		
5000162	Total Chromium (Cr)	2017/05/26	102	80 - 120	100	80 - 120	<5.0	ug/L	NC	20		
5000162	Total Copper (Cu)	2017/05/26	102	80 - 120	102	80 - 120	<1.0	ug/L				
5000162	Total Iron (Fe)	2017/05/26	98	80 - 120	99	80 - 120	<100	ug/L	NC	20		
5000162	Total Lead (Pb)	2017/05/26	97	80 - 120	99	80 - 120	<0.50	ug/L	NC	20		
5000162	Total Zinc (Zn)	2017/05/26	100	80 - 120	100	80 - 120	<5.0	ug/L	NC	20		
5000195	Mercury (Hg)	2017/05/29	109	75 - 125	91	80 - 120	<0.0001	mg/L	NC	20		
5000240	Mercury (Hg)	2017/05/29	89	75 - 125	101	80 - 120	<0.0001	mg/L	NC	20		
5000435	Total Kjeldahl Nitrogen (TKN)	2017/05/30	96	80 - 120	104	80 - 120	<0.10	mg/L	3.9	20	107	80 - 120
5000439	Total Kjeldahl Nitrogen (TKN)	2017/05/29	111	80 - 120	101	80 - 120	<0.10	mg/L	1.4	20	104	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: Nakina Landfill - Spring Sampling Event

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5000536	Total Chemical Oxygen Demand (COD)	2017/05/26	101	80 - 120	104	80 - 120	7.4, RDL=4.0	mg/L	NC	20		
5000543	Total Chemical Oxygen Demand (COD)	2017/05/26	90	80 - 120	104	80 - 120	4.2, RDL=4.0	mg/L	18	20		
5000981	Phenols-4AAP	2017/05/26	100	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		
5001018	Phenols-4AAP	2017/05/28	102	80 - 120	102	80 - 120	<0.0010	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Service Specialist



Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics
9740 Campbell Road, Mississauga, Ontario Canada L5N 2L8 Tel: (905) 817-5700 Toll-free 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:	
Company Name: #17501 exp Services Inc	Company Name: Ahileas Mitsopoulos	Quotation #: B66893			
Attention: accounts payable	Attention:	P.O. #:			
Address: 1142 Roland St	Address:	Project: THB-00011119-FE			
Thunder Bay ON P7B 5M4		Project Name: Nakina LF			
Tel: (807) 623-9495 x	Fax: (807) 623-8070 x	Site #:			
Email: thunderbay@exp.com; Karen.Burke@exp.com	Email: ahileas.mitsopoulos@exp.com; michael.suslyk@exp.co	Sampled By: EF			

20-May-17 15:54

Alison Cameron



B7A3682

MAF

ENV-859



C4607909-01-01

Page 1 of 1

ily:

Bottle Order #:

607909

Project Manager:

Alison Cameron

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)						Other Regulations		Special Instructions	
<input type="checkbox"/> Table 1	<input type="checkbox"/> Res/Park	<input type="checkbox"/> Medium/Fine	<input type="checkbox"/> CCME	<input type="checkbox"/> Sanitary Sewer Bylaw					
<input type="checkbox"/> Table 2	<input type="checkbox"/> Ind/Comm	<input type="checkbox"/> Coarse	<input type="checkbox"/> Reg 558	<input type="checkbox"/> Storm Sewer Bylaw					
<input type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other	<input type="checkbox"/> For RSC	<input type="checkbox"/> MISA	<input type="checkbox"/> Municipality					
<input type="checkbox"/> Table			<input checked="" type="checkbox"/> PWGO						
			<input checked="" type="checkbox"/> Other	oow's					
Include Criteria on Certificate of Analysis (Y/N)?						Field Filtered (please circle): Metals / Hg / Cr / V			
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Metals / Hg / Cr / V	Langfill Standard Sch 5 - GW Comp	Langfill Standard Sch 8 - SW Comp		
1	MW 1	May 18 2017	8:50 AM	GW	metals Hg	X		10	
2	MW 2 (mws)	May 18 2017	11:00 AM	GW	metals Hg	X		10	
3	MW 4	May 18 2017	9:15 AM	GW	metals Hg	X		9	
4	MW 5	May 18 2017	10:35 AM	GW	metals Hg	X		10	
5	MW 6	May 18 2017	8:10 AM	GW	metals Hg	X		10	
6	SW 1	May 18 2017	10:15 AM	SW	Hg		X	8	
7									
8									
9									
10									

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT:

(will be applied if Rush TAT is not specified)

Standard TAT = 5-7 Working days for most tests.

Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)

Date Required: Time Required:

Rush Confirmation Number: (call lab for #)

of Bottles Comments

RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only				
Alileas Mitsopoulos	17/05/19	2:00pm	PARAMSHEER SINGH	2017/05/20	09:50		Time Sensitive	Temperature (°C) on Reel	Custody Seal	Yes	No
								4/5/19	Intact	✓	

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (<10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM.

White: Maxxa Yellow: Client

Your Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Your C.O.C. #: 628777-01-01

Attention: Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2018/03/07
Report #: R5032433
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7L4431

Received: 2017/09/29, 10:40

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	5	N/A	2017/10/02	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	1	2017/09/30	2017/10/05	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	5	N/A	2017/10/02	CAM SOP-00463	EPA 325.2 m
Chemical Oxygen Demand	5	N/A	2017/10/04	CAM SOP-00416	SM 23 5220 D m
Conductivity	5	N/A	2017/10/02	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	4	N/A	2017/10/01	CAM SOP-00446	SM 23 5310 B m
Mercury in Water by CVAA	6	2017/10/04	2017/10/05	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	5	N/A	2017/10/02	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2017/10/05	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	4	N/A	2018/03/06		
Total Ammonia-N	5	N/A	2017/10/04	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	1	N/A	2017/10/03	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate (NO3) and Nitrite (NO2) in Water (2)	4	N/A	2017/10/04	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	5	N/A	2017/10/02	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	5	N/A	2017/10/04	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	5	N/A	2017/10/02	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	2	2017/09/30	2017/10/03	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	3	2017/10/02	2017/10/02	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	4	2017/10/02	2017/10/04	CAM SOP-00938	OMOE E3516 m
Total Kjeldahl Nitrogen in Water	1	2017/10/03	2017/10/03	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2017/10/03	2017/10/03	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	4	2017/10/03	2017/10/03	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	1	2017/09/30	2017/10/02	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	4	N/A	2017/10/04	CAM SOP-00226	EPA 8260C m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using

Your Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Your C.O.C. #: 628777-01-01

Attention: Ahileas Mitsopoulos

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
P7B 5M4

Report Date: 2018/03/07
Report #: R5032433
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7L4431

Received: 2017/09/29, 10:40

accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Alison Cameron, Project Manager

Email: ACameron@maxxam.ca

Phone# (905) 817-5700

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		FFN781			FFN781			FFN782		
Sampling Date		2017/09/27 11:20			2017/09/27 11:20			2017/09/27 13:45		
COC Number		628777-01-01			628777-01-01			628777-01-01		
	UNITS	MW1	RDL	QC Batch	MW1 Lab-Dup	RDL	QC Batch	MW3	RDL	QC Batch

Inorganics										
Total Ammonia-N	mg/L	0.27	0.050	5193224				<0.050	0.050	5193224
Total Chemical Oxygen Demand (COD)	mg/L	69	4.0	5193202				8.0	4.0	5193202
Conductivity	umho/cm	1400	1.0	5191525				2100	1.0	5191525
Total Dissolved Solids	mg/L	875	50	5192611				1040	50	5192611
Total Kjeldahl Nitrogen (TKN)	mg/L	1.1	0.10	5193227				0.26	0.10	5193227
Dissolved Organic Carbon	mg/L	14	0.20	5191549				2.1	0.20	5191549
pH	pH	7.19		5191526				7.91		5191526
Phenols-4AAP	mg/L	<0.0020 (1)	0.0020	5194597				<0.0010	0.0010	5194597
Total Phosphorus	mg/L	0.35	0.040	5193881				0.27	0.10	5193881
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	5191452				13	1.0	5191452
Alkalinity (Total as CaCO3)	mg/L	810	1.0	5191523				300	1.0	5191523
Dissolved Chloride (Cl)	mg/L	15	1.0	5191450				430	5.0	5191450
Nitrite (N)	mg/L	<0.010	0.010	5191501				<0.010	0.010	5191501
Nitrate (N)	mg/L	<0.10	0.10	5191501				0.90	0.10	5191501

Metals										
Mercury (Hg)	mg/L	<0.0001	0.0001	5196953				<0.0001	0.0001	5196953
Dissolved Arsenic (As)	ug/L	1.7	1.0	5191474				<1.0	1.0	5191474
Dissolved Barium (Ba)	ug/L	90	2.0	5191474				46	2.0	5191474
Dissolved Boron (B)	ug/L	110	10	5191474				<10	10	5191474
Dissolved Cadmium (Cd)	ug/L	0.13	0.10	5191474				<0.10	0.10	5191474
Dissolved Calcium (Ca)	ug/L	280000	200	5191474				110000	200	5191474
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	5191474				<5.0	5.0	5191474
Dissolved Copper (Cu)	ug/L	8.6	1.0	5191474				1.4	1.0	5191474
Dissolved Iron (Fe)	ug/L	2600	100	5191474				<100	100	5191474
Dissolved Lead (Pb)	ug/L	<0.50	0.50	5191474				<0.50	0.50	5191474
Dissolved Magnesium (Mg)	ug/L	19000	50	5191474				13000	50	5191474
Dissolved Manganese (Mn)	ug/L	5300	2.0	5191474				<2.0	2.0	5191474
Dissolved Potassium (K)	ug/L	4200	200	5191474				2200	200	5191474
Dissolved Sodium (Na)	ug/L	19000	100	5191474				270000	100	5191474
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	5191474				<5.0	5.0	5191474

Volatile Organics										
Benzene	ug/L	0.65	0.25	5189020	0.68	0.25	5189020	<0.10	0.10	5189020

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

(1) Due to the sample matrix, sample required dilution. Detection Limit was adjusted accordingly.

Maxxam Job #: B7L4431
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		FFN781			FFN781			FFN782		
Sampling Date		2017/09/27 11:20			2017/09/27 11:20			2017/09/27 13:45		
COC Number		628777-01-01			628777-01-01			628777-01-01		
	UNITS	MW1	RDL	QC Batch	MW1 Lab-Dup	RDL	QC Batch	MW3	RDL	QC Batch
1,4-Dichlorobenzene	ug/L	<0.50	0.50	5189020	<0.50	0.50	5189020	<0.20	0.20	5189020
Methylene Chloride(Dichloromethane)	ug/L	<1.3	1.3	5189020	<1.3	1.3	5189020	<0.50	0.50	5189020
Toluene	ug/L	<0.50	0.50	5189020	<0.50	0.50	5189020	<0.20	0.20	5189020
Vinyl Chloride	ug/L	<0.50	0.50	5189020	<0.50	0.50	5189020	<0.20	0.20	5189020
Surrogate Recovery (%)										
4-Bromofluorobenzene	%	98		5189020	97		5189020	97		5189020
D4-1,2-Dichloroethane	%	108		5189020	108		5189020	108		5189020
D8-Toluene	%	100		5189020	100		5189020	99		5189020
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate										

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		FFN782			FFN783		
Sampling Date		2017/09/27 13:45			2017/09/27 15:30		
COC Number		628777-01-01			628777-01-01		
	UNITS	MW3 Lab-Dup	RDL	QC Batch	MW4	RDL	QC Batch

Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5196953	<0.0001	0.0001	5196953
Dissolved Arsenic (As)	ug/L				<1.0	1.0	5191474
Dissolved Barium (Ba)	ug/L				19	2.0	5191474
Dissolved Boron (B)	ug/L				<10	10	5191474
Dissolved Cadmium (Cd)	ug/L				<0.10	0.10	5191474
Dissolved Calcium (Ca)	ug/L				59000	200	5191474
Dissolved Chromium (Cr)	ug/L				<5.0	5.0	5191474
Dissolved Copper (Cu)	ug/L				2.8	1.0	5191474
Dissolved Iron (Fe)	ug/L				<100	100	5191474
Dissolved Lead (Pb)	ug/L				<0.50	0.50	5191474
Dissolved Magnesium (Mg)	ug/L				9000	50	5191474
Dissolved Manganese (Mn)	ug/L				2.1	2.0	5191474
Dissolved Potassium (K)	ug/L				2100	200	5191474
Dissolved Sodium (Na)	ug/L				1900	100	5191474
Dissolved Zinc (Zn)	ug/L				<5.0	5.0	5191474

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		FFN784			FFN784			FFN785		
Sampling Date		2017/09/27 14:30			2017/09/27 14:30			2017/09/27 11:45		
COC Number		628777-01-01			628777-01-01			628777-01-01		
	UNITS	MW5	RDL	QC Batch	MW5 Lab-Dup	RDL	QC Batch	MW6	RDL	QC Batch

Inorganics										
Total Ammonia-N	mg/L	<0.050	0.050	5193224				0.27	0.050	5193224
Total Chemical Oxygen Demand (COD)	mg/L	35	4.0	5193202				63	4.0	5193202
Conductivity	umho/cm	1600	1.0	5191525				1400	1.0	5191525
Total Dissolved Solids	mg/L	1030	50	5191127				855	50	5192611
Total Kjeldahl Nitrogen (TKN)	mg/L	0.56	0.10	5193227				1.2	0.10	5194093
Dissolved Organic Carbon	mg/L	12	0.20	5191549				14	0.20	5191549
pH	pH	7.28		5191526				7.20		5191526
Phenols-4AAP	mg/L	<0.0010	0.0010	5194597				<0.0020 (1)	0.0020	5194597
Total Phosphorus	mg/L	0.24	0.10	5193881				0.35	0.040	5193881
Dissolved Sulphate (SO4)	mg/L	95	1.0	5191452	94	1.0	5191452	<1.0	1.0	5191452
Alkalinity (Total as CaCO3)	mg/L	780	1.0	5191523				810	1.0	5191523
Dissolved Chloride (Cl)	mg/L	56	1.0	5191450	56	1.0	5191450	15	1.0	5191450
Nitrite (N)	mg/L	<0.010	0.010	5191501				<0.010	0.010	5191501
Nitrate (N)	mg/L	0.15	0.10	5191501				<0.10	0.10	5191501

Metals										
Mercury (Hg)	mg/L	<0.0001	0.0001	5196953				<0.0001	0.0001	5196953
Dissolved Arsenic (As)	ug/L	<1.0	1.0	5191474				1.3	1.0	5191474
Dissolved Barium (Ba)	ug/L	79	2.0	5191474				92	2.0	5191474
Dissolved Boron (B)	ug/L	610	10	5191474				110	10	5191474
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	5191474				0.12	0.10	5191474
Dissolved Calcium (Ca)	ug/L	260000	200	5191474				280000	200	5191474
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	5191474				<5.0	5.0	5191474
Dissolved Copper (Cu)	ug/L	13	1.0	5191474				8.0	1.0	5191474
Dissolved Iron (Fe)	ug/L	<100	100	5191474				2600	100	5191474
Dissolved Lead (Pb)	ug/L	<0.50	0.50	5191474				<0.50	0.50	5191474
Dissolved Magnesium (Mg)	ug/L	43000	50	5191474				19000	50	5191474
Dissolved Manganese (Mn)	ug/L	1300	2.0	5191474				5300	2.0	5191474
Dissolved Potassium (K)	ug/L	2800	200	5191474				4200	200	5191474
Dissolved Sodium (Na)	ug/L	50000	100	5191474				19000	100	5191474
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	5191474				<5.0	5.0	5191474

Volatile Organics										
Benzene	ug/L	0.98	0.25	5189020				0.70	0.10	5189020

RDL = Reportable Detection Limit

QC Batch = Quality Control Batch

Lab-Dup = Laboratory Initiated Duplicate

(1) Due to the sample matrix, sample required dilution. Detection Limit was adjusted accordingly.

Maxxam Job #: B7L4431
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		FFN784			FFN784			FFN785		
Sampling Date		2017/09/27 14:30			2017/09/27 14:30			2017/09/27 11:45		
COC Number		628777-01-01			628777-01-01			628777-01-01		
	UNITS	MW5	RDL	QC Batch	MW5 Lab-Dup	RDL	QC Batch	MW6	RDL	QC Batch
1,4-Dichlorobenzene	ug/L	<0.50	0.50	5189020				<0.20	0.20	5189020
Methylene Chloride(Dichloromethane)	ug/L	<1.3	1.3	5189020				<0.50	0.50	5189020
Toluene	ug/L	<0.50	0.50	5189020				<0.20	0.20	5189020
Vinyl Chloride	ug/L	4.1	0.50	5189020				<0.20	0.20	5189020
Surrogate Recovery (%)										
4-Bromofluorobenzene	%	98		5189020				99		5189020
D4-1,2-Dichloroethane	%	109		5189020				108		5189020
D8-Toluene	%	100		5189020				100		5189020
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate										

LANDFILL STANDARDS SCH 5 - SW COMP. LIST (WATER)

Maxxam ID		FFN786			FFN786		
Sampling Date		2017/09/27 14:00			2017/09/27 14:00		
COC Number		628777-01-01			628777-01-01		
	UNITS	SW1	RDL	QC Batch	SW1 Lab-Dup	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.072	0.050	5193224	<0.050	0.050	5193224
Total BOD	mg/L	<2	2	5191090			
Total Chemical Oxygen Demand (COD)	mg/L	30	4.0	5193202			
Conductivity	umho/cm	180	1.0	5191525			
Total Dissolved Solids	mg/L	160	50	5191127			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.66	0.10	5193227			
pH	pH	7.94		5191526			
Phenols-4AAP	mg/L	<0.0010	0.0010	5194597			
Total Phosphorus	mg/L	0.006	0.004	5193756	0.008	0.004	5193756
Total Suspended Solids	mg/L	3	1	5191263			
Dissolved Sulphate (SO4)	mg/L	6.1	1.0	5191452			
Alkalinity (Total as CaCO3)	mg/L	83	1.0	5191523			
Dissolved Chloride (Cl)	mg/L	3.1	1.0	5191450			
Nitrite (N)	mg/L	<0.010	0.010	5191504	<0.010	0.010	5191504
Nitrate (N)	mg/L	<0.10	0.10	5191504	<0.10	0.10	5191504
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5197309			
Total Arsenic (As)	ug/L	<1.0	1.0	5196483			
Total Barium (Ba)	ug/L	9.2	2.0	5196483			
Total Boron (B)	ug/L	33	10	5196483			
Total Cadmium (Cd)	ug/L	<0.10	0.10	5196483			
Total Chromium (Cr)	ug/L	<5.0	5.0	5196483			
Total Copper (Cu)	ug/L	<1.0	1.0	5196483			
Total Iron (Fe)	ug/L	<100	100	5196483			
Total Lead (Pb)	ug/L	<0.50	0.50	5196483			
Total Zinc (Zn)	ug/L	<5.0	5.0	5196483			
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
Lab-Dup = Laboratory Initiated Duplicate							

Maxxam Job #: B7L4431
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

RESULTS OF ANALYSES OF WATER

Maxxam ID		FFN781	FFN782	FFN784	FFN785	
Sampling Date		2017/09/27 11:20	2017/09/27 13:45	2017/09/27 14:30	2017/09/27 11:45	
COC Number		628777-01-01	628777-01-01	628777-01-01	628777-01-01	
	UNITS	MW1	MW3	MW5	MW6	QC Batch
Calculated Parameters						
Ion Balance (% Difference)	%	0.290	0.210	1.63	0.480	5427107
QC Batch = Quality Control Batch						

Maxxam Job #: B7L4431
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

TEST SUMMARY

Maxxam ID: FFN781
Sample ID: MW1
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5191523	N/A	2017/10/02	Surinder Rai
Chloride by Automated Colourimetry	KONE	5191450	N/A	2017/10/02	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5193202	N/A	2017/10/04	Mihaela Ghiricociu
Conductivity	AT	5191525	N/A	2017/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5191549	N/A	2017/10/01	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	5196953	2017/10/04	2017/10/05	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5191474	N/A	2017/10/02	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	5193224	N/A	2017/10/04	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5191501	N/A	2017/10/04	Chandra Nandlal
pH	AT	5191526	N/A	2017/10/02	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5194597	N/A	2017/10/04	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5191452	N/A	2017/10/02	Alina Dobreanu
Total Dissolved Solids	BAL	5192611	2017/10/02	2017/10/02	Xue Zheng Li(Scott)
Total Kjeldahl Nitrogen in Water	SKAL	5193227	2017/10/02	2017/10/04	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5193881	2017/10/03	2017/10/03	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5189020	N/A	2017/10/04	Dina Wang

Maxxam ID: FFN781 Dup
Sample ID: MW1
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Volatile Organic Compounds in Water	P&T/MS	5189020	N/A	2017/10/04	Dina Wang

Maxxam ID: FFN782
Sample ID: MW3
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5191523	N/A	2017/10/02	Surinder Rai
Chloride by Automated Colourimetry	KONE	5191450	N/A	2017/10/02	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5193202	N/A	2017/10/04	Mihaela Ghiricociu
Conductivity	AT	5191525	N/A	2017/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5191549	N/A	2017/10/01	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	5196953	2017/10/04	2017/10/05	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5191474	N/A	2017/10/02	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	5193224	N/A	2017/10/04	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5191501	N/A	2017/10/04	Chandra Nandlal
pH	AT	5191526	N/A	2017/10/02	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5194597	N/A	2017/10/04	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5191452	N/A	2017/10/02	Alina Dobreanu
Total Dissolved Solids	BAL	5192611	2017/10/02	2017/10/02	Xue Zheng Li(Scott)

Maxxam Job #: B7L4431
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

TEST SUMMARY

Maxxam ID: FFN782
Sample ID: MW3
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen in Water	SKAL	5193227	2017/10/02	2017/10/04	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5193881	2017/10/03	2017/10/03	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5189020	N/A	2017/10/04	Dina Wang

Maxxam ID: FFN782 Dup
Sample ID: MW3
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury in Water by CVAA	CV/AA	5196953	2017/10/04	2017/10/05	Ron Morrison

Maxxam ID: FFN783
Sample ID: MW4
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Mercury in Water by CVAA	CV/AA	5196953	2017/10/04	2017/10/05	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5191474	N/A	2017/10/02	Thao Nguyen

Maxxam ID: FFN784
Sample ID: MW5
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5191523	N/A	2017/10/02	Surinder Rai
Chloride by Automated Colourimetry	KONE	5191450	N/A	2017/10/02	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5193202	N/A	2017/10/04	Mihaela Ghiricociu
Conductivity	AT	5191525	N/A	2017/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5191549	N/A	2017/10/01	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	5196953	2017/10/04	2017/10/05	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5191474	N/A	2017/10/02	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	5193224	N/A	2017/10/04	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5191501	N/A	2017/10/04	Chandra Nandlal
pH	AT	5191526	N/A	2017/10/02	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5194597	N/A	2017/10/04	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5191452	N/A	2017/10/02	Alina Doboreanu
Total Dissolved Solids	BAL	5191127	2017/09/30	2017/10/03	Arpan Shah
Total Kjeldahl Nitrogen in Water	SKAL	5193227	2017/10/02	2017/10/04	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5193881	2017/10/03	2017/10/03	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5189020	N/A	2017/10/04	Dina Wang

Maxxam Job #: B7L4431
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

TEST SUMMARY

Maxxam ID: FFN784 Dup
Sample ID: MW5
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	5191450	N/A	2017/10/02	Deonarine Ramnarine
Sulphate by Automated Colourimetry	KONE	5191452	N/A	2017/10/02	Alina Dobreanu

Maxxam ID: FFN785
Sample ID: MW6
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5191523	N/A	2017/10/02	Surinder Rai
Chloride by Automated Colourimetry	KONE	5191450	N/A	2017/10/02	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5193202	N/A	2017/10/04	Mihaela Ghiricociu
Conductivity	AT	5191525	N/A	2017/10/02	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5191549	N/A	2017/10/01	Anastasia Hamanov
Mercury in Water by CVAA	CV/AA	5196953	2017/10/04	2017/10/05	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5191474	N/A	2017/10/02	Thao Nguyen
Ion Balance (% Difference)	CALC	5427107	N/A	2018/03/06	Brad Newman
Total Ammonia-N	LACH/NH4	5193224	N/A	2017/10/04	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5191501	N/A	2017/10/04	Chandra Nandlal
pH	AT	5191526	N/A	2017/10/02	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5194597	N/A	2017/10/04	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5191452	N/A	2017/10/02	Alina Dobreanu
Total Dissolved Solids	BAL	5192611	2017/10/02	2017/10/02	Xue Zheng Li(Scott)
Total Kjeldahl Nitrogen in Water	SKAL	5194093	2017/10/03	2017/10/03	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5193881	2017/10/03	2017/10/03	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5189020	N/A	2017/10/04	Dina Wang

Maxxam ID: FFN786
Sample ID: SW1
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5191523	N/A	2017/10/02	Surinder Rai
Biochemical Oxygen Demand (BOD)	DO	5191090	2017/09/30	2017/10/05	Hinal Shah
Chloride by Automated Colourimetry	KONE	5191450	N/A	2017/10/02	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5193202	N/A	2017/10/04	Mihaela Ghiricociu
Conductivity	AT	5191525	N/A	2017/10/02	Surinder Rai
Mercury in Water by CVAA	CV/AA	5197309	2017/10/04	2017/10/05	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5196483	N/A	2017/10/05	Arefa Dabhad
Total Ammonia-N	LACH/NH4	5193224	N/A	2017/10/04	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5191504	N/A	2017/10/03	Chandra Nandlal
pH	AT	5191526	N/A	2017/10/02	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5194597	N/A	2017/10/04	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5191452	N/A	2017/10/02	Alina Dobreanu
Total Dissolved Solids	BAL	5191127	2017/09/30	2017/10/03	Arpan Shah

Maxxam Job #: B7L4431
Report Date: 2018/03/07

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

TEST SUMMARY

Maxxam ID: FFN786
Sample ID: SW1
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Kjeldahl Nitrogen in Water	SKAL	5193227	2017/10/02	2017/10/04	Bramdeo Motiram
Total Phosphorus (Colourimetric)	LACH/P	5193756	2017/10/03	2017/10/03	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5191263	2017/09/30	2017/10/02	Arpan Shah

Maxxam ID: FFN786 Dup
Sample ID: SW1
Matrix: Water

Collected: 2017/09/27
Shipped:
Received: 2017/09/29

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	5193224	N/A	2017/10/04	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5191504	N/A	2017/10/03	Chandra Nandlal
Total Phosphorus (Colourimetric)	LACH/P	5193756	2017/10/03	2017/10/03	Amanpreet Sappal

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C
Package 2	2.3°C
Package 3	2.3°C
Package 4	1.0°C
Package 5	3.0°C
Package 6	3.3°C
Package 7	6.0°C
Package 8	1.3°C
Package 9	0.7°C
Package 10	2.0°C

VOC Water Analysis: Due to foaming, some samples required dilution. The detection limits were adjusted accordingly.

Revised Report (2018/03/07): Ion Balance analysis has been included in this report.

Results relate only to the items tested.

Maxxam Job #: B7L4431
Report Date: 2018/03/07

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5189020	4-Bromofluorobenzene	2017/10/03	100	70 - 130	100	70 - 130	99	%				
5189020	D4-1,2-Dichloroethane	2017/10/03	105	70 - 130	105	70 - 130	105	%				
5189020	D8-Toluene	2017/10/03	102	70 - 130	101	70 - 130	101	%				
5189020	1,4-Dichlorobenzene	2017/10/04	99	70 - 130	89	70 - 130	<0.20	ug/L	NC	30		
5189020	Benzene	2017/10/04	107	70 - 130	95	70 - 130	<0.10	ug/L	4.8	30		
5189020	Methylene Chloride(Dichloromethane)	2017/10/04	97	70 - 130	88	70 - 130	<0.50	ug/L	NC	30		
5189020	Toluene	2017/10/04	104	70 - 130	91	70 - 130	<0.20	ug/L	NC	30		
5189020	Vinyl Chloride	2017/10/04	124	70 - 130	111	70 - 130	<0.20	ug/L	NC	30		
5191090	Total BOD	2017/10/05					<2	mg/L	NC	30	94	80 - 120
5191127	Total Dissolved Solids	2017/10/03					<50	mg/L	1.9	25	97	90 - 110
5191263	Total Suspended Solids	2017/10/02					<1	mg/L	12	25	98	85 - 115
5191450	Dissolved Chloride (Cl)	2017/10/02	NC	80 - 120	103	80 - 120	<1.0	mg/L	0.33	20		
5191452	Dissolved Sulphate (SO4)	2017/10/02	NC	75 - 125	102	80 - 120	<1.0	mg/L	1.1	20		
5191474	Dissolved Arsenic (As)	2017/10/02	95	80 - 120	100	80 - 120	<1.0	ug/L	1.0	20		
5191474	Dissolved Barium (Ba)	2017/10/02	98	80 - 120	101	80 - 120	<2.0	ug/L	8.4	20		
5191474	Dissolved Boron (B)	2017/10/02	101	80 - 120	104	80 - 120	<10	ug/L	NC	20		
5191474	Dissolved Cadmium (Cd)	2017/10/02	100	80 - 120	103	80 - 120	<0.10	ug/L	NC	20		
5191474	Dissolved Calcium (Ca)	2017/10/02	92	80 - 120	99	80 - 120	<200	ug/L	0.084	20		
5191474	Dissolved Chromium (Cr)	2017/10/02	97	80 - 120	100	80 - 120	<5.0	ug/L	NC	20		
5191474	Dissolved Copper (Cu)	2017/10/02	101	80 - 120	104	80 - 120	<1.0	ug/L	3.0	20		
5191474	Dissolved Iron (Fe)	2017/10/02	98	80 - 120	101	80 - 120	<100	ug/L	0.29	20		
5191474	Dissolved Lead (Pb)	2017/10/02	95	80 - 120	98	80 - 120	<0.50	ug/L	NC	20		
5191474	Dissolved Magnesium (Mg)	2017/10/02	98	80 - 120	101	80 - 120	<50	ug/L	0.93	20		
5191474	Dissolved Manganese (Mn)	2017/10/02	97	80 - 120	99	80 - 120	<2.0	ug/L	1.3	20		
5191474	Dissolved Potassium (K)	2017/10/02	98	80 - 120	101	80 - 120	<200	ug/L	8.3	20		
5191474	Dissolved Sodium (Na)	2017/10/02	96	80 - 120	100	80 - 120	<100	ug/L	0.67	20		
5191474	Dissolved Zinc (Zn)	2017/10/02	98	80 - 120	103	80 - 120	<5.0	ug/L	19	20		
5191501	Nitrate (N)	2017/10/04	NC	80 - 120	88	80 - 120	<0.10	mg/L	2.6	20		
5191501	Nitrite (N)	2017/10/04	NC	80 - 120	104	80 - 120	<0.010	mg/L	3.0	20		
5191504	Nitrate (N)	2017/10/03	99	80 - 120	96	80 - 120	<0.10	mg/L	NC	20		
5191504	Nitrite (N)	2017/10/03	106	80 - 120	103	80 - 120	<0.010	mg/L	NC	20		

Maxxam Job #: B7L4431
Report Date: 2018/03/07

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5191523	Alkalinity (Total as CaCO ₃)	2017/10/02			100	85 - 115	<1.0	mg/L	0.31	20		
5191525	Conductivity	2017/10/02			100	85 - 115	<1.0	umho/cm	0.29	25		
5191526	pH	2017/10/02			101	98 - 103			1.3	N/A		
5191549	Dissolved Organic Carbon	2017/10/01	98	80 - 120	100	80 - 120	<0.20	mg/L	0.58	20		
5192611	Total Dissolved Solids	2017/10/02					<50	mg/L	0	25	102	90 - 110
5193202	Total Chemical Oxygen Demand (COD)	2017/10/04	89	80 - 120	105	80 - 120	5.5, RDL=4.0	mg/L	5.2	20		
5193224	Total Ammonia-N	2017/10/04	96	80 - 120	101	85 - 115	<0.050	mg/L	NC	20		
5193227	Total Kjeldahl Nitrogen (TKN)	2017/10/04	109	80 - 120	99	80 - 120	<0.10	mg/L	1.2	20	103	80 - 120
5193756	Total Phosphorus	2017/10/03	95	80 - 120	90	80 - 120	<0.004	mg/L	NC	20	89	80 - 120
5193881	Total Phosphorus	2017/10/03	111	80 - 120	103	80 - 120	<0.020	mg/L	NC	20	106	80 - 120
5194093	Total Kjeldahl Nitrogen (TKN)	2017/10/04	NC	80 - 120	106	80 - 120	<0.10	mg/L	2.4	20	109	80 - 120
5194597	Phenols-4AAP	2017/10/04	101	80 - 120	101	80 - 120	<0.0010	mg/L	NC	20		
5196483	Total Arsenic (As)	2017/10/05	93	80 - 120	97	80 - 120	<1.0	ug/L	2.9	20		
5196483	Total Barium (Ba)	2017/10/05	92	80 - 120	98	80 - 120	<2.0	ug/L	3.8	20		
5196483	Total Boron (B)	2017/10/05	NC	80 - 120	93	80 - 120	<10	ug/L	8.4	20		
5196483	Total Cadmium (Cd)	2017/10/05	96	80 - 120	103	80 - 120	<0.10	ug/L	NC	20		
5196483	Total Chromium (Cr)	2017/10/05	91	80 - 120	99	80 - 120	<5.0	ug/L	NC	20		
5196483	Total Copper (Cu)	2017/10/05	95	80 - 120	106	80 - 120	<1.0	ug/L	0.39	20		
5196483	Total Iron (Fe)	2017/10/05	90	80 - 120	96	80 - 120	<100	ug/L	1.1	20		
5196483	Total Lead (Pb)	2017/10/05	95	80 - 120	98	80 - 120	<0.50	ug/L	5.3	20		
5196483	Total Zinc (Zn)	2017/10/05	95	80 - 120	99	80 - 120	<5.0	ug/L	8.7	20		
5196953	Mercury (Hg)	2017/10/05	113	75 - 125	111	80 - 120	<0.0001	mg/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-FE
Site Location: NAKINA LANDFILL SITE
Sampler Initials: EF

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5197309	Mercury (Hg)	2017/10/05	110	75 - 125	99	80 - 120	<0.0001	mg/L	NC	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name: #17501 exp Services Inc		Company Name: Ahileas Mitsopoulos		Quotation #: B66893		Maxxam Job #:	
Attention: Ahileas Mitsopoulos		Attention: Ahileas Mitsopoulos		P.O. #: THB-00011119-FE		Bottle Order #:	
Address: 1142 Roland St Thunder Bay ON P7B 5M4		Address:		Project: Making Landfill Site		COC #:	
Tel: (807) 623-9495 x Fax: (807) 623-8070 x		Tel: Fax:		Site #: Elwin Farkas		Project Manager:	
Email: ahileas.mitsopoulos@exp.com, michael.suslyk@exp.co		Email: ahileas.mitsopoulos@exp.com, michael.suslyk@exp.co		Sampled By:		Alison Cameron	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY				ANALYSIS REQUESTED (PLEASE BE SPECIFIC):				Turnaround Time (TAT) Required:																																																																												
Regulation 153 (2011) <input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Medium/Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/Other <input type="checkbox"/> For RSC <input type="checkbox"/> Table				Other Regulations <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> Reg 558 <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> MISA <input type="checkbox"/> Municipality <input checked="" type="checkbox"/> PWQO <input type="checkbox"/> Other: ODWS				Special Instructions				Regular (Standard) TAT: (will be applied if Rush TAT is not specified) Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details. <input checked="" type="checkbox"/>																																																																								
* Include Criteria on Certificate of Analysis (Y/N)? *				Field Filtered (please circle): Metals (circle) <input checked="" type="checkbox"/> Cr VI Landfill Standards Sch 5 - GW Comp List Landfill Standards Sch 5 - SW Comp List				Job Specific Rush TAT (if applies to entire submission) Date Required: Time Required: Rush Confirmation Number: (call lab for #)																																																																												
<table border="1"> <thead> <tr> <th>Sample Barcode Label</th> <th>Sample (Location) Identification</th> <th>Date Sampled</th> <th>Time Sampled</th> <th>Matrix</th> <th>TSP</th> <th>ENV-908</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MW 1</td> <td>Sept 27 2017</td> <td>11:20am</td> <td>GW</td> <td>X</td> <td>X</td> </tr> <tr> <td>2</td> <td>MW 3</td> <td>Sept 27 2017</td> <td>1:45pm</td> <td>GW</td> <td>X</td> <td>X</td> </tr> <tr> <td>3</td> <td>MW 4</td> <td>Sept 27 2017</td> <td>3:30pm</td> <td>GW</td> <td>X</td> <td>X</td> </tr> <tr> <td>4</td> <td>MW 5</td> <td>Sept 27 2017</td> <td>2:30pm</td> <td>GW</td> <td>X</td> <td>X</td> </tr> <tr> <td>5</td> <td>MW 6</td> <td>Sept 27 2017</td> <td>11:45am</td> <td>GW</td> <td>X</td> <td>X</td> </tr> <tr> <td>6</td> <td>SW 1</td> <td>Sept 27 2017</td> <td>2:00pm</td> <td>SW</td> <td></td> <td>X</td> </tr> <tr> <td>7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>9</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	TSP	ENV-908	1	MW 1	Sept 27 2017	11:20am	GW	X	X	2	MW 3	Sept 27 2017	1:45pm	GW	X	X	3	MW 4	Sept 27 2017	3:30pm	GW	X	X	4	MW 5	Sept 27 2017	2:30pm	GW	X	X	5	MW 6	Sept 27 2017	11:45am	GW	X	X	6	SW 1	Sept 27 2017	2:00pm	SW		X	7							8							9							10							# of Bottles: 10 Comments: Mercury bottle filtered, low level & slow recovery metals, No nutrients, No general, No solids bottle			
Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	TSP	ENV-908																																																																														
1	MW 1	Sept 27 2017	11:20am	GW	X	X																																																																														
2	MW 3	Sept 27 2017	1:45pm	GW	X	X																																																																														
3	MW 4	Sept 27 2017	3:30pm	GW	X	X																																																																														
4	MW 5	Sept 27 2017	2:30pm	GW	X	X																																																																														
5	MW 6	Sept 27 2017	11:45am	GW	X	X																																																																														
6	SW 1	Sept 27 2017	2:00pm	SW		X																																																																														
7																																																																																				
8																																																																																				
9																																																																																				
10																																																																																				
* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)		Time:		RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)		Time:		Laboratory Use Only																																																																								
Ahileas Mitsopoulos		17/09/28		4:00pm		Ahileas Mitsopoulos		2017/09/28		10:40		Time Sensitive: <input checked="" type="checkbox"/> Temperature (°C) on Recd: 10°C Custody Seal Present: <input checked="" type="checkbox"/> White: Maxxam Yellow: Client																																																																								

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CAWP-CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

Your Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Your C.O.C. #: 663246-01-01

Attention: Jay Zhang

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
CANADA P7B 5M4

Report Date: 2018/05/24
Report #: R5169248
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B8361

Received: 2018/05/17, 14:45

Sample Matrix: Water
Samples Received: 7

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	7	N/A	2018/05/20	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	1	2018/05/19	2018/05/24	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	7	N/A	2018/05/22	CAM SOP-00463	EPA 325.2 m
Chemical Oxygen Demand	6	N/A	2018/05/24	CAM SOP-00416	SM 23 5220 D m
Conductivity	7	N/A	2018/05/20	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	3	N/A	2018/05/22	CAM SOP-00446	SM 23 5310 B m
Dissolved Organic Carbon (DOC) (1)	2	N/A	2018/05/23	CAM SOP-00446	SM 23 5310 B m
Mercury in Water by CVAA	1	2018/05/22	2018/05/23	CAM SOP-00453	EPA 7470A m
Mercury in Water by CVAA	5	2018/05/23	2018/05/24	CAM SOP-00453	EPA 7470A m
Dissolved Metals by ICPMS	5	N/A	2018/05/23	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2018/05/23	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	5	N/A	2018/05/23		
Total Ammonia-N	6	N/A	2018/05/24	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	7	N/A	2018/05/22	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	7	N/A	2018/05/20	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	6	N/A	2018/05/23	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	7	N/A	2018/05/22	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	6	2018/05/22	2018/05/22	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	6	2018/05/23	2018/05/23	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2018/05/23	2018/05/24	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	5	2018/05/23	2018/05/24	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	1	2018/05/22	2018/05/22	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	5	N/A	2018/05/23	CAM SOP-00226	EPA 8260C m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All

Your Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Your C.O.C. #: 663246-01-01

Attention: Jay Zhang

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
CANADA P7B 5M4

Report Date: 2018/05/24
Report #: R5169248
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8B8361

Received: 2018/05/17, 14:45

data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Michelle Brescacin, Project Manager Assistant - National Accounts

Email: MBrescacin@maxxam.ca

Phone# (905) 817-5700

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		GST130		GST131			GST132		
Sampling Date		2018/05/16 09:45		2018/05/16 11:15			2018/05/16 11:55		
COC Number		663246-01-01		663246-01-01			663246-01-01		
	UNITS	MW1	QC Batch	MW2	RDL	QC Batch	MW3	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L	0.24	5543077	0.091	0.050	5543077	0.050	0.050	5543077
Total Chemical Oxygen Demand (COD)	mg/L	38	5543495	15	4.0	5543495	6.6	4.0	5543495
Conductivity	umho/cm	1000	5540062	240	1.0	5540062	1800	1.0	5540062
Total Dissolved Solids	mg/L	550	5541347	130	10	5541107	920	10	5541347
Total Kjeldahl Nitrogen (TKN)	mg/L	0.88	5543062	<0.10	0.10	5543062	<0.10	0.10	5543062
Dissolved Organic Carbon	mg/L	5.8	5539844	5.9	0.50	5539884	1.8	0.50	5539844
pH	pH	7.16	5540064	7.94		5540064	7.92		5540064
Phenols-4AAP	mg/L	<0.0010	5542522	<0.0010	0.0010	5542522	<0.0010	0.0010	5542522
Total Phosphorus	mg/L	1.6	5543365	1.1	0.10	5543365	0.21	0.020	5543365
Dissolved Sulphate (SO ₄)	mg/L	<1.0	5540325	<1.0	1.0	5540325	9.8	1.0	5540325
Alkalinity (Total as CaCO ₃)	mg/L	570	5540061	130	1.0	5540061	290	1.0	5540061
Dissolved Chloride (Cl)	mg/L	2.0	5540324	1.3	1.0	5540324	370	4.0	5540324
Nitrite (N)	mg/L	<0.010	5540196	<0.010	0.010	5540196	<0.010	0.010	5540189
Nitrate (N)	mg/L	2.95	5540196	<0.10	0.10	5540196	0.52	0.10	5540189
Metals									
Mercury (Hg)	mg/L	<0.0001	5543252	<0.0001	0.0001	5543252	<0.0001	0.0001	5543252
Dissolved Arsenic (As)	ug/L	1.1	5539833	<1.0	1.0	5539833	<1.0	1.0	5539833
Dissolved Barium (Ba)	ug/L	56	5539833	4.3	2.0	5539833	42	2.0	5539833
Dissolved Boron (B)	ug/L	48	5539833	<10	10	5539833	<10	10	5539833
Dissolved Cadmium (Cd)	ug/L	0.10	5539833	<0.10	0.10	5539833	<0.10	0.10	5539833
Dissolved Calcium (Ca)	ug/L	200000	5539833	38000	200	5539833	110000	200	5539833
Dissolved Chromium (Cr)	ug/L	<5.0	5539833	<5.0	5.0	5539833	<5.0	5.0	5539833
Dissolved Copper (Cu)	ug/L	6.0	5539833	1.5	1.0	5539833	6.5	1.0	5539833
Dissolved Iron (Fe)	ug/L	510	5539833	<100	100	5539833	<100	100	5539833
Dissolved Lead (Pb)	ug/L	<0.50	5539833	<0.50	0.50	5539833	1.0	0.50	5539833
Dissolved Magnesium (Mg)	ug/L	13000	5539833	6200	50	5539833	13000	50	5539833
Dissolved Manganese (Mn)	ug/L	2100	5539833	<2.0	2.0	5539833	<2.0	2.0	5539833
Dissolved Potassium (K)	ug/L	2800	5539833	330	200	5539833	2000	200	5539833
Dissolved Sodium (Na)	ug/L	2700	5539833	1300	100	5539833	230000	100	5539833
Dissolved Zinc (Zn)	ug/L	<5.0	5539833	<5.0	5.0	5539833	17	5.0	5539833
Volatile Organics									
Benzene	ug/L	<0.10	5535802	<0.10	0.10	5535802	<0.10	0.10	5535802
1,4-Dichlorobenzene	ug/L	<0.20	5535802	<0.20	0.20	5535802	<0.20	0.20	5535802
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									

Maxxam Job #: B8B8361
Report Date: 2018/05/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		GST130		GST131			GST132		
Sampling Date		2018/05/16 09:45		2018/05/16 11:15			2018/05/16 11:55		
COC Number		663246-01-01		663246-01-01			663246-01-01		
	UNITS	MW1	QC Batch	MW2	RDL	QC Batch	MW3	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<0.50	5535802	<0.50	0.50	5535802	<0.50	0.50	5535802
Toluene	ug/L	<0.20	5535802	<0.20	0.20	5535802	<0.20	0.20	5535802
Vinyl Chloride	ug/L	<0.20	5535802	<0.20	0.20	5535802	<0.20	0.20	5535802
Surrogate Recovery (%)									
4-Bromofluorobenzene	%	99	5535802	99		5535802	96		5535802
D4-1,2-Dichloroethane	%	107	5535802	104		5535802	103		5535802
D8-Toluene	%	99	5535802	98		5535802	98		5535802
RDL = Reportable Detection Limit									
QC Batch = Quality Control Batch									

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		GST134			GST135		
Sampling Date		2018/05/16 10:40			2018/05/16 11:50		
COC Number		663246-01-01			663246-01-01		
	UNITS	MW5	RDL	QC Batch	MW6	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.059	0.050	5543077	0.25	0.050	5543077
Total Chemical Oxygen Demand (COD)	mg/L	31	4.0	5543495	44	4.0	5543495
Conductivity	umho/cm	1600	1.0	5540062	1000	1.0	5540062
Total Dissolved Solids	mg/L	910	10	5541107	560	10	5541347
Total Kjeldahl Nitrogen (TKN)	mg/L	0.39	0.10	5543062	0.86	0.10	5543062
Dissolved Organic Carbon	mg/L	11	0.50	5539884	5.8	0.50	5539844
pH	pH	7.19		5540064	7.13		5540064
Phenols-4AAP	mg/L	0.0013	0.0010	5542522	<0.0010	0.0010	5542522
Total Phosphorus	mg/L	0.26	0.020	5543365	1.9	0.10	5543365
Dissolved Sulphate (SO4)	mg/L	42	1.0	5540325	<1.0	1.0	5540325
Alkalinity (Total as CaCO3)	mg/L	840	1.0	5540061	580	1.0	5540061
Dissolved Chloride (Cl)	mg/L	66	1.0	5540324	1.8	1.0	5540324
Nitrite (N)	mg/L	<0.010	0.010	5540196	0.010	0.010	5540196
Nitrate (N)	mg/L	0.14	0.10	5540196	3.18	0.10	5540196
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5543252	<0.0001	0.0001	5543252
Dissolved Arsenic (As)	ug/L	<1.0	1.0	5539833	1.0	1.0	5539833
Dissolved Barium (Ba)	ug/L	75	2.0	5539833	54	2.0	5539833
Dissolved Boron (B)	ug/L	490	10	5539833	46	10	5539833
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	5539833	0.10	0.10	5539833
Dissolved Calcium (Ca)	ug/L	250000	200	5539833	200000	200	5539833
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	5539833	<5.0	5.0	5539833
Dissolved Copper (Cu)	ug/L	14	1.0	5539833	5.1	1.0	5539833
Dissolved Iron (Fe)	ug/L	<100	100	5539833	500	100	5539833
Dissolved Lead (Pb)	ug/L	<0.50	0.50	5539833	<0.50	0.50	5539833
Dissolved Magnesium (Mg)	ug/L	42000	50	5539833	13000	50	5539833
Dissolved Manganese (Mn)	ug/L	1400	2.0	5539833	2100	2.0	5539833
Dissolved Potassium (K)	ug/L	2900	200	5539833	2800	200	5539833
Dissolved Sodium (Na)	ug/L	53000	100	5539833	2700	100	5539833
Dissolved Zinc (Zn)	ug/L	5.3	5.0	5539833	<5.0	5.0	5539833
Volatile Organics							
Benzene	ug/L	1.2	0.10	5535802	<0.10	0.10	5535802
1,4-Dichlorobenzene	ug/L	<0.20	0.20	5535802	<0.20	0.20	5535802
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

Maxxam Job #: B888361
Report Date: 2018/05/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		GST134			GST135		
Sampling Date		2018/05/16 10:40			2018/05/16 11:50		
COC Number		663246-01-01			663246-01-01		
	UNITS	MW5	RDL	QC Batch	MW6	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<0.50	0.50	5535802	<0.50	0.50	5535802
Toluene	ug/L	<0.20	0.20	5535802	<0.20	0.20	5535802
Vinyl Chloride	ug/L	4.6	0.20	5535802	<0.20	0.20	5535802
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	101		5535802	97		5535802
D4-1,2-Dichloroethane	%	107		5535802	107		5535802
D8-Toluene	%	98		5535802	98		5535802
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

LANDFILL STANDARDS SCH 5 - SW COMP. LIST (WATER)

Maxxam ID		GST136			GST136		
Sampling Date		2018/05/16 10:25			2018/05/16 10:25		
COC Number		663246-01-01			663246-01-01		
	UNITS	SW1	RDL	QC Batch	SW1 Lab-Dup	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.31	0.050	5543077			
Total BOD	mg/L	2	2	5539801			
Total Chemical Oxygen Demand (COD)	mg/L	22	4.0	5543495			
Conductivity	umho/cm	210	1.0	5540062			
Total Dissolved Solids	mg/L	100	10	5541107	90	10	5541107
Total Kjeldahl Nitrogen (TKN)	mg/L	0.63	0.10	5543062			
pH	pH	7.90		5540064			
Phenols-4AAP	mg/L	<0.0010	0.0010	5542522			
Total Phosphorus	mg/L	0.013	0.004	5542940			
Total Suspended Solids	mg/L	5	1	5541587			
Dissolved Sulphate (SO4)	mg/L	5.0	1.0	5540325	5.0	1.0	5540325
Alkalinity (Total as CaCO3)	mg/L	100	1.0	5540061			
Dissolved Chloride (Cl)	mg/L	2.6	1.0	5540324	2.6	1.0	5540324
Nitrite (N)	mg/L	<0.010	0.010	5540196			
Nitrate (N)	mg/L	<0.10	0.10	5540196			
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5541513			
Total Arsenic (As)	ug/L	<1.0	1.0	5542384			
Total Barium (Ba)	ug/L	8.4	2.0	5542384			
Total Boron (B)	ug/L	26	10	5542384			
Total Cadmium (Cd)	ug/L	<0.10	0.10	5542384			
Total Chromium (Cr)	ug/L	<5.0	5.0	5542384			
Total Copper (Cu)	ug/L	<1.0	1.0	5542384			
Total Iron (Fe)	ug/L	<100	100	5542384			
Total Lead (Pb)	ug/L	<0.50	0.50	5542384			
Total Zinc (Zn)	ug/L	<5.0	5.0	5542384			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							

RESULTS OF ANALYSES OF WATER

Maxxam ID		GST130	GST131	GST132		GST133		
Sampling Date		2018/05/16 09:45	2018/05/16 11:15	2018/05/16 11:55		2018/05/16 13:45		
COC Number		663246-01-01	663246-01-01	663246-01-01		663246-01-01		
	UNITS	MW1	MW2	MW3	QC Batch	MW4	RDL	QC Batch
Calculated Parameters								
Ion Balance (% Difference)	%	2.95	NC	0.440	5537742			
Inorganics								
Conductivity	umho/cm					380	1.0	5540062
pH	pH					8.15		5540064
Dissolved Sulphate (SO ₄)	mg/L					4.0	1.0	5540325
Alkalinity (Total as CaCO ₃)	mg/L					200	1.0	5540061
Dissolved Chloride (Cl)	mg/L					1.4	1.0	5540324
Nitrite (N)	mg/L					<0.010	0.010	5540196
Nitrate (N)	mg/L					0.18	0.10	5540196
RDL = Reportable Detection Limit								
QC Batch = Quality Control Batch								

Maxxam ID		GST134		GST135	
Sampling Date		2018/05/16 10:40		2018/05/16 11:50	
COC Number		663246-01-01		663246-01-01	
	UNITS	MW5	QC Batch	MW6	QC Batch
Calculated Parameters					
Ion Balance (% Difference)	%	3.24	5537742	2.95	5538912
QC Batch = Quality Control Batch					

Maxxam Job #: B8B8361
Report Date: 2018/05/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

TEST SUMMARY

Maxxam ID: GST130
Sample ID: MW1
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5540061	N/A	2018/05/20	Yogesh Patel
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5543495	N/A	2018/05/24	Shivani Shivani
Conductivity	AT	5540062	N/A	2018/05/20	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5539844	N/A	2018/05/22	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5543252	2018/05/23	2018/05/24	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5539833	N/A	2018/05/23	Thao Nguyen
Ion Balance (% Difference)	CALC	5537742	N/A	2018/05/23	Automated Statchk
Total Ammonia-N	LACH/NH4	5543077	N/A	2018/05/24	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5540196	N/A	2018/05/22	Chandra Nandlal
pH	AT	5540064	N/A	2018/05/20	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5542522	N/A	2018/05/23	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine
Total Dissolved Solids	BAL	5541347	2018/05/22	2018/05/22	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5543062	2018/05/23	2018/05/23	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5543365	2018/05/23	2018/05/24	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5535802	N/A	2018/05/23	Rebecca McClean

Maxxam ID: GST131
Sample ID: MW2
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5540061	N/A	2018/05/20	Yogesh Patel
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5543495	N/A	2018/05/24	Shivani Shivani
Conductivity	AT	5540062	N/A	2018/05/20	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5539884	N/A	2018/05/23	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5543252	2018/05/23	2018/05/24	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5539833	N/A	2018/05/23	Thao Nguyen
Ion Balance (% Difference)	CALC	5537742	N/A	2018/05/23	Automated Statchk
Total Ammonia-N	LACH/NH4	5543077	N/A	2018/05/24	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5540196	N/A	2018/05/22	Chandra Nandlal
pH	AT	5540064	N/A	2018/05/20	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5542522	N/A	2018/05/23	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine
Total Dissolved Solids	BAL	5541107	2018/05/22	2018/05/22	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5543062	2018/05/23	2018/05/23	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5543365	2018/05/23	2018/05/24	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5535802	N/A	2018/05/23	Rebecca McClean

Maxxam Job #: B8B8361
Report Date: 2018/05/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

TEST SUMMARY

Maxxam ID: GST132
Sample ID: MW3
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5540061	N/A	2018/05/20	Yogesh Patel
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5543495	N/A	2018/05/24	Shivani Shivani
Conductivity	AT	5540062	N/A	2018/05/20	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5539844	N/A	2018/05/22	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5543252	2018/05/23	2018/05/24	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5539833	N/A	2018/05/23	Thao Nguyen
Ion Balance (% Difference)	CALC	5537742	N/A	2018/05/23	Automated Statchk
Total Ammonia-N	LACH/NH4	5543077	N/A	2018/05/24	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5540189	N/A	2018/05/22	Chandra Nandlal
pH	AT	5540064	N/A	2018/05/20	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5542522	N/A	2018/05/23	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine
Total Dissolved Solids	BAL	5541347	2018/05/22	2018/05/22	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5543062	2018/05/23	2018/05/23	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5543365	2018/05/23	2018/05/24	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5535802	N/A	2018/05/23	Rebecca McClean

Maxxam ID: GST133
Sample ID: MW4
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5540061	N/A	2018/05/20	Yogesh Patel
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Conductivity	AT	5540062	N/A	2018/05/20	Yogesh Patel
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5540196	N/A	2018/05/22	Chandra Nandlal
pH	AT	5540064	N/A	2018/05/20	Yogesh Patel
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine

Maxxam ID: GST134
Sample ID: MW5
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5540061	N/A	2018/05/20	Yogesh Patel
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5543495	N/A	2018/05/24	Shivani Shivani
Conductivity	AT	5540062	N/A	2018/05/20	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5539884	N/A	2018/05/23	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5543252	2018/05/23	2018/05/24	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5539833	N/A	2018/05/23	Thao Nguyen
Ion Balance (% Difference)	CALC	5537742	N/A	2018/05/23	Automated Statchk
Total Ammonia-N	LACH/NH4	5543077	N/A	2018/05/24	Parminder Sangha

Maxxam Job #: B8B8361
Report Date: 2018/05/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

TEST SUMMARY

Maxxam ID: GST134
Sample ID: MW5
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5540196	N/A	2018/05/22	Chandra Nandlal
pH	AT	5540064	N/A	2018/05/20	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5542522	N/A	2018/05/23	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine
Total Dissolved Solids	BAL	5541107	2018/05/22	2018/05/22	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5543062	2018/05/23	2018/05/23	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5543365	2018/05/23	2018/05/24	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5535802	N/A	2018/05/23	Rebecca McClean

Maxxam ID: GST135
Sample ID: MW6
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5540061	N/A	2018/05/20	Yogesh Patel
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5543495	N/A	2018/05/24	Shivani Shivani
Conductivity	AT	5540062	N/A	2018/05/20	Yogesh Patel
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5539844	N/A	2018/05/22	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5543252	2018/05/23	2018/05/24	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5539833	N/A	2018/05/23	Thao Nguyen
Ion Balance (% Difference)	CALC	5538912	N/A	2018/05/23	Automated Statchk
Total Ammonia-N	LACH/NH4	5543077	N/A	2018/05/24	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5540196	N/A	2018/05/22	Chandra Nandlal
pH	AT	5540064	N/A	2018/05/20	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5542522	N/A	2018/05/23	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine
Total Dissolved Solids	BAL	5541347	2018/05/22	2018/05/22	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5543062	2018/05/23	2018/05/23	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5543365	2018/05/23	2018/05/24	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5535802	N/A	2018/05/23	Rebecca McClean

Maxxam ID: GST136
Sample ID: SW1
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5540061	N/A	2018/05/20	Yogesh Patel
Biochemical Oxygen Demand (BOD)	DO	5539801	2018/05/19	2018/05/24	Prakash Piya
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5543495	N/A	2018/05/24	Shivani Shivani
Conductivity	AT	5540062	N/A	2018/05/20	Yogesh Patel
Mercury in Water by CVAA	CV/AA	5541513	2018/05/22	2018/05/23	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5542384	N/A	2018/05/23	Kevin Comerford

Maxxam Job #: B8B8361
Report Date: 2018/05/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

TEST SUMMARY

Maxxam ID: GST136
Sample ID: SW1
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Ammonia-N	LACH/NH4	5543077	N/A	2018/05/24	Parminder Sangha
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5540196	N/A	2018/05/22	Chandra Nandlal
pH	AT	5540064	N/A	2018/05/20	Yogesh Patel
Phenols (4AAP)	TECH/PHEN	5542522	N/A	2018/05/23	Zahid Soikot
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine
Total Dissolved Solids	BAL	5541107	2018/05/22	2018/05/22	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5543062	2018/05/23	2018/05/23	Rajni Tyagi
Total Phosphorus (Colourimetric)	LACH/P	5542940	2018/05/23	2018/05/24	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5541587	2018/05/22	2018/05/22	Nusrat Naz

Maxxam ID: GST136 Dup
Sample ID: SW1
Matrix: Water

Collected: 2018/05/16
Shipped:
Received: 2018/05/17

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride by Automated Colourimetry	KONE	5540324	N/A	2018/05/22	Deonarine Ramnarine
Sulphate by Automated Colourimetry	KONE	5540325	N/A	2018/05/22	Deonarine Ramnarine
Total Dissolved Solids	BAL	5541107	2018/05/22	2018/05/22	Jingwei (Alvin) Shi

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	4.0°C
Package 2	1.7°C
Package 3	4.7°C
Package 4	5.7°C
Package 5	5.3°C
Package 6	4.3°C
Package 7	3.0°C
Package 8	4.0°C
Package 9	2.7°C
Package 10	1.3°C

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5535802	4-Bromofluorobenzene	2018/05/22	100	70 - 130	101	70 - 130	98	%				
5535802	D4-1,2-Dichloroethane	2018/05/22	101	70 - 130	100	70 - 130	103	%				
5535802	D8-Toluene	2018/05/22	100	70 - 130	100	70 - 130	99	%				
5535802	1,4-Dichlorobenzene	2018/05/22	101	70 - 130	102	70 - 130	<0.20	ug/L	NC	30		
5535802	Benzene	2018/05/22	NC	70 - 130	102	70 - 130	<0.10	ug/L	0.82	30		
5535802	Methylene Chloride(Dichloromethane)	2018/05/22	97	70 - 130	97	70 - 130	<0.50	ug/L	NC	30		
5535802	Toluene	2018/05/22	100	70 - 130	100	70 - 130	<0.20	ug/L	NC	30		
5535802	Vinyl Chloride	2018/05/22	104	70 - 130	104	70 - 130	<0.20	ug/L	NC	30		
5539801	Total BOD	2018/05/24					<2	mg/L	NC	30	94	80 - 120
5539833	Dissolved Arsenic (As)	2018/05/23	104	80 - 120	99	80 - 120	<1.0	ug/L	5.3	20		
5539833	Dissolved Barium (Ba)	2018/05/23	100	80 - 120	100	80 - 120	<2.0	ug/L	0.018	20		
5539833	Dissolved Boron (B)	2018/05/23	NC	80 - 120	100	80 - 120	<10	ug/L	0.50	20		
5539833	Dissolved Cadmium (Cd)	2018/05/23	102	80 - 120	102	80 - 120	<0.10	ug/L	NC	20		
5539833	Dissolved Calcium (Ca)	2018/05/23	NC	80 - 120	98	80 - 120	<200	ug/L	0.43	20		
5539833	Dissolved Chromium (Cr)	2018/05/23	99	80 - 120	97	80 - 120	<5.0	ug/L	NC	20		
5539833	Dissolved Copper (Cu)	2018/05/23	102	80 - 120	101	80 - 120	<1.0	ug/L	17	20		
5539833	Dissolved Iron (Fe)	2018/05/23	104	80 - 120	103	80 - 120	<100	ug/L	0.68	20		
5539833	Dissolved Lead (Pb)	2018/05/23	94	80 - 120	96	80 - 120	<0.50	ug/L	NC	20		
5539833	Dissolved Magnesium (Mg)	2018/05/23	NC	80 - 120	101	80 - 120	<50	ug/L	1.2	20		
5539833	Dissolved Manganese (Mn)	2018/05/23	NC	80 - 120	100	80 - 120	<2.0	ug/L	0.57	20		
5539833	Dissolved Potassium (K)	2018/05/23	NC	80 - 120	102	80 - 120	<200	ug/L	0.13	20		
5539833	Dissolved Sodium (Na)	2018/05/23	NC	80 - 120	100	80 - 120	<100	ug/L	0.52	20		
5539833	Dissolved Zinc (Zn)	2018/05/23	98	80 - 120	99	80 - 120	<5.0	ug/L	NC	20		
5539844	Dissolved Organic Carbon	2018/05/22	92	80 - 120	94	80 - 120	<0.50	mg/L	2.6	20		
5539844	Dissolved Organic Carbon	2018/05/23	92	80 - 120	95	80 - 120	<0.50	mg/L	1.0	20		
5540061	Alkalinity (Total as CaCO3)	2018/05/20			93	85 - 115	<1.0	mg/L	0.66	20		
5540062	Conductivity	2018/05/20			100	85 - 115	<1.0	umho/cm	0	25		
5540064	pH	2018/05/20			101	98 - 103			0.28	N/A		
5540189	Nitrate (N)	2018/05/22	104	80 - 120	102	80 - 120	<0.10	mg/L	NC	20		
5540189	Nitrite (N)	2018/05/22	95	80 - 120	93	80 - 120	<0.010	mg/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5540196	Nitrate (N)	2018/05/22	106	80 - 120	102	80 - 120	<0.10	mg/L	NC	20		
5540196	Nitrite (N)	2018/05/22	96	80 - 120	93	80 - 120	<0.010	mg/L	NC	20		
5540324	Dissolved Chloride (Cl)	2018/05/22	108	80 - 120	103	80 - 120	<1.0	mg/L	2.5	20		
5540325	Dissolved Sulphate (SO4)	2018/05/22	112	75 - 125	101	80 - 120	<1.0	mg/L	0.56	20		
5541107	Total Dissolved Solids	2018/05/22					<10	mg/L	11	25	98	90 - 110
5541347	Total Dissolved Solids	2018/05/22					<10	mg/L	0	25	100	90 - 110
5541513	Mercury (Hg)	2018/05/23	114	75 - 125	104	80 - 120	<0.0001	mg/L	NC	20		
5541587	Total Suspended Solids	2018/05/22					<1	mg/L	0	25	97	85 - 115
5542384	Total Arsenic (As)	2018/05/23	103	80 - 120	99	80 - 120	<1.0	ug/L	NC	20		
5542384	Total Barium (Ba)	2018/05/23	100	80 - 120	98	80 - 120	<2.0	ug/L	3.7	20		
5542384	Total Boron (B)	2018/05/23	97	80 - 120	93	80 - 120	<10	ug/L				
5542384	Total Cadmium (Cd)	2018/05/23	103	80 - 120	101	80 - 120	<0.10	ug/L	NC	20		
5542384	Total Chromium (Cr)	2018/05/23	97	80 - 120	94	80 - 120	<5.0	ug/L	NC	20		
5542384	Total Copper (Cu)	2018/05/23	101	80 - 120	96	80 - 120	<1.0	ug/L	1.4	20		
5542384	Total Iron (Fe)	2018/05/23	100	80 - 120	98	80 - 120	<100	ug/L	2.8	20		
5542384	Total Lead (Pb)	2018/05/23	96	80 - 120	98	80 - 120	<0.50	ug/L	1.5	20		
5542384	Total Zinc (Zn)	2018/05/23	99	80 - 120	102	80 - 120	<5.0	ug/L	0.43	20		
5542522	Phenols-4AAP	2018/05/23	92	80 - 120	95	80 - 120	<0.0010	mg/L	NC	20		
5542940	Total Phosphorus	2018/05/24	102	80 - 120	86	80 - 120	<0.004	mg/L	7.7	20	88	80 - 120
5543062	Total Kjeldahl Nitrogen (TKN)	2018/05/23	88	80 - 120	103	80 - 120	<0.10	mg/L	NC (1)	20	97	80 - 120
5543077	Total Ammonia-N	2018/05/24	104	75 - 125	102	80 - 120	<0.050	mg/L	NC	20		
5543252	Mercury (Hg)	2018/05/24	96	75 - 125	94	80 - 120	<0.0001	mg/L	NC	20		
5543365	Total Phosphorus	2018/05/24	101	80 - 120	104	80 - 120	<0.020	mg/L	2.2	20	100	80 - 120

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: JZ

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5543495	Total Chemical Oxygen Demand (COD)	2018/05/24	104	80 - 120	101	80 - 120	<4.0	mg/L	4.8	20		

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times$ RDL).

(1) Due to a high concentration of NO_x, the sample required dilution. The detection limit was adjusted accordingly.

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Cristina Carriere

Cristina Carriere, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics.
6740 Campbell Road, Mississauga, Ontario Canada L5N 2L8 Tel:(905) 817-5700 Toll-free: 800-593-6266 Fax:(905) 817-5777 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name: #17501 exp Services Inc		Company Name: Jay Zhang		Quotation #: B75386		Maxxam Job #:	
Attention: accounts payable		Attention: Jay Zhang		P.O. #:		Bottle Order #:	
Address: 1142 Roland St		Address:		Project: THB-00011119-GE		663246	
Thunder Bay ON P7B 5M4				Project Name: Nakina Landfill		COC #:	
Tel: (807) 623-9495 x Fax: (807) 623-8070 x		Tel: (807) 623-9495 x Fax:		Site #: 32/MC		Project Manager:	
Email: thunderbay@exp.com; Karen.Burke@exp.com; AP@ex		Email: jay.zhang@exp.com		Sampled By:		Michelle Brescacin	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)		Other Regulations		Special Instructions	
<input type="checkbox"/> Table 1	<input type="checkbox"/> Res/Park	<input type="checkbox"/> CCME	<input type="checkbox"/> Sanitary Sewer Bylaw		
<input type="checkbox"/> Table 2	<input type="checkbox"/> Ind/Comm	<input type="checkbox"/> Reg 558	<input type="checkbox"/> Storm Sewer Bylaw		
<input type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other	<input type="checkbox"/> MISA	<input type="checkbox"/> Municipality		
<input type="checkbox"/> Table		<input checked="" type="checkbox"/> PWGO			
		<input checked="" type="checkbox"/> Other: OPWS			

Include Criteria on Certificate of Analysis (Y/N)?

Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (Please circle): Metals / Hg / Cr / V	Landfill Standard Sch 5 - GW Comp. List	Landfill Standard Sch 5 - SW Comp. List	Analysis Requested (Please be specific)	Turnaround Time (TAT) Required: Please provide advance notice for rush projects
1	MW1	May 16/18	09:45	GW	Metals Hg X			17-May-18 14:45 Michelle Brescacin B8B8361 HGL ENV-021	Regular (Standard) TAT: (will be applied if Rush TAT is not specified) Standard TAT = 5-7 Working days for most tests. Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details. Job Specific Rush TAT (if applies to entire submission) Date Required: Time Required: Rush Confirmation Number: (call lab for #)
2	MW2	May 16/18	11:15	GW	Metals Hg X				# of Bottles: 10 Comments:
3	MW3	May 16/18	11:55	GW	Metals Hg X				
4	MW4	May 16/18	13:45	GW	Metals Hg X				
5	MW5	May 16/18	10:40	GW	Metals Hg X				
6	MW6	May 16/18	11:50	GW	Metals Hg X				
7	SW1	May 16/18	10:25	SW	Hg X	X			Only have enough water to fill half of a general bottle.
8									
9									
10									

BOD

Rec'd in Thunder Bay

* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	# Jars used and not submitted	Laboratory Use Only	
Jay Zhang		18/05/17	2:00pm	Michelle Brescacin		18/05/17	14:45		Time Sensitive	Temperature (°C) on Receipt
Jay Zhang									Present	Custody Seal
									Intact	Yes
										No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/WP-CONTENT/UPLOADS/ONTARIO-DOC.PDF.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxa Yellow: Client

Your Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Your C.O.C. #: 684815-01-01

Attention: Jay Zhang

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
CANADA P7B 5M4

Report Date: 2018/10/24
Report #: R5455055
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8R7142

Received: 2018/10/18, 13:00

Sample Matrix: Water
Samples Received: 6

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Alkalinity	6	N/A	2018/10/21	CAM SOP-00448	SM 23 2320 B m
Biochemical Oxygen Demand (BOD)	1	2018/10/19	2018/10/24	CAM SOP-00427	SM 23 5210B m
Chloride by Automated Colourimetry	6	N/A	2018/10/23	CAM SOP-00463	EPA 325.2 m
Chemical Oxygen Demand	5	N/A	2018/10/23	CAM SOP-00416	SM 23 5220 D m
Chemical Oxygen Demand	1	N/A	2018/10/24	CAM SOP-00416	SM 23 5220 D m
Conductivity	6	N/A	2018/10/21	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	5	N/A	2018/10/21	CAM SOP-00446	SM 23 5310 B m
Mercury in Water by CVAA	6	2018/10/22	2018/10/23	CAM SOP-00453	EPA 7470A m
Lab Filtered Metals by ICPMS	1	2018/10/20	2018/10/23	CAM SOP-00447	EPA 6020B m
Dissolved Metals by ICPMS	4	N/A	2018/10/22	CAM SOP-00447	EPA 6020B m
Total Metals Analysis by ICPMS	1	N/A	2018/10/23	CAM SOP-00447	EPA 6020B m
Ion Balance (% Difference)	5	N/A	2018/10/24		
Total Ammonia-N	6	N/A	2018/10/24	CAM SOP-00441	EPA GS I-2522-90 m
Nitrate (NO3) and Nitrite (NO2) in Water (2)	5	N/A	2018/10/22	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate (NO3) and Nitrite (NO2) in Water (2)	1	N/A	2018/10/23	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	6	N/A	2018/10/21	CAM SOP-00413	SM 4500H+ B m
Phenols (4AAP)	6	N/A	2018/10/22	CAM SOP-00444	OMOE E3179 m
Sulphate by Automated Colourimetry	6	N/A	2018/10/23	CAM SOP-00464	EPA 375.4 m
Total Dissolved Solids	4	2018/10/20	2018/10/22	CAM SOP-00428	SM 23 2540C m
Total Dissolved Solids	2	2018/10/23	2018/10/24	CAM SOP-00428	SM 23 2540C m
Total Kjeldahl Nitrogen in Water	6	2018/10/22	2018/10/23	CAM SOP-00938	OMOE E3516 m
Total Phosphorus (Colourimetric)	1	2018/10/22	2018/10/23	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	1	2018/10/22	2018/10/22	CAM SOP-00407	SM 23 4500 P B H m
Total Phosphorus (Colourimetric)	4	2018/10/22	2018/10/23	CAM SOP-00407	SM 23 4500 P B H m
Low Level Total Suspended Solids	1	2018/10/22	2018/10/23	CAM SOP-00428	SM 23 2540D m
Volatile Organic Compounds in Water	5	N/A	2018/10/23	CAM SOP-00226	EPA 8260C m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

Your Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Your C.O.C. #: 684815-01-01

Attention: Jay Zhang

exp Services Inc
Thunder Bay Branch
1142 Roland St
Thunder Bay, ON
CANADA P7B 5M4

Report Date: 2018/10/24
Report #: R5455055
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8R7142

Received: 2018/10/18, 13:00

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Michelle Brescacin, Project Manager Assistant - National Accounts

Email: MBrescacin@maxxam.ca

Phone# (905) 817-5700

=====

This report has been generated and distributed using a secure automated process.

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		IBI349			IBI350		
Sampling Date		2018/10/15 16:30			2018/10/15 15:53		
COC Number		684815-01-01			684815-01-01		
	UNITS	MW1	RDL	QC Batch	MW3	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.51	0.050	5796360	0.062	0.050	5796360
Total Chemical Oxygen Demand (COD)	mg/L	110	4.0	5796411	8.3	4.0	5796407
Conductivity	umho/cm	1200	1.0	5794469	1900	1.0	5794469
Total Dissolved Solids	mg/L	695	10	5798461	1030	10	5793539
Total Kjeldahl Nitrogen (TKN)	mg/L	2.2	0.10	5796384	0.19	0.10	5796384
Dissolved Organic Carbon	mg/L	11	0.50	5793484	2.1	0.50	5793484
pH	pH	7.27		5794470	7.83		5794470
Phenols-4AAP	mg/L	<0.0010	0.0010	5795428	<0.0010	0.0010	5795417
Total Phosphorus	mg/L	2.6	0.10	5795845	0.18	0.10	5795903
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	5794622	9.2	1.0	5794622
Alkalinity (Total as CaCO3)	mg/L	690	1.0	5794468	260	1.0	5794468
Dissolved Chloride (Cl-)	mg/L	15	1.0	5794621	430	5.0	5794621
Nitrite (N)	mg/L	0.048	0.010	5794833	<0.010	0.010	5794612
Nitrate (N)	mg/L	0.28	0.10	5794833	0.53	0.10	5794612
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5795858	<0.0001	0.0001	5795962
Dissolved Arsenic (As)	ug/L	1.7	1.0	5794741	<1.0	1.0	5794741
Dissolved Barium (Ba)	ug/L	80	2.0	5794741	50	2.0	5794741
Dissolved Boron (B)	ug/L	67	10	5794741	12	10	5794741
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	5794741	<0.10	0.10	5794741
Dissolved Calcium (Ca)	ug/L	240000	200	5794741	140000	200	5794741
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	5794741	<5.0	5.0	5794741
Dissolved Copper (Cu)	ug/L	12	1.0	5794741	1.9	1.0	5794741
Dissolved Iron (Fe)	ug/L	2500	100	5794741	<100	100	5794741
Dissolved Lead (Pb)	ug/L	<0.50	0.50	5794741	<0.50	0.50	5794741
Dissolved Magnesium (Mg)	ug/L	17000	50	5794741	17000	50	5794741
Dissolved Manganese (Mn)	ug/L	4100	2.0	5794741	<2.0	2.0	5794741
Dissolved Potassium (K)	ug/L	4400	200	5794741	2100	200	5794741
Dissolved Sodium (Na)	ug/L	9000	100	5794741	180000	100	5794741
Dissolved Zinc (Zn)	ug/L	10	5.0	5794741	<5.0	5.0	5794741
Volatile Organics							
Benzene	ug/L	<0.50	0.50	5793701	<0.10	0.10	5793701
1,4-Dichlorobenzene	ug/L	<1.0	1.0	5793701	<0.20	0.20	5793701
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		IBI349			IBI350		
Sampling Date		2018/10/15 16:30			2018/10/15 15:53		
COC Number		684815-01-01			684815-01-01		
	UNITS	MW1	RDL	QC Batch	MW3	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<2.5	2.5	5793701	<0.50	0.50	5793701
Toluene	ug/L	<1.0	1.0	5793701	<0.20	0.20	5793701
Vinyl Chloride	ug/L	<1.0	1.0	5793701	<0.20	0.20	5793701
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	101		5793701	99		5793701
D4-1,2-Dichloroethane	%	101		5793701	101		5793701
D8-Toluene	%	98		5793701	96		5793701
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		IBI352			IBI352		
Sampling Date		2018/10/15 17:11			2018/10/15 17:11		
COC Number		684815-01-01			684815-01-01		
	UNITS	MW5	RDL	QC Batch	MW5 Lab-Dup	RDL	QC Batch
Inorganics							
Total Ammonia-N	mg/L	0.071	0.050	5796360			
Total Chemical Oxygen Demand (COD)	mg/L	39	4.0	5796411	40	4.0	5796411
Conductivity	umho/cm	1600	1.0	5794469	1500	1.0	5794469
Total Dissolved Solids	mg/L	905	10	5793539			
Total Kjeldahl Nitrogen (TKN)	mg/L	0.59	0.10	5796384			
Dissolved Organic Carbon	mg/L	11	0.50	5793484			
pH	pH	7.16		5794470	7.10		5794470
Phenols-4AAP	mg/L	<0.0010	0.0010	5795417	<0.0010	0.0010	5795417
Total Phosphorus	mg/L	0.18	0.10	5795903			
Dissolved Sulphate (SO4)	mg/L	39	1.0	5794622			
Alkalinity (Total as CaCO3)	mg/L	790	1.0	5794468	790	1.0	5794468
Dissolved Chloride (Cl-)	mg/L	62	1.0	5794621			
Nitrite (N)	mg/L	<0.010	0.010	5794612			
Nitrate (N)	mg/L	0.11	0.10	5794612			
Metals							
Mercury (Hg)	mg/L	<0.0001	0.0001	5795858			
Dissolved Arsenic (As)	ug/L	<1.0	1.0	5794741			
Dissolved Barium (Ba)	ug/L	83	2.0	5794741			
Dissolved Boron (B)	ug/L	470	10	5794741			
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	5794741			
Dissolved Calcium (Ca)	ug/L	240000	200	5794741			
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	5794741			
Dissolved Copper (Cu)	ug/L	15	1.0	5794741			
Dissolved Iron (Fe)	ug/L	<100	100	5794741			
Dissolved Lead (Pb)	ug/L	<0.50	0.50	5794741			
Dissolved Magnesium (Mg)	ug/L	42000	50	5794741			
Dissolved Manganese (Mn)	ug/L	1400	2.0	5794741			
Dissolved Potassium (K)	ug/L	2900	200	5794741			
Dissolved Sodium (Na)	ug/L	53000	100	5794741			
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	5794741			
Volatile Organics							
Benzene	ug/L	1.2	0.25	5793701			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate							

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		IBI352			IBI352		
Sampling Date		2018/10/15 17:11			2018/10/15 17:11		
COC Number		684815-01-01			684815-01-01		
	UNITS	MW5	RDL	QC Batch	MW5 Lab-Dup	RDL	QC Batch
1,4-Dichlorobenzene	ug/L	<0.50	0.50	5793701			
Methylene Chloride(Dichloromethane)	ug/L	<1.3	1.3	5793701			
Toluene	ug/L	<0.50	0.50	5793701			
Vinyl Chloride	ug/L	4.1	0.50	5793701			
Surrogate Recovery (%)							
4-Bromofluorobenzene	%	100		5793701			
D4-1,2-Dichloroethane	%	100		5793701			
D8-Toluene	%	98		5793701			
RDL = Reportable Detection Limit							
QC Batch = Quality Control Batch							
Lab-Dup = Laboratory Initiated Duplicate							

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		IBI353		
Sampling Date		2018/10/15 17:45		
COC Number		684815-01-01		
	UNITS	MW6	RDL	QC Batch
Inorganics				
Total Ammonia-N	mg/L	0.52	0.050	5796360
Total Chemical Oxygen Demand (COD)	mg/L	130	4.0	5796411
Conductivity	umho/cm	1200	1.0	5794469
Total Dissolved Solids	mg/L	650	10	5793539
Total Kjeldahl Nitrogen (TKN)	mg/L	2.1	0.10	5796384
Dissolved Organic Carbon	mg/L	10	0.50	5793484
pH	pH	7.17		5794470
Phenols-4AAP	mg/L	<0.0010	0.0010	5795417
Total Phosphorus	mg/L	2.4	0.10	5795903
Dissolved Sulphate (SO4)	mg/L	<1.0	1.0	5794622
Alkalinity (Total as CaCO3)	mg/L	680	1.0	5794468
Dissolved Chloride (Cl-)	mg/L	9.7	1.0	5794621
Nitrite (N)	mg/L	0.011	0.010	5794612
Nitrate (N)	mg/L	0.22	0.10	5794612
Metals				
Mercury (Hg)	mg/L	<0.0001	0.0001	5795858
Dissolved Arsenic (As)	ug/L	1.6	1.0	5794741
Dissolved Barium (Ba)	ug/L	77	2.0	5794741
Dissolved Boron (B)	ug/L	65	10	5794741
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	5794741
Dissolved Calcium (Ca)	ug/L	240000	200	5794741
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	5794741
Dissolved Copper (Cu)	ug/L	3.7	1.0	5794741
Dissolved Iron (Fe)	ug/L	2400	100	5794741
Dissolved Lead (Pb)	ug/L	<0.50	0.50	5794741
Dissolved Magnesium (Mg)	ug/L	16000	50	5794741
Dissolved Manganese (Mn)	ug/L	4000	2.0	5794741
Dissolved Potassium (K)	ug/L	4200	200	5794741
Dissolved Sodium (Na)	ug/L	8600	100	5794741
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	5794741
Volatile Organics				
Benzene	ug/L	0.16	0.10	5793701
1,4-Dichlorobenzene	ug/L	<0.20	0.20	5793701
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

LANDFILL STANDARDS SCH 5 - GW COMP. LIST (WATER)

Maxxam ID		IBI353		
Sampling Date		2018/10/15 17:45		
COC Number		684815-01-01		
	UNITS	MW6	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<0.50	0.50	5793701
Toluene	ug/L	<0.20	0.20	5793701
Vinyl Chloride	ug/L	<0.20	0.20	5793701
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	101		5793701
D4-1,2-Dichloroethane	%	103		5793701
D8-Toluene	%	96		5793701
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

LANDFILL SCH 5 - GW COMP. (LAB FILTERED)

Maxxam ID		IBI351		
Sampling Date		2018/10/15 15:15		
COC Number		684815-01-01		
	UNITS	MW4	RDL	QC Batch
Inorganics				
Total Ammonia-N	mg/L	0.18	0.050	5796360
Total Chemical Oxygen Demand (COD)	mg/L	7.0	4.0	5796411
Conductivity	umho/cm	350	1.0	5794469
Total Dissolved Solids	mg/L	165	10	5795752
Total Kjeldahl Nitrogen (TKN)	mg/L	0.48	0.10	5796384
Dissolved Organic Carbon	mg/L	2.5	0.50	5793484
pH	pH	8.07		5794470
Phenols-4AAP	mg/L	<0.0010	0.0010	5795428
Total Phosphorus	mg/L	5.7	0.40	5795903
Dissolved Sulphate (SO4)	mg/L	1.1	1.0	5794622
Alkalinity (Total as CaCO3)	mg/L	190	1.0	5794468
Dissolved Chloride (Cl-)	mg/L	1.0	1.0	5794621
Nitrite (N)	mg/L	<0.010	0.010	5794612
Nitrate (N)	mg/L	0.29	0.10	5794612
Metals				
Mercury (Hg)	mg/L	<0.0001	0.0001	5795858
Dissolved Arsenic (As)	ug/L	<1.0	1.0	5794844
Dissolved Barium (Ba)	ug/L	14	2.0	5794844
Dissolved Boron (B)	ug/L	<10	10	5794844
Dissolved Cadmium (Cd)	ug/L	<0.10	0.10	5794844
Dissolved Calcium (Ca)	ug/L	60000	200	5794844
Dissolved Chromium (Cr)	ug/L	<5.0	5.0	5794844
Dissolved Copper (Cu)	ug/L	2.0	1.0	5794844
Dissolved Iron (Fe)	ug/L	<100	100	5794844
Dissolved Lead (Pb)	ug/L	<0.50	0.50	5794844
Dissolved Magnesium (Mg)	ug/L	8900	50	5794844
Dissolved Manganese (Mn)	ug/L	<2.0	2.0	5794844
Dissolved Potassium (K)	ug/L	1200	200	5794844
Dissolved Sodium (Na)	ug/L	2400	100	5794844
Dissolved Zinc (Zn)	ug/L	<5.0	5.0	5794844
Volatile Organics				
Benzene	ug/L	<0.10	0.10	5793701
1,4-Dichlorobenzene	ug/L	<0.20	0.20	5793701
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

LANDFILL SCH 5 - GW COMP. (LAB FILTERED)

Maxxam ID		IBI351		
Sampling Date		2018/10/15 15:15		
COC Number		684815-01-01		
	UNITS	MW4	RDL	QC Batch
Methylene Chloride(Dichloromethane)	ug/L	<0.50	0.50	5793701
Toluene	ug/L	<0.20	0.20	5793701
Vinyl Chloride	ug/L	<0.20	0.20	5793701
Surrogate Recovery (%)				
4-Bromofluorobenzene	%	99		5793701
D4-1,2-Dichloroethane	%	102		5793701
D8-Toluene	%	96		5793701
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

LANDFILL STANDARDS SCH 5 - SW COMP. LIST (WATER)

Maxxam ID		IBI354		
Sampling Date		2018/10/15 17:23		
COC Number		684815-01-01		
	UNITS	SW1	RDL	QC Batch
Inorganics				
Total Ammonia-N	mg/L	0.099	0.050	5796360
Total BOD	mg/L	<2	2	5792512
Total Chemical Oxygen Demand (COD)	mg/L	76	4.0	5796411
Conductivity	umho/cm	210	1.0	5794469
Total Dissolved Solids	mg/L	85	10	5793539
Total Kjeldahl Nitrogen (TKN)	mg/L	0.64	0.10	5796384
pH	pH	7.67		5794470
Phenols-4AAP	mg/L	0.0013	0.0010	5795428
Total Phosphorus	mg/L	0.19	0.008	5796157
Total Suspended Solids	mg/L	48	1	5795780
Dissolved Sulphate (SO ₄)	mg/L	6.6	1.0	5794618
Alkalinity (Total as CaCO ₃)	mg/L	100	1.0	5794468
Dissolved Chloride (Cl ⁻)	mg/L	3.6	1.0	5794617
Nitrite (N)	mg/L	<0.010	0.010	5794612
Nitrate (N)	mg/L	<0.10	0.10	5794612
Metals				
Mercury (Hg)	mg/L	<0.0001	0.0001	5795858
Total Arsenic (As)	ug/L	<1.0	1.0	5795405
Total Barium (Ba)	ug/L	16	2.0	5795405
Total Boron (B)	ug/L	36	10	5795405
Total Cadmium (Cd)	ug/L	<0.10	0.10	5795405
Total Chromium (Cr)	ug/L	<5.0	5.0	5795405
Total Copper (Cu)	ug/L	1.4	1.0	5795405
Total Iron (Fe)	ug/L	780	100	5795405
Total Lead (Pb)	ug/L	<0.50	0.50	5795405
Total Zinc (Zn)	ug/L	7.0	5.0	5795405
RDL = Reportable Detection Limit				
QC Batch = Quality Control Batch				

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

RESULTS OF ANALYSES OF WATER

Maxxam ID		IBI349	IBI350	IBI351	IBI352	IBI353	
Sampling Date		2018/10/15 16:30	2018/10/15 15:53	2018/10/15 15:15	2018/10/15 17:11	2018/10/15 17:45	
COC Number		684815-01-01	684815-01-01	684815-01-01	684815-01-01	684815-01-01	
	UNITS	MW1	MW3	MW4	MW5	MW6	QC Batch
Calculated Parameters							
Ion Balance (% Difference)	%	1.47	3.17	0.650	1.98	0.590	5792212
QC Batch = Quality Control Batch							

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

TEST SUMMARY

Maxxam ID: IBI349
Sample ID: MW1
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5794468	N/A	2018/10/21	Surinder Rai
Chloride by Automated Colourimetry	KONE	5794621	N/A	2018/10/23	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5796411	N/A	2018/10/23	Viorica Rotaru
Conductivity	AT	5794469	N/A	2018/10/21	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5793484	N/A	2018/10/21	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5795858	2018/10/22	2018/10/23	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5794741	N/A	2018/10/22	Thao Nguyen
Ion Balance (% Difference)	CALC	5792212	N/A	2018/10/24	Automated Statchk
Total Ammonia-N	LACH/NH4	5796360	N/A	2018/10/24	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5794833	N/A	2018/10/23	Chandra Nandlal
pH	AT	5794470	N/A	2018/10/21	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5795428	N/A	2018/10/22	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5794622	N/A	2018/10/23	Alina Dobreanu
Total Dissolved Solids	BAL	5798461	2018/10/23	2018/10/24	Jingwei (Alvin) Shi
Total Kjeldahl Nitrogen in Water	SKAL	5796384	2018/10/22	2018/10/23	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5795845	2018/10/22	2018/10/22	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5793701	N/A	2018/10/23	Michael Leschinsky

Maxxam ID: IBI350
Sample ID: MW3
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5794468	N/A	2018/10/21	Surinder Rai
Chloride by Automated Colourimetry	KONE	5794621	N/A	2018/10/23	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5796407	N/A	2018/10/24	Nimarta Singh
Conductivity	AT	5794469	N/A	2018/10/21	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5793484	N/A	2018/10/21	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5795962	2018/10/22	2018/10/23	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5794741	N/A	2018/10/22	Thao Nguyen
Ion Balance (% Difference)	CALC	5792212	N/A	2018/10/24	Automated Statchk
Total Ammonia-N	LACH/NH4	5796360	N/A	2018/10/24	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5794612	N/A	2018/10/22	Chandra Nandlal
pH	AT	5794470	N/A	2018/10/21	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5795417	N/A	2018/10/22	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5794622	N/A	2018/10/23	Alina Dobreanu
Total Dissolved Solids	BAL	5793539	2018/10/20	2018/10/22	Niket Kumar Patel
Total Kjeldahl Nitrogen in Water	SKAL	5796384	2018/10/22	2018/10/23	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5795903	2018/10/22	2018/10/23	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5793701	N/A	2018/10/23	Michael Leschinsky

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

TEST SUMMARY

Maxxam ID: IBI351
Sample ID: MW4
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5794468	N/A	2018/10/21	Surinder Rai
Chloride by Automated Colourimetry	KONE	5794621	N/A	2018/10/23	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5796411	N/A	2018/10/23	Viorica Rotaru
Conductivity	AT	5794469	N/A	2018/10/21	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5793484	N/A	2018/10/21	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5795858	2018/10/22	2018/10/23	Ron Morrison
Lab Filtered Metals by ICPMS	ICP/MS	5794844	2018/10/20	2018/10/23	Thao Nguyen
Ion Balance (% Difference)	CALC	5792212	N/A	2018/10/24	Automated Statchk
Total Ammonia-N	LACH/NH4	5796360	N/A	2018/10/24	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5794612	N/A	2018/10/22	Chandra Nandlal
pH	AT	5794470	N/A	2018/10/21	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5795428	N/A	2018/10/22	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5794622	N/A	2018/10/23	Alina Dobreanu
Total Dissolved Solids	BAL	5795752	2018/10/23	2018/10/24	Massarat Jan
Total Kjeldahl Nitrogen in Water	SKAL	5796384	2018/10/22	2018/10/23	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5795903	2018/10/22	2018/10/23	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5793701	N/A	2018/10/23	Michael Leschinsky

Maxxam ID: IBI352
Sample ID: MW5
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5794468	N/A	2018/10/21	Surinder Rai
Chloride by Automated Colourimetry	KONE	5794621	N/A	2018/10/23	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5796411	N/A	2018/10/23	Viorica Rotaru
Conductivity	AT	5794469	N/A	2018/10/21	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5793484	N/A	2018/10/21	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5795858	2018/10/22	2018/10/23	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5794741	N/A	2018/10/22	Thao Nguyen
Ion Balance (% Difference)	CALC	5792212	N/A	2018/10/24	Automated Statchk
Total Ammonia-N	LACH/NH4	5796360	N/A	2018/10/24	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5794612	N/A	2018/10/22	Chandra Nandlal
pH	AT	5794470	N/A	2018/10/21	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5795417	N/A	2018/10/22	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5794622	N/A	2018/10/23	Alina Dobreanu
Total Dissolved Solids	BAL	5793539	2018/10/20	2018/10/22	Niket Kumar Patel
Total Kjeldahl Nitrogen in Water	SKAL	5796384	2018/10/22	2018/10/23	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5795903	2018/10/22	2018/10/23	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5793701	N/A	2018/10/23	Michael Leschinsky

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

TEST SUMMARY

Maxxam ID: IBI352 Dup
Sample ID: MW5
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5794468	N/A	2018/10/21	Surinder Rai
Chemical Oxygen Demand	SPEC	5796411	N/A	2018/10/23	Viorica Rotaru
Conductivity	AT	5794469	N/A	2018/10/21	Surinder Rai
pH	AT	5794470	N/A	2018/10/21	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5795417	N/A	2018/10/22	Bramdeo Motiram

Maxxam ID: IBI353
Sample ID: MW6
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5794468	N/A	2018/10/21	Surinder Rai
Chloride by Automated Colourimetry	KONE	5794621	N/A	2018/10/23	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5796411	N/A	2018/10/23	Viorica Rotaru
Conductivity	AT	5794469	N/A	2018/10/21	Surinder Rai
Dissolved Organic Carbon (DOC)	TOCV/NDIR	5793484	N/A	2018/10/21	Nimarta Singh
Mercury in Water by CVAA	CV/AA	5795858	2018/10/22	2018/10/23	Ron Morrison
Dissolved Metals by ICPMS	ICP/MS	5794741	N/A	2018/10/22	Thao Nguyen
Ion Balance (% Difference)	CALC	5792212	N/A	2018/10/24	Automated Statchk
Total Ammonia-N	LACH/NH4	5796360	N/A	2018/10/24	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5794612	N/A	2018/10/22	Chandra Nandlal
pH	AT	5794470	N/A	2018/10/21	Surinder Rai
Phenols (4AAP)	TECH/PHEN	5795417	N/A	2018/10/22	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5794622	N/A	2018/10/23	Alina Dobreanu
Total Dissolved Solids	BAL	5793539	2018/10/20	2018/10/22	Niket Kumar Patel
Total Kjeldahl Nitrogen in Water	SKAL	5796384	2018/10/22	2018/10/23	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5795903	2018/10/22	2018/10/23	Amanpreet Sappal
Volatile Organic Compounds in Water	P&T/MS	5793701	N/A	2018/10/23	Michael Leschinsky

Maxxam ID: IBI354
Sample ID: SW1
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	5794468	N/A	2018/10/21	Surinder Rai
Biochemical Oxygen Demand (BOD)	DO	5792512	2018/10/19	2018/10/24	Nusrat Naz
Chloride by Automated Colourimetry	KONE	5794617	N/A	2018/10/23	Deonarine Ramnarine
Chemical Oxygen Demand	SPEC	5796411	N/A	2018/10/23	Viorica Rotaru
Conductivity	AT	5794469	N/A	2018/10/21	Surinder Rai
Mercury in Water by CVAA	CV/AA	5795858	2018/10/22	2018/10/23	Ron Morrison
Total Metals Analysis by ICPMS	ICP/MS	5795405	N/A	2018/10/23	Thao Nguyen
Total Ammonia-N	LACH/NH4	5796360	N/A	2018/10/24	Charles Opoku-Ware
Nitrate (NO3) and Nitrite (NO2) in Water	LACH	5794612	N/A	2018/10/22	Chandra Nandlal
pH	AT	5794470	N/A	2018/10/21	Surinder Rai

Maxxam Job #: B8R7142
Report Date: 2018/10/24

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

TEST SUMMARY

Maxxam ID: IBI354
Sample ID: SW1
Matrix: Water

Collected: 2018/10/15
Shipped:
Received: 2018/10/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Phenols (4AAP)	TECH/PHEN	5795428	N/A	2018/10/22	Bramdeo Motiram
Sulphate by Automated Colourimetry	KONE	5794618	N/A	2018/10/23	Alina Dobreanu
Total Dissolved Solids	BAL	5793539	2018/10/20	2018/10/22	Niket Kumar Patel
Total Kjeldahl Nitrogen in Water	SKAL	5796384	2018/10/22	2018/10/23	Shivani Shivani
Total Phosphorus (Colourimetric)	LACH/P	5796157	2018/10/22	2018/10/23	Amanpreet Sappal
Low Level Total Suspended Solids	BAL	5795780	2018/10/22	2018/10/23	Mandeep Kaur

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	2.0°C
Package 2	3.3°C

Sample IBI349 [MW1] : VOC Water Analysis: Due to foaming, sample required dilution. The detection limits were adjusted accordingly.

Sample IBI352 [MW5] : VOC Water Analysis: Due to foaming, sample required dilution. The detection limits were adjusted accordingly.

Results relate only to the items tested.

QUALITY ASSURANCE REPORT

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5793701	4-Bromofluorobenzene	2018/10/23	101	70 - 130	102	70 - 130	100	%				
5793701	D4-1,2-Dichloroethane	2018/10/23	98	70 - 130	98	70 - 130	99	%				
5793701	D8-Toluene	2018/10/23	100	70 - 130	100	70 - 130	98	%				
5792512	Total BOD	2018/10/24					<2	mg/L	0	30	98	80 - 120
5793484	Dissolved Organic Carbon	2018/10/21	94	80 - 120	96	80 - 120	<0.50	mg/L	5.0	20		
5793539	Total Dissolved Solids	2018/10/22					<10	mg/L	2.4	25	98	90 - 110
5793701	1,4-Dichlorobenzene	2018/10/23	110	70 - 130	109	70 - 130	<0.20	ug/L				
5793701	Benzene	2018/10/23	105	70 - 130	105	70 - 130	<0.10	ug/L				
5793701	Methylene Chloride(Dichloromethane)	2018/10/23	101	70 - 130	101	70 - 130	<0.50	ug/L				
5793701	Toluene	2018/10/23	105	70 - 130	104	70 - 130	<0.20	ug/L				
5793701	Vinyl Chloride	2018/10/23	101	70 - 130	101	70 - 130	<0.20	ug/L				
5794468	Alkalinity (Total as CaCO3)	2018/10/21			96	85 - 115	<1.0	mg/L	0.20	20		
5794469	Conductivity	2018/10/21			100	85 - 115	<1.0	umho/cm	0.26	25		
5794470	pH	2018/10/21			102	98 - 103			0.84	N/A		
5794612	Nitrate (N)	2018/10/22	103	80 - 120	104	80 - 120	<0.10	mg/L	NC	20		
5794612	Nitrite (N)	2018/10/22	92	80 - 120	96	80 - 120	<0.010	mg/L	NC	20		
5794617	Dissolved Chloride (Cl-)	2018/10/23	NC	80 - 120	103	80 - 120	<1.0	mg/L	1.4	20		
5794618	Dissolved Sulphate (SO4)	2018/10/23	108	75 - 125	101	80 - 120	<1.0	mg/L	1.8	20		
5794621	Dissolved Chloride (Cl-)	2018/10/23	NC	80 - 120	103	80 - 120	<1.0	mg/L	1.2	20		
5794622	Dissolved Sulphate (SO4)	2018/10/23	NC	75 - 125	102	80 - 120	<1.0	mg/L	0.0061	20		
5794741	Dissolved Arsenic (As)	2018/10/22	100	80 - 120	100	80 - 120	<1.0	ug/L	2.6	20		
5794741	Dissolved Barium (Ba)	2018/10/22	107	80 - 120	106	80 - 120	<2.0	ug/L	0.45	20		
5794741	Dissolved Boron (B)	2018/10/22	99	80 - 120	100	80 - 120	<10	ug/L	0.44	20		
5794741	Dissolved Cadmium (Cd)	2018/10/22	103	80 - 120	101	80 - 120	<0.10	ug/L	NC	20		
5794741	Dissolved Calcium (Ca)	2018/10/22	NC	80 - 120	97	80 - 120	<200	ug/L	0.27	20		
5794741	Dissolved Chromium (Cr)	2018/10/22	99	80 - 120	97	80 - 120	<5.0	ug/L	NC	20		
5794741	Dissolved Copper (Cu)	2018/10/22	101	80 - 120	100	80 - 120	<1.0	ug/L	NC	20		
5794741	Dissolved Iron (Fe)	2018/10/22	100	80 - 120	98	80 - 120	<100	ug/L	0.037	20		
5794741	Dissolved Lead (Pb)	2018/10/22	98	80 - 120	97	80 - 120	<0.50	ug/L	NC	20		
5794741	Dissolved Magnesium (Mg)	2018/10/22	100	80 - 120	98	80 - 120	<50	ug/L	0.78	20		

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5794741	Dissolved Manganese (Mn)	2018/10/22	101	80 - 120	99	80 - 120	<2.0	ug/L	1.9	20		
5794741	Dissolved Potassium (K)	2018/10/22	104	80 - 120	100	80 - 120	<200	ug/L	0.83	20		
5794741	Dissolved Sodium (Na)	2018/10/22	98	80 - 120	97	80 - 120	<100	ug/L	0.15	20		
5794741	Dissolved Zinc (Zn)	2018/10/22	99	80 - 120	97	80 - 120	<5.0	ug/L	NC	20		
5794833	Nitrate (N)	2018/10/23	103	80 - 120	103	80 - 120	<0.10	mg/L	3.8	20		
5794833	Nitrite (N)	2018/10/23	101	80 - 120	101	80 - 120	<0.010	mg/L	NC	20		
5794844	Dissolved Arsenic (As)	2018/10/23	103	80 - 120	99	80 - 120	<1.0	ug/L	2.8	20		
5794844	Dissolved Barium (Ba)	2018/10/23	103	80 - 120	102	80 - 120	<2.0	ug/L	0.44	20		
5794844	Dissolved Boron (B)	2018/10/23	109	80 - 120	105	80 - 120	<10	ug/L	1.7	20		
5794844	Dissolved Cadmium (Cd)	2018/10/23	106	80 - 120	101	80 - 120	<0.10	ug/L				
5794844	Dissolved Calcium (Ca)	2018/10/23	NC	80 - 120	100	80 - 120	<200	ug/L	1.8	20		
5794844	Dissolved Chromium (Cr)	2018/10/23	103	80 - 120	100	80 - 120	<5.0	ug/L				
5794844	Dissolved Copper (Cu)	2018/10/23	104	80 - 120	101	80 - 120	<1.0	ug/L				
5794844	Dissolved Iron (Fe)	2018/10/23	105	80 - 120	101	80 - 120	<100	ug/L	NC	20		
5794844	Dissolved Lead (Pb)	2018/10/23	99	80 - 120	97	80 - 120	<0.50	ug/L				
5794844	Dissolved Magnesium (Mg)	2018/10/23	NC	80 - 120	101	80 - 120	<50	ug/L	1.7	20		
5794844	Dissolved Manganese (Mn)	2018/10/23	102	80 - 120	100	80 - 120	<2.0	ug/L	0.71	20		
5794844	Dissolved Potassium (K)	2018/10/23	105	80 - 120	100	80 - 120	<200	ug/L	0.57	20		
5794844	Dissolved Sodium (Na)	2018/10/23	NC	80 - 120	101	80 - 120	<100	ug/L	2.1	20		
5794844	Dissolved Zinc (Zn)	2018/10/23	101	80 - 120	101	80 - 120	<5.0	ug/L				
5795405	Total Arsenic (As)	2018/10/22	98	80 - 120	99	80 - 120	<1.0	ug/L	NC	20		
5795405	Total Barium (Ba)	2018/10/22	105	80 - 120	104	80 - 120	<2.0	ug/L	12	20		
5795405	Total Boron (B)	2018/10/22	97	80 - 120	100	80 - 120	<10	ug/L	NC	20		
5795405	Total Cadmium (Cd)	2018/10/22	100	80 - 120	100	80 - 120	<0.10	ug/L	NC	20		
5795405	Total Chromium (Cr)	2018/10/22	96	80 - 120	98	80 - 120	<5.0	ug/L	NC	20		
5795405	Total Copper (Cu)	2018/10/22	100	80 - 120	100	80 - 120	<1.0	ug/L	NC	20		
5795405	Total Iron (Fe)	2018/10/22	95	80 - 120	97	80 - 120	<100	ug/L	NC	20		
5795405	Total Lead (Pb)	2018/10/22	96	80 - 120	97	80 - 120	<0.50	ug/L	NC	20		
5795405	Total Zinc (Zn)	2018/10/22	99	80 - 120	101	80 - 120	<5.0	ug/L	6.1	20		
5795417	Phenols-4AAP	2018/10/22	97	80 - 120	100	80 - 120	<0.0010	mg/L	NC	20		
5795428	Phenols-4AAP	2018/10/22	97	80 - 120	99	80 - 120	<0.0010	mg/L	NC	20		

QUALITY ASSURANCE REPORT(CONT'D)

exp Services Inc
Client Project #: THB-00011119-GE
Site Location: NAKINA LANDFILL
Sampler Initials: KK

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
5795752	Total Dissolved Solids	2018/10/24					<10	mg/L	1.9	25	97	90 - 110
5795780	Total Suspended Solids	2018/10/23					<1	mg/L	0	25	98	85 - 115
5795845	Total Phosphorus	2018/10/22	101	80 - 120	100	80 - 120	<0.020	mg/L	3.8	20	99	80 - 120
5795858	Mercury (Hg)	2018/10/23	90	75 - 125	92	80 - 120	<0.0001	mg/L	NC	20		
5795903	Total Phosphorus	2018/10/23	98	80 - 120	98	80 - 120	<0.020	mg/L	11	20	98	80 - 120
5795962	Mercury (Hg)	2018/10/23	90	75 - 125	93	80 - 120	<0.0001	mg/L	NC	20		
5796157	Total Phosphorus	2018/10/23	83	80 - 120	94	80 - 120	<0.004	mg/L	NC	20	95	80 - 120
5796360	Total Ammonia-N	2018/10/24	89	75 - 125	102	80 - 120	<0.050	mg/L	0.67	20		
5796384	Total Kjeldahl Nitrogen (TKN)	2018/10/23	101	80 - 120	96	80 - 120	<0.10	mg/L	8.5	20	91	80 - 120
5796407	Total Chemical Oxygen Demand (COD)	2018/10/24	94	80 - 120	105	80 - 120	<4.0	mg/L	8.8	20		
5796411	Total Chemical Oxygen Demand (COD)	2018/10/23	97	80 - 120	101	80 - 120	<4.0	mg/L	1.9	20		
5798461	Total Dissolved Solids	2018/10/24					<10	mg/L	7.2	25	97	90 - 110

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference $\leq 2 \times \text{RDL}$).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, Scientific Service Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.



Maxxam Analytics International Corporation o/a Maxxam Analytics
6740 Campbell Road, Mississauga, Ontario Canada L5N 2L8 Tel: (905) 817-5700 Toll-free 800-563-6266 Fax: (905) 817-5777 www.maxxam.ca

CHAIN OF CUSTODY RECORD

Page 1 of 1

INVOICE TO:		REPORT TO:		PROJECT INFORMATION:		Laboratory Use Only:	
Company Name: #17501 exp Services Inc		Company Name: Jay Zhang ; Kristof Karpink		Quotation #: B75386		Maxxam Job #:	
Attention: accounts payable		Attention: Jay Zhang ; Kristof Karpink		P.O. #:		Bottle Order #:	
Address: 1142 Roland St		Address:		Project: THB-00011119-GE		Barcode: 684815	
Thunder Bay ON P7B 5M4				Project Name: Nakina Landfill		Project Manager:	
Tel: (807) 623-9495 Fax: (807) 623-8070		Tel: (807) 623-9495 Fax: (807) 623-8070		Site #:		COC #:	
Email: thunderbay@exp.com; Karen.Burke@exp.com; AP@exp.com		Email: jay.zhang@exp.com; Kristof.Karpink@exp.com		Sampled By: Kk/MS		Barcode: C#684815-01-01	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE MAXXAM DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011)		Other Regulations		Special Instructions
<input type="checkbox"/> Table 1	<input type="checkbox"/> Res/Park <input type="checkbox"/> Medium/Fine	<input type="checkbox"/> CCME	<input type="checkbox"/> Sanitary Sewer Bylaw	
<input type="checkbox"/> Table 2	<input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse	<input type="checkbox"/> Reg 558	<input type="checkbox"/> Storm Sewer Bylaw	
<input type="checkbox"/> Table 3	<input type="checkbox"/> Agri/Other <input type="checkbox"/> For RSC	<input type="checkbox"/> MISA	<input type="checkbox"/> Municipality	
<input type="checkbox"/> Table		<input checked="" type="checkbox"/> PWOO		
		<input checked="" type="checkbox"/> Other	DDWS	

Include Criteria on Certificate of Analysis (Y/N)?

Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle)	Metals Pb / Cr / VI	Landfill Standard Sch 5 - GW Comp. List	Landfill Standard Sch 5 - SW Comp. List
1	MW1	Oct 15/18	4:30pm	GW	X	X		
2	MW2	Oct 15/18	3:53pm	GW	X	X		
3	MW4	Oct 15/18	3:15pm	GW	X	X		
4	MW5	Oct 15/18	5:11pm	GW	X	X		
5	MW6	Oct 15/18	5:45pm	GW	X	X		
6	SW1	Oct 15/18	5:23pm	SW	X	m	X	
7				SW		m		
8								
9								
10								

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:	
Please provide advance notice for rush projects	
Regular (Standard) TAT:	
(will be applied if Rush TAT is not specified)	
Standard TAT = 5-7 Working days for most tests.	
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.	
<input checked="" type="checkbox"/>	
Job Specific Rush TAT (if applies to entire submission)	
Date Required:	Time Required:
Rush Confirmation Number:	(call lab for #)
# of Bottles	Comments

HT

18-Oct-18 13:00

Michelle Brescacin

B8R7142

GID ENV-641

RECEIVED
IBay

* RELINQUISHED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)		Date: (YY/MM/DD)	Time	# Jars used and not submitted	Laboratory Use Only				
Kristof Karpink		18/10/18	11:40am	Michelle Brescacin		18/10/18	13:00		Time Sensitive	Temperature (°C) on Recel	Custody Seal Present	Yes	No
				Police Division		2018/10/19	09:33			1/3/2 3/3/4	Intact		N/A

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO MAXXAM'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.MAXXAM.CA/TERMS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

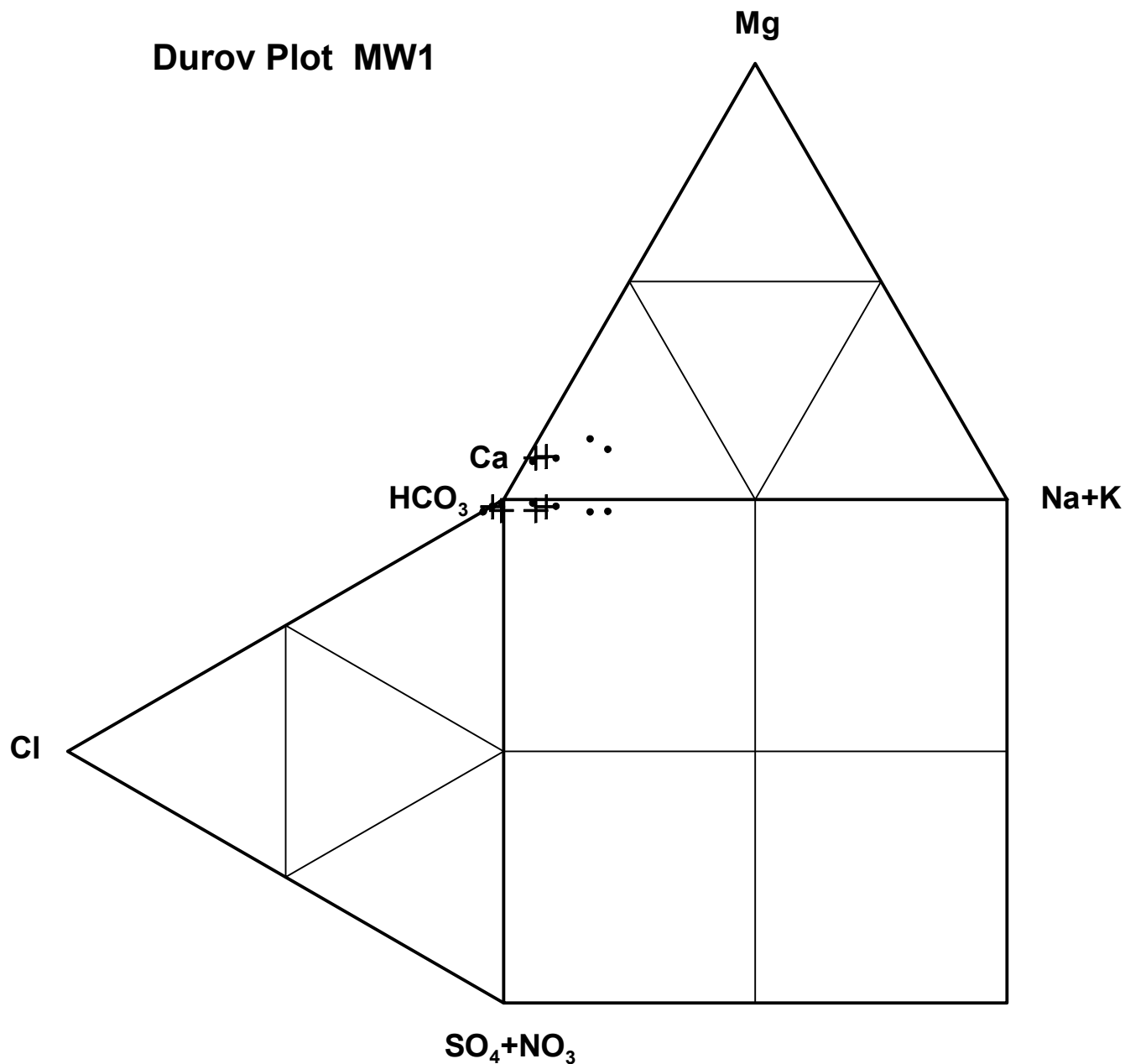
** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT HTTP://MAXXAM.CA/CONTENT/UPLOADS/ONTARIO-COC.PDF.

SAMPLES MUST BE KEPT COOL (< 10°C) FROM TIME OF SAMPLING UNTIL DELIVERY TO MAXXAM

White: Maxxa Yellow: Client

Appendix F – Durov Plots

Durov Plot MW1



Legend	
•	Historical Data Point
+	2018 Data

Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

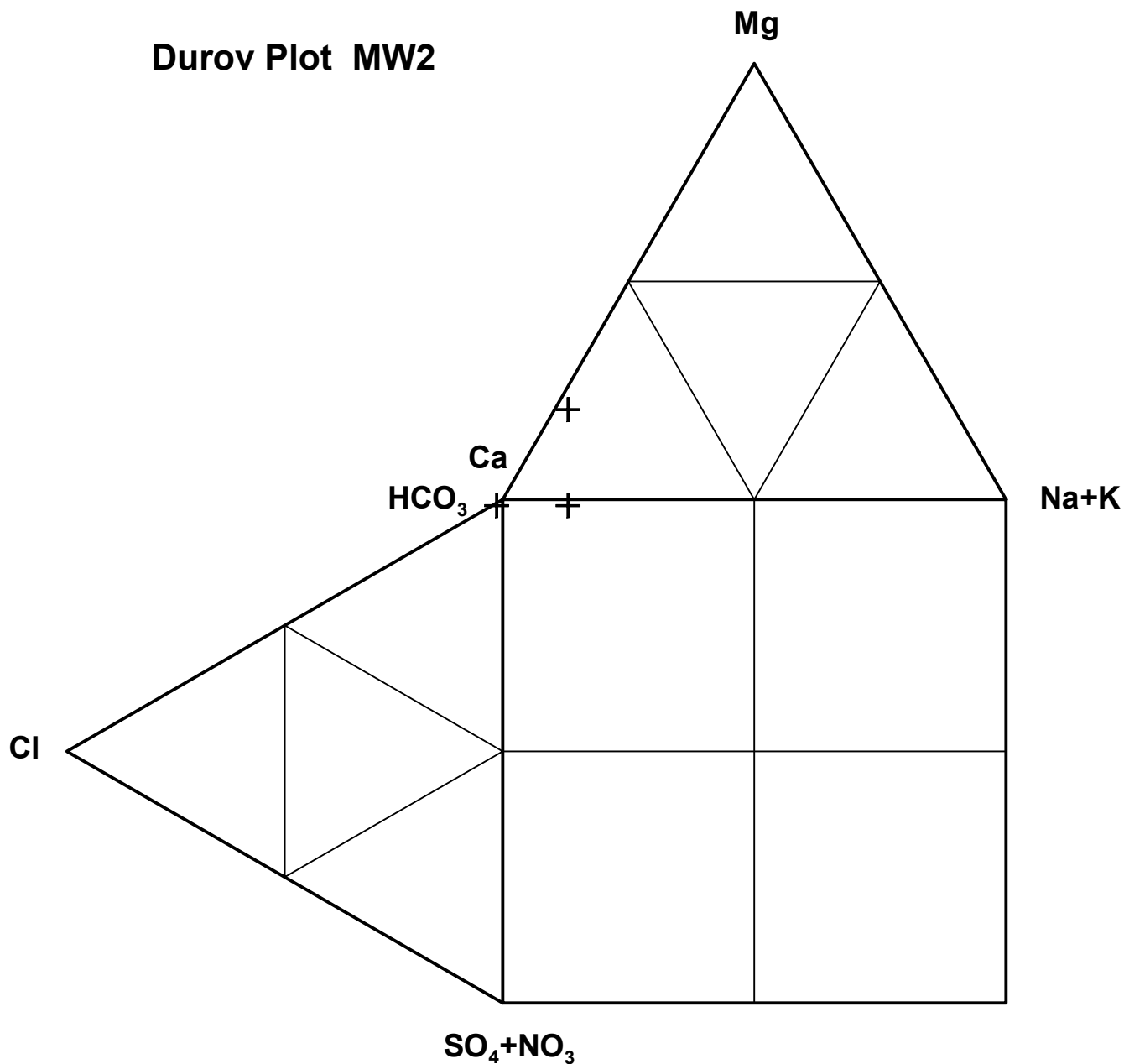
Figure
F-1

Monitoring Well MW1

2016, 2017 & 2018 Environmental Quality Monitoring
Nakina Landfill
Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	March 12, 2019

Durov Plot MW2



Legend	
•	Historical Data Point
+	2018 Data

Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

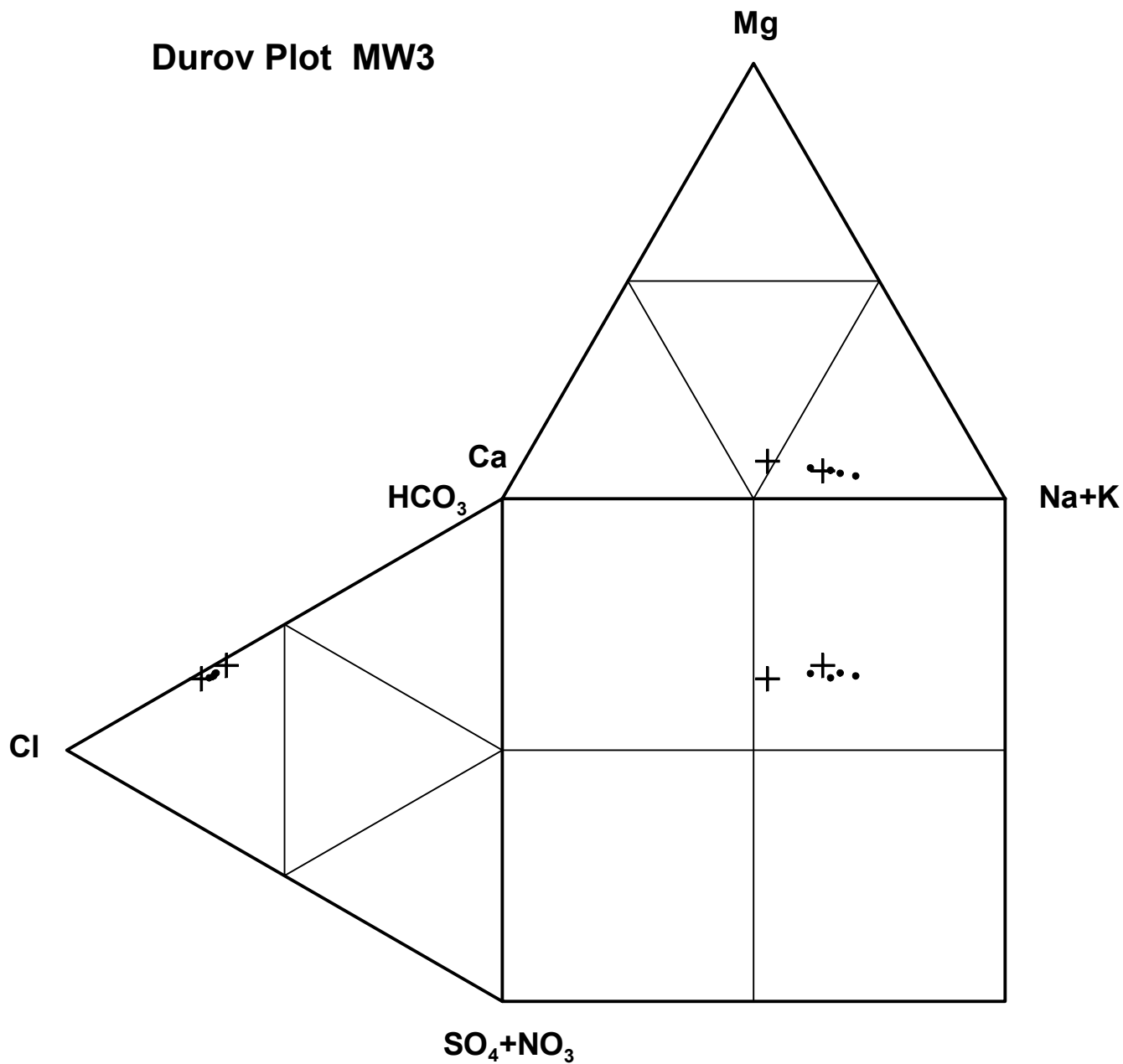
Figure
F-2

Monitoring Well MW2

2016, 2017 & 2018 Environmental Quality Monitoring
Nakina Landfill
Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	March 12, 2019

Durov Plot MW3



•

+

Legend

Historical Data Point

2018 Data

Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

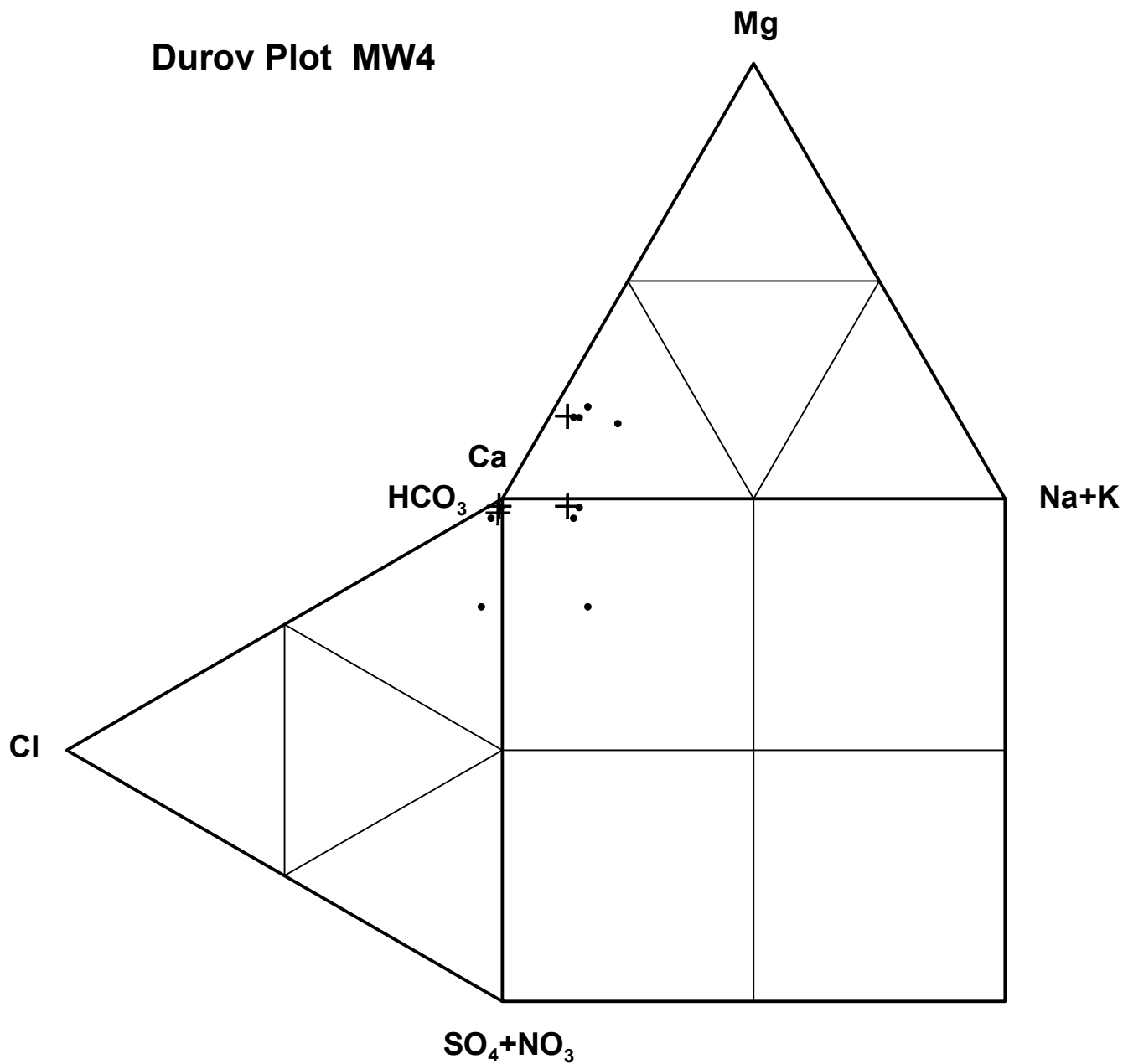
Figure
F-3

Monitoring Well MW3

2016, 2017 & 2018 Environmental Quality Monitoring
Nakina Landfill
Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	February 14, 2019

Durov Plot MW4



Legend	
•	Historical Data Point
+	2018 Data

Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

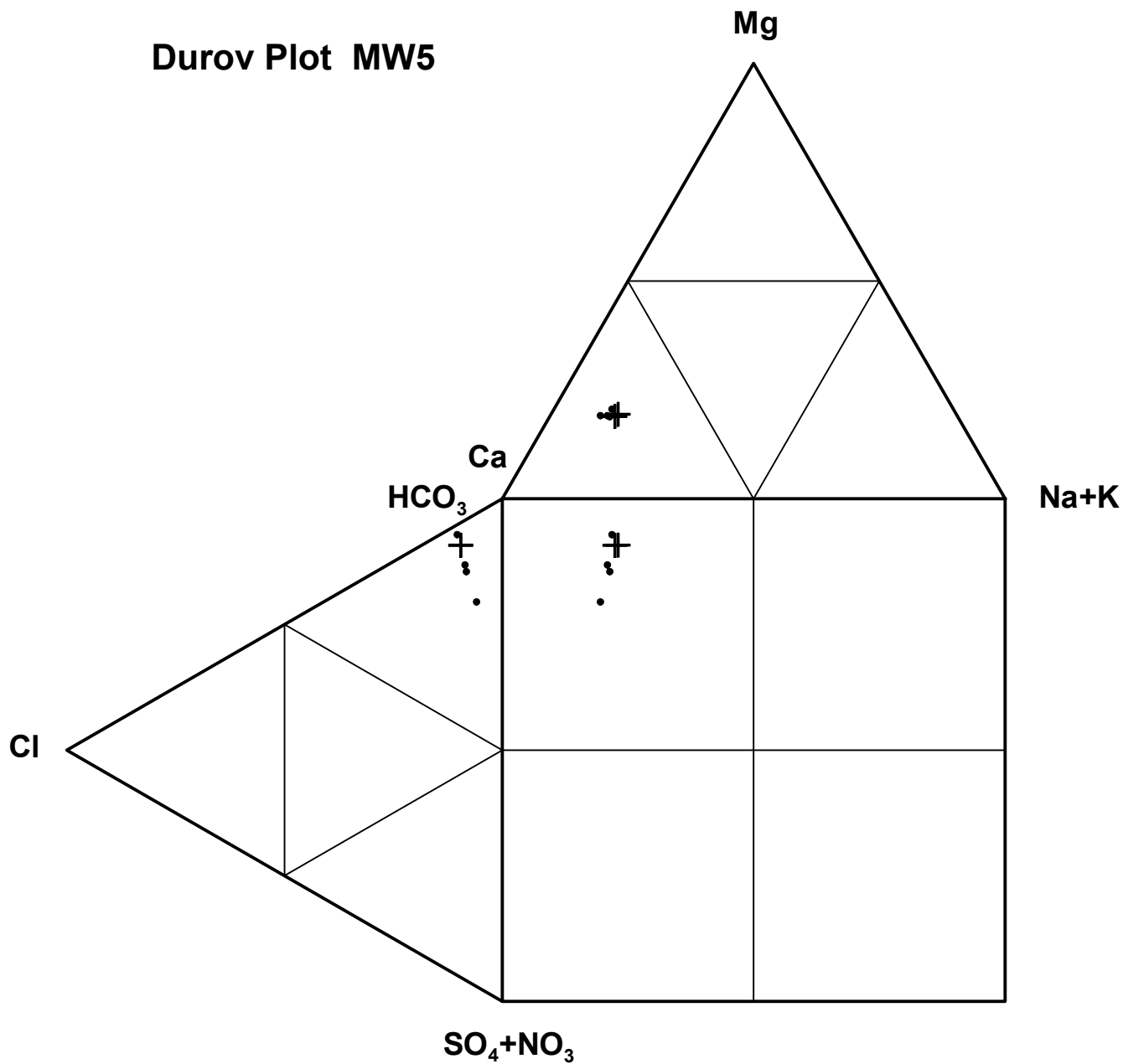
Figure
F-4

Monitoring Well MW4

2016, 2017 & 2018 Environmental Quality Monitoring
Nakina Landfill
Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	February 14, 2019

Durov Plot MW5



Legend	
•	Historical Data Point
+	2018 Data

Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

Figure
F-5

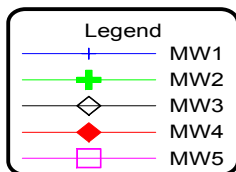
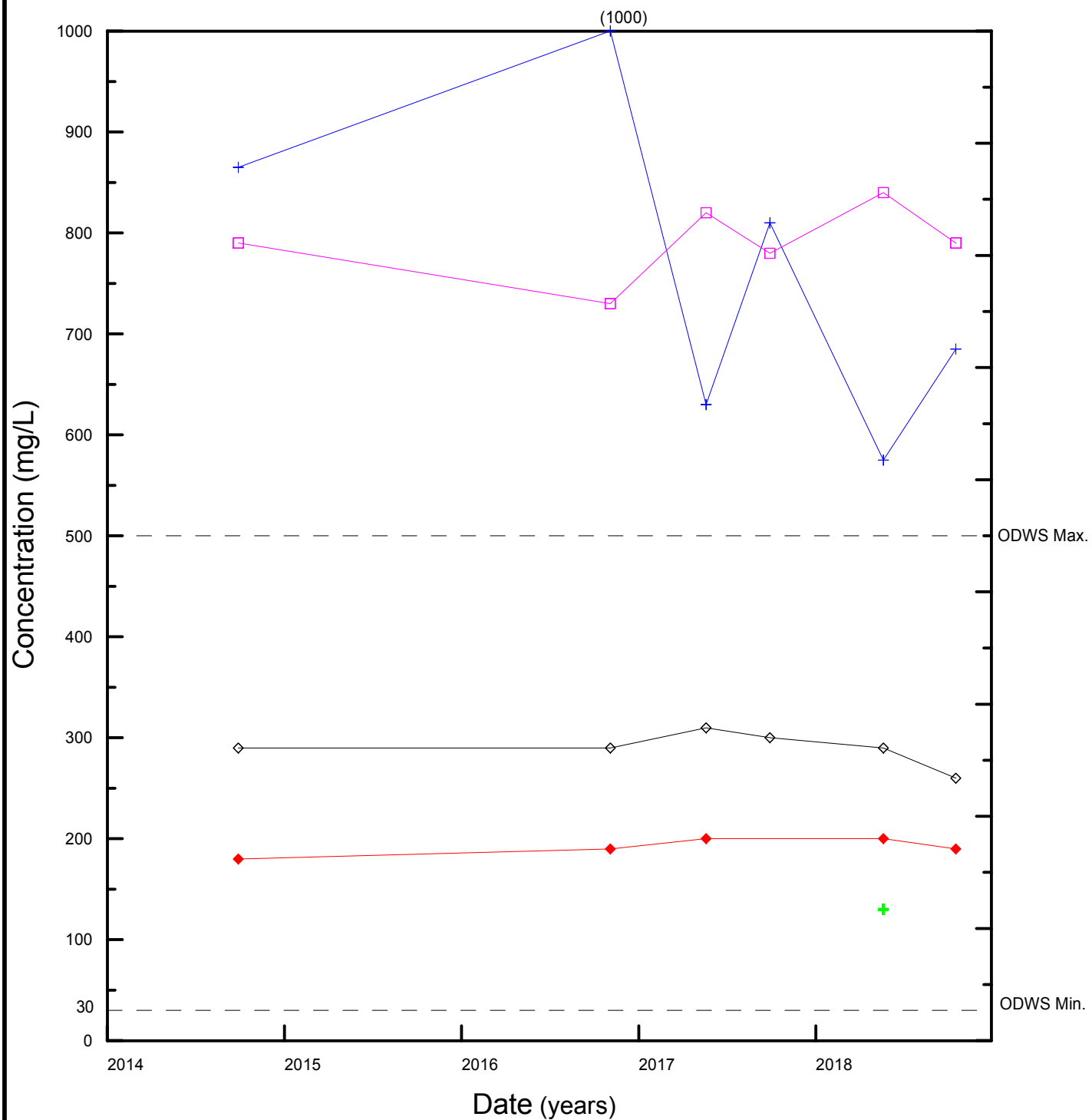
Monitoring Well MW5

2016, 2017 & 2018 Environmental Quality Monitoring
Nakina Landfill
Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	February 14, 2019

Appendix G – Time Series Graphs

Alkalinity



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being constantly dry.
 3) Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

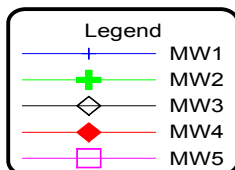
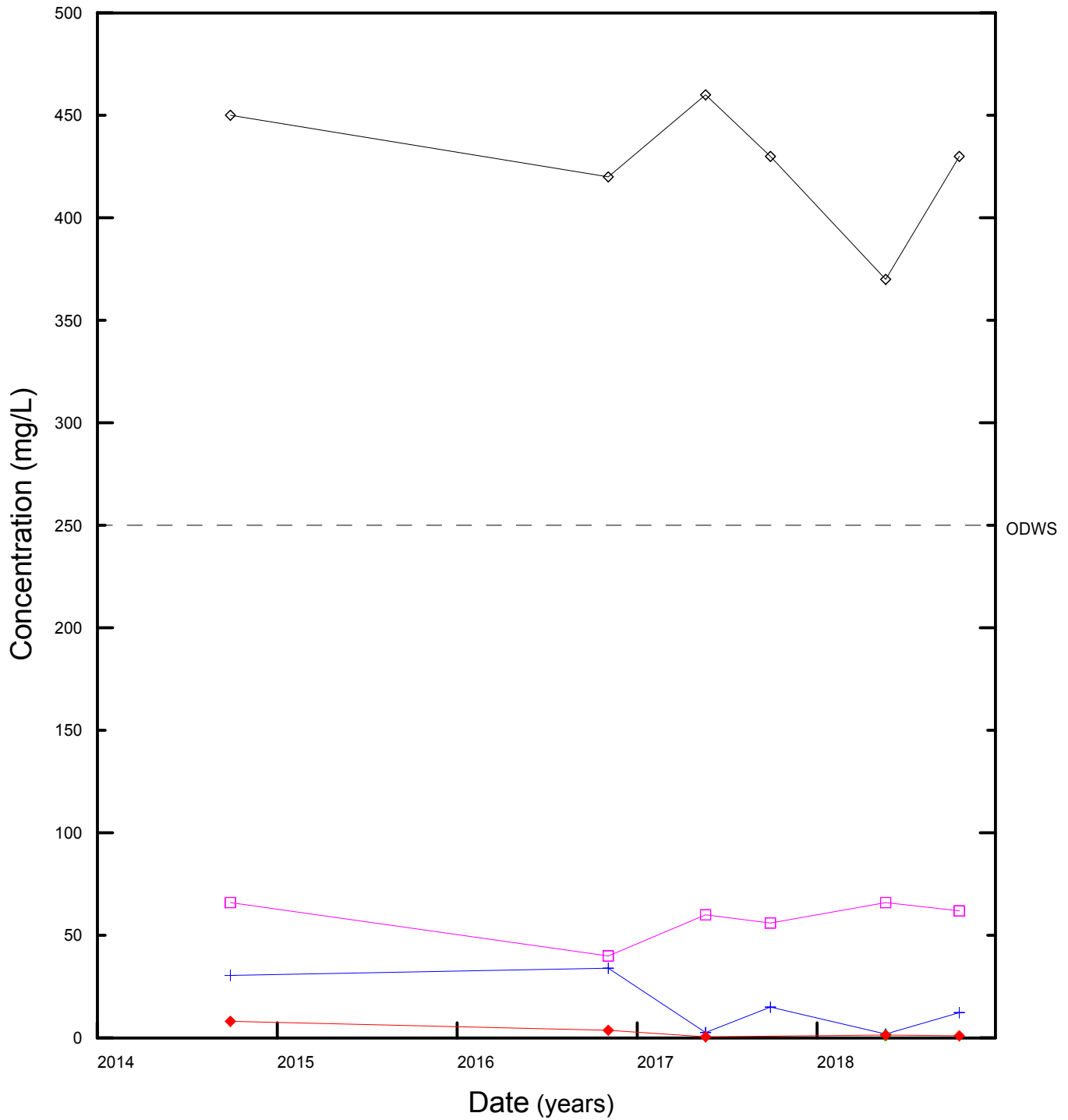
Figure G-1

Alkalinity

2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

Chloride



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being consistently dry.
 3) Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

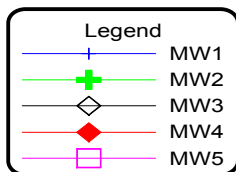
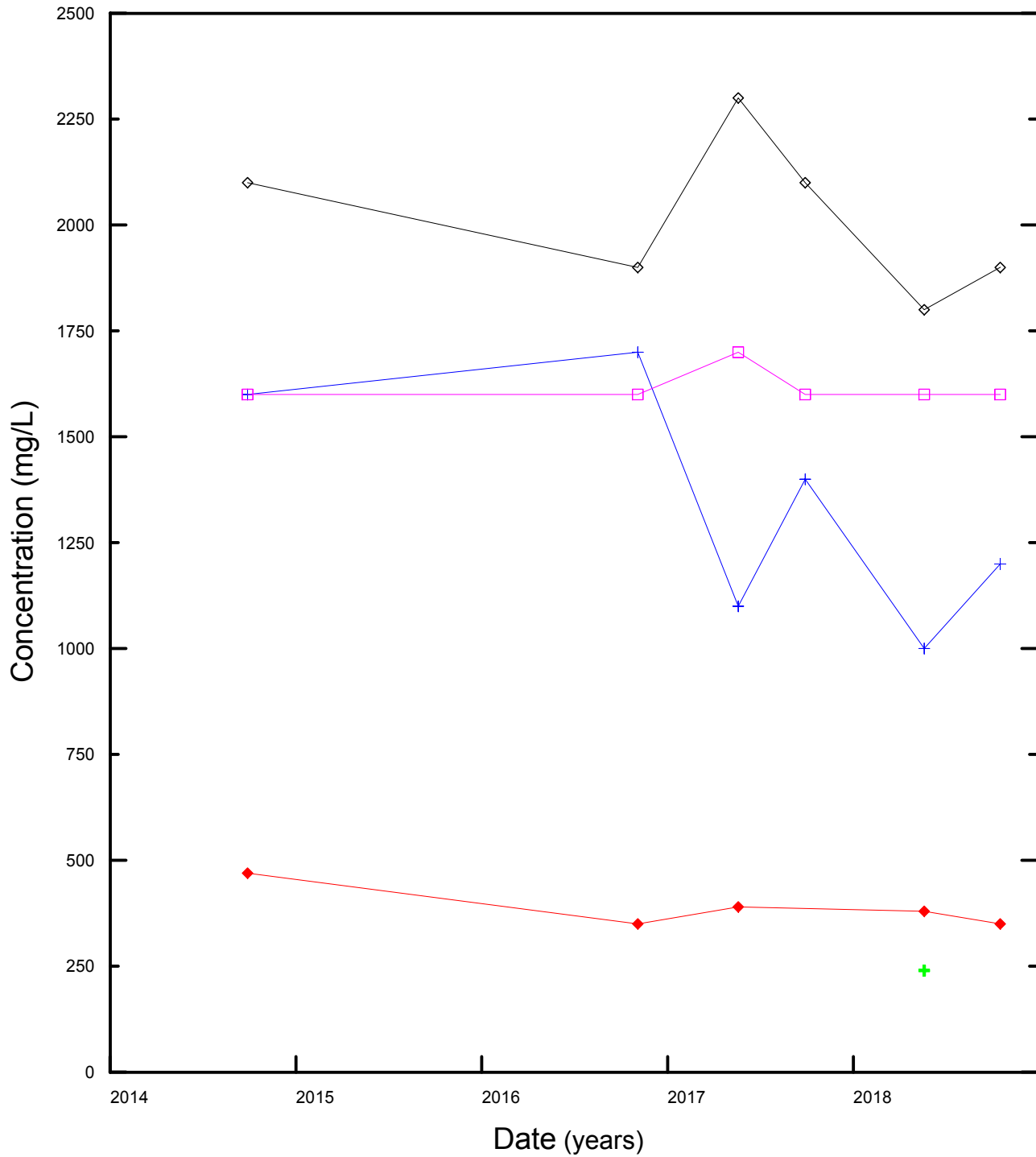
Figure
G-2

Chloride

2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

Conductivity



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being constantly dry.
 3) Drawing to be read in conjunction with accompanying report.



Conductivity

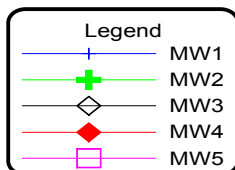
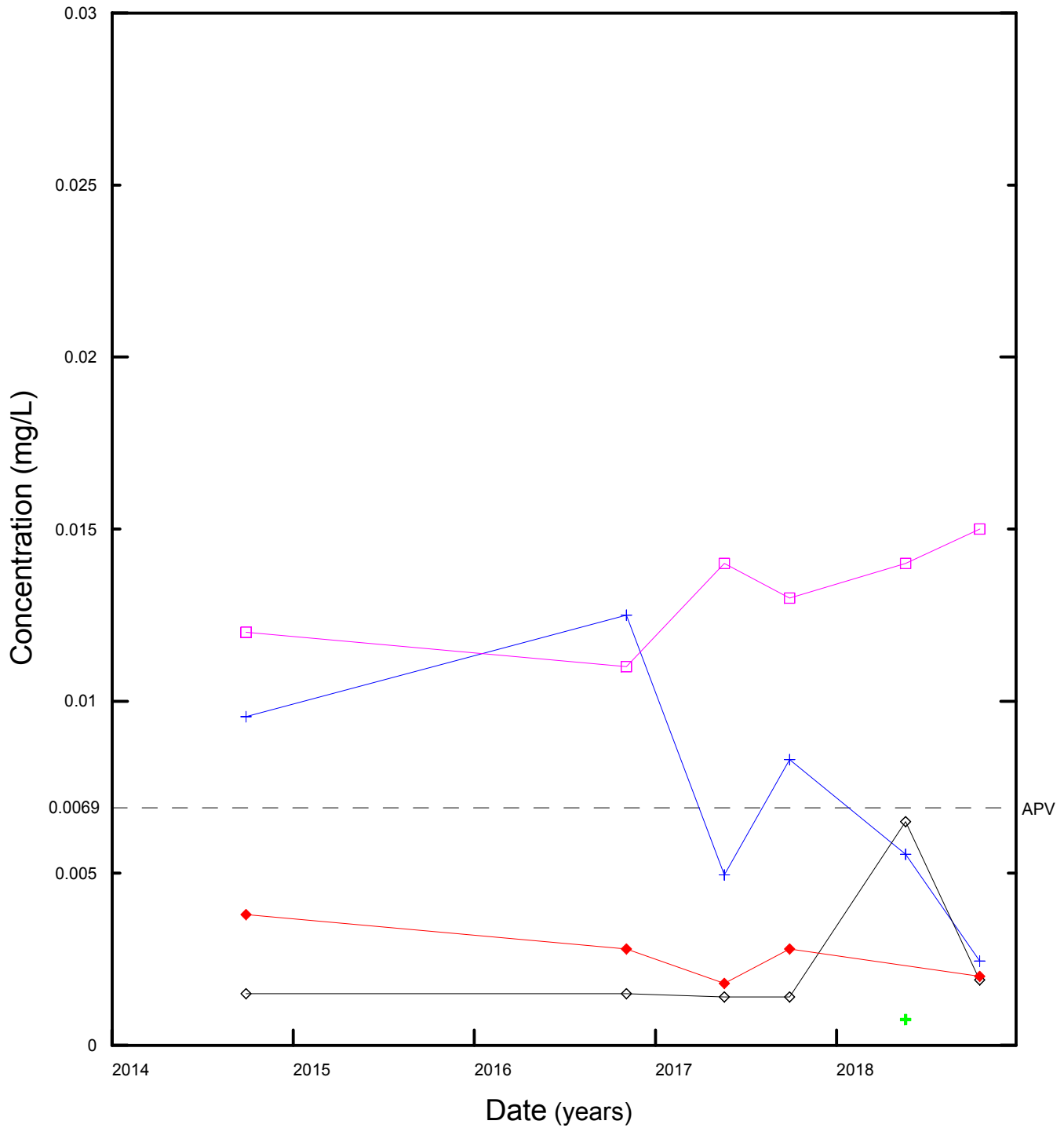
2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

Thunder Bay, Ontario

Figure
G-3

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

Copper



Notes: 1) APV: Aquatic Protection Values (MECP, April 2011)
 2) MW2 does not have enough data due to well being consistently dry.
 3) Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

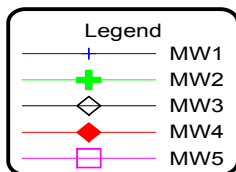
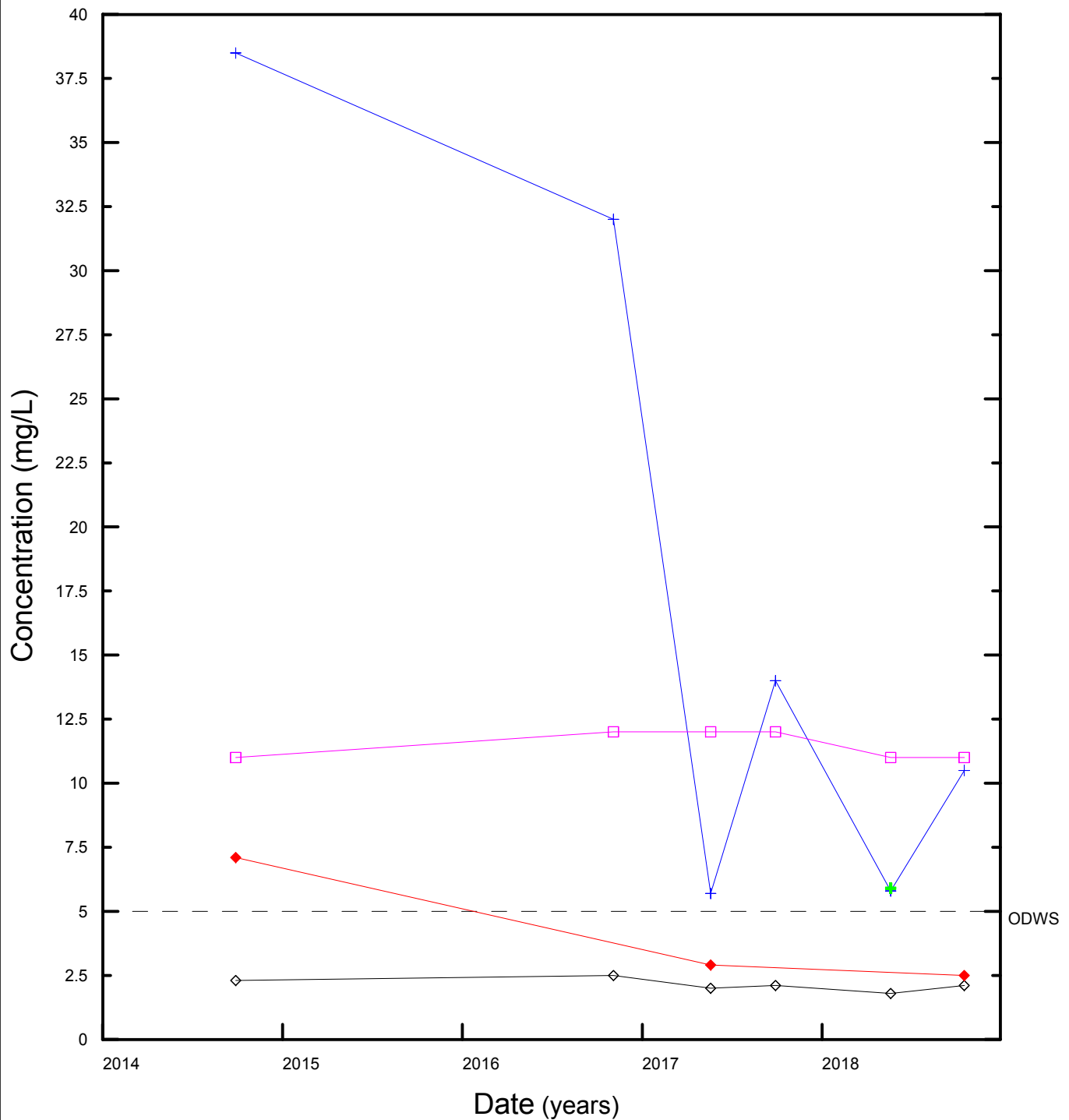
Figure
G-4

Copper

2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

DOC



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being constantly dry.
 3) Drawing to be read in conjunction with accompanying report.



DOC

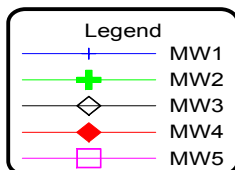
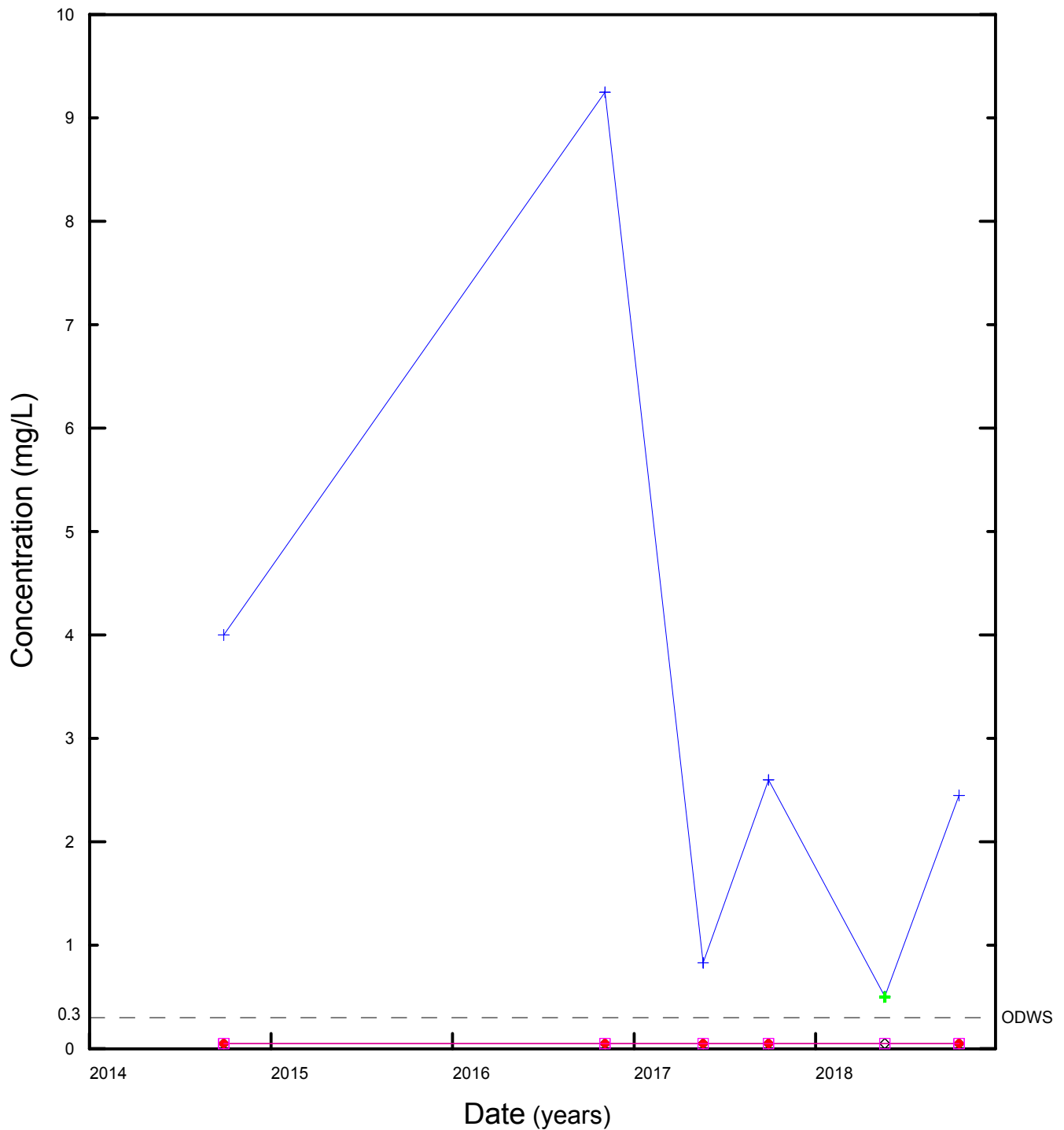
2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

Thunder Bay, Ontario

Figure
G-5

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

Iron



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being constantly dry.
 3) Drawing to be read in conjunction with accompanying report.



Iron

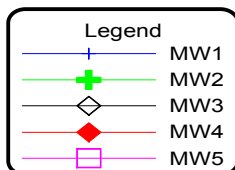
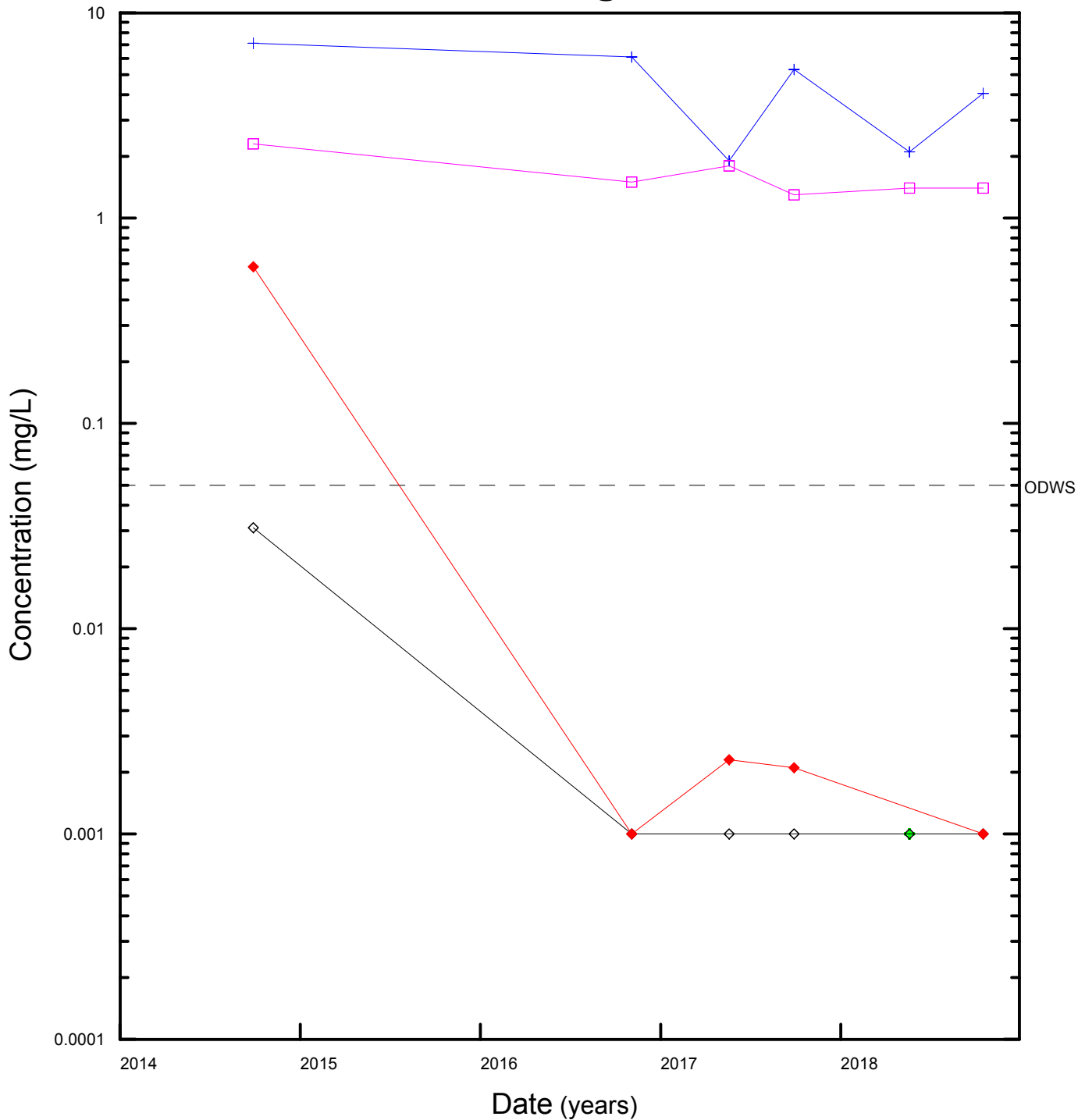
2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

Thunder Bay, Ontario

Figure
G-6

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

Manganese



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being constantly dry.
 3) Drawing to be read in conjunction with accompanying report.



Thunder Bay, Ontario

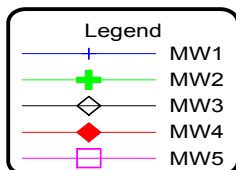
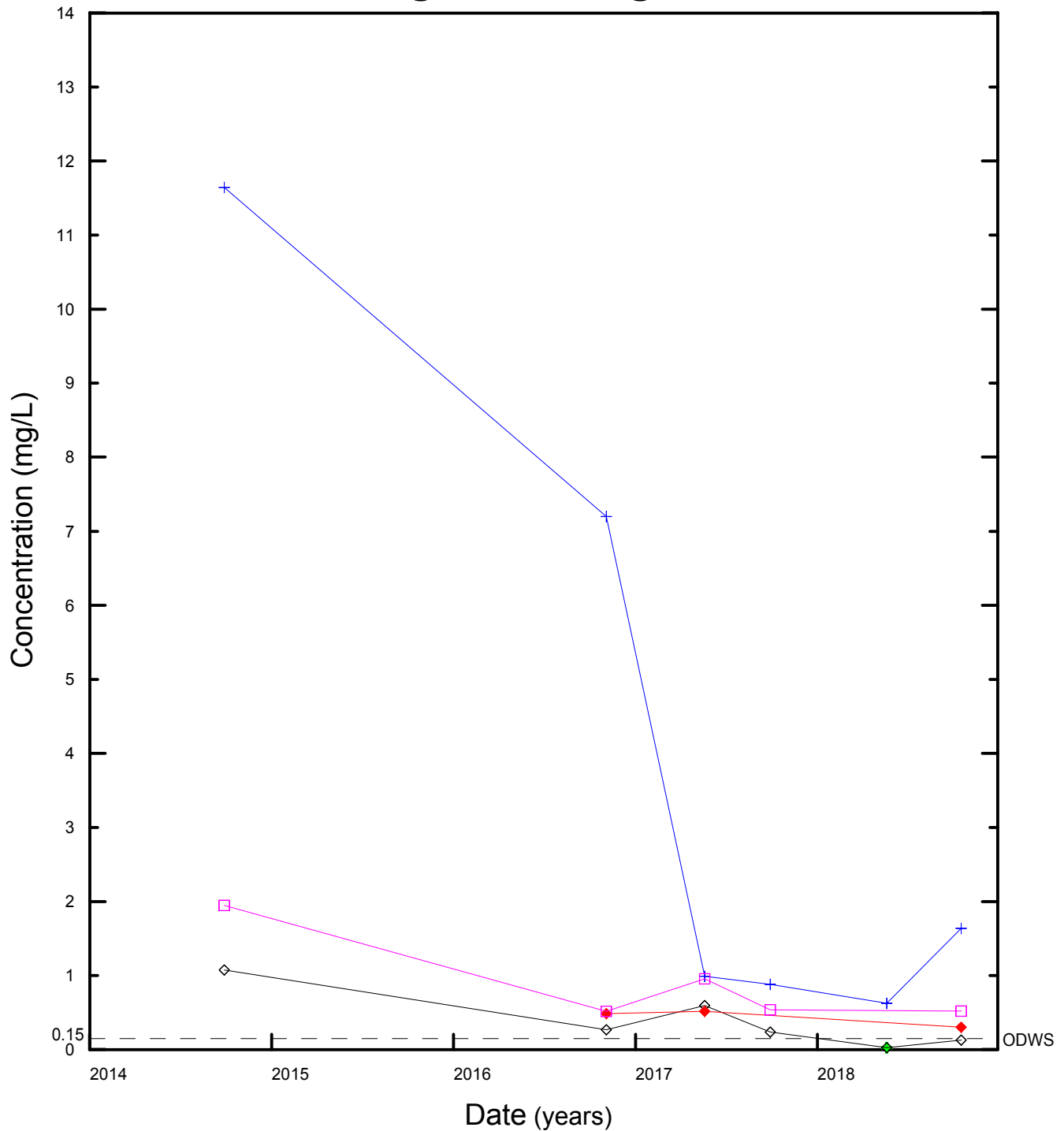
Figure
G-7

Manganese

2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

Organic Nitrogen



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being constantly dry.
 3) Drawing to be read in conjunction with accompanying report.



Organic Nitrogen

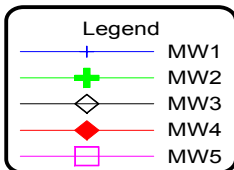
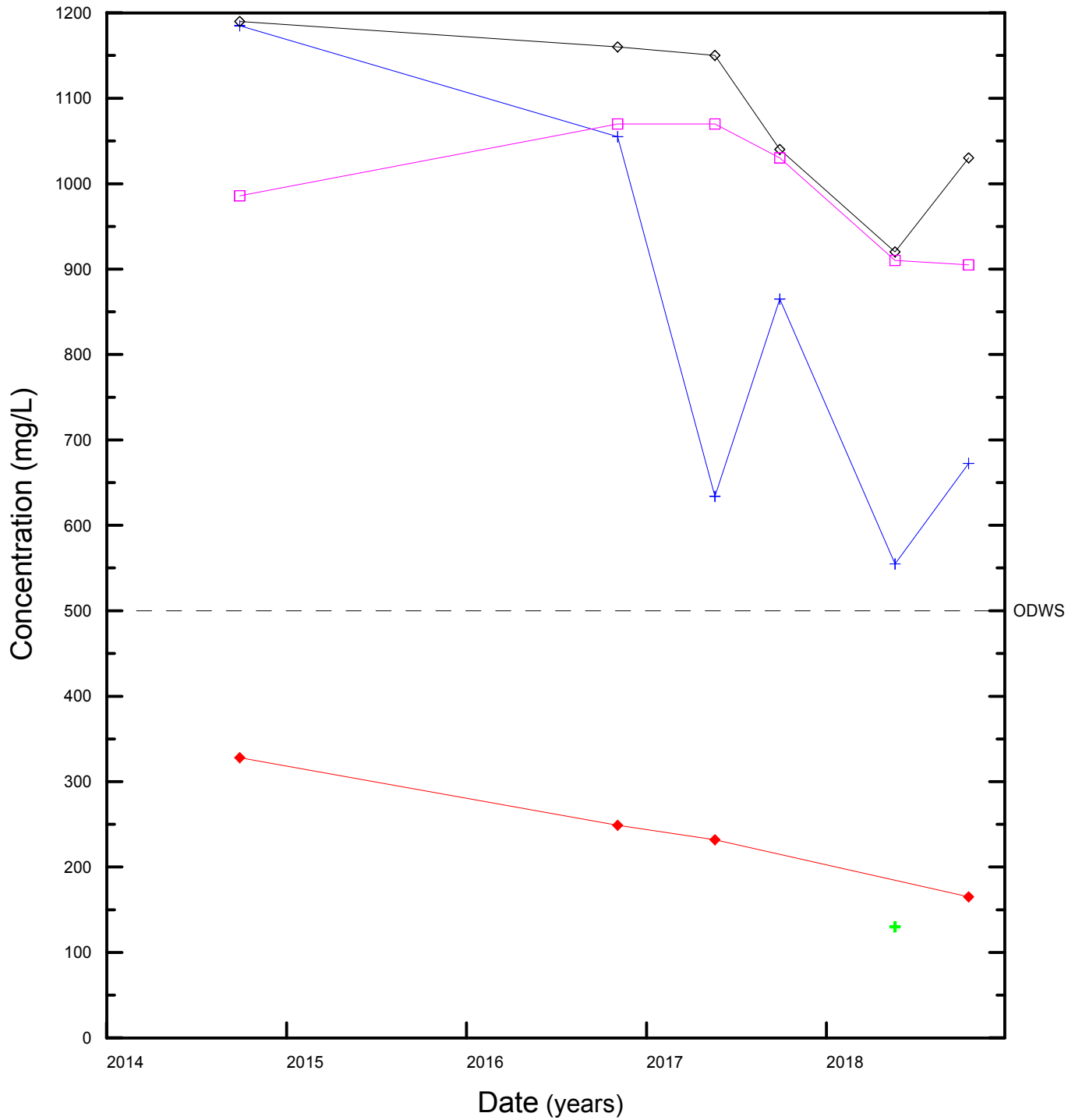
2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

Thunder Bay, Ontario

Figure
 G-8

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019

TDS



Notes: 1) ODWS: Ontario Drinking Water Standard rev 2001.
 2) MW2 does not have enough data due to well being consistently dry.
 3) Drawing to be read in conjunction with accompanying report.



TDS

2016, 2017, 2018 Groundwater Monitoring
 Nakina Landfill
 Municipality of Greenstone

Thunder Bay, Ontario

Figure
 G-9

REF. NO.:	THB-00011119-GE
SCALE:	N/A
DRAWN BY:	KK
CHECKED BY:	AM
DATE:	April 5, 2019