2023 Annual Monitoring Report

Kincardine Ward 1 Landfill Site Groundwater Collection System and Leachate Collection System Environmental Monitoring Programs

Municipality of Kincardine

30 April 2024

→ The Power of Commitment

Contents

Figure Index

Table Index

Appendices

Appendices

1. Introduction

1.1 Site Location

The Ward 1 Landfill is located at 140 Valentine Avenue in the Municipality of Kincardine (Municipality) on Part of Lots A, B, and C, Concession A, Plan 61 in the former Town of Kincardine, County of Bruce (herein referred to as the Site). The Site is located west of Highway 21 and south of Bruce Avenue and north of the road allowance between the former Town of Kincardine and the Township of Huron-Kinloss. The Site is located immediately east of the Municipality's Waste Water Treatment Plant (WWTP).

The Site location is shown on Figure 1.1.

1.2 Site Background and Regulatory Setting

The Site, now closed, operates under the Ontario Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) No. A270203. The original ECA was issued in September 1977. Since 1977 several amendments to the ECA have been made including an interim expansion approved by the MECP in 1994. The expansion was subsequently developed in 2001. The re-issued ECA dated September 29, 1994 and Notice 1 dated October 22, 2001 govern the current Site operations. The Site has an approved landfilling area of 4.94 hectares (ha) and a total Site area of 9.11 ha. The main report outlining the operation of the Site is the 1993 report entitled "Design and Operation Report, Interim Expansion, Valentine Avenue Landfill Site, Town of Kincardine" (CRA, 1993) (D&O Report).

Copies of the September 1994 Provisional ECA and October 2001 Amendment are included in Appendix A.

The Site was formerly approved to accept domestic, commercial, and non-hazardous solid waste streams (waste disposal ceased in November 2011). The Site is comprised of two landfill areas and includes:

– OLA Refers to the Original Landfill Area (OLA) used for landfilling between 1977 and 1994. This area is capped and vegetated.

– ELA Refers to the Existing Landfill Area (ELA) used for landfilling since 2001 and is comprised of Cell 1, Cell 2, and Cell 3. This area is capped and vegetated.

Between 1994 and 2001, waste was landfilled in an area referred to as the Interim Expansion Area (IEA).

A Landfill Closure Report was submitted to the MECP by the Municipality in November 2009. The Site closure activities began in 2010 with the progressive capping of the completed ELA areas. Capping and grading activities continued throughout 2011 and 2012 with the majority of works completed by the end of 2012. The Municipality stopped waste deposition on November 21, 2011 and all waste previously received at the Ward 1 landfill Site was diverted to the Kincardine Waste Management Centre (KWMC). Final capping, grading, and seeding was completed in 2013 with some minor, capping repairs being completed the following year.

The Site is capped and vegetated and is shown on Figure 1.2, which provides the existing Site conditions of the landfilling areas and ground surface contours.

1.3 Groundwater Collection System

The westerly and southerly buffer zones adjacent to the OLA contain a Groundwater Collection System (GCS), which is actively operated to hydraulically control off-Site migration of leachate impacted groundwater and maintain the Site's compliance with the MECP's Reasonable Use Guideline. Further details regarding the Reasonable Use Guideline are provided in Section 6.0. The GCS consists of a perforated 200 mm diameter HDPE collector pipe installed in the shallow sand aquifer. Design details for the GCS are provided in the D&O Report (CRA, 1993).

The GCS maintains hydraulic control of shallow groundwater between the OLA and Sewage Stabilization Lagoon No. 1 and thus reduces the potential for off-Site migration of landfill-related shallow groundwater quality impairments. The GCS discharge location is at Pump Station No. 1, where it is pumped to the Municipality's WWTP located on the adjacent property. The location of the GCS and Pump Station No. 1 is shown on Figures 1.2 and 1.3.

Figure 1.4 provides a schematic geological cross-section which shows the approximate location and installation depth of the GCS relative to the landfill footprint and immediately downgradient monitoring wells.

The GCS is operated under ECA No. 3-0408-93-006, which was issued on July 21, 1993, and was subsequently amended on August 18, 1993; November 22, 1994; and September 27, 1995. Copies of the ECA and Amendments are included in Appendix A.

1.4 Leachate Collection System

The ELA is equipped with a Leachate Collection System (LCS). The LCS consists of a series of french drains and collector pipes which collect leachate from the base of the ELA. The LCS reduces leachate mounding on the landfill base of the ELA, thereby minimizing leachate seepage through the landfill base. The LCS also reduces the occurrence of leachate seeps through the final cover soils, which can occur as a result of leachate mounding. Leachate collected by the LCS is routed to Pump Station No. 2, where it is pumped by a forcemain for treatment at the Municipality's WWTP.

ECA No. 3-0354-94-006 was issued for the operation of the LCS on June 29, 1994. The ECA was subsequently amended on March 13, 1997. Copies of the ECA and Amendment are provided in Appendix A.

The locations of the LCS and Pump Station No. 2 are shown on Figure 1.2 and 1.3. Design details of the LCS are provided in the D&O Report (CRA, 1993).

1.5 Surface Water Management System

Stormwater management ponds (SWMPs) manage the discharge of surface water from the Site. The operation of the SWMPs is outlined in the ECA for the Site.

Drainage ditches extend along the west and east sides of the OLA and ELA respectively and convey surface water in a southerly direction. A drainage ditch also extends along the southern toe of the ELA and OLA and conveys surface water in a westerly direction. SWMPs, Pond No. 1, and Pond No. 2A/2B, collect surface water runoff generated from the OLA and ELA. The SWMPs are shown on Figures 1.2 and 1.3. The SWMPs attenuate the peak flows during storm events and allow sediments to settle.

Pond No. 1 collects surface water runoff from the OLA and a portion of the southern toe of slope of the ELA. Pond No. 1 is situated on the native uniform fine-grained sands and is classified as an infiltration pond. Discharge of surface water over the pond's emergency overflow weir occurs only during significant storm events.

Pond No. 2 collects surface water runoff from the ELA. Pond No. 2 was constructed within native silt-clay and is classified as a retention pond. Pond No. 2B services the former Dry Compost Area in the buffer and discharges into Pond No 2A, which in turn discharges to on-Site ditching, located at the southern boundary of the Site. The on-Site ditching discharges to the north ditch of the road allowance to the south of the Site, which ultimately discharges to swampy areas west of the sewage lagoons (the swamps have not been evaluated in the Provincially significant wetland database).

1.6 Geologic and Hydrogeologic Setting

The geologic and hydrogeologic setting at the Site has previously been described in the Hydrogeologic Investigation Report (CRA, 1993). In general, a water table aquifer is found within a surficial sand deposit, which thickens in a north-westerly direction forming a wedge shape. The sand deposit essentially pinches out along a northeast to southwest trending line, which approximates the eastern limit of the OLA. Underlying the surficial sand deposit is the

St. Joseph Till, a regionally extensive clayey silt to silt till, which forms an aquitard horizon. The till is exposed to the immediate east of the OLA, where the surficial sand is absent. At the Site, the St. Joseph Till is at least 30 m thick (CRA, 1993).

Regional geology indicates that a deep gravel/dense gravelly till (hardpan) is present beneath the St. Joseph Till. This horizon rests on limestone bedrock of the Detroit River Group, which is utilized as a source of groundwater in the region.

The surficial sand deposit forms a water table aquifer. The hydraulic conductivity for the water table aquifer (sand) monitoring wells was determined by single well response testing. The geometric mean of the single well response tests was 2.6×10^{-3} cm/sec (CRA, 1993).

Groundwater flow within the water table aquifer is dominated by radial flow originating from the northern, western, and southern perimeters of the two Sewage Stabilization Lagoons at the Municipality's WWTP located immediately west of the OLA. This flow pattern is eventually incorporated into the regional flow system, which is assumed to be in a north-westerly direction toward Lake Huron. Groundwater flow from beneath the OLA is in a north-westerly direction toward Sewage Stabilization Lagoon No. 1 (eastern lagoon), at which point the groundwater flow intersects a constant head boundary induced by the lagoon and is partially redirected south-westward toward the southern boundary of the Site. Beyond the southern boundary of the Site, groundwater flow continues to be in a south-westerly direction to a point beyond the southern perimeter of Sewage Stabilization Lagoon No. 1, where it is incorporated into the regional groundwater flow pattern.

The St. Joseph Till, which underlies the surficial sand deposit, forms an aquitard horizon that restricts the vertical flow of groundwater from the water table aquifer to the deeper groundwater flow systems. The effectiveness of the till as an aquitard is demonstrated by a low hydraulic conductivity in the order of 3.5×10^{-8} cm/sec (CRA, 1993).

Groundwater flow within the bedrock aquifer is in a westerly direction. The bedrock aquifer unit is not monitored through the current monitoring program and groundwater flow direction at the Site has been estimated based on regional flow directions.

Alteration of the groundwater quality within the water table aquifer, due to the presence of the OLA, occurs within the western buffer zone located between the OLA and Sewage Stabilization Lagoon No. 1, and along the southern boundary of the Site. This zone of water quality alteration also extends a short distance off-Site from the southern boundary.

Groundwater quality is typical of background or unaltered conditions north of the OLA. A zone of groundwater quality alteration, indicating influence from the Sewage Stabilization Lagoons, is found parallel to the northern, western, and southern perimeter of the lagoons. Southwest of the OLA and east of Sewage Stabilization Lagoon No. 1, a zone of mixed water quality indicating partial influence from the Sewage Stabilization Lagoons, the OLA, and background water quality is evident.

1.7 Scope and Organization of Report

This report has been prepared to present and discuss the results of the environmental monitoring programs undertaken for the Ward 1 Landfill and the associated GCS and LCS. Historically a separate report was prepared for the GCS and LCS monitoring program; however, although the landfill, leachate collection, and GCS operate under three separate ECAs, the monitoring programs for the landfill and collection systems are not independent and as such, it is not suitable to provide separate evaluations of monitoring programs that are inherently linked. A meaningful evaluation of the leachate and GCS cannot be undertaken without direct consideration of data from the monitoring program for the landfill and thus, the reports have been combined.

This report is organized as follows:

– **Section 1.0** – provides an introduction of the report
– **Section 2.0** – provides a summary of the Site Operations/Closure works
– **Section 3.0** – provides details on the environmental monitoring program

- **Section 4.0** – provides a discussion on the quality assurance and control measures implemented into the environmental quality monitoring program
- **Section 5.0** – provides an assessment of the environmental quality monitoring program results
- **Section 6.0** – provides a summary of the monitoring results with a discussion of MECP Guideline B-7
- **Section 7.0** – discusses the annual monitoring report completion checklist
- **Section 8.0** – provides the conclusions and recommendations
- **Section 9.0** – provides the references

2. Site Operations

2.1 Site Closure Requirements

A Landfill Closure Report was submitted to the MECP by the Municipality in November 2009. The Municipality began implementing the closure plan for the Ward 1 Landfill Site in 2010 and stopped receiving waste at the Site on November 21, 2011. All wastes previously received at the Site are diverted to the KWMC.

The Site closure activities began in 2010 with the progressive capping of the completed ELA areas. In 2012, an overall Site clean-up was conducted which included the removal of the majority of the former waste-disposal-related items. Closure works, including final capping and grading, were completed in 2013. Minor clean-up activities continued throughout 2013 in conjunction with the final closure activities and are now complete. Minor cap repairs were completed during the first half of 2014. All post-closure activities are being carried out in accordance with the conditions of the ECA as well as the Landfill Closure Report approved by the MECP.

The Landfill Closure Report required that quarterly final cover inspections be completed for the initial two-years post-closure. Final cover inspections began after the minor repairs were completed in early 2014. Inspections were completed in July and October 2014 and in May and October 2015. Each inspection noted that the cap remained in generally good condition with minor erosion and small areas of weak vegetation growth. The cap deficiencies noted in 2014 and 2015 have subsequently been repaired. A summary of landfill cap inspections is provided in Appendix B.

As per the Landfill Closure Report, Municipal staff continue to complete annual inspections of the landfill cap. In addition, GHD field staff complete an inspection of the landfill cap during the regularly scheduled monitoring events. No deficiencies were noted by GHD field staff or reported by the Municipality in 2023.

As per the Landfill Closure Report, annual inspections should continue in 2024.

2.2 MECP Correspondence

2.2.1 Comments on Past Annual Reports

Previously, MECP comments on the surface water portion of the 2015 AMR were received on June 6, 2016, in a letter dated June 3, 2016. Each of the comments were addressed in the 2016 AMR (GHD, 2017). A copy of the letter is provided in Appendix C. MECP comments were received on the groundwater portion of the 2013 AMR in a letter dated October 1, 2014. An additional letter dated July 7, 2014 provides comment in regards to the landfill gas (LFG) monitoring at the Site. Comments on the 2013 AMR surface water portion were made in a letter dated October 1, 2014. Copies of the original MECP comment letters are provided in Appendix C. Comments on the groundwater portions of the 2009 through 2012 Annual Reports were prepared and sent by the District Office in a letter dated January 30, 2014 to the Municipality. A copy of the letter is included in Appendix C. All additional information and corrections requested in the various MECP letters are included throughout this report.

Most recently, MECP comments on the surface water portion of the 2020 AMR (GHD, 2021) were received in a letter dated January 10, 2022. A copy of the letter is provided in Appendix C. Comments from the MECP were addressed as follows:

– The requested TSS monitoring on the ponds was completed in November 2021 and 2023 and are provided in Table 5.4 and discussed in Section 5.2.3.
  - The MECP had originally made the comment to include TSS in a letter data June 3, 2016 (see Appendix C).
– In addition, the concentration vs. time graphs for all locations have been added to this report and are discussed throughout.
– In 2022, TSS analysis was requested from the lab; however, was missed due to laboratory communication/contractual issues. This was corrected. Future monitoring events and reports will continue to include TSS and concentration versus time plots for surface water locations.

2.2.2 MECP Landfill Inspection

GHD is unaware of any MECP Site inspections that occurred during 2023.

The most recent MECP inspection took place on August 14, 2013. The Municipality provided a brief email response to the MECP on October 18, 2013 and GHD provided a detailed written response to MECP on January 20, 2014. GHD's letter, which is included in Appendix C, directly addressed most of the issues raised by the MECP.

3. Monitoring Program

3.1 2023 Monitoring Program

Semi-annual monitoring for the landfill, GCS, and LCS is conducted in accordance with the ECAs that govern the operations of the Site. Table 3.1 provides the specifications for the 2023 monitoring program. The frequency of annual monitoring has been selected to monitor seasonal effects at the Site. Site monitoring is scheduled to be conducted during the spring and fall consists of the following aspects:

– On-Site observation wells – water levels, sample collection, and analysis
– Leachate monitoring wells – water levels, sample collection, and analysis
– Stormwater management ponds – sample collection and analysis
– Leachate collection system – sample collection and analysis
– Groundwater collection system – sample collection and analysis
– Sewage Stabilization Lagoons – sample collection and analysis
– On-Site LFG monitoring probes – measurement of pressure and percent methane

GHD field staff typically complete LFG monitoring during the regular monitoring events (i.e., spring and fall) as well as during January, February, March, April, July and December.

The location(s) of the groundwater and leachate monitoring wells, surface water ponds, LFG probes, GCS, LCS, and the Sewage Stabilization Lagoons are on Figures 1.2 and 1.3.

4. Environmental Quality Monitoring Program

4.1 Water Quality Monitoring Program

4.1.1 Water Quality Analysis

The water quality monitoring program and respective parameter analysis at each monitoring location for the 2023 reporting period is summarized in Table 3.1. The water quality monitoring locations are shown on Figure 1.2.

Additional samples were collected and analyzed for Quality Assurance/Quality Control (QA/QC) purposes. Laboratory Analytical Certificates for the spring (May) and fall (November) 2023 monitoring events can be provided upon request. The QA/QC Data Verification discussion is provided in Section 4.1.3.

4.1.2 Monitoring Well Inspection and Monitoring Program Deviations

As part of the regular monitoring events, GHD field staff completed an inspection of each monitoring well and gas probe. The conditions of each location are summarized in Table 4.1.

A number of monitors are in need of repair and are discussed throughout the report. Several locations need to have locks replaced.

The following deviations from the regular monitoring program occurred during 2023:

Location	Monitoring Event	Reason
OW1-89, OW3-91	Spring and fall	Wells have been destroyed, abandoned or plugged.
OW12-92	Spring and fall	Was observed to be damaged and clogged with surface mud in May 2019. The well casing could not be found in 2022 and 2023 and is presumed destroyed. The well has not been sampled since November 2018.
SGR1R-91	Spring and Fall	The T-bar has been destroyed/missing since 2021 which has prevented water level measurements.
SWMP1	Fall	Dry or insufficient water to sample.
Stormwater Management Pond Discharge Ditch	Spring and Fall	GHD attempted to establish an additional surface water monitoring point in the ditch which receives discharge from the Stormwater Management Ponds. The ditch was dry during both monitoring events.
GP3A/B-92	Fall	Noted by field staff as gone or destroyed in November 2023.
OW10-92 OW11-92	Fall	Insufficient volume to sample.
LW1-92	Spring and Fall	Water level not measured due to an oversight.
LW2-92	Fall	Access issues.
LW3-98	Spring	Water level not measured.

4.1.3 Quality Assurance/Quality Control Program

The Quality Assurance/Quality Control (QA/QC) program involved both field and laboratory measures to identify any form of sample contamination that might have occurred, or if any lack in precision of the analytical methods employed by the lab was evident. In addition, the QA/QC program addresses the potential source and degree of contamination or analytical imprecision.

The laboratory QA/QC program consisted of the analysis of method blank samples, laboratory spike samples, and surrogate recovery samples. Analyses of these samples were conducted in conjunction with the analyses of each batch of investigative samples.

The field QA/QC program consisted of the collection of field duplicate samples and the preparation of field blank samples. Field blank and field duplicate samples were collected at a frequency of one each per sampling event. Duplicate samples were collected from OW17B-96 and OW16B-92 during the spring and fall 2023 monitoring events, respectively.

Results of statistical comparisons between original and field duplicate samples is conducted through calculating the Relative Percent Difference (RPD) following the MOE's Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (MOE, March 9, 2004, amended July 1, 2011). Relative percent difference provides an absolute difference between the original and split or field duplicate samples using the following equation:

$$RPD = \left(\frac{x_1 - x_2}{(x_1 - x_2)/2}\right) x100\%$$

Where:

X1 and X2 are the respective concentrations of analytes from the original and split/duplicate sample.

An RPD value that is below 30 percent is considered the acceptable level for differences; parameters that have an RPD greater than 30 percent should be considered estimates. For instances where analytes were detected in one sample and not detected in the other, the detection limit was used to calculate the RPD for the non detect. If the detected value was lower than the detection limit of the other sample, an RPD could not be calculated due to uncertainty. Where both the original and split/duplicate sample were below laboratory reporting limits, the RPD could not be calculated due to differing reporting limits.

Parameters detected in field blanks should also be considered estimates.

The complete analytical data assessment for the current reporting period is included in Appendix D/Appendix D shows that the 2023 duplicate and original samples were generally acceptable, with the exception of lab conductivity at OW17B-96 during the spring monitoring event. Some low-level detections were made in the field blank samples. These parameters should be considered as estimates.

The qualifications of the above analytes as estimates do not significantly alter the interpretation of the data or affect the conclusions provided in this report. The analytical data are of good quality to be used in assessing the ongoing environmental performance at the Site.

4.2 Landfill Gas Monitoring Program

The LFG monitoring program includes three gas probe nests including: GP1A-92 and GP1B-92, GP2A-92 and GP2B-92, and GP3A-92 and GP3B-92. The gas probes are located between the OLA and the Public Utilities Commission (PUC) maintenance facility and municipal operations building situated to the north and northwest of the Site, respectively, as shown on Figure 1.2.

The stratigraphic and instrumentation logs for each of the gas probes are included in Appendix E (Appendix E provides all of the available stratigraphic and instrumentation logs for the Site).

The gas probes monitor the surficial sand above the water table aquifer adjacent to the buildings. As per the Site ECA, and as recommended in the 2017 AMR, gas monitoring is conducted for percent methane, pressure, oxygen (O_2) and carbon dioxide (CO_2) six times annually, during the months of January through April July, and November. In 2023, locations were monitored in January, February, March, April, July, and November.

Methane gas concentrations and pressures measured during 2023 at gas probe nests GP1A/B-92, GP2A/B-92, and GP3A/B-92 are provided in Table 4.2. Historic landfill gas monitoring results (2017 to 2022) are included in Appendix F. For the purpose of analysis and interpretation, these detections are considered non detect because the

gas detection equipment's measurements of methane concentrations have an accuracy limit of 0.3 percent (by volume).

In March 2021, GHD field staff noted a strong petroleum hydrocarbon odour in GP3A/B-92 which may have been related to a hydrocarbon spill in the vicinity of the gas probes. Methane was not monitored in GP3A/B-92 between January and July 2022 because the presence of hydrocarbons (oil/gas) would be detected as methane gas and, with GHD's equipment, would be indistinguishable from landfill gas. Hydrocarbon odours were not noted during the December 2022 monitoring event and monitoring of GP3A/B-92 resumed. GHD understands that the Municipality remediated the impacted soils in the vicinity of GP3A/B-92 in November 2023. Impacted soils were removed from the Site and disposed of at the KWMC. GP3A/B-92 were decommissioned during the soil remedial works. GHD recommends the GP3A/B-92 nest be replaced and monitoring resume in 2024.

The Site's weigh scales are located in proximity to GP1-92; however, the scales are no longer used and no other structures are present in the immediate vicinity of the gas probes. Historical monitoring results have shown methane gas is present in the area. It is recommended that the Municipality continue to avoid construction in that area. Methane has not been detected at GP2-92 which is located adjacent to the nearest structures (occupied or not). Thus, the detection of methane at GP1-92 is not of immediate concern but should continue to be monitored closely.

The 2023 methane concentration detections are summarized below:

Monitoring Location	Methane (% v/v)		
	January 2023	February 2023	March 2023
GP1A-92	1.6	ND (0.1)	3.1
GP1B-92	0.6	ND (0.1)	0.6
GP2A-92	ND (0.0)	ND (0.0)	ND (0.0)
GP2B-92	ND (0.0)	ND (0.1)	ND (0.0)
GP3A-92	ND (0.1)	1.1	ND (0.0)
GP3B-92	ND (0.1)	1.1	ND (0.0)

In 2023, none of the methane detections were above the lower explosive limits for methane (5% v/v). However, detections of landfill gas (methane) were made at GP1A/B-92, near the former weigh scales and in GP3A/B-92. The detections in GP3A/B-92 are most likely related to hydrocarbon impacted soils; however, the detections at GP1A/B-92 have continued. GHD continues to recommend that the Municipality avoid construction in this area.

The ratio of O_2 to CO_2 provides additional information with regard to the composition of the soil gas being measured and if there is any potential for short-circuiting from ambient/outside air. The 2023 results in Table 4.2 show that CO_2 is present at each gas probe location during each monitoring event, with the exception of readings at GP3B-92 in March and GP1A-92 in April. The presence of detectable levels of CO_2 provides evidence that there is no short-circuiting of ambient air. On occasions where methane gas was detected in 2023, there was a corresponding increases in CO_2 and decrease in O_2. Corresponding increases in CO_2 and methane gas with decreases in O_2 provides additional evidence that landfill gas measurements accurately represent subsurface conditions.

It is recommended that landfill gas monitoring continue to include O_2 and CO_2, in addition to percent methane and pressure.

5. Environmental Quality Monitoring Results

5.1 Groundwater Flow

Static groundwater and leachate level elevations for the 2023 reporting period are presented in Table 5.1. A review of the data shows that the spring and fall 2023 groundwater elevations were generally consistent with historical elevations.

The results of the hydraulic monitoring program have been used to create groundwater contours of the water table aquifer for the May and November 2023 monitoring events as shown on Figures 5.1 and 5.2. The groundwater contours show that the predominant groundwater flow direction in the vicinity of the Site is to the northwest. It is important to note that it is anticipated that a partial radial component of flow originating from the two Sewage Stabilization Lagoons is likely present. This flow pattern has been described as a persistent feature (CRA, 1993). Groundwater flow from beneath the OLA is in a north-westerly direction towards the Sewage Stabilization Lagoon No. 1. A constant head boundary induced by the lagoon is interpreted to intercept a portion of this flow pattern and redirects the flow to the southwest and across the southern boundary of the Site (CRA, 1993). The constant head boundary is interpreted to be the result of a hydraulic connection between the shallow sand aquifer and the Sewage Stabilization Lagoons.

The 2023 water levels show that the vertical hydraulic gradients are downwards between the shallow flow zone and the underlying silty clay till across much of the Site, except for a slight upwards gradient of 0.003 metres per metre (m/m) at OW16A/B-92 during the spring 2023 event. The vertical hydraulic gradient within the individual stratigraphic units is typically downwards. The 2023 downward vertical hydraulic gradients ranged from approximately 0.095 m/m at OW6A/B-91 to 0.414 m/m at OW18AR/BR-13.

The 2023 gradients and flow patterns are consistent with historical interpretations of groundwater flow patterns at the Site.

The GCS was designed to induce an inward gradient in the vicinity of the collector to discourage lateral migration of shallow groundwater from the landfill area beyond the collector. Detailed monitoring of the water levels in the immediate vicinity of the GCS is accomplished through measurement of static water levels at OW1-78, OW2-78, OW12-92, OW14-92, OW15R-13, and the SG1R-91 (staff gauge in Lagoon No. 1).

Historical interpretations indicated that shallow groundwater capture was effectively achieved through the operation of the GCS. The water level data available for May and November 2023 show hydraulic capture of shallow groundwater is occurring from the operation of the GCS, particularly in the vicinity of Stormwater Management Pond No. 1 and in the vicinity of OW14-92. However, with the loss of the SG1R-91 staff gauge and OW12-92, analysis of the GCS operation is difficult.

In general, analyzing the groundwater elevation data in the immediate vicinity of the GCS shows the general groundwater flow pattern is reversing towards the GCS. Thus, indicating that hydraulic capture is occurring. Water quality trends provide additional interpretive data to support the effectiveness of the GCS.

It is recommended that a replacement staff gauge be installed and geodetically surveyed within or alongside Lagoon No. 1. Monitoring well OW12-92 should be replaced.

5.2 Water Quality Results

The results of the 2023 water quality monitoring program are discussed in the following sections. Groundwater quality is assessed in terms of evidence of landfill-related water quality impacts. This is accomplished through an assessment of spatial and temporal trends of water quality across the Site and through a comparison of key leachate indicator parameter concentrations between each monitoring location and background or non-impacted water quality. The MECP criteria listed in the Ontario Drinking Water Standards (ODWS) (MOE, 2003 amended 2006 and 2017) are used for comparative reference.

Groundwater quality compliance at the Site boundaries is assessed with respect to the Trigger Level Assessment Contingency Plan (TLAC Plan) (CRA, 2000c) and MECP Guideline B-7 "Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities" (MOEE, 1994).

Surface water quality is assessed with respect to MECP criteria listed in the Provincial Water Quality Objectives (PWQO) (MOEE, July 1994, reprinted February 1999).

Alkalinity, hardness, and pH concentrations are evaluated as part of the groundwater monitoring program for the Site. As identified in the ODWS, criteria for these parameters are considered Operational Guidelines (OG) established to promote effective treatment, disinfection, and distribution of potable water by water treatment plants for domestic and industrial consumption. As such, ODWS criteria for alkalinity, hardness, and pH parameters are not considered applicable to landfill water quality evaluations. Therefore, exceedances of the ODWS OG for alkalinity, hardness, and pH parameters are not highlighted within the analytical data tables or in the summary tables embedded within the text of this report.

Currently, four key leachate indicator parameters have been selected to evaluate the potential effects of the landfill on surrounding water quality:

- Chloride: formed in part by the degradation of paper products, food wastes, and a major component of salts.
- Alkalinity: caused by the increased concentrations of carbonate, bicarbonate, and hydroxide ions due to the waste materials.
- Hardness: caused by the increased concentrations of calcium and magnesium ions due to the waste materials and more acidic pH breaking down the native lime-rich soils.
- Conductivity: electrical conductivity is a measurement of the ability for water to conduct electrical current through it. This ability is directly linked to the dissolved materials in an aqueous solution. An increase in conductivity corresponds with an increase in dissolved materials such as those originating from the landfill.

Many other analytical parameter concentrations are also altered as a result of leachate impacts, but not generally at the high levels of change noted in the above-listed parameters. Ammonia, boron, iron, and manganese have been used as secondary leachate indicator parameters and are used, where appropriate, in the discussion of water quality.

5.2.1 Leachate Monitoring Wells

The 2019 through 2023 analytical results for general chemistry and total metals, and volatile organic compound (VOC) concentrations detected in samples collected from LW2-92 and LW3-98 are provided in Table 5.2A and 5.2B, respectively. Historical leachate quality data is provided in Appendix F.

The 2023 leachate analytical results for samples collected from LW2-92 and LW3-98 generally follow historical trends. Leachate indicator parameter concentrations, with ammonia and iron, from LW2-92 and LW3-92 for the current monitoring period are summarized below:

Parameter	Median Concentration (2019 – 2023)	LW2-92		LW3-98	
		Spring (May 2023)	Fall (November 2023)	Spring (May 2023)	Fall (November 2023)
Alkalinity (mg/L)	1940	1820	N/A	1600	2350
Ammonia (mg/L)	158	142	N/A	131	250
Chloride (mg/L)	240	160	N/A	140	390
Hardness (mg/L)	1270	1330	N/A	1280	1440

Parameter	Median Concentration (2019 – 2023)	LW2-92		LW3-98	
		Spring (May 2023)	Fall (November 2023)	Spring (May 2023)	Fall (November 2023)
Iron (mg/L)	35.9	28	N/A	242	51
Conductivity (µS/cm), field	3890	N/A	3800	3250	5120
Note: Samples collected from LW2-92 and LW3-98 are unfiltered and as such represent total concentrations. µS/cm - microSiemens per centimetre; N/A – no access					

The concentrations of the key leachate indicator parameters indicate typical leachate derived from municipal waste that is of moderate strength.

The analytical results for the key leachate indicator parameters, from LW2-92 and LW3-98, are graphically illustrated on Figures 5.3a and 5.3b. The following observations are made regarding the leachate water quality trends:

– Leachate strength is comparable at both leachate monitoring wells.
– Concentrations of ammonia, alkalinity, chloride at LW2-92 have been relatively stable over time. There have been some minor decreasing trends in boron and hardness. Concentrations of ammonia and manganese are variable at LW2-92.
– Concentrations of boron and alkalinity at LW3-98 have shown overall declining trends, while manganese shows a slight increasing trend. Ammonia and hardness are relatively stable, while iron concentrations at LW3-98 are observed to be variable over time, with indications of the average concentration stabilizing in the long-term.
    - The spring 2023 iron result from the LW3-98 sample was elevated well above historical ranges. Further observation is required to confirm that the spike in iron concentration observed at LW3-98 is anomalous.
– Alkalinity, chloride concentrations and electrical conductivity (not plotted) are observed to be stabilizing following a period of decrease over time. Other key leachate parameters are observed to be relatively steady over the long term.

Detected VOC concentrations are generally at low levels at both LW2-98 and LW3-98 with more parameter detections reported at LW3-98. Chlorobenzene and benzene concentrations are slightly higher at LW2-92 in comparison with LW3-92.

The following VOC parameters have historically been detected within leachate at the Site:

LW2-92	LW3-98
1,4-Dicholorbenzene	1,4-Dichlorobenzene
Acetone	Acetone
Benzene	Benzene
Carbon Disulfide	Chloroethane
Chlorobenzene	m&p-Xylene
Chloroethane	MTBE
	o-Xylene

In 2023, only benzene (1.8 µg/L) and chlorobenzene (1.1 µg/L) were detected at LW2-92. In comparison, 1-4 dichlorobenzene, acetone, benzene, and chlorobenzene were detected at LW3-98 in the spring 2023 sample. In fall 2023, 1-4 dichlorobenzene, benzene, m&p-xylene, and o-xylene were detected at LW3-98.

At both leachate wells, benzene was detected in exceedance of ODWS concentrations during the spring 2023 monitoring event. This is consistent with historical results.

5.2.2 Groundwater Monitoring Wells

The current analytical results for general chemistry and metals parameters detected in samples collected from on-Site monitoring wells from the water table aquifer and till aquitard are provided in Table 5.3. Historical groundwater quality data is provided in Appendix F.

5.2.2.1 Water Table Aquifer

The following discussion assesses groundwater quality in an upgradient to downgradient fashion. The groundwater monitoring well locations for the current reporting period are grouped as follows:

– Background Wells OW10-92, OW19A-96, OW19B-96, OW18AR-13, and OW18BR-13.
– Landfill Vicinity Wells OW1-78, OW2-78, OW2-89, OW3-89, OW11-92, OW12-92, OW13-92, OW14-92, OW15R-13, OW16A-92, OW16B-92, OW17A-92, and OW17B-96.
– Cross Gradient Wells OW20-13.
– Downgradient Wells OW2-82.

In addition to the wells listed above, there are a number of monitoring wells that are not included as part of the annual sampling program but are typically used for hydraulic monitoring purposes.

Background Wells

Monitoring well nest OW19A/B-96 is located approximately 80 m north (cross-gradient) from the eastern (upgradient) limit of the ELA and is thus considered to be a reasonably reliable background well nest. OW10-92 is located along Bruce Avenue, approximately 200 m cross gradient from the landfilled area. Based on the current and historical documented groundwater flow direction it is considered unlikely that this well will be impacted by landfilling activities.

Leachate indicator parameter concentrations from the background monitoring wells for the current monitoring period are summarized below:

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW10-92		OW19A-96		OW19B-96	
			Spring	Fall	Spring	Fall	Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	177	Insufficient volume	147	144	235	243
Chloride (mg/L)	250 (AO)	7	4		4	5	31	34
Hardness (mg/L)	80-100 (OG)	178	175		155	156	198	195
Conductivity, lab (µS/cm)	-	628	341		645	641	633	688

Notes:
Bold concentrations exceed ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

The analytical results for the key leachate indicator parameters from OW10-92 and OW19A/B-96 are graphically illustrated on Figures 5.4 and 5.5, respectively. The following observations are made regarding the water quality trends:

– Overall, Figure 5.4 illustrates stable to slightly decreasing concentrations of chloride and conductivity at OW10-92 with some seasonal variability in both parameters. Concentrations of alkalinity and hardness are consistent.

– Figure 5.5 shows concentrations of indicator parameters in the shallow monitoring well, OW19B-96 are elevated compared to the deep monitoring well, OW19A-96. Chloride concentrations at OW19B-96 show an increasing trend.

Replacement monitoring well nest OW18A/BR-13 was installed in September 2013 east of the landfill footprint. Concentration versus time graphs for OW18AR/BR-13 are shown on Figure 5.6. Leachate indicator parameter concentrations from the replacement well nest for the current monitoring period are summarized below:

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW18AR-13		OW18BR-13	
			Spring	Fall	Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	174	96	103	185
Chloride (mg/L)	250 (AO)	7	8	4	4	8
Hardness (mg/L)	80-100 (OG)	178	154	154	153	154
Conductivity, lab (µS/cm)	-	628	567	697	678	605

Notes:
Bold concentration exceeds ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

The analytical results for the key leachate indicator parameters from OW18AR/BR-13 are graphically illustrated on Figure 5.6. The following observations are made regarding the water quality trends:

– Water quality in both replacement wells has shown concentrations that reasonably corresponded with the original well nest. Concentrations have decreased since their installation and are currently comparable to water quality in the original well nest and overall median background concentrations.
– Figure 5.6 shows that concentrations are comparable between OW18AR/BR-13.

Based on the observations presented in recent annual monitoring reports, shallow background monitoring wells OW10-92, OW19B-96, and OW18AR-13 and the deep monitoring wells OW19A-96 and OW18BR-13 demonstrate reliable representations of background groundwater quality. Under these circumstances, continued sampling of OW19A-96 and OW19B-96 as part of the annual monitoring program is redundant. It is therefore recommended that monitoring well nest OW19A/B-96 be removed from the groundwater quality sampling portion of the annual monitoring program at the Site. If OW19A/B-96 is removed from the sampling program, median background concentrations will be calculated using OW10-92 and OW18AR/BR-13 going forward. Nested monitoring wells OW18AR-13 and OW18BR-13 should be used to calculate future maximum acceptable boundary concentration (MABC) values (see Section 6.0). Hydraulic monitoring should continue at OW19A/B-96 in order to support determination of groundwater flow direction across the Site.

Landfill Vicinity Wells

The landfill vicinity monitoring wells are located in close proximity to the OLA and ELA, cross gradient to downgradient from the landfilled areas.

Monitoring well nest OW17A/B-96 is located cross gradient from the ELA. Concentration versus time graphs for OW17A/B-96 are shown on Figure 5.7. Leachate indicator parameter concentrations from the landfill vicinity monitoring wells OW17A/B-96 for the current monitoring period are summarized in the table below.

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW17A-96		OW17B-96	
			Spring	Fall	Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	171	171	228 (233)	241
Chloride (mg/L)	250 (AO)	7	3	4	7 (7)	8
Hardness (mg/L)	80-100 (OG)	178	154	165	193 (202)	191
Conductivity, lab (µS/cm)	-	628	537	542	493 (348)	526

Notes:

Bold concentration exceeds ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023
Values in parenthesis represent duplicate sample results.

AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.

µS/cm - microSiemens per centimetre.

Analytical results for samples collected from this monitoring well nest continue to show stable trends comparable to background water quality, with the exception of alkalinity at OW17B-96, which remains stable but has consistently been elevated above background. No landfill related impacts are interpreted to be present.

Monitoring locations OW3-89 and OW11-92 are located cross-gradient and in close proximity to the landfilled area. Concentration versus time graphs for the two wells are shown on Figure 5.8. Leachate indicator parameter concentrations for the current monitoring period are summarized in the table below.

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW3-89		OW11-92	
			Spring	Fall	Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	637	263	670	Insufficient volume
Chloride (mg/L)	250 (AO)	7	120	48	40	
Hardness (mg/L)	80-100 (OG)	178	588	298	649	
Conductivity, lab (µS/cm)	-	628	1400	658	1230	

Notes:

Bold concentration exceeds ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

Figure 5.8 shows elevated indicator parameters alkalinity, hardness, chloride and hardness which are consistent with mild to moderate landfill-related groundwater quality impairment at these locations. Past results show indicator parameters are more significantly elevated at OW11-92, indicating a more pronounced landfill effect on water quality.

The OW3-89 sample results from August 2020 were significantly higher than previous results and were expected to be erroneous. However, given the similarly elevated results in 2021 and 2022, the previously omitted concentrations from Figure 5.8 (chloride and hardness) have been included. An inspection of OW3-89 during the fall 2022 monitoring event noted that the well may have been damaged (loose surface seal and protective casing). Surface water may be

influencing water quality in this well. It is recommended that a licenced well drilling contractor be retained to reset the surface seal and casing. With the exception of chloride, in 2023, OW3-89 results have returned to levels comparable to historical parameter concentrations observed at this location. Chloride has remained slightly elevated.

Monitoring wells OW1-78 and OW2-78 are located just off the eastern corner of the OLA near to Pump Station No. 1. Concentration versus time graphs for the two wells are shown on Figure 5.9. Leachate indicator parameter concentrations for the current monitoring period are summarized in the table below.

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW1-78		OW2-78	
			Spring	Fall	Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	650	698	299	297
Chloride (mg/L)	250 (AO)	7	230	190	31	37
Hardness (mg/L)	80-100 (OG)	178	642	673	248	262
Conductivity, lab (µS/cm)	-	628	1760	1690	623	647

Notes:
Bold concentration exceeds ODWS
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

Based on an assessment of groundwater sample analytical results compared to median concentrations at background wells, landfill-derived water quality impacts appear present at OW1-78. This is consistent with the proximity of OW1-78 to the landfilled area. Concentrations of select indicator parameters are observed to be slightly decreasing over time at OW1-78 since approximately 2010 as illustrated in Figure 5.9. An increase in chloride concentrations was noted in 2022 at OW1-78 and remained elevated through 2023. This is potentially due to a degraded surface seal and should be investigated further. It is recommended that the licensed drilling subcontractor investigate and repair OW1-78 while repairing the seal and casing at OW3-89.

Monitoring wells OW1-89 (destroyed), OW2-89, OW12-92, OW13-92, OW14-92, and OW16B-92 are located downgradient from the OLA, between the OLA and Sewage Stabilization Lagoon No. 1. Monitoring well OW12-92 has not been sampled since 2019 due to an obstruction in the riser pipe and later being buried/lost and presumed destroyed. Figure 5.10 illustrates the concentration versus time plots for the key leachate indicator parameters at each OW2-89 and OW12-92. Figure 5.11 illustrates the concentration versus time plots for OW13-92, OW14-92, and OW16B-92. Leachate indicator parameter concentrations for the current monitoring period are summarized in the table below.

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW2-89		OW12-92	
			Spring	Fall	Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	382	535	buried/lost	
Chloride (mg/L)	250 (AO)	7	21	36		
Hardness (mg/L)	80-100 (OG)	178	373	514		
Conductivity, lab (µS/cm)	-	628	735	1100		

Notes:
Bold concentration exceeds ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm – microSiemens per centimetre.

Parameter	ODWS		Median Background Concentration (2019 – 2023)	OW13-92		OW14-92		OW16B-92	
			Spring	Fall	Spring	Fall	Spring	Fall	
Alkalinity (mg/L)	30-500 (OG)	183	685	384	787	543	161	849 (779)	
Chloride (mg/L)	250 (AO)	7	56	43	18	47	32	51 (53)	
Hardness (mg/L)	80-100 (OG)	178	3720	338	739	541	78.7	584 (542)	
Conductivity, lab (µS/cm)	-	628	1390	845	1340	1120	415	1750 (1610)	

Notes:
Bold concentrations exceed ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
Values in parenthesis represent duplicate sample results.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm – microSiemens per centimetre.

Based on the analytical results from the 2023 monitoring program, as well as an interpretation of temporal trend data for each location as presented on Figures 5.10 and 5.11, the following observations are made:

– OW2-89 generally shows stable trends at or slightly above background concentrations; however there is a possible increasing trend in conductivity and alkalinity occurring since 2022 that should continue to be observed.
– Indicator parameter concentrations at OW13-92, OW14-92 and OW16B-92 are significantly elevated compared to median background concentrations. Concentrations of indicator parameters are consistent with moderate landfill-derived impairment of groundwater quality at these locations. Occasionally, elevated chloride concentrations are likely related to influences on groundwater quality from both the landfill and the Sewage Stabilization Lagoons.
– Historical concentrations of select indicator parameters indicate that landfill-derived impacts are most significant at OW16B-92.

– It is noted that the spring 2023 hardness and calcium concentrations were abnormally elevated and likely anomalous at OW13-92. Hardness is the sum of calcium and magnesium and while magnesium concentration in the spring 2023 sample were comparable to past results. Thus, the calcium results are likely anomalous.

Based on past and present observations, monitoring well OW14-92 demonstrates similar groundwater quality results and trends as OW13-92 (disregarding the abnormal calcium at OW13-92 in the spring 2023 sample) which is located approximately 36 m downgradient towards Sewage Stabilization Lagoon No. 1. Under these circumstances, continued sampling of OW14-92 as part of the annual monitoring program is redundant. It is therefore recommended that monitoring well OW14-92 be removed from the groundwater quality sampling portion of the annual monitoring program at the Site. Hydraulic monitoring should continue at OW14-92 to support determination of groundwater flow direction across the Site as well as to assess the effectiveness of the GCS.

Hydraulic water level data at monitoring well OW12-92 is useful in assessing the functioning of the GCS. It is recommended that a licensed well drilling contractor be retained to replace this well.

Monitoring well OW15R-13 was installed in 2013 to replace monitoring well OW15-92. OW15R-13 was installed approximately 35 m west of the former location in the vicinity of the former brush pile to provide additional protection. A significant layer of wood waste was encountered extending from just below ground surface to an approximate depth of 3.81 metres below ground surface (mBGS). The well was completed just below the waste materials within the underlying native sand. Figure 5.12 illustrates the concentration versus time plots for the well and leachate indicator parameter concentrations from the replacement well for the current monitoring period are summarized below:

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW15R-13	
			Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	536	509
Chloride (mg/L)	250 (AO)	7	**10**	**13**
Hardness (mg/L)	80-100 (OG)	178	507	411
Conductivity, lab (µS/cm)	-	628	995	962

Notes:
Bold concentration exceeds ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

Indicator parameter concentrations observed at OW15R-13 are generally similar to those observed at monitoring wells OW14-92 and OW16B-92, and are elevated compared to median background concentrations, with the exception of chloride in recent years which has shown a decreasing trend nearing background concentration. The presence of historically elevated concentrations of select indicator parameters may be attributable to wood waste present in the vicinity of OW15R-13, as presented in the stratigraphic logs provided in Appendix E.

Based on the results of the 2023 monitoring program, shallow monitoring wells located between the OLA and Sewage Stabilization Lagoon No. 1 are characterized by moderate to elevated concentrations of several indicator parameters which are indicative of leachate impairment derived from the operation of Sewage Stabilization Lagoon No. 1. Although water quality within Sewage Stabilization Lagoon No. 1 is not typically elevated in terms of alkalinity or hardness, chloride concentrations within the lagoon are typically elevated due to the addition of ferric chloride, which serves as a coagulant in wastewater treatment operations. For this reason, in combination with the observed flattening of the horizontal hydraulic gradient between the lagoon and the OLA, the lagoon is interpreted to likely be a contributing source of chloride concentrations observed in shallow wells around the lagoon.

Cross-Gradient Wells

Monitoring well OW20-13 was installed in the fall 2013 and is located north of the wastewater treatment buildings and aeration lagoon. The well is located in a cross-gradient position, to the north of the landfilling areas. Leachate indicator parameter concentrations for OW20-13 for the current monitoring period are summarized below and concentration versus time plots are provided on Figure 5.13.

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW20-13	
			Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	295	325
Chloride (mg/L)	250 (AO)	7	**350**	**420**
Hardness (mg/L)	80-100 (OG)	178	385	422
Conductivity (µS/cm)	-	628	1590	1910

Notes:
Bold concentration exceeds ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

As shown in Figure 5.13, alkalinity, chloride, and hardness concentrations observed at OW20-13 remain elevated and demonstrate variable water quality since 2013. Concentrations in 2023 were within historical ranges. Chloride concentrations are observed to be greater at OW20-13 than at landfill monitoring wells LW2-92 and LW3-98. Based on relative concentrations of other indicator parameters, elevated chloride concentrations at OW20-13 are unlikely to be related to landfill-derived impairment of the groundwater and more likely attributable to impacts resulting from road salting activities.

Downgradient Wells

Monitoring well OW2-82 is located downgradient and to the southwest of the landfilling areas. Leachate indicator parameter concentrations for the current monitoring period at OW2-82 are summarized below and concentration versus time plots are provide on Figure 5.14.

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW2-82	
			Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	214	464
Chloride (mg/L)	250 (AO)	7	11	36
Hardness (mg/L)	80-100 (OG)	178	208	429
Conductivity (µS/cm)	-	628	414	962

Notes:
Bold concentration exceeds ODWS.
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

Based on long-term assessment of groundwater quality results for monitoring well OW2-82, groundwater quality remains variable at this location. Since 2010 concentrations of indicator parameters have approached median background water quality, as illustrated on Figure 5.14, but then increase to levels above background. Overall trends show increasing trends in alkalinity, hardness, and conductivity but overall stable chloride levels. Particular attention

should be paid to this monitoring location in future reporting years as the results may indicate migration of impacts to this area. If worsening trends continue, additional actions may be warranted.

5.2.2.2 Till Aquitard

The groundwater quality of the underlying clayey silt till aquitard immediately downgradient of the landfill footprint is monitored at monitoring well OW16A-92.

Concentration versus time plots for OW16A-92 are provided on Figure 5.15. Leachate indicator parameter concentrations for the current monitoring period are summarized below:

Parameter	ODWS	Median Background Concentration (2019 – 2023)	OW16A-92	
			Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	183	919	190
Chloride (mg/L)	250 (AO)	7	40	30
Hardness (mg/L)	80-100 (OG)	178	667	81.5
Conductivity, lab (µS/cm)	-	628	1660	400

Notes:
Bold concentration exceeds ODWS
Median concentrations have been calculated from OW10-92, OW18AR/BR-13, and OW19A/B-96 from 2019 – 2023.
AO – aesthetic objective; N/A – data not available; OG – operational guideline; mg/L – milligrams per litre.
µS/cm - microSiemens per centimetre.

As shown in Figure 5.15, analytical results for monitoring well OW16A-92 are observed to be consistently similar to median background concentrations with the exception of elevated levels of chloride. An irregularly high increase in alkalinity, chloride and conductivity is noted in the May 2023 sample and is suspected to be an error. Overall, indicator parameters concentrations, including chloride, are interpreted to be stable over time and do not indicate landfill-derived deterioration in groundwater quality in the vicinity of OW16A-92.

5.2.3 Stormwater Management Ponds

As previously discussed in Section 1.5, Pond No. 1 manages the flow of stormwater from the OLA. Based on the presence of sandy subsoil identified at the base of the pond, Pond No. 1 is classified as an infiltration pond. Discharge of surface water from the pond's emergency overflow weir has not been observed since it was first constructed in 1994. Analytical results for Pond No. 1 have therefore historically been compared to the ODWS (for groundwater quality assessment purposes) and to the PWQOs (for surface water quality assessment purposes). It is noted that the PWQO may not necessarily be appropriate for enforcement of surface water quality at Pond No. 1, as the immediate receptor of the collected surface water is the underlying shallow sand aquifer. Analytical results for Pond No. 1 are therefore compared to the PWQOs for reference purposes only. In addition, Pond No. 1 has been frequently reported as dry during routine monitoring events. As a result, historical analytical results for Pond No. 1 are fairly limited and assessment is limited to those periods where representative samples could be successfully collected.

Pond No. 2 manages flow from the ELA and the Dry Composting Area. Pond No. 2 is a double cell pond design which facilitates retention of surface water runoff from the two distinct zones. Pond No. 2A provides storage for runoff from the ELA and Pond No. 2B provides storage for runoff from the Dry Compost Area. These two distinct areas are physically separated by a gravel road that also acts as a surface water divide. The till below the base of Pond No. 2 results in the pond operating as a retention pond. Pond No. 2 discharges to a swale located at the south boundary of the Site. The swale discharges to the north ditch of the road allowance, which ultimately discharges to the Kincardine Swamp. The analytical results for Pond No. 2 are therefore compared to the PWQOs.

The analytical results for samples collected from both SWMPs are provided in Table 5.4. Historical monitoring results for the SWMP are provided in Appendix F.

Leachate indicator parameters with aluminium, iron, boron, and Total Suspended Solids (TSS) are presented below:

Parameter	PWQO	Pond No. 1 (SWP1)		Pond No. 2 (SWP2)	
		Spring	Fall	Spring	Fall
Alkalinity (mg/L)	-	1350	Dry or insufficient volume	116	171
Aluminium (mg/L)	0.075[a]	**1.04**		**0.289**	**0.164**
Chloride (mg/L)	-	78		2	26
Hardness (mg/L)	-	890		132	213
Iron (mg/L)	0.3	**65**		**0.957**	**0.387**
Boron (mg/L)	0.2	**0.981**		0.038	0.021
TSS (mg/L)	-	186		28	16

Notes:
Bold concentration exceeds PWQO
(a) PWQO is pH dependent; for a pH range of 6.5 to 9.0, the interim PWQO is 0.075 mg/L.
mg/L – milligrams per litre; TSS – total suspended solids

At Pond No. 1, aluminium, boron, cobalt, iron, phosphorous and phenolics were detected above their respective PWQOs in the spring event. Pond No. 1 was noted as dry during the fall event. Almost all analyzed parameters were higher in 2023 than 2022, with iron significantly increased from previous sample concentrations. This increase in indicator parameter concentrations observed at Pond No. 1 is most likely due to stagnant water conditions in the pond and a high amount of vegetation debris. It is noted that water within Pond No. 1 is often visually very turbid with high organic debris (vegetation). A comparison between the November 2021 and May 2023 samples show low and high TSS, respectively (9 versus 186 mg/L). The concentrations of leachate indicator parameters increase significantly in May 2023 which corresponds to the increased TSS. It is noted that this is only two data points and that more TSS concentrations are needed to confidently conclude that elevated concentration in Pond No. 1 are not landfill related.

At Pond No. 2, aluminium, iron, and phosphorous was detected above the PWQO during the fall 2023 monitoring event, and aluminium, iron, and field pH were in exceedance of their respective PWQOs during the spring 2023 event. Aluminium concentrations are variable at SWP2 but within historic ranges. Iron does not have consistent trends and may represent variability in pond chemistry or interference from suspended sediment. Indicator parameter concentrations at Pond No. 2 are generally low but variable indicating water quality is less-impacted by landfilling activities.

GHD field staff have noted that during drier periods water levels in both Pond No. 1 and Pond No. 2 drop and water becomes stagnant (particularly in Pond No. 1). These periods typically correspond to poorer water quality. During these periods it is unlikely that significant discharge occurs as water levels typically drop below the discharge point. Both stormwater management ponds discharge to a ditch that runs along the southern Site boundary.

It is recommended that a new monitoring point be established within the ditch downstream of the discharge from Pond No. 2. This point will allow for a better understanding of potential surface water impacts flowing off-Site. GHD field staff attempted to collect a sample from this location in 2023 but were unsuccessful due to dry conditions (i.e., no discharge was occurring at the time of sampling).

Concentration versus time graphs are provided for SWP1 and SWP2 showing all indicator parameters on Figure 5.16a/b. The following observations are drawn based on the plots:

– In 2023, there appears to be a decline in surface water quality in Pond No. 1 when comparing historical data. Prior to 2023, water quality in Pond No. 1 appears to be, overall, stable. Continued monitoring is recommended to determine if this decline in water quality is abnormal or indicative of impacts.

– In general, current water quality shows improvements in surface water quality in Pond No. 2 when comparing historical data. In comparison to recent data, water quality in Pond No. 2 appears to be, overall, stable and shows evidence of minor landfill-derived impacts.

5.2.4 Groundwater and Leachate Collection Systems

As presented in Section 1.3 and 1.4, groundwater and leachate collection systems (GCS and LCS, respectively) are implemented at the Site. The GCS is operated within the westerly and southerly buffer zones adjacent to the OLA to hydraulically control off-Site leachate migration. The LCS collects leachate from the base of the ELA to reduce leachate mounding and the occurrence of leachate seeps through the final cover soils. Detailed descriptions of the GCS and LCS are provided in the report entitled "Ward 1 Waste Disposal Site, Municipality of Kincardine, Performance Report – 2008, Groundwater and Leachate Collection Systems" prepared by Pryde, Shropp & McComb (2008).

The total recorded volumes of groundwater and leachate extracted and discharged to the Municipality's WWTP during the last five monitoring periods is presented below:

Collection System	Total Annual Flow (m^3)				
	2019	2020	2021	2022	2023
Groundwater Collection System	816	783	931	1,241	1,473
Leachate Collection System	5,325	5,178	4,329	1,040	3,348

The groundwater in the GCS pump station (Pump Station No. 1) was monitored semi-annually in 2023 during routine monitoring events. The leachate in the LCS pump station (Pump Station No. 2) was monitored four times in 2023; May and November by GHD field staff and January and July by Municipal staff.

The 2023 analytical results for samples collected by GHD field staff from the GCS and LCS are presented in Table 5.5A (for metals and general chemistry) and Table 5.5B (for VOCs) for the GCS, and in Table 5.6A (for metals and general chemistry) and Table 5.6B (for VOCs) for the LCS. Laboratory certificates for the analysis of samples collected by the Municipality have been included in Appendix H. Historical analytical results for the GCS and LCS are provided in Appendix F.

Select leachate indicator parameter concentrations with aluminium, iron, and boron for the GCS and LCS for the current monitoring period are summarized in the tables below. Concentration versus time plots are provided on Figures 5.17 and 5.18.

Parameter	ODWS	GCS		LCS	
		Spring	Fall	Spring	Fall
Alkalinity (mg/L)	30-500 (OG)	717	1020	987	796
Aluminium (mg/L)	0.1 (OG)	0.012	0.876	0.073	0.02
Chloride (mg/L)	250 (AO)	38	170	120	82
Hardness (mg/L)	80-100 (OG)	653	813	737	844
Iron (mg/L)	0.3 (AO)	**7.13**	**8.41**	**10.2**	**28.4**
Boron (mg/L)	5.0 (IMAC)	0.181	0.519	0.469	0.301

Notes:
Samples collected from the GCS and LCS were unfiltered and as such represent total concentrations.
Bold sample results are above their respective ODWS.
AO – aesthetic objective; IMAC – interim maximum acceptable concentration;
OG – operational guideline; mg/L – milligrams per litre; NA – not analyzed

As illustrated on Figure 5.17, alkalinity, ammonia, boron, iron, and hardness concentrations observed within the GCS have followed slight to clear decreasing trends over time. In November 2023 increases in ammonia, boron, alkalinity, and chloride are observed but concentrations remained within historical ranges.

Historically, leachate indicator parameter concentrations for samples collected from the LCS have been greater than samples collected from the GCS. Select indicator parameters concentrations observed within the LCS have also shown greater variability over time compared to concentrations within the GCS, as shown on Figure 5.18. In general, decreasing trends are observed for all select indicator parameters in the LCS, and recent concentrations of select indicator parameters are generally lower than historical norms (i.e., pre-2015). Results from 2022 showed an increase in all select indicator parameters, with the exception of manganese. In 2023 the concentrations of these parameters returned to historical ranges except for iron which showed continue variability and an increase. Further data collection is necessary to determine if these results are indicative of worsening water quality within the LCS or if these results are anomalous.

Select VOC parameters have been detected within groundwater samples collected from the GCS and LCS during previous monitoring events including 1,4-dichlorobenzene, acetone, benzene, and chlorobenzene. The 2023 monitoring results show similar low-level detections of 1,4-dichlorobenzene and chlorobenzene in the GCS. Detections of VOC parameters have increased in 2022 and 2023 in the LCS relative to prior years. In 2023, 1,4-dichlorobenzene, benzene, chlorobenzene, ethylbenzene, m&p xylenes, o-xylene, toluene and total xylenes were detected above laboratory reporting limits.

Tables 5.5A/B and 5.6A/B provide a comparison of the GCS and LCS analytical result against the modelled (predicted) concentrations. These modelled concentrations were originally provided in the Design Brief (CRA, 1993) prepared for the GCS and LCS. Modelled groundwater concentrations were further refined to include short-term and long-term projections in groundwater. These are presented in Tables 5.5A/B. Groundwater and leachate analytical results for metals and general chemistry parameters are also assessed against the Municipality's Sewer Use By-Law (No. 1987-107) criteria, where applicable, for the purposes of monitoring compliance with Municipality by-laws and best practices.

Based on an assessment the 2023 analytical results from the GCS (Table 5.5A/B) the following interpretations are noted:

– Groundwater quality within the GCS currently meets the Municipality's Sewer-Use By-Law.
– Alkalinity and hardness concentrations remain above the long-term modelled groundwater concentrations.
– The 2023 analytical data shows all VOC parameters are below their respective short and long-term modelled concentrations.

Based on an assessment the results of the 2023 annual monitoring program for the LCS, provided in Tables 5.6A and 5.6B, the following interpretations are noted:

– Leachate quality within the LCS currently meets the Municipality's Sewer-Use By-Law.
– All parameter concentrations remain below the modelled leachate concentrations at present.

5.2.4.1 Pumping Station Operations

During the 2023 reporting period, daily records of the operation of the pumping stations associated with the GCS (Pumping Station No. 1) and the LCS (Pumping Station No. 2) were maintained by WWTP staff. A summary of the monthly and annual flow data collected at the GCS and LCS is provided below:

Monitoring Period	GCS Monthly Flows		LCS Monthly Flow	
	Total Monthly Flow (m^3)	Average Daily Flow (m^3/day)	Total Monthly Flow (m^3)	Average Daily Flow (m^3/day)
January	167	5.4	177	nd
February	153	5.5	157	22.4

Monitoring Period	GCS Monthly Flows		LCS Monthly Flow	
	Total Monthly Flow (m^3)	Average Daily Flow (m^3/day)	Total Monthly Flow (m^3)	Average Daily Flow (m^3/day)
March	173	5.6	644	34.0
April	108	3.6	402	36.5
May	91	3.0	333	24.0
June	77	2.6	259	8.6
July	114	3.7	134	4.3
August	111	3.6	120	3.9
September	103	3.4	198	6.6
October	114	3.7	104	3.3
November	117	3.9	225	7.5
December	145	4.7	597	19.2
Total/Average	1,473	4.0	3,348	9.2

Notes:
m^3 – cubic metres
m^3/day – cubic metres per day
nd – no data

Pump Station No. 1 (GCS)

As indicated above, the average daily pumping rate for 2023 for Pumping Station No. 1 was 4.0 cubic metres per day (m^3/day). For comparison, historical daily average volume pumped between 2011 and 2014 ranged from 8.01 to 46.24 m^3/day. The theoretical design flow rate for Pumping Station No. 1 is 354 m^3/day. The GCS is permitted to operate at a maximum rate of 200 m^3/day.

The total volume of groundwater pumped during 2023 increased slightly from 2022. Pumping rates at the GCS remain below the rates in years prior to 2014. Total volume of groundwater pumped in 2022 was 1,473 m^3. Between 2010 and 2015 the total annual volumes were between 12,422 m^3 (in 2011) and 289 m^3 (in 2015). Historically, volumes pumped via Pumping Station No. 1 were on the order of 15,221 m^3 to 18,688 m^3 (in 2006 and 2007, respectively).

Pump Station No. 2 (LCS)

As indicated in the table above, the average pumping rate for 2023 for Pumping Station No. 2 was 9.2 m^3/day. This average rate is an increase from 2022 but still within the normal range of recent years. For reference, the LCS is permitted to operate at a rate of approximately 33 m^3/day.

The Municipality notes that daily pumping rates exceeded the permitted flow rate of 30 m^3 / day on multiple dates in 2023. The exceedances are summarized below:

Date of Exceedance	Daily Leachate Pumping Rate (m^3/ day)
March 13	134.1
March 14	69.6
March 22	38.6
March 27	36.2

March 28	40.3
April 6	200.6
May 8	31.2
May 14	33.3
May 28	32.3
September 15	40.9
September 16	40.9
September 17	40.9
December 27	52.5
December 28	52.5

The total volume of leachate pumped from the LCS during 2023 was 3,348 m^3.

Construction of the KWMC's leachate treatment facility (LTF) was completed in mid-2016. In January 2023, 105 m^3 of leachate was hauled to the LCS from KWMC due to a spill. Under the current ECA, Section 9 outlines permitted groundwater and leachate flow limits. A monthly average flow of approximately 200 m^3/day of groundwater and a combined total flow rate from the LCS and the LTF of 63 m^3/day is permitted.

Throughout 2022 and until February 8, 2023, the LCS pump was out of service. During this time, leachate was hauled by Bluewater Sanitation on an as-needed basis from the pump station to the aerated cell at the lagoon. Leachate flows listed above, during this time period, represent the volumes hauled by Bluewater Sanitation.

5.2.5 Collection System Maintenance

Both the GCS and LCS have defined programs for regular maintenance, which are carried out by the WWTP staff. The following sections describe the routine maintenance programs for each system.

Groundwater Collection System

The GCS and associated pump station are inspected on a daily basis by WWTP staff, and routine maintenance and repairs are performed as necessary. Pumping volumes, maintenance requirements, and repairs are also recorded and filed by WWTP staff. The routine maintenance program was first implemented in 1996 and is provided in Appendix G.1 for reference.

The following points summarize the regularly scheduled maintenance tasks:

– Flushing of sediment/solids from the collection system pipes on a semi-annual basis using high pressure water.
– Semi-annual removal of sediment/solids from manholes and the pump chamber.
– Removal of sediment from the GCS discharge piping and forcemain is scheduled annually or when the flow rate is observed to be 1.58 L/s or lower.
– Inspection of the pump on a regular basis.

It is recommended that the regular maintenance program for the GCS be continued during the next monitoring period.

Leachate Collection System

The LCS and associated pump station are inspected on a daily basis by WWTP staff, and routine maintenance and repairs are performed as necessary. Pumping volumes, maintenance requirements, and repairs are also recorded and filed by WWTP staff. The routine maintenance program was first implemented in 1998 and is provided in Appendix G.1 for reference.

The following points summarize the regularly scheduled maintenance tasks:

– Flushing of sediment/solids from the header and collection system pipes on a semi-annual basis using high pressure water.
– Semi-annual removal of sediment/solids from manholes and the pump chamber.
– Removal of solids from the LCS discharge piping and forcemain annually or when the flow rate is observed to be 1.26 L/s or lower.
– Inspection of the pump on a regular basis.

It is recommended that the regular maintenance program for the LCS be continued during the next monitoring period.

5.2.6 GCS and LCS Operational Review

A review of the operation of the GCS and LCS was completed in 2017. The purpose of the 2017 operational review was to assess whether the GCS and LCS were working as intended, following a period of decline in both pumping rates and total volumes pumped through each system. The review, which utilized 2016 data, concluded that environmental factors are not impeding flow into the GCS. An assessment of geochemical trends showed improvements in water quality though mostly attributed to installation of a final cap as opposed to the GCS, as the effectiveness of the GCS was observed to be decreasing with time. The review concluded that the likely cause of the progressive decline in flow through the GCS was related to fouling of the filter sock/perforated pipe.

The 2017 operational review identified an increase in leachate mounding, which may be related to increased flows in the LCS, and noted leachate production is expected to continue to stabilize with the final cap over the landfill footprint. The 2017 review further concluded that the observed increases in LCS flow prior to the review corresponded to the time period when leachate was being transported to the Site from the KWMC, and that, as a result, some error may be present regarding reporting of the sources of flow through the LCS. Reported leachate flows in 2019 returned to historical rates, which supports the interpretation that some error in reporting the source of leachate in the LCS in 2016 is likely.

Finally, the 2017 operational review noted that groundwater quality at the Site was in compliance with the MECP's Reasonable Use Guidelines, based on the 2016 analytical data, and concluded that a decline in GCS operation would be acceptable.

Based on the conclusions of the 2017 operational review, the following recommendations were provided:

– It was recommended that operation of the GCS continue as is. If improved operations are required in the future (due to future compliance issues), it was recommended that a downhole camera be used to visually inspect the underground portions of the GCS (i.e., the perforated collector pipe).
– Visual diagnostic information will allow for a focused remediation of the GCS. Additional recommendations for remediation will be made based on the results of the visual inspection. These may include additional high-powered water scouring, scrubbing, bleaching and/or acid treatments, or replacing sections of the collector piping.
– It was recommended to continue operation of the LCS as is. If future monitoring shows significantly increased flow into the LCS from the ELA and/or increased leachate mounding, additional action may be required to prevent leachate seepage/leachate control. This may include decreasing the high-water level in Pumphouse No. 2 that would increase flow through the system.

A copy of the Groundwater and Leachate Collection Systems Review (GHD, November 2017) is provided in Appendix G.2.

5.2.7 Sewage Stabilization Lagoon

General chemistry parameter results for the Sewage Stabilization Lagoon No. 1 (SG1R-91) are presented in Table 5.7. SG1R-91 replaced location SG1-91 in the spring of 2016. Historical analytical results for the Sewage Stabilization Lagoon No. 1 are provided in Appendix F. The SG1R-91 was destroyed prior to the spring 2021 monitoring event. It is recommended that the staff gauge be re-installed either in the lagoon or adjacent to it so that surface water elevation measurement can be made in future reports.

Leachate indicator parameters and nitrate and nitrite concentrations at the Sewage Stabilization Lagoon No. 1 for the current monitoring period are summarized below:

Parameter	SG1R-91	
	Spring	Fall
Alkalinity	245	206
Chloride	130	91
Hardness	277	206
Conductivity, field (µS/cm)	952	835
Nitrate	<0.06	0.24
Nitrite	<0.03	0.17
Notes: All units are mg/L – milligrams per litre unless otherwise noted		

Concentration versus time plots for the SG1R-91 are included on Figure 5.19.

Analytical results for the samples collected at SG1R-91 in 2023 are generally comparable to historical ranges. Water quality at SG1R-91 is typically characterized as having significantly lower concentrations of most general chemistry parameters in comparison to leachate present at the Site, with the occasional exception of nitrate and/or nitrite. Un-ionized ammonia concentrations at SG1R-91 typically exceed the PWQO of 0.02 mg/L. In 2023, un-ionized ammonia exceeded the PWQO during both monitoring events. The PWQOs were developed to be protective of aquatic life and as this is a sewage stabilization lagoon, there is little risk to aquatic life.

5.3 Wastewater Treatment Plant Performance

The WWTP consists of a stilling basin, open channel flow measuring device (Parshall flume), distribution box, aeration basin, a second distribution box and two polishing ponds (Sewage Stabilization Lagoons No. 1 and 2, followed by ultraviolet (UV) disinfection prior to discharge into Lake Huron.

Prior to April 2012 and the implementation of UV disinfection, the final stages of the WWTP relied on sodium hypochlorite disinfection. Since the WWTP is not equipped with emergency backup power generators, the use of sodium hypochlorite is retained as an option by the Municipality for disinfection purposes during power outages (i.e., when UV disinfection is not possible). Further details regarding the WWTP operational processes are included in the Design Brief for the WWTP (CRA, 1993).

Annual Performance Reports for the WWTP are prepared by the Municipality. A copy of the 2023 Annual Performance Report for the WWTP, including details regarding analytical results for influent and effluent sampling by the Municipality, is provided in Appendix H. As presented in the 2023 Annual Performance Report, the analytical results for final effluent quality indicate that the WWTP effluent was in compliance with the effluent limits defined in the ECA for the WWTP.

The following tables provide a comparison of the analytical results for samples collected from the GCS and LCS to the monthly average analytical results of final effluent samples collected from the WWTP:

Parameter	Spring (May) Sampling		Fall (November) Sampling	
	GCS	WWTP Effluent	GCS	WWTP Effluent
cBOD/BOD (mg/L)	32	11.0	13	23.5
TSS (mg/L)	19	14.7	30	30.0
Phosphorus (mg/L)	<0.03	0.24	0.66	0.42
Alkalinity (mg/L)	717	223	1020	198
Ammonia (mg/L)	14.3	17.8	54.9	16.5
Notes: mg/L – milligrams per litre; Phosphorus – general chemistry cBOD – carbonaceous biochemical oxygen demand; BOD – biological oxygen demand GCS results include BOD, WWTP Effluent is reported as cBOD				

Consistent with previous years, concentrations of alkalinity were observed to be lower in the WWTP Effluent than in samples collected from the GCS. Ammonia is typically lower in the WWTP Effluent than in the GCS however, in 2022 and May 2023, ammonia concentrations were higher in the WWTP Effluent. Conversely, total suspended solids (TSS) was noted to be slightly higher in the GCS than in the WWTP Effluent in May 2023. Carbonaceous biological oxygen demand (cBOD) was greater in the WWTP Effluent than the GCS in May but less in WWTP Effluent than GCS in November. Phosphorous was lower at GCS in May but higher than WWTP in November. It is noted that cBOD, TSS and total phosphorus concentrations are not considered elevated in the GCS samples, and therefore differences between WWTP final effluent and GCS sample concentrations for cBOD, TSS and total phosphorous are interpreted to be minor.

Parameter	Spring (May) Sampling		Fall (November) Sampling	
	LCS	WWTP Effluent	LCS	WWTP Effluent
cBOD (mg/L)	32	11.0	7	23.5
TSS (mg/L)	23	14.7	73	30.0
Phosphorus (mg/L)	0.67	0.24	<0.03	0.42
Alkalinity (mg/L)	987	223	796	198
Ammonia (mg/L)	57.5	17.8	15.1	16.5
Notes: mg/L – milligrams per litre; Phosphorus – general chemistry cBOD – carbonaceous biochemical oxygen demand; BOD – biological oxygen demand GCS results include BOD, WWTP Effluent is reported as cBOD				

Comparable to the LCS, WWTP effluent concentrations of alkalinity and ammonia were significantly reduced in the WWTP Effluent with the exception of November ammonia concentrations. Concentrations of cBOD, and TSS were decreased in the spring and fall samples from the WWTP Effluent compared to the LCS samples with the exception of November cBOD concentrations.

Based on the interpretation of monitoring results from the 2023 monitoring period, as presented above, the WWTP is effectively treating the leachate collected by the LCS. Treatment of the GCS was less successful due to lower concentrations within the GCS.

It should be noted that the analytical results for the GCS and LCS include BOD while the WWTP Effluent is reported as cBOD. Future sampling at the WWTP should include BOD or analysis of the GCS and LCS should include cBOD to support a more direct comparison of the results.

6. Compliance Assessment

6.1 Groundwater Quality

The overall groundwater quality observed at the Site in 2023 was generally consistent with historical trends. Concentrations of leachate indicator parameters in monitoring wells in the vicinity and downgradient of the landfilled area generally remain stable. A zone of altered groundwater quality continues to exist between the OLA and Sewage Stabilization Lagoon No. 1. The groundwater quality impairments observed in this area are interpreted to be the result of a combination of influences from both the landfill and the Sewage Stabilization Lagoon.

Ministry of the Environment, Conservation and Parks (MECP) Guideline B-7, entitled *Incorporation of the Reasonable Use Concept into the MOEE Groundwater Management Activities*, regulates the allowable effects, which a landfill site can have on groundwater in the surrounding environment (MOEE, 1994). The Reasonable Use Concept maximum concentration (RUC) of a particular contaminant that is acceptable in the groundwater beneath the adjacent property (to the Site) is calculated in accordance with the following relationship as outlined in related Guideline B-7-1 (*Determination of Contaminant Limits and Attenuation Zones)*:

$$MABC = Cb + x(Cr – Cb)$$

Where:

MABC = Maximum Acceptable Boundary Concentration acceptable in groundwater on adjacent property (the term Cm, maximum acceptable concentration, is used in Guideline B-7-1)

Cb = background concentration of a particular groundwater contaminant before it has been affected by human activity

Cr = maximum allowable concentration in groundwater as per Ontario's water management guideline deemed appropriate for reasonable use at the Site in question; for the Kincardine Ward 1 Landfill Site, this is the ODWS of the particular contaminant

x = 0.25 for health-related parameters, 0.5 for non-health related and other parameters

Therefore, the allowable concentrations for groundwater leaving a site determined through the MABC calculation are Site-specific. Guideline B-7 also states that if background water quality is higher than ODWS guidelines where the water may be used for consumption, the landowner or user is responsible to ensure water quality is not impacted beyond what is already present.

To account for natural fluctuations in groundwater quality, the MABC should be recalculated, utilizing the 5-year median value for background water quality, every 3 to 5 years.

The RUCs for the Ward 1 Landfill Site were calculated by using the median concentrations from background monitoring wells OW10-92, OW19A-96, OW19B-96, OW18AR-13, and OW18BR-13 for 2018-2022.

Chloride is the only analytical parameter for which there is sufficient analytical data from the background monitoring wells and/or where there is an ODWS (excluding Operational Guidelines) to calculate an RUC. An RUC for chloride of 129 mg/L was established in 2022 to assess groundwater compliance at the Site.

In order to assess the Site's compliance with respect to the Reasonable Use Concept, groundwater quality at the Site's property boundary is compared to the RUC for all monitoring wells at or near the Site property boundaries. For the purposes of this RUC assessment, the following downgradient wells were considered to be property boundary wells:

OW1-78	OW11-92	OW16A-92
OW2-78	OW13-92	OW16B-92
OW2-89	OW14-92	OW20-13

OW3-89	OW15R-13

Chloride concentrations at OW3-89 were uncharacteristically high between 2020-2022. However, both spring (120 mg/L) and fall (48 mg/L) 2023 samples at OW3-89 reported concentrations below 129 mg/L. It is anticipated that past elevated results are due to well degradation. While results are improved in 2023, well repairs are still recommended.

In 2022, chloride concentrations at OW1-78 were significantly higher than expected and exceeded the chloride RUC (129 mg/L). Similarly elevated chloride concentrations were reported in the 2023 samples (spring – 230 mg/L and fall – 190 mg/L). Prior to 2022, concentrations had been steadily declining at this location since 2010. OW1-78 is located in proximity to the landfill and landfill-related groundwater impacts appear to be present at OW1-78. As previously discuss, water quality impacts maybe landfill related or may be due to well casing degradation. It is recommended that the licensed drilling subcontractor investigate and repair OW1-78 while repairing the seal and casing at OW3-89.

In 2023, chloride concentrations detected at OW20-13 in spring (350 mg/L) and fall (420 mg/L) were elevated in comparison but are within the range of historical detections of RUC exceedances for chloride at this location. Overall, chloride concentrations at OW20-13 are demonstrating an overall decreasing trend since 2016 as shown in Figure 5.13. Monitoring well OW20-13 is located north of the wastewater treatment buildings and aeration lagoon. The well is located in a cross-gradient position, to the north of the landfilling areas. As previously mentioned, water quality impacts at this location are not interpreted to be related to the landfill.

6.2 GCS and LCS Monitoring

The monitoring programs undertaken during the current reporting period for the GCS indicate that groundwater quality was reasonably consistent with historical results.

As indicated in the 2023 Annual Performance Report for the WWTP, as provided in Appendix H, the WWTP final effluent quality was in compliance with the criteria outlined in the ECA for the WWTP.

7. Annual Monitoring Report Completion Checklist

Appendix D of the document entitled "Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water, Technical Guidance Document" (MOE, November 2010) includes a monitoring and screening checklist which is intended to provide the MECP with a quick reference for Site information and relevant monitoring results for the monitoring period. A completed checklist is provided in Appendix I of this report. As there is still some uncertainty regarding the nature of the declaration included in the checklist, the checklist has not been signed, but has been completed, as much as possible, and is included for reference.

8. Conclusions and Recommendations

Based on the operational information and the results of the water quality monitoring program presented in this report, the following conclusions are provided:

8.1 Conclusions

Site Operation and Development

1. The Site ceased receiving municipal waste in November 2011. Final cover and grading over the most recently active portions of the landfill footprint were completed in 2014. All wastes, previously received, are being redirected to the KWMC for disposal.

Landfill Gas Monitoring Results

1. Methane concentrations were observed in landfill gas probes GP1A/B-92 and GP3A/B-92 during the current reporting year. None of these methane detections were above the lower explosive limits for methane (5% v/v). Oxygen and carbon dioxide levels provide evidence that the landfill gas readings are representative of gas conditions at each probe.
2. In February 2023, methane was detected at a concentration of 1.1 percent at both GP3A/B-92. During the November monitoring event, GHD field staff noted GP3A/B-92 to be gone or destroyed. Given the prior methane detections at this location, GHD recommends the GP3A/B-92 nest be replaced and monitoring resume in 2024.

Groundwater Flow

1. Overall, groundwater flow in the vicinity of the Site is in a north-westerly direction.
2. Based on the historical elevations recorded at the staff gauge located in Sewage Stabilization Lagoon No. 1, groundwater elevations are higher between the landfill footprint than the eastern side of Lagoon No. 1. Water levels in the lagoon are higher than groundwater elevations to the south and west sides of the lagoon. Based on this observation it is likely that a component of flow from the lagoon enters the groundwater regime to the north, south and west while some component of groundwater flow enters the lagoon from the east. Thus, creating a partial radial component of flow originating from the Sewage Stabilization Lagoons.
3. The influence of the GCS on water levels is demonstrated by the groundwater elevations reported in the monitoring wells located between the landfill footprint and Sewage Stabilization Lagoon No. 1. A hydraulic gradient towards the GCS has been calculated for this area.

Groundwater Quality

1. Background groundwater quality remains consistent with historical results and is characterized by reduced concentrations of general chemistry parameters, with the exception of chloride. Chloride concentrations at OW19B-96 are elevated and are attributed to the effects of road-salting operations in the area. Monitoring results from OW18A/BR-13 indicate similar concentrations of general chemistry parameters, as well as reduced chloride concentrations compared to OW19B-96.
2. In spring of 2019, OW12-92 was reported to be clogged with mud and could not be sampled. The well was subsequently buried and presumed destroyed. Historical concentrations of select indicator parameters indicate that landfill-derived impacts are more significant at this location and along the northern portion of the landfill.
3. Landfill vicinity groundwater quality remains consistent with historical results, with elevated leachate indicator parameters at several locations consistent with mild to moderate landfill-related groundwater quality impairment. Chloride concentrations within the lagoon are typically elevated due to the addition of ferric chloride, which serves as a coagulant in wastewater treatment operations. The lagoon is interpreted to likely be a contributing source of chloride concentrations observed in shallow wells in this vicinity. The elevated indicator parameter concentrations

in the landfill vicinity monitoring wells is interpreted to be a combination of impacts from leachate and the Sewage Stabilization Lagoon No. 1.

4. Analysis of the current groundwater quality results indicates water quality that is acceptable with respect the RUC for chloride with the exception of OW20-13. Water quality alterations at OW20-13 are not interpreted to be related to the landfill.
5. Concentrations of select indicator parameters are elevated at OW1-78, and uncharacteristically high chloride concentrations were detected at OW3-89 between 2020 and 2022. Chloride concentrations decreased in 2023 but are still elevated compared to the historical average. Elevated concentrations at both locations may be attributed to well degradation.

Stormwater Management Pond Water Quality

1. GHD field staff have noted that during drier periods water levels in both Pond No. 1 and Pond No. 2 drop and water becomes stagnant. These periods typically correspond to poorer water quality and elevated TSS. During these periods it is unlikely that significant discharge occur as water levels typically drop below the discharge point.
2. In order to further understand potential off-Site impacts, GHD recommended that an additional monitoring point be established in the ditch downstream of the discharge from the Site. This ditch was dry in 2023 and could not be sampled.
3. Pond No. 1 was unable to be sampled in spring 2023 due to insufficient volume/overly turbid conditions IN the fall 2023 sample, all indicator parameter concentrations were elevated well above historical ranges. Water quality in Pond No. 1 appears to be, overall, stable. Water quality is likely only minimally impacted by landfilling activities and is more likely impacted by stagnant conditions.
4. Indicator parameter concentrations at Pond No. 2 observed in 2023 are generally low and have decreased or stabilized relative to historical data, indicating water quality has improved and is less-impacted by landfilling activities.

8.2 Recommendations

Based on the conclusions and information presented, the following recommendations are provided:

1. Conduct the 2024 monitoring program in accordance with Table 3.1 with the following exceptions:
    a. The number of background monitoring locations should be reduced. Background monitoring wells OW19A/B-96 are redundant for the purpose of establishing background groundwater quality. Is it recommended that these locations be removed from the water quality portion of the monitoring program.
    b. The number of locations for monitoring water quality between the landfill footprint and Sewage Stabilization Lagoon No. 1 should be reduced. Cross-gradient monitoring well OW14-92 is redundant for the purpose of monitoring groundwater quality between the OLA and Sewage Stabilization Lagoon No. 1. It is recommended that this location be removed from the water quality portion of the monitoring program.
    c. An additional surface water monitoring point should be established downstream of Stormwater Management Pond No. 2's discharge point. This will allow for a better understanding of potential off-Site issues related to discharge from the stormwater management ponds.
2. Continue to conduct annual inspections of the landfill cover in 2024. The results of the inspections should be documented in the upcoming 2024 AMR. Any repairs to final cover, grading, and vegetation should be made in a timely manner.
3. It is recommended that the regular maintenance programs for the operating components of the landfill be followed during 2024. Special attention should be paid to LCS pumping rate to ensure adequate removal of sediments and solids from the LCS discharge piping and forcemain.
4. Future sampling of the effluent at the WWTP should include BOD or analysis of the GCS and LCS should include cBOD. Comparable analyses will support a more direct comparison of the results.

5. Future LFG monitoring should continue to include measurements of O_2 and CO_2 in addition to percent methane and pressure.
6. Several monitors need repair, maintenance, or replacement. This following maintenance items should be conducted during 2024:
    a. A replacement staff gauge should be installed in or adjacent to Lagoon No. 1
    b. The surface seal and casing at OW3-89 should be repaired/replaced
    c. The surface seal and casing at OW1-78 should be investigated and repaired (if needed)
    d. Monitoring well OW12-92 should be replaced. This well should continue to be used for hydraulic, water level monitoring purposes
    e. Replace GP3A/B-92

9. References

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10. Closure

All of Which is Respectfully Submitted,

GHD Ltd.

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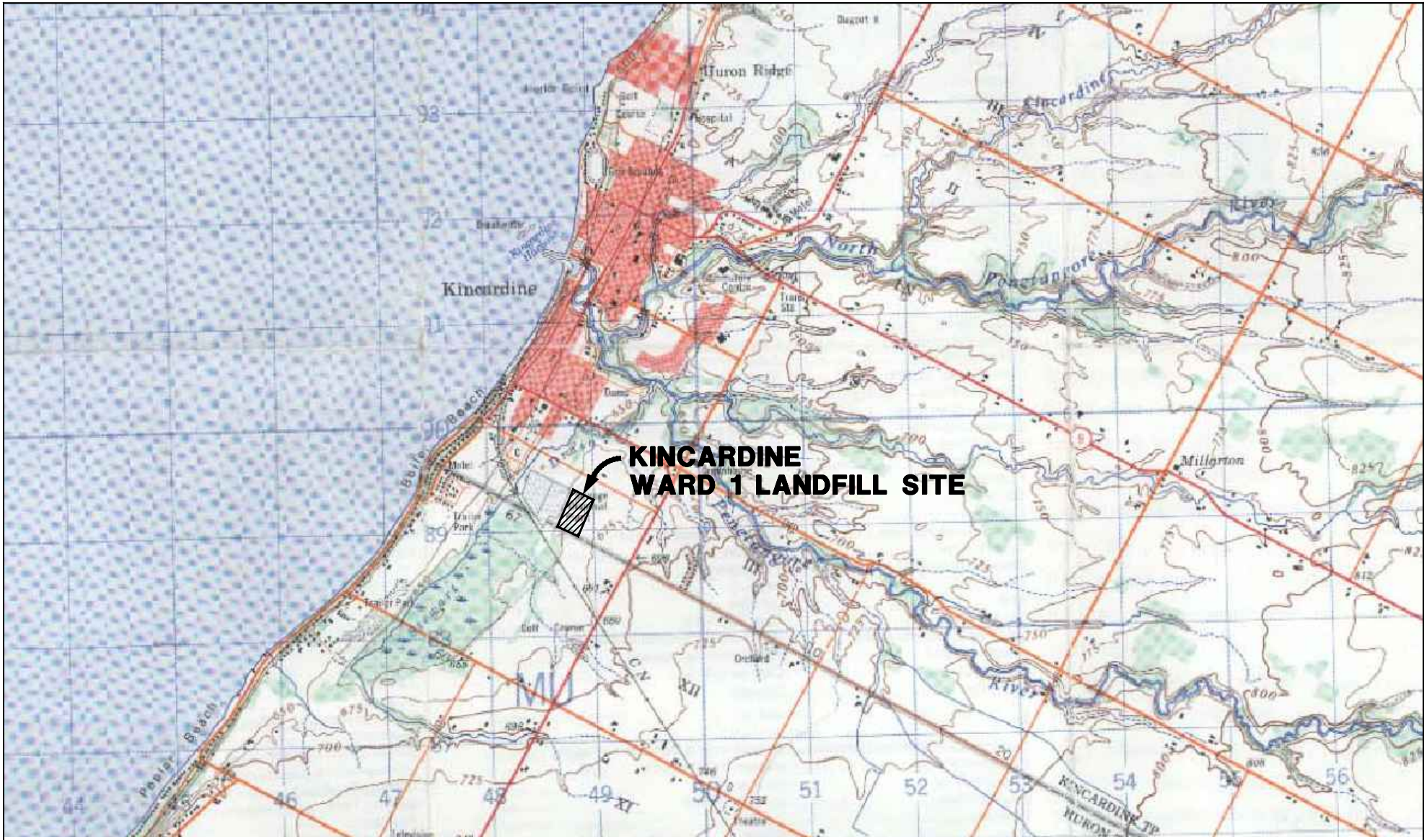
Figures



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MUNICIPALITY OF KINCARDINE
KINCARDINE, ONTARIO
2023 ANNUAL MONITORING REPORT

SITE LOCATION
KINCARDINE WARD 1 LANDFILL SITE

Project No. **4074**
Date **March 2024**

FIGURE 1.1

Filename: N:\CA\Waterloo\Projects\662\004074\Digital_Design\ACAD\Figures\RPT121\004074-GHD-00-00-RPT-EN-D101_WA-121.DWG
Plot Date: 28 March 2024 9:16 AM

LEGEND

- PROPERTY BOUNDARY (GENERAL)
- SITE PROPERTY BOUNDARY
- 200 SEPTEMBER 2014 EXISTING GROUND CONTOUR
- EDGE OF GRAVEL
- EXISTING FENCE LINE
- EXISTING DITCH AND DIRECTION OF FLOW
- BOTTOM OF SLOPE / TOP OF SLOPE
- EXISTING TREELINE
- EXISTING TREE
- RIP RAP EROSION PROTECTION
- EXISTING BUILDING
- OW12-92 OBSERVATION WELL
- OW15-92 (DESTROYED) FORMER MONITORING LOCATION
- LW2-92 LEACHATE WELL
- GP1-92 GAS PROBE NEST
- SG1R-91 STAFF GAUGE

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No.	Issue	Checked	Approved	Date

Author	I.R.	Designer	NA
Drafting Check	E.M.	Design Check	NA
Project Manager	J. YARDLEY	Project Director	

Client
MUNICIPALITY OF KINCARDINE
KINCARDINE WARD 1
LANDFILL SITE

Project
2023 ANNUAL MONITORING REPORT

Date	Scale
March 2024	1 : 1500

Project No.
4074

Title
MONITORING LOCATIONS

Size
ANSI D

Sheet No
FIGURE 1.2

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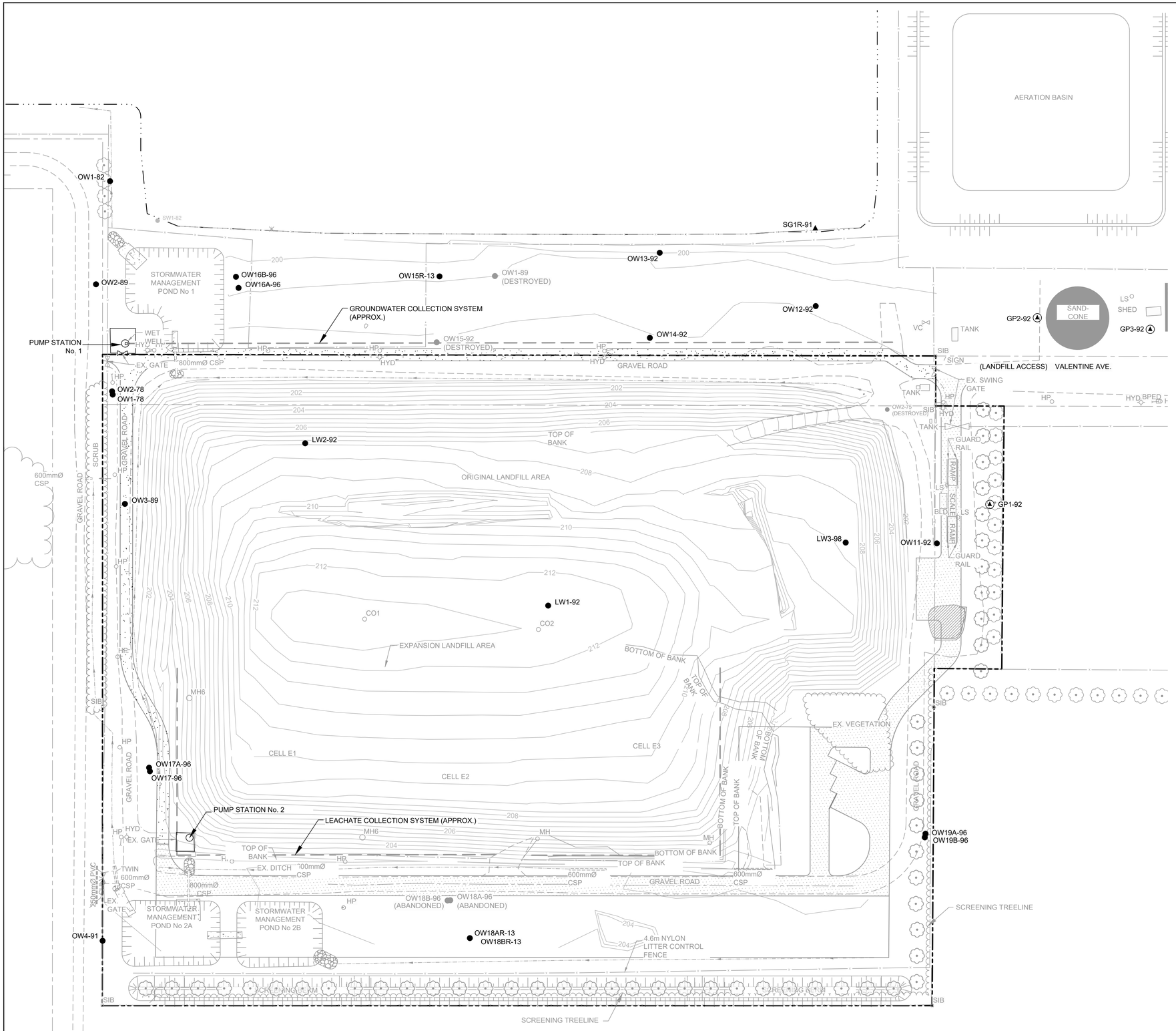

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- PROPERTY BOUNDARY (GENERAL)
- SITE PROPERTY BOUNDARY
- SEPTEMBER 2014 EXISTING GROUND CONTOUR
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- EXISTING FENCE LINE
- EXISTING DITCH AND DIRECTION OF FLOW
- BOTTOM OF SLOPE / TOP OF SLOPE
- EXISTING TREELINE
- EXISTING TREE
- RIP RAP EROSION PROTECTION
- OW12-92 OBSERVATION WELL
- OW15-92 (DESTROYED) FORMER MONITORING LOCATION
- LW2-92 LEACHATE WELL
- GP1-92 GAS PROBE NEST
- SG1R-91 STAFF GAUGE
- EXISTING MANHOLE
- EXISTING CLEANOUT
- EXISTING BUILDING
- STANDARD IRON BAR
- HYDRO POLE
- HYDRANT

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-	-	-	-
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Project Manager	J. YARDLEY	Project Director	

Client
MUNICIPALITY OF KINCARDINE KINCARDINE WARD 1 LANDFILL SITE

Project
2023 ANNUAL MONITORING REPORT

Date	Scale
March 2024	AS SHOWN

Project No.
4074

Title
LANDFILL AREA

Size
ANSI D

Sheet No.
FIGURE 1.3

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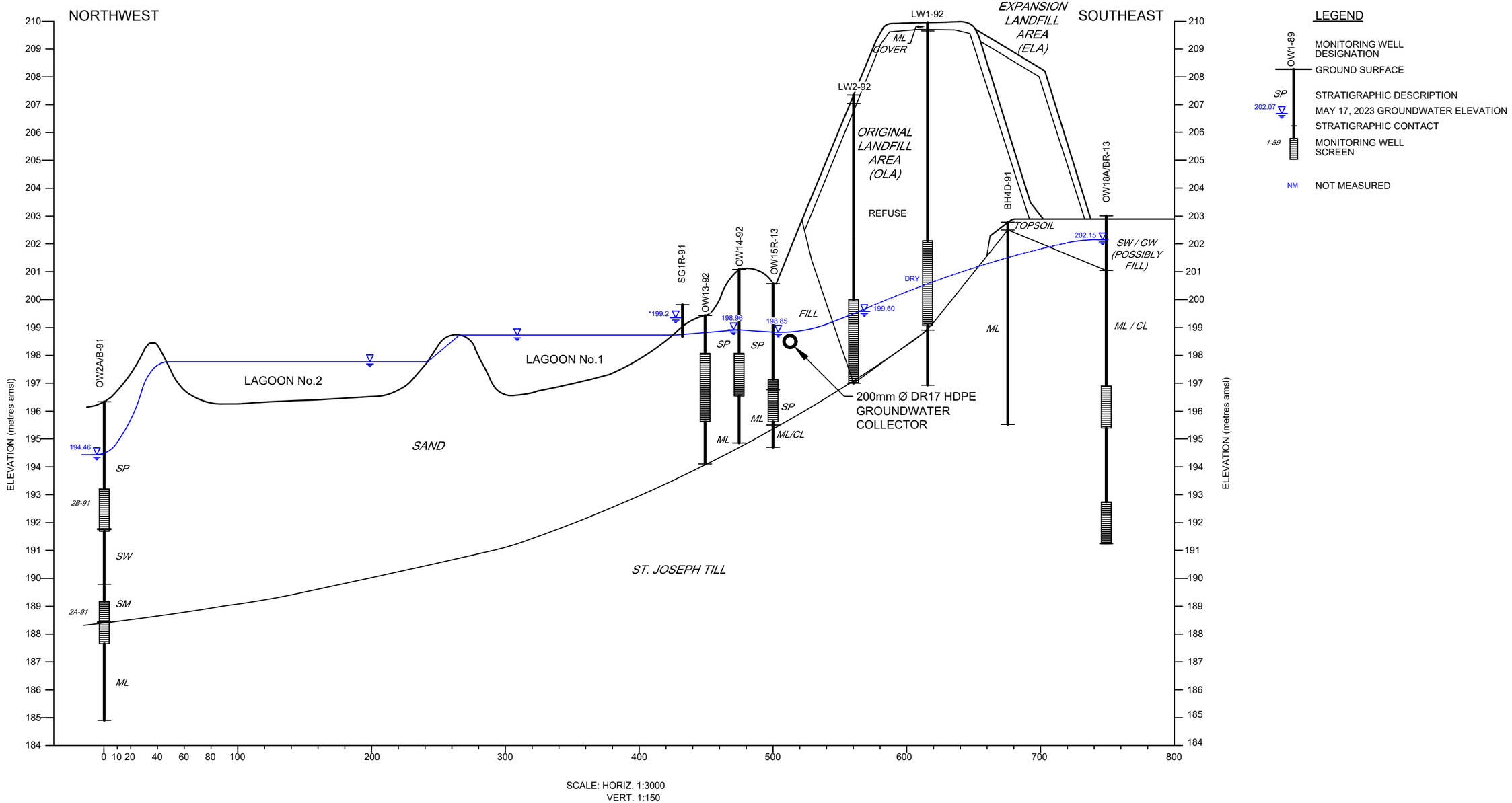

LEGEND

- OW1-89 — MONITORING WELL DESIGNATION
- GROUND SURFACE
- SP — STRATIGRAPHIC DESCRIPTION
- 202.07 — MAY 17, 2023 GROUNDWATER ELEVATION
- STRATIGRAPHIC CONTACT
- 1-89 — MONITORING WELL SCREEN
- NM — NOT MEASURED

SCALE: HORIZ. 1:3000
VERT. 1:150

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MUNICIPALITY OF KINCARDINE
KINCARDINE, ONTARIO
2023 ANNUAL MONITORING REPORT

SCHEMATIC CROSS-SECTION
KINCARDINE WARD 1 LANDFILL SITE

Project No. **4074**
Date **March 2024**

FIGURE 1.4

Filename: N:\CA\Waterloo\Projects\662\004074\Digital_Design\ACAD\Figures\RPT121\004074-GHD-00-00-RPT-EN-D104_WA-121.dwg
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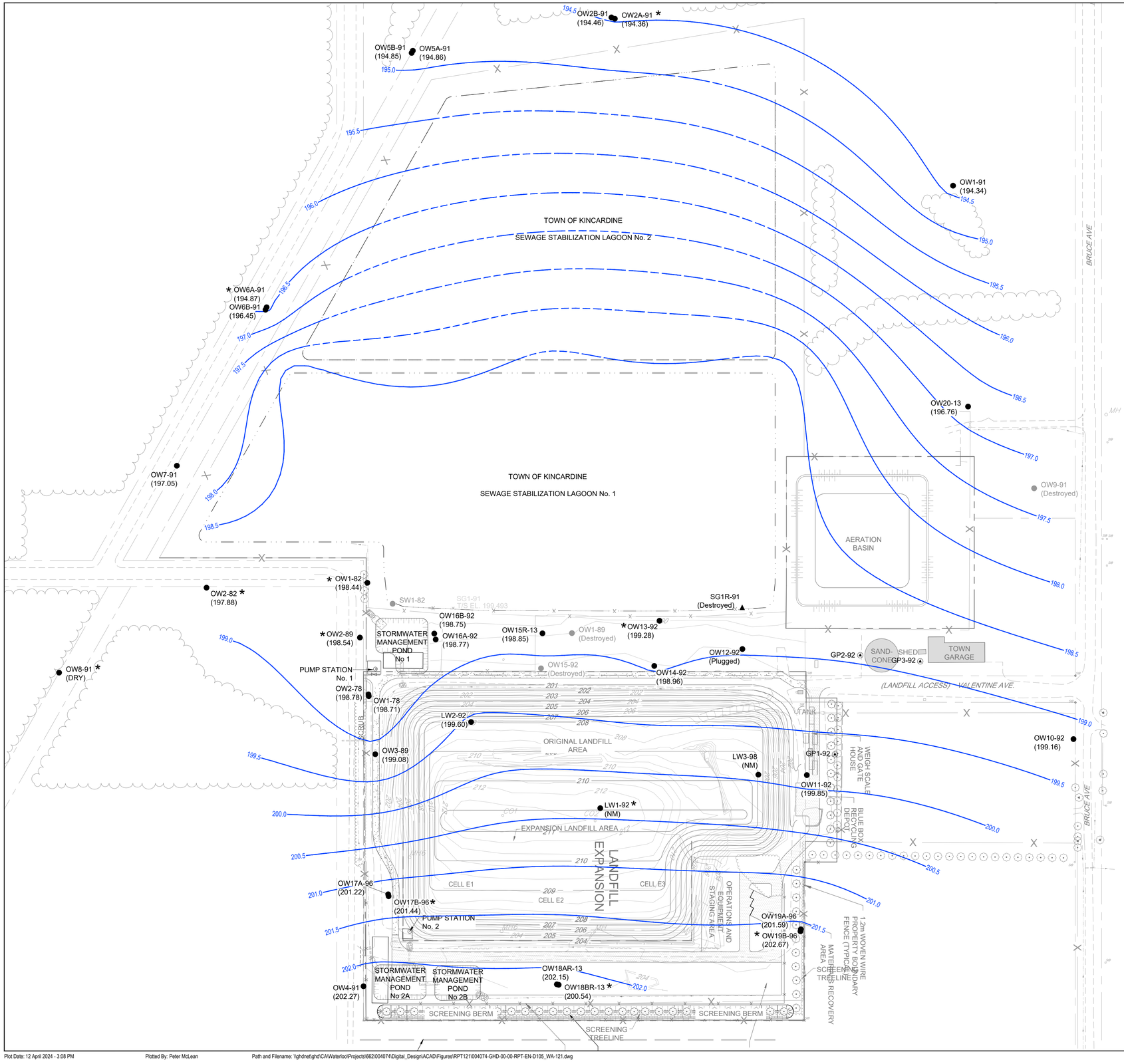

LEGEND

- PROPERTY BOUNDARY (GENERAL)
- SITE PROPERTY BOUNDARY
- 200 — SEPTEMBER 2014 EXISTING GROUND CONTOUR
- EDGE OF GRAVEL
- EXISTING FENCE LINE
- EXISTING DITCH AND DIRECTION OF FLOW
- BOTTOM OF SLOPE / TOP OF SLOPE
- EXISTING TREELINE
- EXISTING TREE
- RIP RAP EROSION PROTECTION
- EXISTING BUILDING
- ● OW12-92 — OBSERVATION WELL
- ● OW15-92 (DESTROYED) — FORMER MONITORING LOCATION
- ● LW2-92 — LEACHATE WELL
- ◉ GP1-92 — GAS PROBE NEST
- ▲ SG1R-91 — STAFF GAUGE
- (198.67) — GROUNDWATER ELEVATION (m AMSL)
- * — NOT USED TO GENERATE CONTOURS
- NM — NOT MEASURED
- mbtbar — METRES BELOW TBAR
- 196.5 — GROUNDWATER ELEVATION CONTOUR (m AMSL)
- 196.5 — INFERRED GROUNDWATER ELEVATION CONTOUR (m AMSL)

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Drafting Check	E.M.	Design Check	NA	
Project Manager	J. YARDLEY	Project Director		

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KINCARDINE WARD 1
LANDFILL SITE

Project
2023 ANNUAL MONITORING REPORT

Date	Scale
April 2024	1 : 1500

Project No.
4074

Title
GROUNDWATER CONTOURS
WATER TABLE AQUIFER
MAY 17, 2023

Size
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Sheet No.
FIGURE 5.1

Plot Date: 12 April 2024 - 3:08 PM
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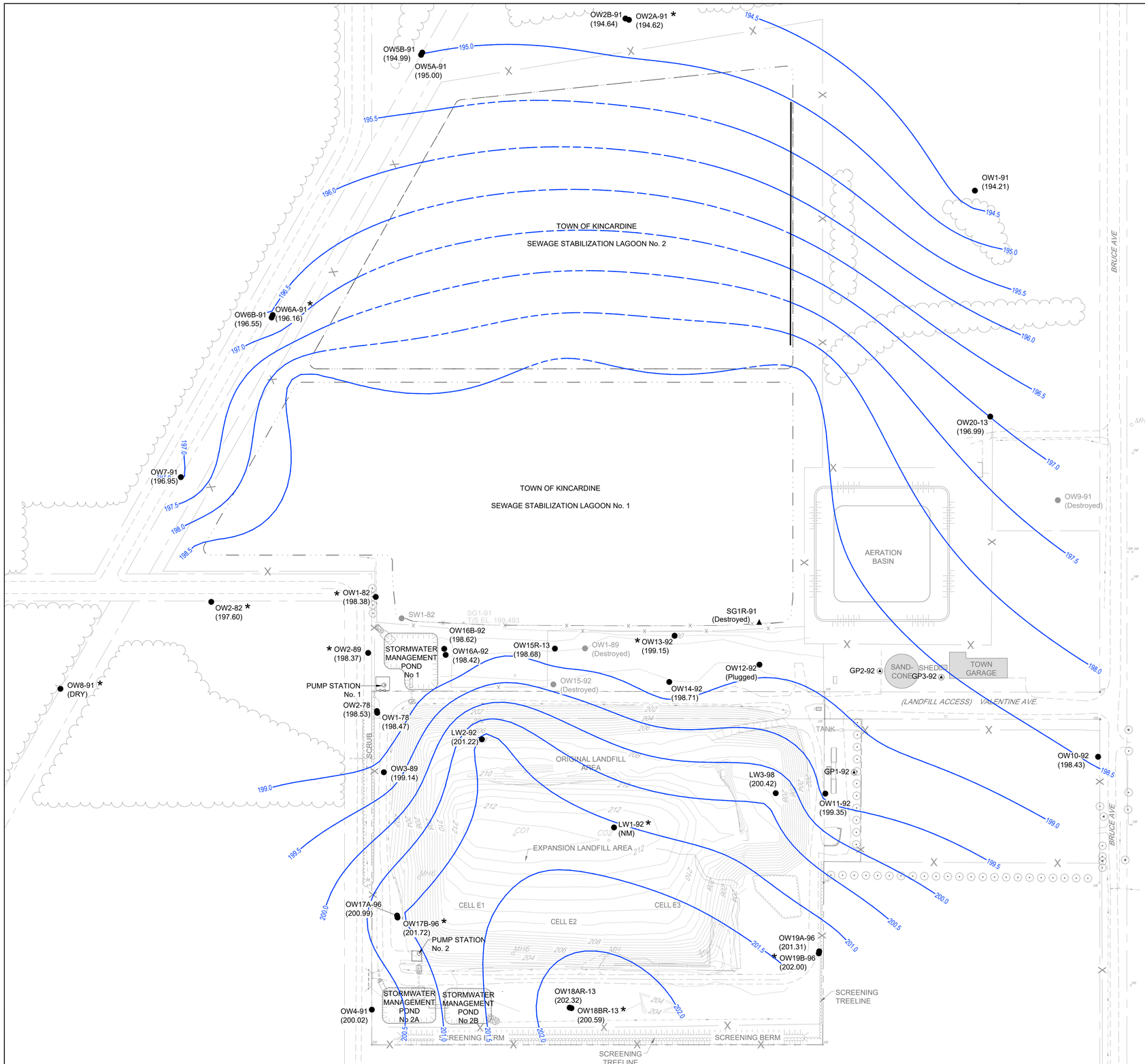

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Project Manager	J. YARDLEY	Project Director	

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KINCARDINE WARD 1
LANDFILL SITE

Project
2023 ANNUAL MONITORING REPORT

Date	Scale
April 2024	1 : 1500

Project No.
4074

Title
GROUNDWATER CONTOURS
WATER TABLE AQUIFER
NOVEMBER 9, 2023

Size
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Sheet No.
FIGURE 5.2

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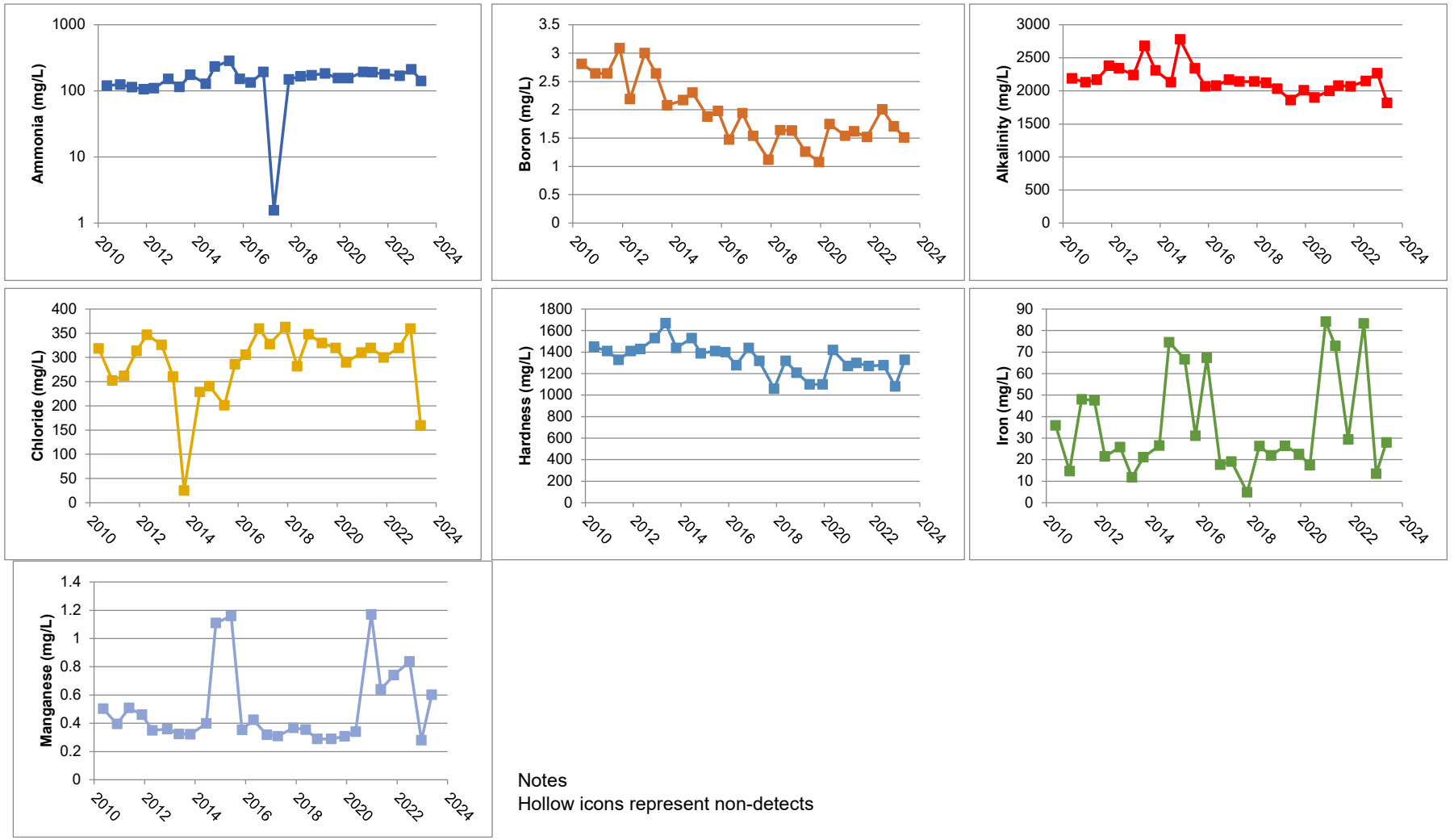

Notes
Hollow icons represent non-detects

Figure 5.3a
LW2-92 - Concentration versus Time
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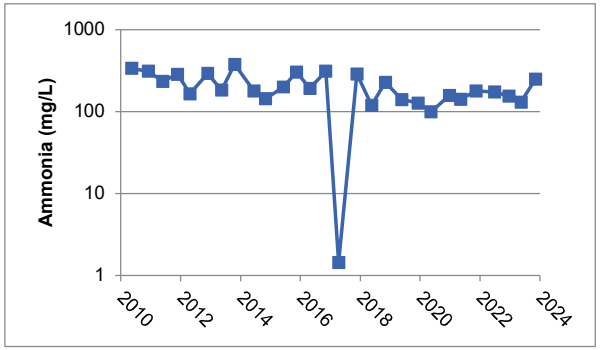
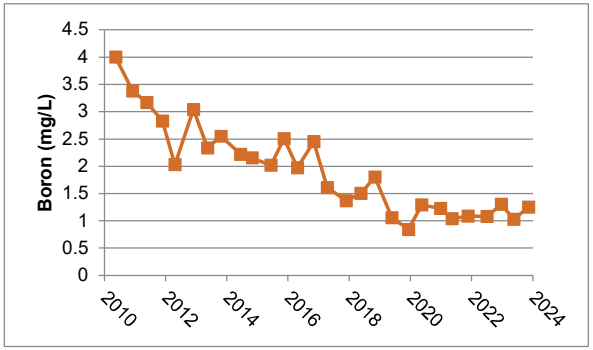
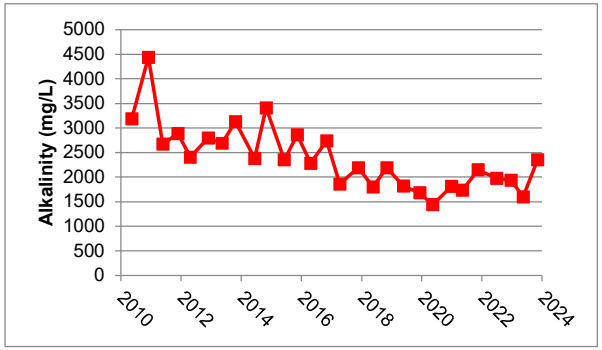
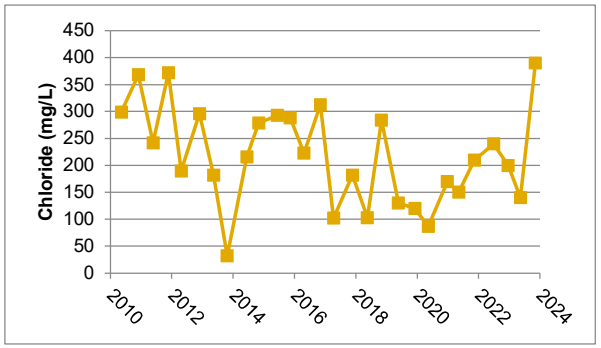
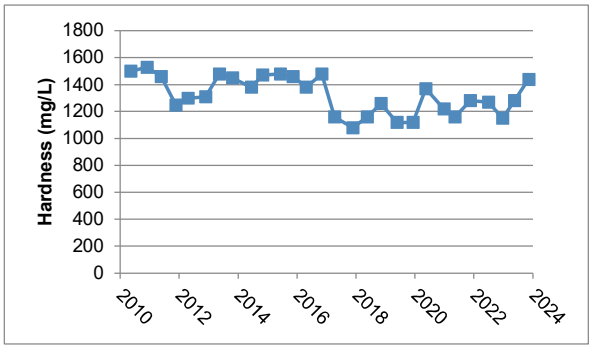
Municipality of Kincardine, Ontario

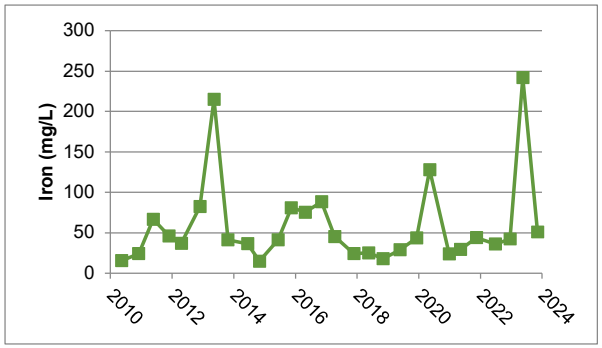


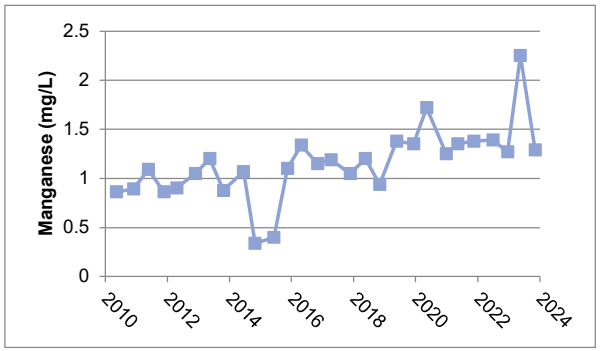












Notes
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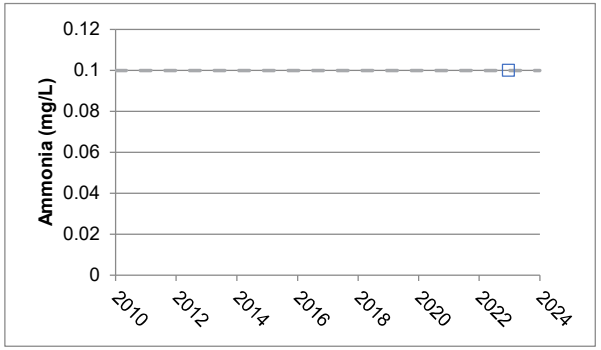
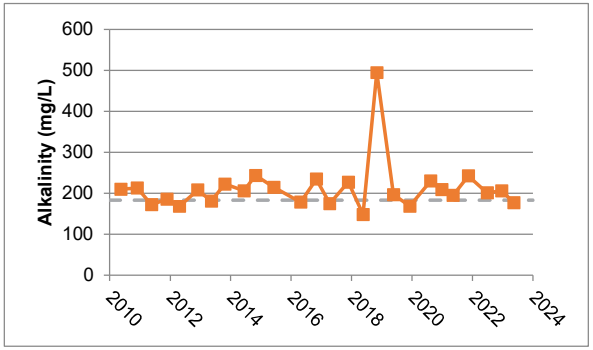
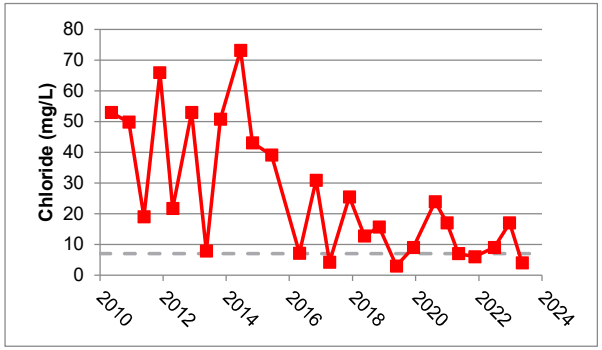
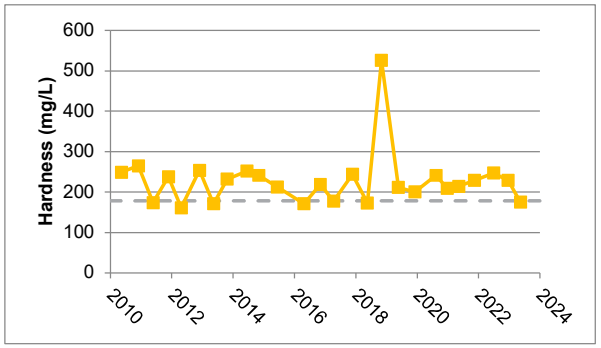
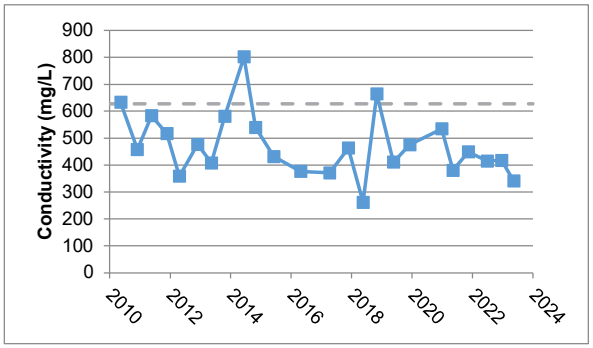
Figure 5.3b
LW3-98 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario











Notes
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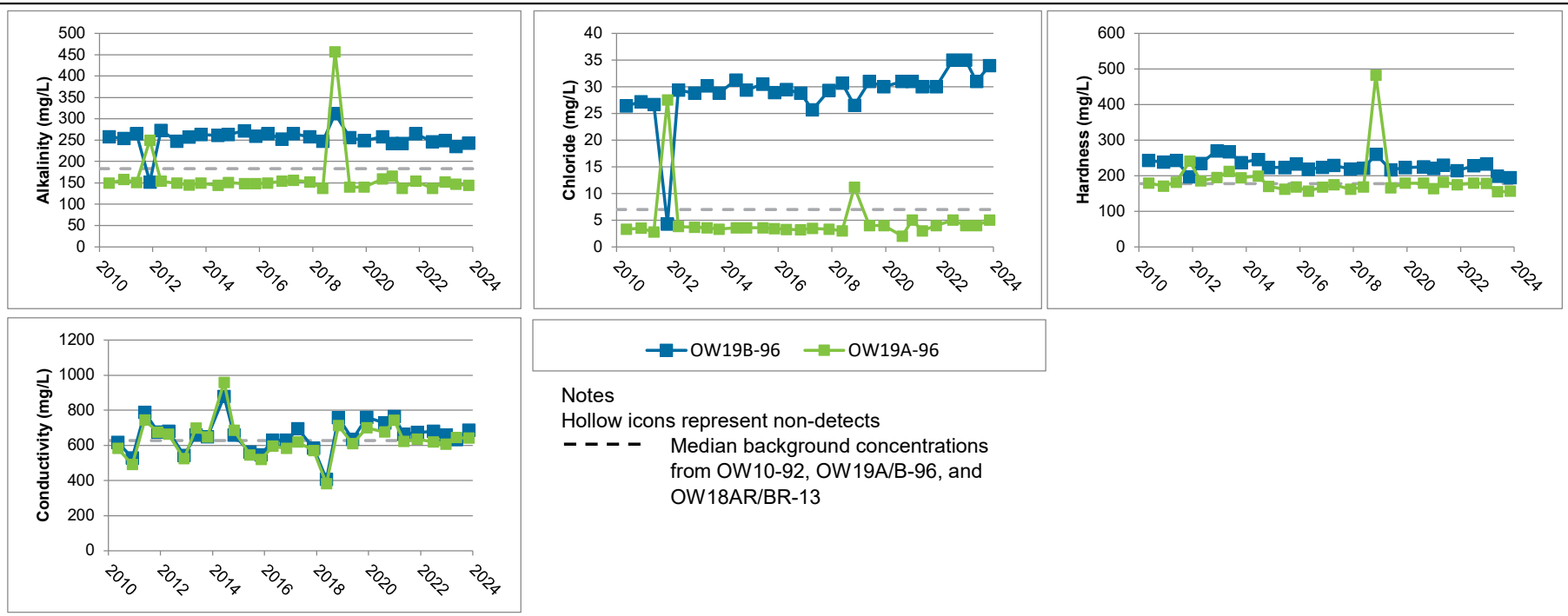
- - - - Median background concentrations from OW10-92, OW19A/B-96, and OW18AR/BR-13

Figure 5.4
OW10-92 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario



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- - - - Median background concentrations from OW10-92, OW19A/B-96, and OW18AR/BR-13

Figure 5.5
OW19A-96 and OW19B-96 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

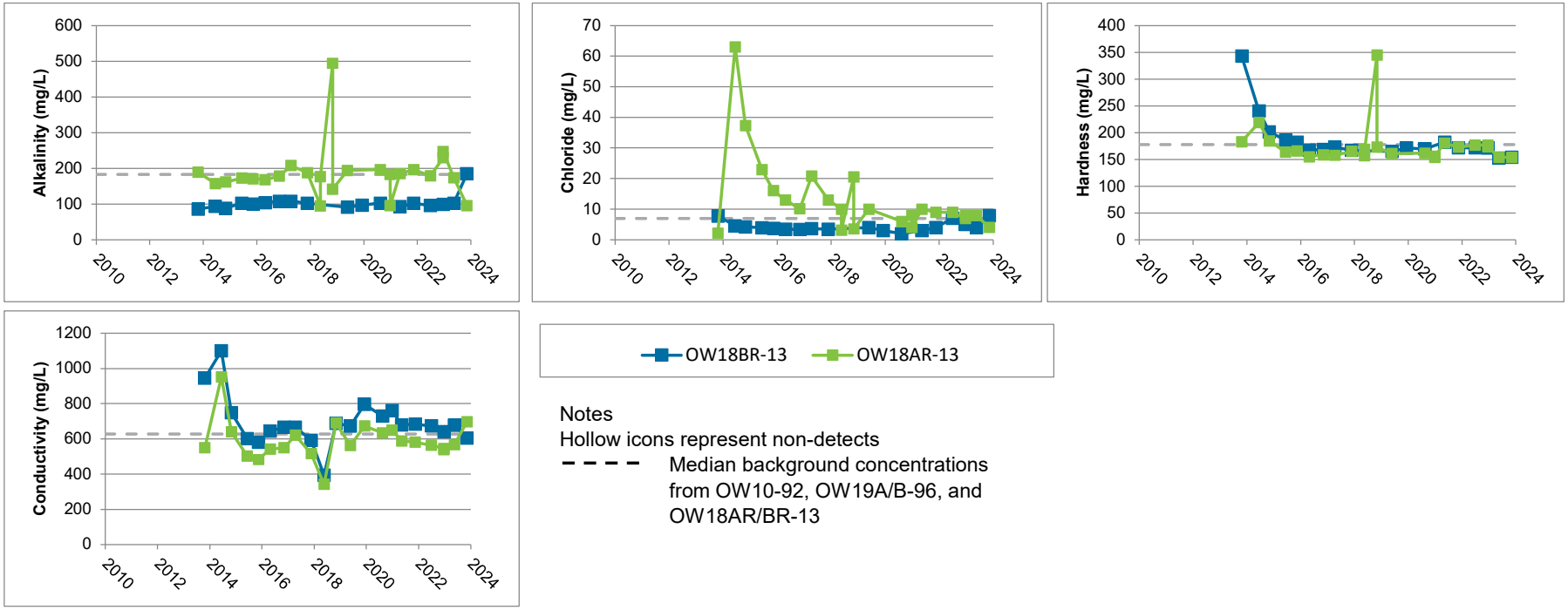

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Figure 5.6
OW18AR-13 and OW18BR-13 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

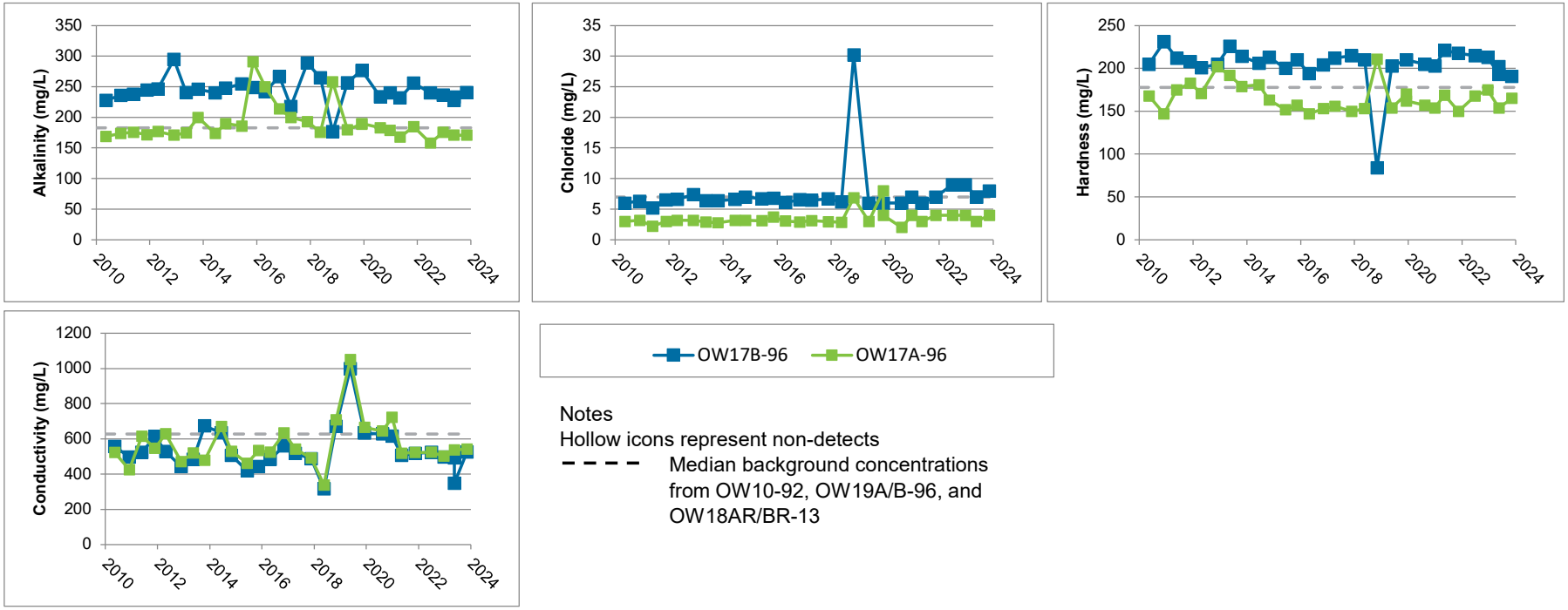

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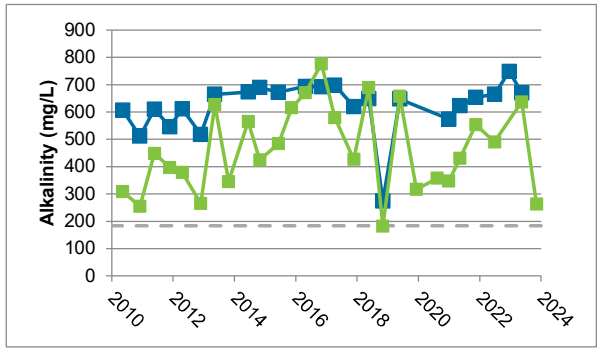
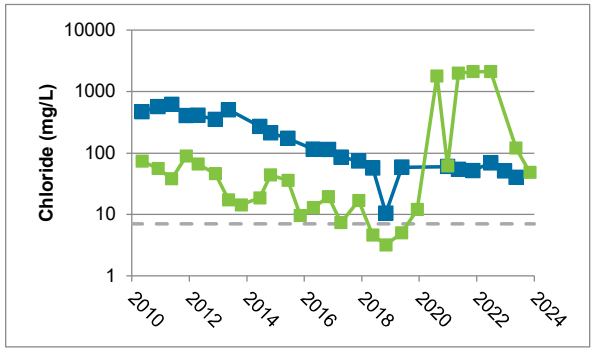
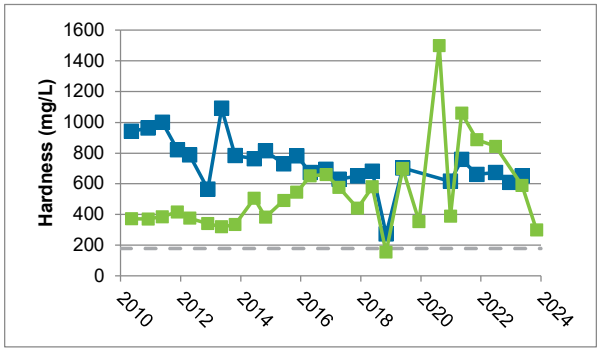
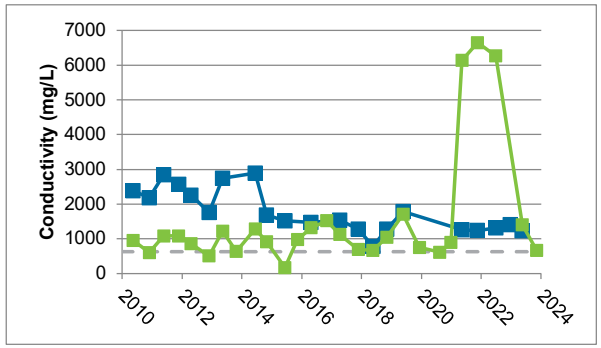
Figure 5.7
OW17A-96 and OW17B-96 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario









Notes
Hollow icons represent non-detects
- - - - Median background concentrations from OW10-92, OW19A/B-96, and OW18AR/BR-13

Figure 5.8
OW11-92 and OW3-89 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

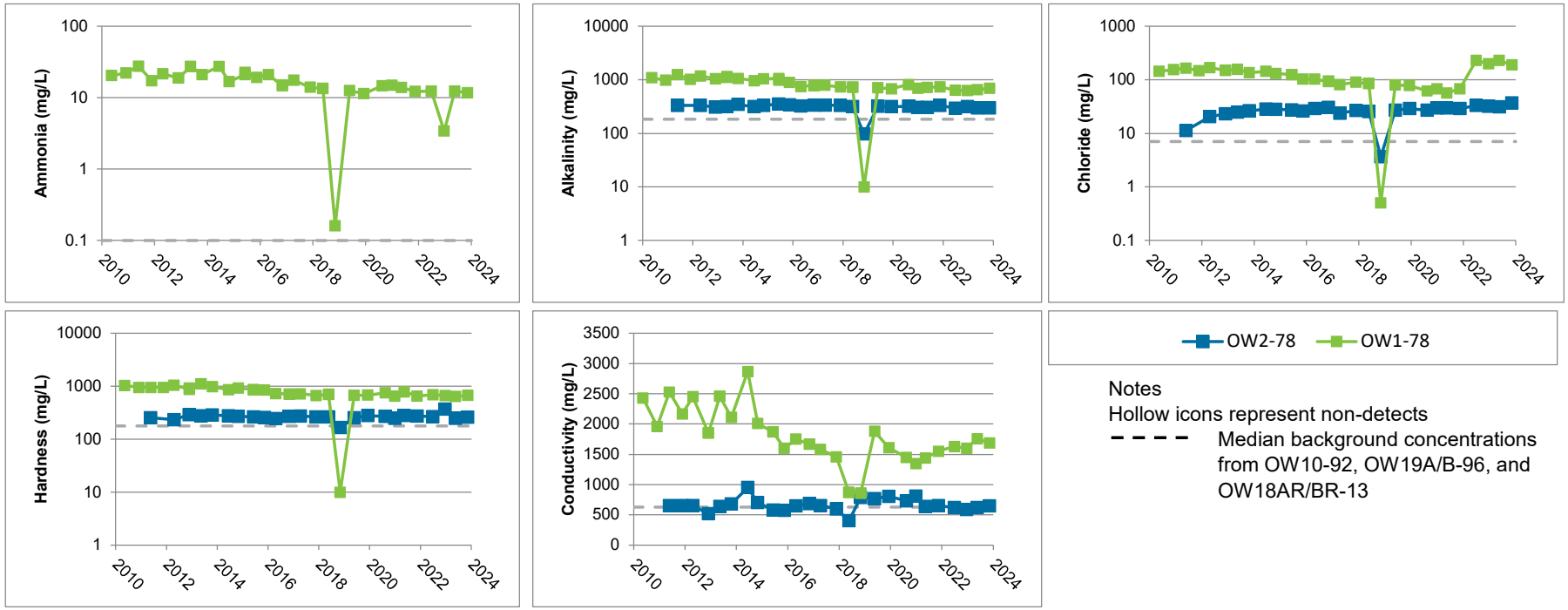
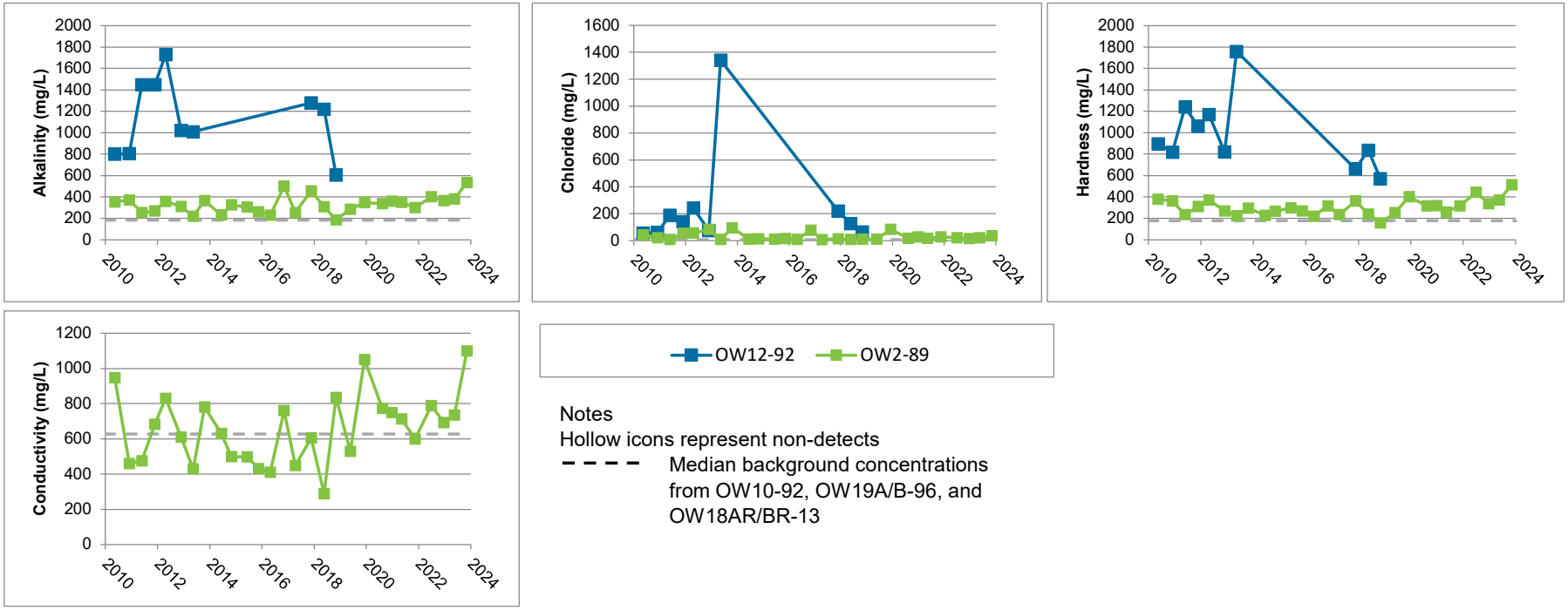


Figure 5.9
OW1-78 and OW2-78 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario



Notes
Hollow icons represent non-detects
- - - - Median background concentrations from OW10-92, OW19A/B-96, and OW18AR/BR-13

Figure 5.10
OW12-92, and OW2-89 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

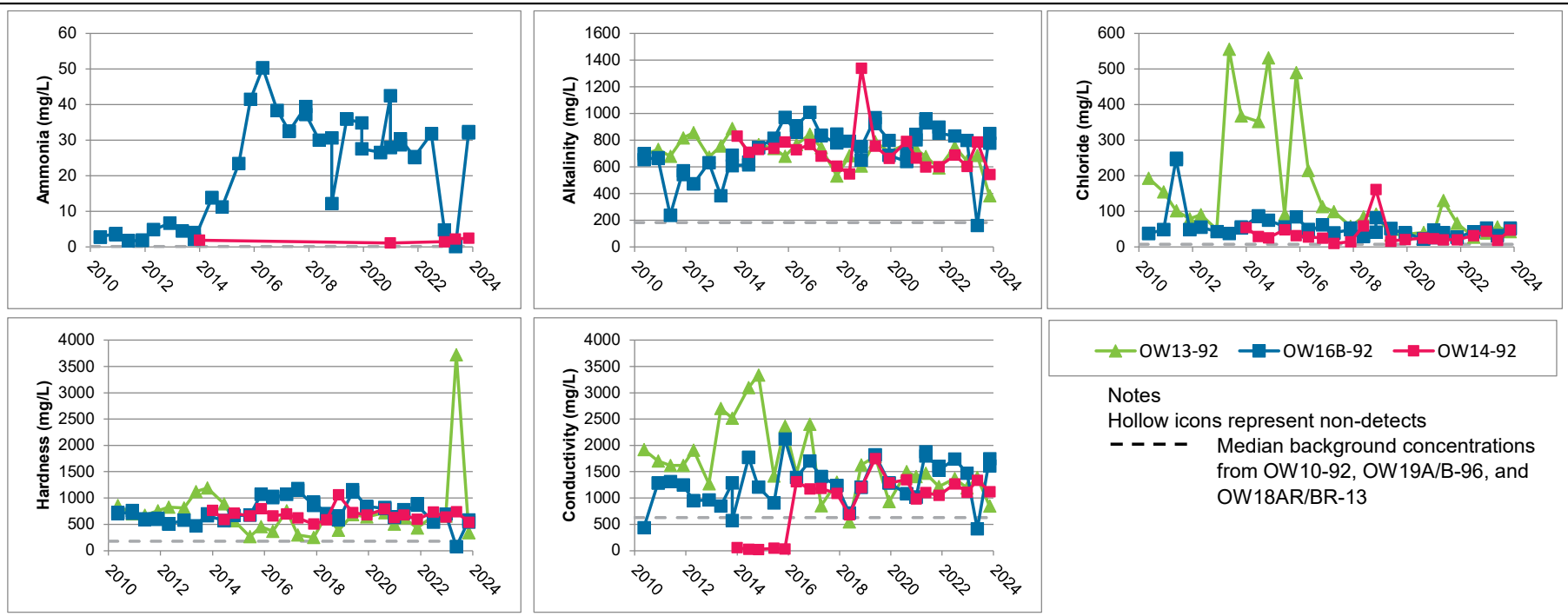
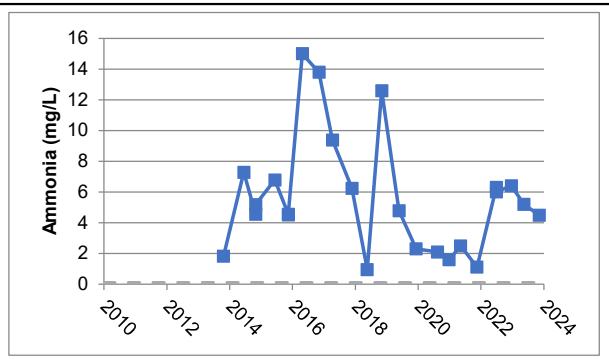
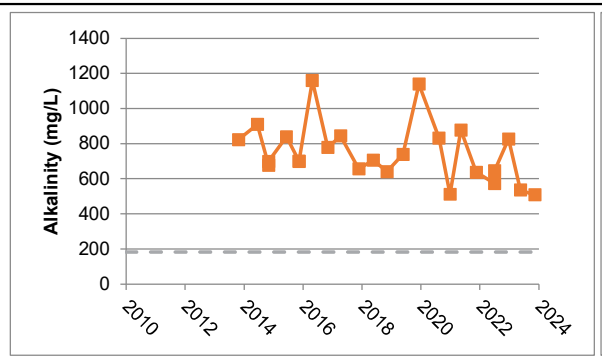
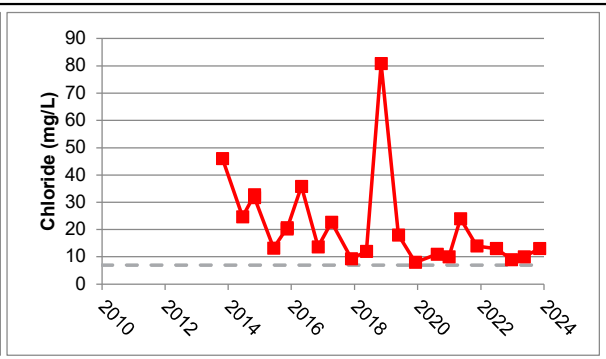
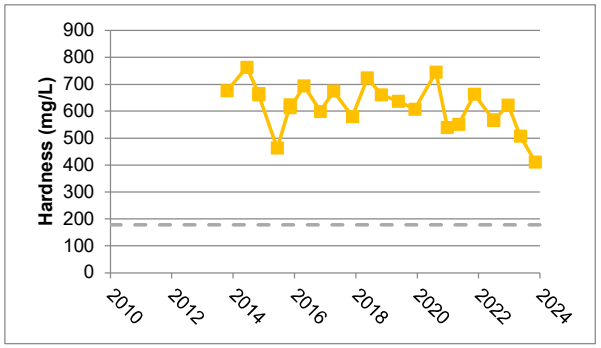


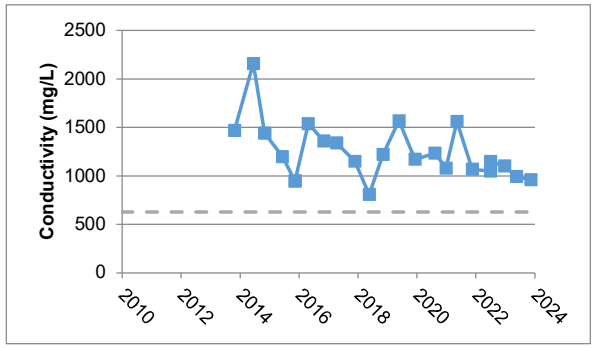
Figure 5.11
OW14-92, OW13-92 and OW16B-92 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario











Notes
Hollow icons represent non-detects
- - - - Median background concentrations from OW10-92, OW19A/B-96, and OW18AR/BR-13

Figure 5.12
OW15R-13 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

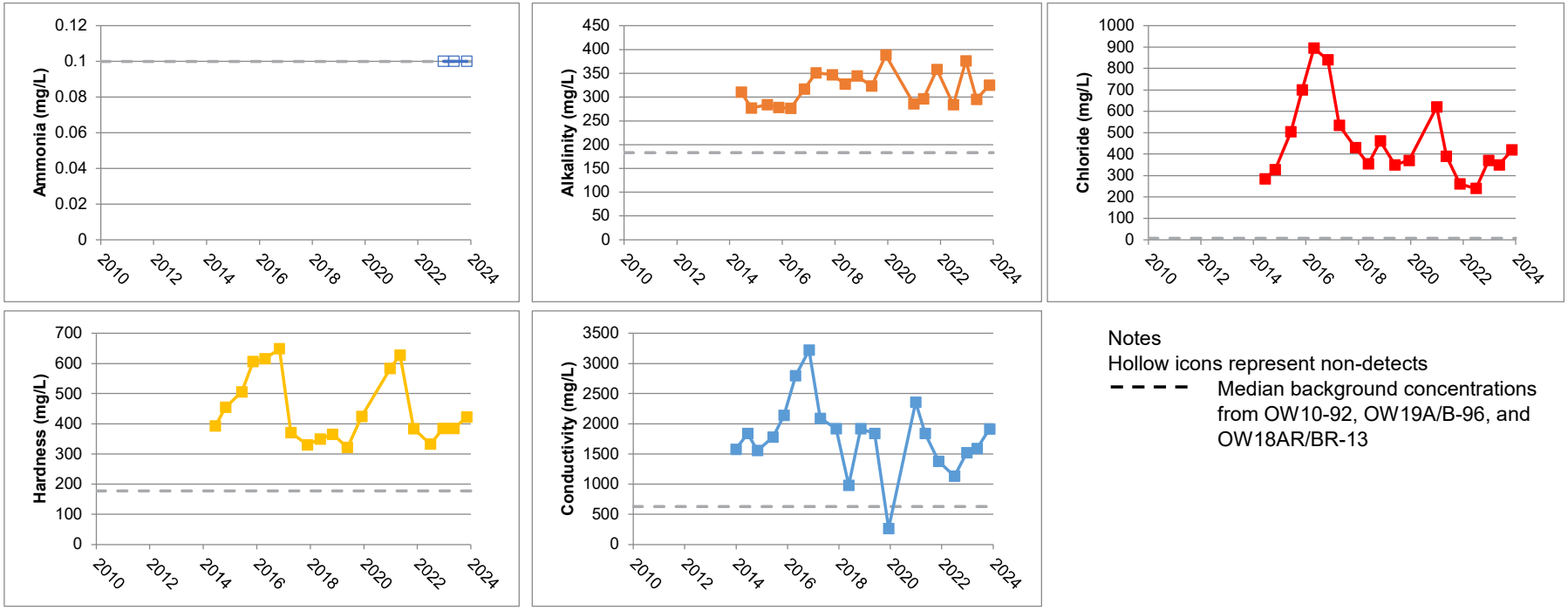
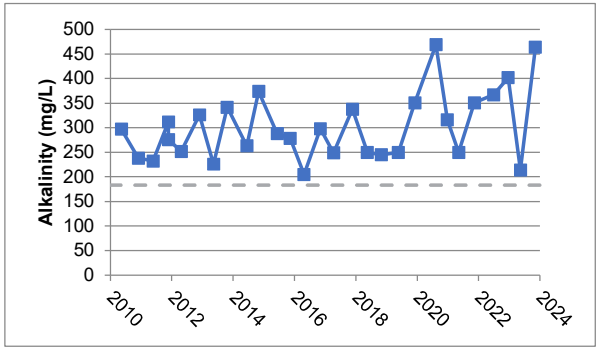
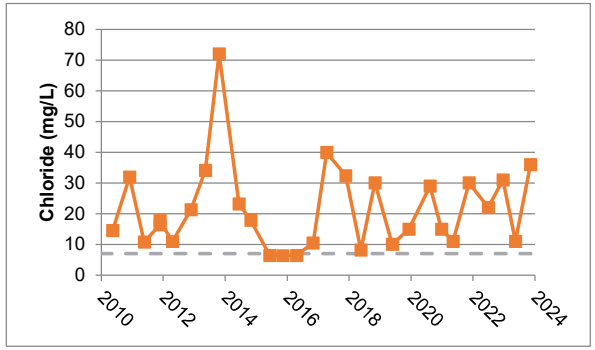
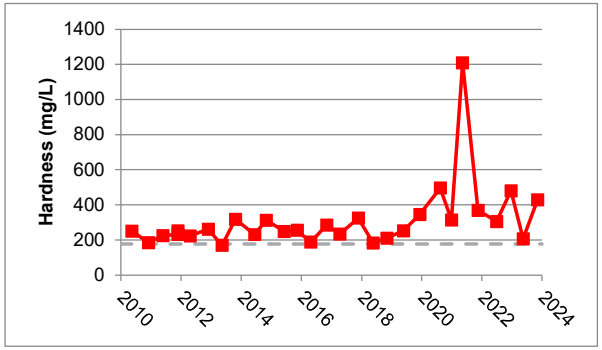
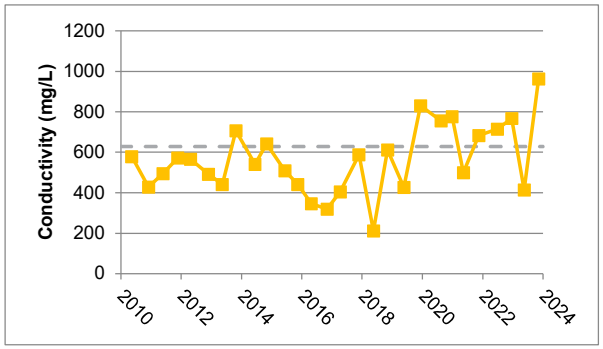


Figure 5.13
OW20-13 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario



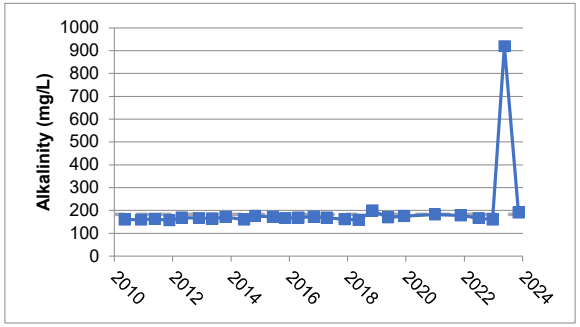


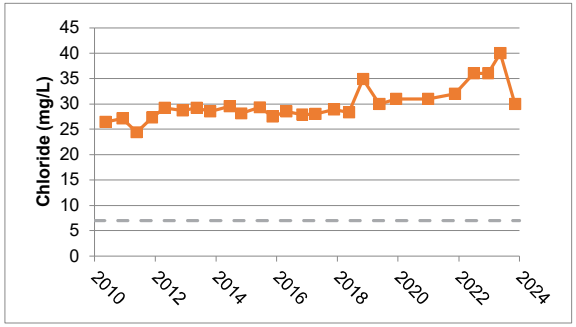


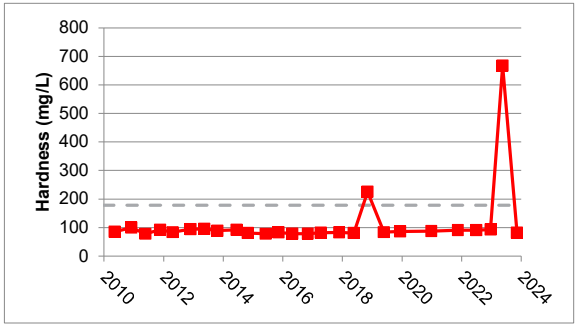


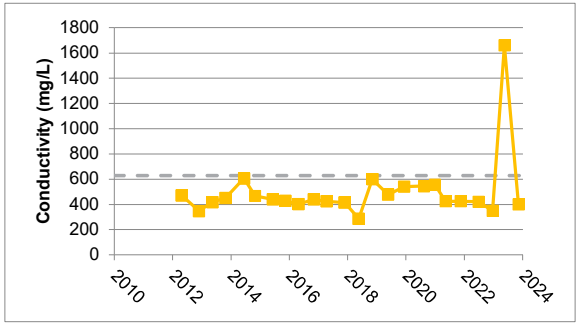
Notes
Hollow icons represent non-detects
- - - - Median background concentrations from OW10-92, OW19A/B-96, and OW18AR/BR-13

Figure 5.14
OW2-82 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario



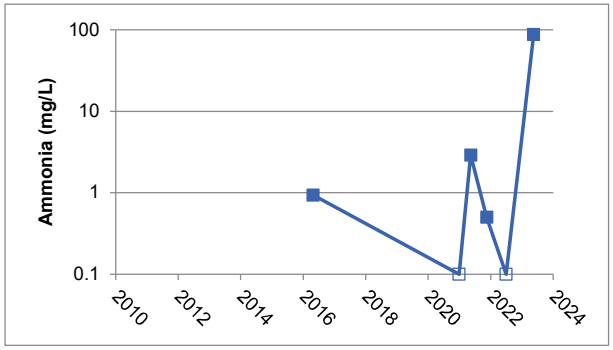


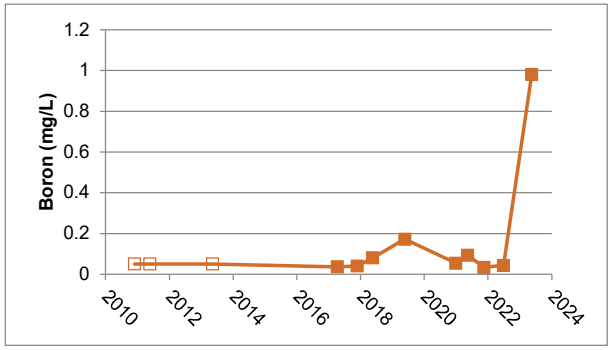


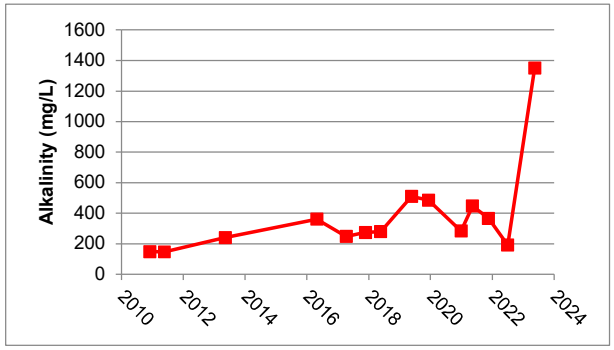


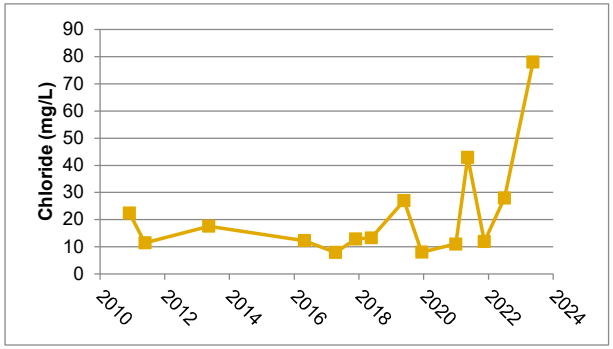
Notes
Hollow icons represent non-detects
Median background concentrations from OW10-92, OW19A/B-96, and OW18AR/BR-13

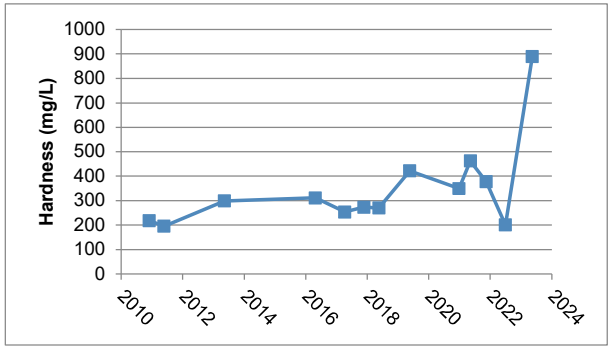
Figure 5.15
OW16A-92 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

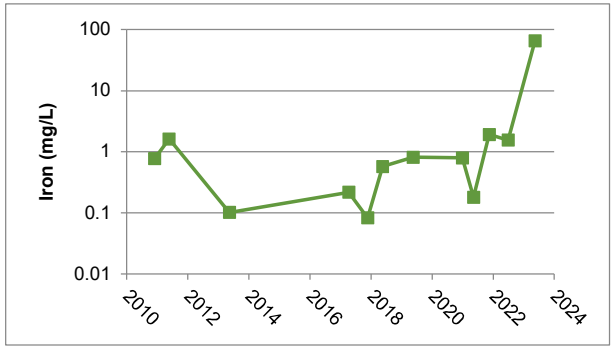


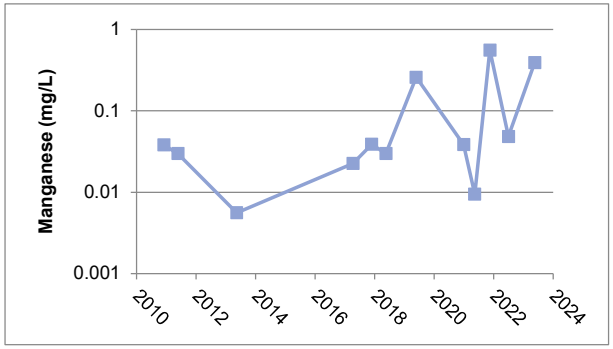






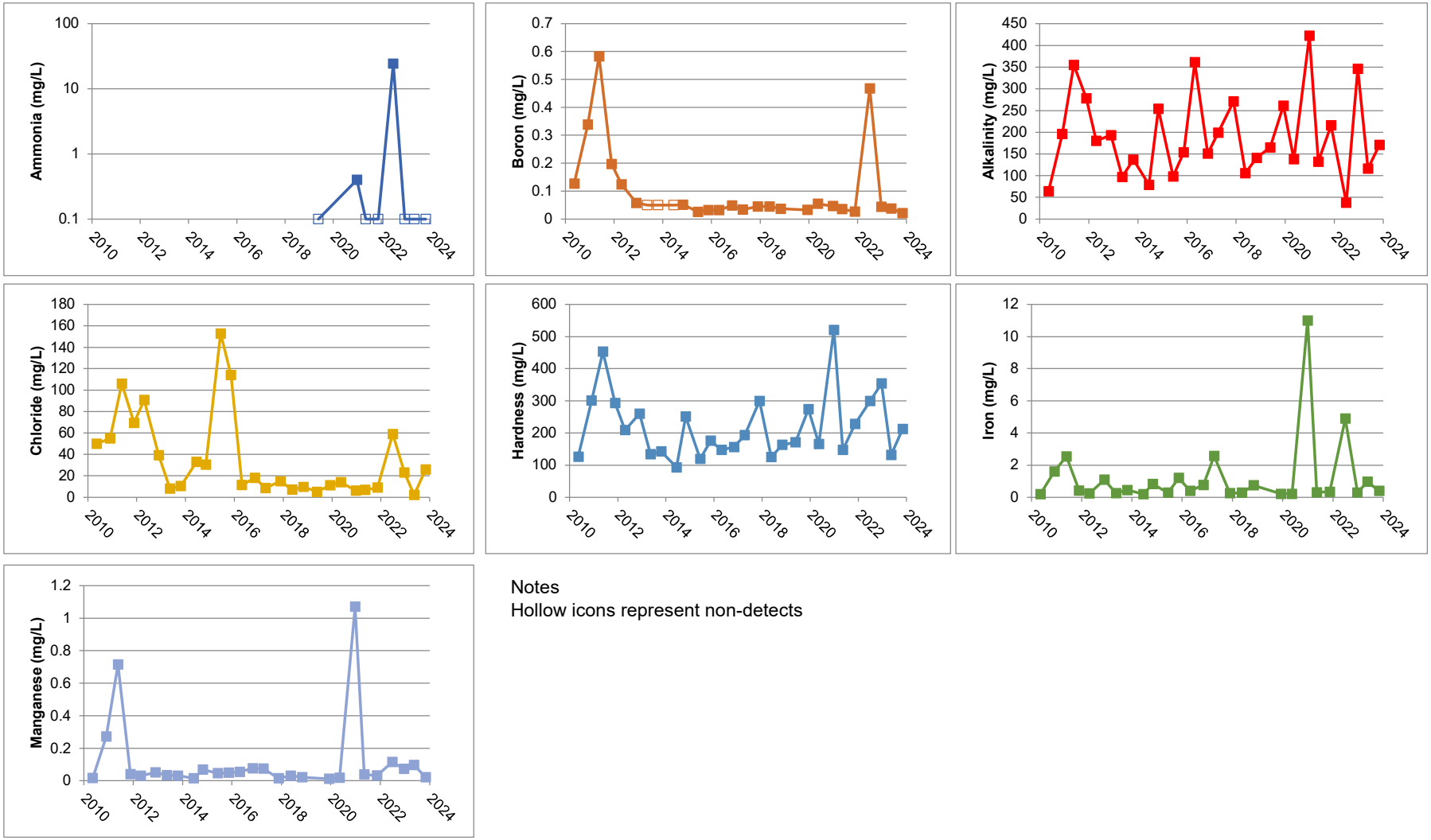






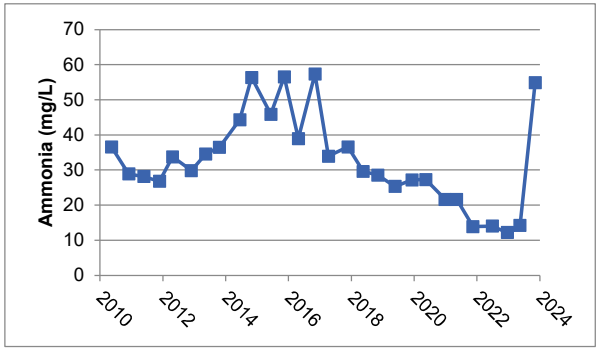
Notes
Hollow icons represent non-detects

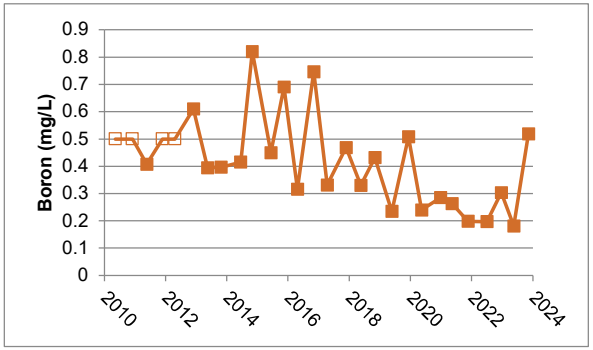
Figure 5.16a
SWP1 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

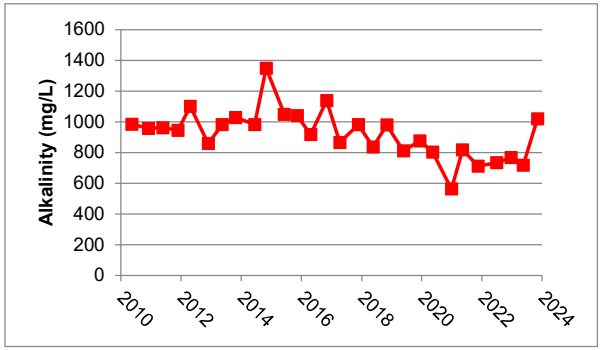


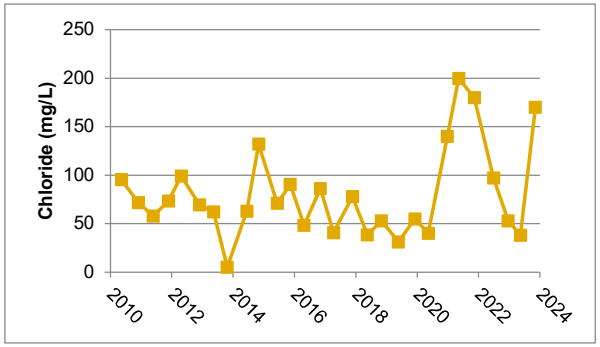
Notes
Hollow icons represent non-detects

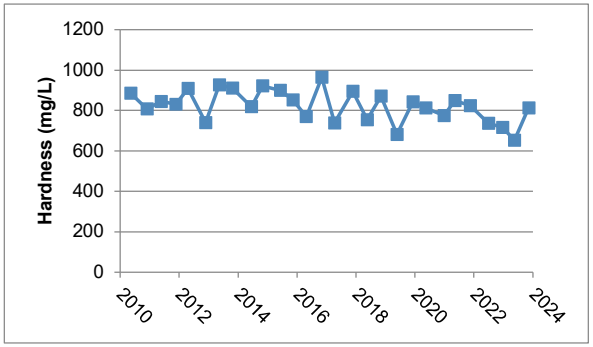
Figure 5.16b
SWP2 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

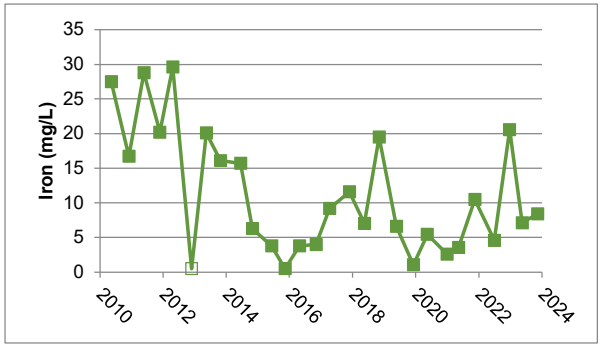


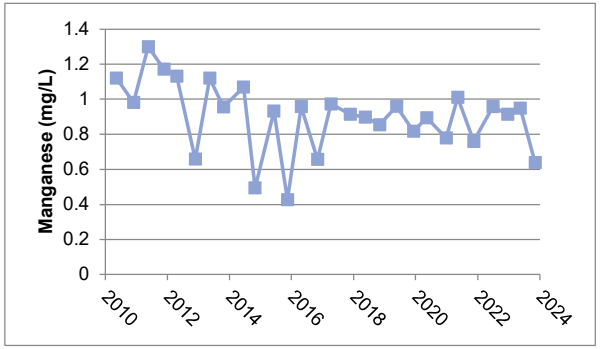






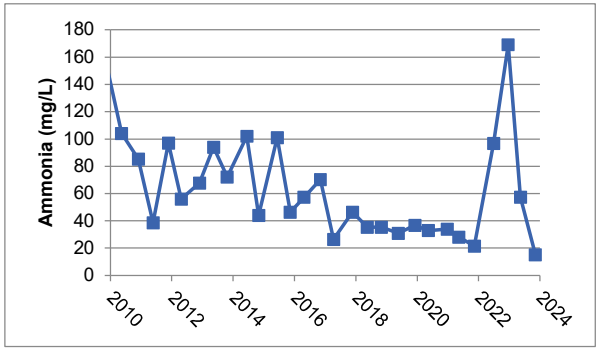


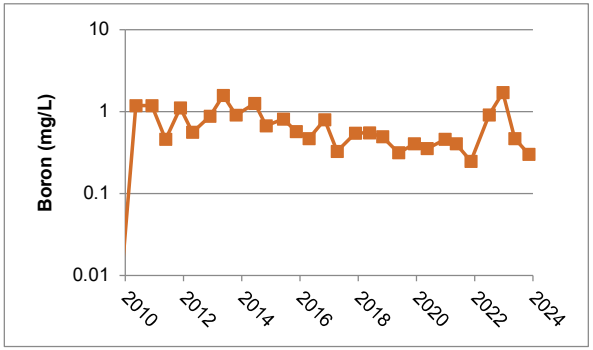


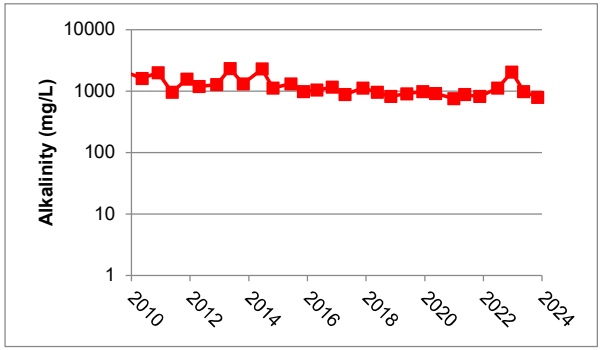


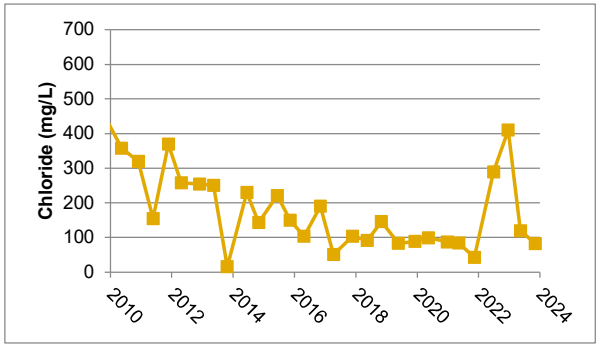
Notes
Hollow icons represent non-detects

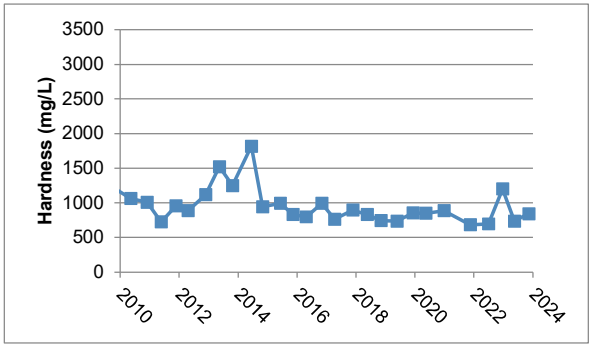
Figure 5.17
GCS - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

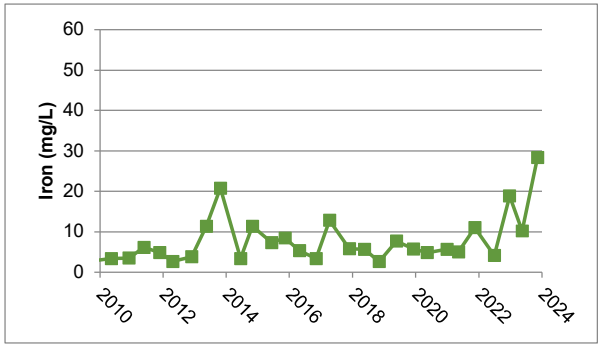


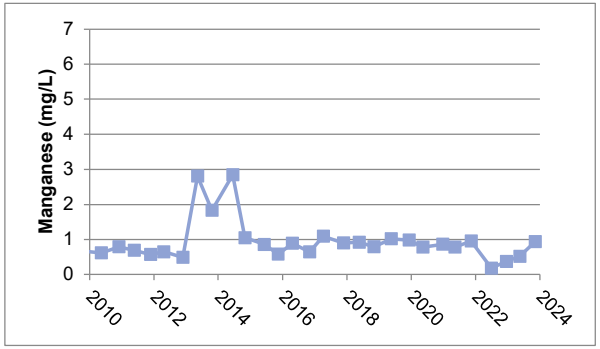






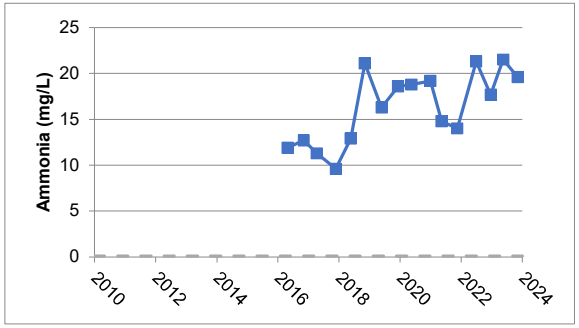


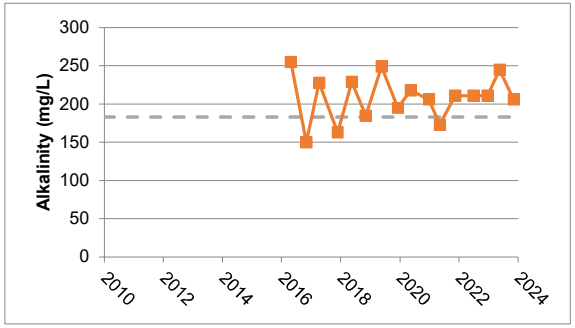


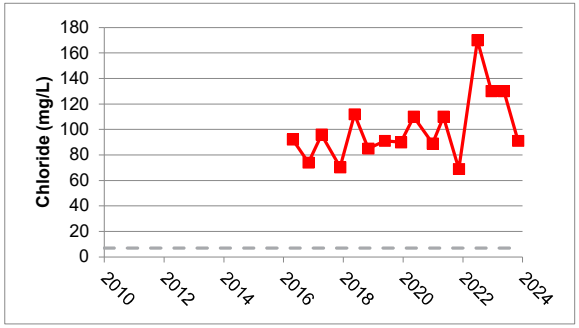


Notes
Hollow icons represent non-detects

Figure 5.18
LCS - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario







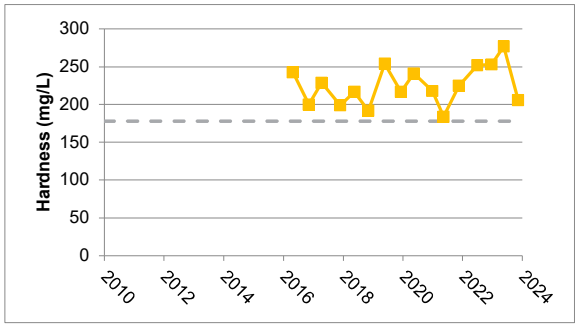


Figure 5.19
SG1R-91 - Concentration versus Time
2023 Annual Monitoring Report - Ward 1 Landfill
Municipality of Kincardine, Ontario

Tables

Table 3.1

Summary of 2023 Monitoring Program
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site

Monitoring Locations	Field Test Parameters				Laboratory Test Parameters					
	Hydraulic Monitoring	Field pH, Conductivity, Temperature	Field Dissolved Oxygen	% Methane, pressure, CO_2, and O_2	General Chemistry[1]	Additional General Chemistry[2]	Dissolved Metals[3]	Total Metals[3]	VOCs[4]	TSS/Total Phosphorus
Groundwater Monitoring Wells (32 locations, 21 samples)										
OW1-78	√	√			√	√	√			
OW1-82	√									
OW1-89[5]	√	√			√		√			
OW1-91	√									
OW2-78	√	√			√		√			
OW2-82	√	√			√		√			
OW2-89	√	√			√		√			
OW2A-91	√									
OW2B-91	√									
OW3-89	√	√			√		√			
OW3-91[5]	√									
OW4-91	√									
OW5A-91	√									
OW5B-91	√									
OW6A-91	√									
OW6B-91	√									
OW7-91	√									
OW10-92	√	√			√		√			
OW11-92	√	√			√		√			
OW12-92[5]	√	√			√		√			
OW13-92	√	√			√		√			
OW14-92	√	√			√	√	√			
OW16A-92	√	√			√		√			
OW16B-92	√	√			√	√	√			
OW17A-96	√	√			√		√			
OW17B-96	√	√			√		√			
OW19A-96	√	√			√		√			
OW19B-96	√	√			√		√			
OW15R-13	√	√			√	√	√			
OW18AR-13	√	√			√		√			
OW18BR-13	√	√			√		√			
OW20-13	√	√			√	√	√			

Table 3.1

Summary of 2023 Monitoring Program
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site

Monitoring Locations	Field Test Parameters				Laboratory Test Parameters					
	Hydraulic Monitoring	Field pH, Conductivity, Temperature	Field Dissolved Oxygen	% Methane, pressure, CO_2, and O_2	General Chemistry[1]	Additional General Chemistry[2]	Dissolved Metals[3]	Total Metals[3]	VOCs[4]	TSS/Total Phosphorus
Leachate Monitoring Wells (3 locations)										
LW1-92	√									
LW2-92	√	√			√	√		√	√	
LW3-98	√	√			√	√		√	√	
Surface Water (2 locations)										
Pond No. 1		√	√		√	√		√		√
Pond No. 2		√	√		√	√		√		√
Groundwater Collection System (1 location)										
GCS - Pump Station No. 1 (PS1)		√			√	√		√	√	√
Leachate Collection System (1 location)										
LCS - Pump Station No. 2 (PS2)		√			√	√		√	√	√
Sewage Stabilization Lagoon (1 location)										
SG1R-91	√	√	√		√	√				
Landfill Gas (6 locations)										
GP1A-92				•						
GP1B-92				•						
GP2A-92				•						
GP2B-92				•						
GP3A-92				•						
GP3B-92				•						

Notes:

√ Samples to be collected semi-annually (spring and fall)

• To be monitored once per month (January through April, July, and November)

(1) General Chemistry Parameter list - Alkalinity, Calcium, Chloride, Conductivity, Dissolved Organic Carbon (DOC), Hardness, Magnesium, Phenols, pH, and Temperature

(2) Additional General Chemistry and Metals Parameter list - Ammonia, Biological Oxygen Demand, Chemical Oxygen Demand, Nitrate, Nitrite, Total Kjedahl Nitrogen

(3) Select Metals - ICP metals scan (dissolved metals are field filtered)

(4) VOCs - Volatile Organic Compounds - EPA 624 list

(5) Monitoring well noted as destroyed/abandoned. MW12-92 is plugged and cannot be monitored

Table 4.1

Monitoring Well, Leachate Well, and Gas Probe Inspection Summary
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Monitoring Well Designation	Identification	Riser Pipe Size/Type	Riser Pipe Condition	Cap	Instrumentation Type	Instrumentation Condition	Protective Casing	Lock	Surface Seal	Comments
Groundwater Monitoring Wells (38 locations)										
OW1-78	X	1 1/2"ø PVC	Good	√	Waterra	Good	X	√	X	potentially bad surface seal
OW1-82	√	1 1/2"ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW1-91	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW2-78	√	1 1/2"ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW2-82	√	1 1/2"ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW2-89	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW2A-91	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW2B-91	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW3-89	X	2" ø PVC	Good	√	Waterra	Good	X	√	X	bad surface seal and casing
OW4-91	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW5A-91	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW5B-91	√	2" ø PVC	Good	√	Waterra	Good	√	X	√	OK
OW6A-91	√	2" ø PVC	Good	√	Waterra	Good	√	X	√	OK
OW6B-91	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW7-91	√	2" ø PVC	x	√	Waterra	Good	x	√	√	OK
OW8-91	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW10-92	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW11-92	√	2" ø PVC	x	√	Waterra	Good	x	√	√	OK
OW12-92	X	-	-	-	-	-	-	-	-	Buried/destroyed before 2022
OW13-92	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW14-92	√	2" ø PVC	Good	√	Waterra	Good	√	x	√	OK
OW16A-92	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW16B-92	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW17A-96	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW17B-96	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW19A-96	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW19B-96	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW15R-13	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW18AR-13	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW18BR-13	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
OW20-13	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK

Table 4.1

Monitoring Well, Leachate Well, and Gas Probe Inspection Summary
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Monitoring Well Designation	Identification	Riser Pipe Size/Type	Riser Pipe Condition	Cap	Instrumentation Type	Instrumentation Condition	Protective Casing	Lock	Surface Seal	Comments
Leachate Monitoring Wells (3 locations)										
LW1-92	√	2" ø PVC	Good	√	Waterra	Good	√	√	√	OK
LW2-92	√	2" ø PVC	Good	√	Waterra	Good	√	X	√	OK
LW3-98	√	2" ø PVC	Good	√	Waterra	Good	√	X	√	OK
Landfill Gas Probes (6 locations)										
GP1A-92	√	1" ø PVC	Good	√	-	-	√	√	√	OK
GP1B-92	√	1" ø PVC	Good	√	-	-	√	√	√	OK
GP2A-92	√	1" ø PVC	Good	√	-	-	√	√	√	OK
GP2B-92	√	1" ø PVC	Good	√	-	-	√	√	√	OK
GP3A-92	√	1" ø PVC	Good	√	-	-	√	√	√	OK
GP3B-92	√	1" ø PVC	Good	√	-	-	√	√	√	OK
Staff Gauge										
SG1R-92	**X**	-	-	-	-	-	-	-	-	gone

Notes:

√ - Status is OK
x - Status is deficient
- - Not Applicable/No Information Available

Table 4.2

Landfill Gas Probes - Methane Gas Monitoring Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Monitoring Location	January 2023				February 2023				March 2023				April 2023			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas	Pressure	CO_2	O_2	Methane Gas	Pressure	CO_2	O_2
GP1A-92	1.6	0.0	14.2	1.5	0.1	0.0	1.1	20.1	3.1	0.05	15.9	1.2	0.1	0.13	0.1	20.0
GP1B-92	0.6	0.0	9.4	8.6	0.1	0.0	0.8	20.4	0.6	0.0	3.0	18.4	0.1	0.0	5.1	15.4
GP2A-92	0.0	0.05	0.6	20.8	0.0	0.0	0.7	20.1	0.0	0.0	0.6	21.5	0.0	0.0	1.1	18.3
GP2B-92	0.0	0.0	0.9	20.9	0.1	0.0	0.8	20.1	0.0	0.0	0.6	21.5	0.0	0.0	1.1	18.4
GP3A-92	0.1	0.0	0.9	20.8	1.1	0.0	15.6	0.7	0.0	0.0	1.1	21.6	0.0	0.0	1.4	18.6
GP3B-92	0.1	0.0	1.0	20.4	1.1	0.0	12.7	5.5	0.0	0.0	0.1	22.6	0.0	0.0	0.7	19.3

Monitoring Location	July 2023				November 2023			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	6.6	14.6	0.0	0.0	2.9	17.8
GP1B-92	0.0	0.0	3.3	17.3	0.0	0.0	4.8	15.9
GP2A-92	0.0	0.0	1.6	18.2	0.0	0.0	1.4	18.5
GP2B-92	0.0	0.0	1.8	17.8	0.0	0.0	1.5	18.3
GP3A-92	0.0	0.0	2.6	17.2	Decommissioned			
GP3B-92	0.0	0.0	1.0	19.1				

Notes:

Methane gas is expressed in percent by volume in air.
Pressure is measured in inches of water.
GHD field staff use a Landtec® GEM2000 portable gas monitoring instrument that is calibrated daily (prior to use).
nm - Not measured (GP3A & B were compromised in March 2021).

Table 5.1

Groundwater and Leachate Level Elevations
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Monitoring Well ID	Ground Surface Elevation (m AMSL)	Reference Elevation (m AMSL)	20-May-18	4-Nov-18	23-May-19	8-Dec-19	13-Aug-20	27-Dec-20
Groundwater Observation Wells								
OW1-78	200.42	201.20	198.37	198.37	198.85	198.65	198.15	198.70
OW1-82	198.79	199.72	198.56	198.36	198.56	198.45	nm	198.47
OW1-89	200.22	201.03	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
OW1-91	197.08	196.90	194.42	193.62	194.43	Buried	nm	194.29
OW2-78	200.50	201.11	198.96	198.45	198.93	198.72	198.23	198.72
OW2-82	--	199.55	198.15	197.46	198.24	197.74	197.25	197.76
OW2-89	199.50	200.31	198.68	198.32	198.66	197.49	198.16	198.52
OW2A-91	196.31	197.35	194.63	194.27	194.57	194.52	nm	194.56
OW2B-91	196.23	197.25	194.64	194.29	194.58	194.52	nm	194.58
OW3-89	199.72	200.49	199.17	199.05	199.21	199.16	198.32	199.15
OW3-91	202.06	203.04	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned
OW4-91	203.27	204.24	202.19	199.22	202.25	200.44	nm	201.65
OW5A-91	197.91	198.83	195.03	194.57	195.04	195.01	nm	195.08
OW5B-91	197.89	198.77	195.01	194.56	194.83	195.00	nm	195.09
OW6A-91	198.01	198.87	195.12	194.72	195.04	195.04	nm	195.13
OW6B-91	197.95	198.86	196.50	196.51	196.49	196.50	nm	196.50
OW7-91	198.39	199.26	197.16	196.84	197.17	197.01	nm	197.03
OW10-92	202.30	203.11	199.28	198.44	199.35	198.76	198.44	198.73
OW11-92	202.04	202.80	199.91	199.39	200.14	199.44	199.37	199.48
OW12-92	200.10	201.02	198.61	198.32	Plugged	Plugged	Plugged	Plugged
OW13-92	199.43	200.82	199.34	199.23	199.51	199.25	199.21	199.26
OW14-92	201.08	201.44	199.03	198.78	199.08	198.90	198.72	198.89
OW15R-13	200.65	201.43	198.94	198.78	198.95	198.77	198.71	198.83
OW16A-92	200.17	200.90	199.01	198.62	198.88	198.72	198.52	198.77
OW16B-92	200.14	200.99	198.90	198.62	198.86	198.71	198.51	198.75
OW17A-96	202.43	203.27	201.20	200.74	201.28	201.30	200.32	201.47
OW17B-96	202.41	203.29	201.72	201.60	201.65	201.94	200.72	201.89
OW18AR-13	203.34	204.21	202.08	202.48	201.98	202.41	202.52	202.41
OW18BR-13	203.44	204.31	200.42	200.70	200.35	200.87	200.30	201.03
OW19A-96	203.36	203.88	201.62	201.13	201.58	201.11	201.50	201.54
OW19B-96	203.27	204.06	202.69	201.72	202.77	202.32	201.75	202.71
OW20-13	197.09	198.01	196.94	196.90	197.05	196.95	na	196.89
Leachate Monitoring Wells								
LW1-92	210.11	211.21	202.21	202.24	202.07	Dry	na	Dry
LW2-92	208.18	209.23	199.53	199.00	199.54	199.26	na	199.57
LW3-98	209.28	210.25	200.70	199.95	200.97	200.59	na	203.40
Sewage Stabilization Lagoon								
SG1R-91	ns	199.85	198.71	198.70	198.75	198.72	na	199.24

Notes:

m AMSL	- Meters above mean sea level
m btbar	- Meters below the top of the T-bar
--	- No data available
na	- no access
nm	- not monitored
ns	- not surveyed
mbtor	- Meters below top of riser

Table 5.1

Groundwater and Leachate Level Elevations
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Monitoring Well ID	Ground Surface Elevation (m AMSL)	Reference Elevation (m AMSL)	11-May-21	15-Nov-21	26-Jun-22	20-Dec-22	17-May-23	9-Nov-23
Groundwater Observation Wells								
OW1-78	200.42	201.20	198.53	198.49	198.44	198.68	198.71	198.47
OW1-82	198.79	199.72	nm	198.62	198.37	198.52	198.44	198.38
OW1-89	200.22	201.03	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
OW1-91	197.08	196.90	194.11	194.49	193.83	194.26	194.34	194.21
OW2-78	200.50	201.11	198.67	199.02	198.48	198.77	198.78	198.53
OW2-82	--	199.55	197.70	198.08	197.48	197.82	197.88	197.60
OW2-89	199.50	200.31	198.46	198.72	198.34	198.56	198.54	198.37
OW2A-91	196.31	197.35	nm	194.76	194.14	194.56	194.36	194.62
OW2B-91	196.23	197.25	194.44	194.77	194.15	194.62	194.46	194.64
OW3-89	199.72	200.49	199.10	199.29	198.71	nm	199.08	199.14
OW3-91	202.06	203.04	Abandoned	Abandoned	Abandonded	Abandoned	Abandoned	Abandoned
OW4-91	203.27	204.24	202.20	202.31	201.72	202.27	202.27	200.02
OW5A-91	197.91	198.83	194.78	195.25	194.46	194.99	194.86	195.00
OW5B-91	197.89	198.77	194.77	195.25	194.45	194.98	194.85	194.99
OW6A-91	198.01	198.87	194.77	195.38	194.46	195.04	194.87	196.16
OW6B-91	197.95	198.86	196.38	196.59	196.30	196.52	196.45	196.55
OW7-91	198.39	199.26	nm	197.17	196.68	197.04	197.05	196.95
OW10-92	202.30	203.11	198.84	199.12	198.76	198.72	199.16	198.43
OW11-92	202.04	202.80	199.57	199.61	199.53	199.44	199.85	199.35
OW12-92	200.10	201.02	Plugged	Plugged	Plugged	Plugged	Plugged	Plugged
OW13-92	199.43	200.82	199.25	199.47	199.33	199.42	199.28	199.15
OW14-92	201.08	201.44	198.84	199.12	198.90	199.02	198.96	198.71
OW15R-13	200.65	201.43	198.78	199.12	198.88	198.78	198.85	198.68
OW16A-92	200.17	200.90	nm	198.96	198.69	198.85	198.77	198.42
OW16B-92	200.14	200.99	198.67	198.99	198.78	198.84	198.75	198.62
OW17A-96	202.43	203.27	201.01	201.51	200.84	201.44	201.22	200.99
OW17B-96	202.41	203.29	201.47	202.04	200.99	201.89	201.44	201.72
OW18AR-13	203.34	204.21	202.25	202.65	202.31	202.33	202.15	202.32
OW18BR-13	203.44	204.31	200.66	201.09	200.54	201.06	200.54	200.59
OW19A-96	203.36	203.88	201.57	201.51	201.65	201.52	201.59	201.31
OW19B-96	203.27	204.06	202.48	202.82	202.26	202.61	202.67	202.00
OW20-13	197.09	198.01	196.80	197.12	196.60	196.80	196.76	196.99
Leachate Monitoring Wells								
LW1-92	210.11	211.21	Dry	Dry	Dry	Dry	nm	nm
LW2-92	208.18	209.23	199.51	199.61	199.49	200.13	199.60	201.22
LW3-98	209.28	210.25	203.52	200.57	200.37	200.75	nm	200.42
Sewage Stabilization Lagoon								
SG1R-91	ns	199.85	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed

Notes:

m AMSL - Meters above mean sea level
m btbar - Meters below the top of the T-bar
-- - No data available
na - no access
nm - not monitored
ns - not surveyed
mbtor - Meters below top of riser

Table 5.2A

General Chemistry And Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW3-98
Sample ID:			LW-WARD1-19-002	LW-WARD1-19-002	LW-WARD 1-19-001	LW2-92	LW-WARD 1-002	LW-WARD 1-001	LW-WARD 1-002	LW-WARD1-122022-001	LW2-92	LW-WARD1-19-001
Sample Date:			5/23/2019	12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	5/23/2019
Parameters	**Units**	***ODWS*** [1]										
Metals												
Aluminum	mg/L	0.10 (OG)	0.119	0.046	0.07	0.642	1.87	0.627	4.37	0.345	0.856	0.256
Barium	mg/L	1	0.555	0.574	0.515	0.456	0.507	0.398	0.746	0.406	0.51	0.138
Beryllium	mg/L	--	0.00001	0.000011	<0.00007	0.000043	0.000095	0.00005	0.00025	0.000025	0.000042	0.000024
Boron	mg/L	5	1.26	1.08	1.75	1.54	1.62	1.52	2.01	1.71	1.51	1.06
Cadmium	mg/L	0.005	0.000481	0.000208	0.00035	0.001311	0.00451	0.00463	**0.00991**	0.000558	0.0025	0.00058
Calcium	mg/L	--	-	-	297	277	295	262	288	198	299	-
Chromium	mg/L	0.05	0.00337	0.00302	0.0045	0.00664	0.013	0.00503	0.0169	0.00456	0.00713	0.00712
Cobalt	mg/L	--	0.00627	0.00549	0.0083	0.0101	0.0161	0.0102	0.014	0.00915	0.0106	0.00708
Copper	mg/L	1.0 (AO)	0.0098	0.0022	0.01	0.0161	0.0817	0.0144	0.105	0.0111	0.0372	0.0074
Iron	mg/L	0.30 (AO)	**26.4**	**22.6**	**17.5**	**84.3**	**72.9**	**29.4**	**83.4**	**13.4**	**28**	**29**
Lead	mg/L	0.01	0.00357	0.00127	0.0025	0.00272	**0.0293**	0.0026	**0.0179**	0.00207	0.00507	0.00225
Magnesium	mg/L	--	119	109	165	141	138	149	137	142	143	94.2
Manganese	mg/L	0.05 (AO)	**0.29**	**0.307**	**0.341**	**1.17**	**0.64**	**0.741**	**0.837**	**0.279**	**0.602**	**1.38**
Molybdenum	mg/L	--	0.00063	0.00044	0.0008	0.00158	0.00446	0.00114	0.00297	0.001	0.0021	0.00094
Nickel	mg/L	--	0.0105	0.0095	0.014	0.0283	0.0553	0.0191	0.0377	0.0128	0.0908	0.0096
Silver	mg/L	--	<0.00005	<0.00005	<0.0005	0.00006	0.00014	0.0001	0.00038	<0.00005	0.00007	<0.00005
Strontium	mg/L	--	2.44	2.44	2.58	2.51	2.41	2.2	2.14	1.93	2.33	1.74
Titanium	mg/L	--	0.00685	0.00459	0.0077	0.0189	0.064	0.0169	0.128	0.0144	0.0334	0.0205
Vanadium	mg/L	--	0.00573	0.00642	0.0082	0.00743	0.0143	0.0116	0.0232	0.00882	0.0101	0.00495
Zinc	mg/L	5.0 (AO)	0.013	0.008	<0.02	0.039	0.108	0.039	0.141	0.011	0.027	0.007
General Chemistry												
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	1860	2010	1900	2000	2080	2070	2150	2270	1820	1820
Ammonia-N	mg/L	--	183	156	156	193	192	179	169	212	142	140
Biochemical oxygen demand (BOD)	mg/L	--	27	29	16	53	67	134	261	52	18	13
Chemical oxygen demand (COD)	mg/L	--	202	156	226	206	228	242	1320	206	158	103
Chloride	mg/L	250 (AO)	**330**	**320**	**290**	**310**	**320**	**300**	**320**	**360**	160	130
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	-	-	-	-	**82**	-	-	**56**	-
Hardness	mg/L	80-100 (OG)	1100	1100	1420	1270	1300	1270	1280	1080	1330	1120
Nitrate (as N)	mg/L	10	<0.06	<0.06	3.59	<0.06	<0.06	6.47	**12.1**	0.07	0.08	<0.06
Nitrite (as N)	mg/L	1	<0.03	<0.03	<0.03	<0.03	<0.3	<0.3	<0.3	<0.3	<0.03	<0.03
Total kjeldahl nitrogen (TKN)	mg/L	--	189	170	162	191	193	164	174	164	144	144
Field Parameters												
Conductivity, field	uS/cm	--	4930	3970	-	4910	4830	3890	NM	NM	3800	3720
pH, field	s.u.	6.5-8.5 (OG)	7.16	7.06	NM	6.31	6.26	6.72	NM	NM	6.16	6.89
Temperature, field	Deg C	15 (AO)	10.37	8.45	-	6.18	10.3	8.7	NM	NM	12.76	11.06

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.2A

General Chemistry And Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98
Sample ID:			LW-WARD1-19-001	LW-WARD 1-19-002	LW3-98	LW-WARD 1-001	LW-WARD 1-002	LW-WARD 1-001	LW-WARD1-122022-002	LW3-98	LW3-98
Sample Date:			12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023
Parameters	**Units**	*ODWS* [1]									
Metals											
Aluminum	mg/L	0.10 (OG)	0.267	1.03	0.2	0.377	0.376	0.31	0.389	2.65	0.5
Barium	mg/L	1	0.258	0.538	0.144	0.167	0.279	0.208	0.273	**1.14**	0.376
Beryllium	mg/L	--	0.000029	0.00014	0.000025	0.000046	0.000043	0.000038	0.000051	0.000237	0.000054
Boron	mg/L	5	0.844	1.29	1.23	1.04	1.09	1.08	1.3	1.03	1.25
Cadmium	mg/L	0.005	0.000452	0.00094	0.000284	0.00045	0.000338	0.000322	0.000311	0.00212	0.000312
Calcium	mg/L	--	-	355	315	305	315	326	287	344	341
Chromium	mg/L	0.05	0.0071	0.0186	0.00624	0.0089	0.00891	0.00598	0.00906	**0.0677**	0.0142
Cobalt	mg/L	--	0.00601	0.00905	0.00908	0.00805	0.0105	0.00957	0.00987	0.0181	0.0185
Copper	mg/L	1.0 (AO)	0.0056	0.019	0.0081	0.0086	0.004	0.0052	0.0065	0.0944	0.0116
Iron	mg/L	0.30 (AO)	**43.7**	**128**	**23.8**	**29.2**	**44**	**35.9**	**42.2**	**242**	**51**
Lead	mg/L	0.01	0.00164	0.0045	0.00139	0.0023	0.00131	0.00142	0.00162	**0.0141**	0.00196
Magnesium	mg/L	--	92	118	106	95.8	120	110	106	103	143
Manganese	mg/L	0.05 (AO)	**1.35**	**1.72**	**1.25**	**1.35**	**1.38**	**1.39**	**1.27**	**2.25**	**1.29**
Molybdenum	mg/L	--	0.00081	0.0017	0.00103	0.00079	0.00087	0.00079	0.00108	0.00759	0.00234
Nickel	mg/L	--	0.0075	0.013	0.0077	0.0091	0.0086	0.0078	0.0096	0.0762	0.0216
Silver	mg/L	--	<0.00005	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/L	--	2.02	2.14	1.9	1.63	2.34	1.9	1.84	2.03	2.12
Titanium	mg/L	--	0.0273	0.081	0.0193	0.0322	0.033	0.0272	0.0344	0.19	0.0433
Vanadium	mg/L	--	0.00557	0.0144	0.00465	0.00558	0.00775	0.00577	0.00695	0.0259	0.0104
Zinc	mg/L	5.0 (AO)	0.005	<0.02	0.022	0.004	0.012	0.008	0.005	0.032	0.006
General Chemistry											
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	1680	1440	1810	1740	2150	1980	1940	1600	2350
Ammonia-N	mg/L	--	127	99.5	158	141	179	173	155	131	250
Biochemical oxygen demand (BOD)	mg/L	--	20	11	17	19	34	16	20	24	21
Chemical oxygen demand (COD)	mg/L	--	117	137	142	113	194	128	190	216	264
Chloride	mg/L	250 (AO)	120	87	170	150	210	240	200	140	**390**
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	-	-	-	**69.4**	-	-	**48**	**87**
Hardness	mg/L	80-100 (OG)	1120	1370	1220	1160	1280	1270	1150	1280	1440
Nitrate (as N)	mg/L	10	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	2.7	<0.06
Nitrite (as N)	mg/L	1	<0.03	<0.03	<0.03	<0.3	<0.3	<0.3	<0.3	**3.38**	<0.03
Total kjeldahl nitrogen (TKN)	mg/L	--	136	93.8	160	139	175	177	152	128	247
Field Parameters											
Conductivity, field	uS/cm	--	3610	-	3930	3520	3960	3640	3870	3250	5120
pH, field	s.u.	6.5-8.5 (OG)	6.8	NM	6.3	6.14	6.54	6.75	6.52	5.99	6.89
Temperature, field	Deg C	15 (AO)	8.71	-	7.59	10.4	9.8	14	8.98	12.53	11.37

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).

AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).

\- Parameter not analyzed / no information available

-- No guideline.

< Parameter detected below the laboratory method detection limit.

NM Not Measured.

36.0 Parameter exceeds the ODWS.

Table 5.2B

Volatile Organic Compounds
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98
Sample ID:			LW-WARD 1-19-001	LW2-92	LW-WARD 1-002	LW-WARD 1-001	LW-WARD 1-002	LW2-92	LW-WARD 1-19-002	LW3-98	LW-WARD 1-001	LW-WARD 1-002	LW-WARD 1-001	LW-WARD1-122022-002	LW3-98	LW3-98
Sample Date:			5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	5/17/2023	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023
Parameters	**Units**	***ODWS*** [1]														
Volatiles																
1,1,1,2-Tetrachloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,1,1-Trichloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,1,2,2-Tetrachloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,1,2-Trichloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,1-Dichloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.8**	<0.5	**0.6**	<20	<0.5	<0.5
1,1-Dichloroethene	ug/L	14	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,2-Dibromoethane (Ethylene dibromide)	ug/L	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<8	<0.2	<0.2
1,2-Dichlorobenzene	ug/L	200/3 (MAC/AO)	<0.5	<0.5	<0.5	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,2-Dichloroethane	ug/L	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,2-Dichloropropane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,3-Dichlorobenzene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
1,4-Dichlorobenzene	ug/L	5/1 (MAC/AO)	<0.5	<0.5	<0.5	**0.8**	<0.5	<0.5	**1.7**	**2.4**	**2.2**	**2.3**	**1**	<20	**1.6**	**2**
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	--	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<800	<20	<20
2-Hexanone	ug/L	--	<20	<20	<20	<20	<20	-	<20	<20	<20	<20	<20	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	--	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<800	<20	<20
Acetone	ug/L	--	**42**	<30	<30	<30	<30	<30	<30	<30	<30	<30	<30	<1200	**30**	<30
Benzene	ug/L	1	**2.9**	**2.4**	**2.8**	**2.6**	**2**	**1.8**	**0.6**	**1.1**	**1.5**	**0.6**	**0.8**	<20	**1.4**	**0.8**
Bromodichloromethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Bromoform	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Bromomethane (Methyl bromide)	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Carbon tetrachloride	ug/L	2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<8	<0.2	<0.2
Chlorobenzene	ug/L	80/30 (MAC/AO)	**1**	**0.9**	**1.2**	**1.2**	**0.9**	**1.1**	<0.5	**0.5**	**0.6**	<0.5	<0.5	<20	**0.6**	<0.5
Chloroethane	ug/L	--	<5	<5	<5	<5	<5	-	<5	<5	**5.7**	<5	<5	-	-	-
Chloroform (Trichloromethane)	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Chloromethane (Methyl chloride)	ug/L	--	<5	<5	<5	<5	<5	-	<5	<5	<5	<5	<5	-	-	-
cis-1,2-Dichloroethene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
cis-1,3-Dichloropropene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Dibromochloromethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Dichlorodifluoromethane (CFC-12)	ug/L	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<80	<2	<2
Ethylbenzene	ug/L	140/1.6 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Hexane	ug/L	--	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<40	<1	<1
m&p-Xylenes	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.7**	<0.5	<0.5	<0.5	<20	<0.5	**6.4**
Methyl tert butyl ether (MTBE)	ug/L	--	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<80	<2	<2
Methylene chloride	ug/L	50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
o-Xylene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	**1.7**
Styrene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Tetrachloroethene	ug/L	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Toluene	ug/L	60/24 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
trans-1,2-Dichloroethene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
trans-1,3-Dichloropropene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Trichloroethene	ug/L	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20	<0.5	<0.5
Trichlorofluoromethane (CFC-11)	ug/L	--	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<200	<5	<5
Vinyl chloride	ug/L	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<8	<0.2	<0.2
Xylenes (total)	ug/L	90/20 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2.1**	<0.5	<0.5	<0.5	<20	<0.5	**8.1**

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW2-78	OW2-78
Sample ID:			**GW-WARD1-19-021**	**GW-WARD1-19-022**	**GW-WARD1-19-022**	**OW1-78**	**GW-WARD 1-017**	**GW-WARD 1-022**	**GW-WARD 1-019**	**GW-WARD 1-020**	**OW1-78**	**OW1-78**	**GW-WARD1-19-009**	**GW-WARD1-19-005**
Sample Date:			**5/23/2019**	**12/8/2019**	**8/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**5/17/2023**	**11/9/2023**	**5/23/2019**	**12/8/2019**
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	-	-	194	158	207	162	165	164	162	166	-	-
Magnesium (dissolved)	mg/L	--	-	-	64.8	62.6	64.7	60.7	67.4	62.5	57.6	62.9	-	-
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	706	682	811	698	715	738	638	631	650	698	319	313
Chloride	mg/L	250 (AO)	80	78	62	67	56	68	230	200	230	190	27	29
Conductivity	uS/cm	--	-	-	-	-	1440	1550	1630	1600	1760	1690	-	-
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	-	-	-	**11**	**10**	**9**	**9**	**9**	**9**	-	-
Hardness	mg/L	80-100 (OG)	678	682	752	652	783	654	690	667	642	673	252	278
pH	s.u.	6.5-8.5 (OG)	-	-	-	-	7.93	7.92	7.8	7.41	8.07	7.75	-	-
Phenolics (total)	mg/L	--	-	-	-	-	<0.002	<0.002	0.033	<0.002	<0.002	<0.002	-	-
Field Parameters														
Conductivity, field	uS/cm	--	1880	1610	1450	1350	1580	1210	1410	2160	1840	1720	770	806
pH, field	s.u.	6.5-8.5 (OG)	7.1	7.49	6.6	6.28	6.37	6.7	6.07	6.73	7.17	6.78	7.24	7.47
Temperature, field	Deg C	15 (AO)	7.72	8.73	13.1	7.91	7.7	9.91	12.7	6	9.11	12.96	7.96	8.82

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-82	OW2-82	OW2-82	OW2-82
Sample ID:			GW-WARD1-19-004	OW2-78	GW-WARD 1-001	GW-WARD 1-005	GW-WARD 1-007	GW-WARD 1-001	OW2-78	OW2-78	GW-WARD1-19-005	GW-WARD1-19-011	GW-WARD1-19-007	OW2-82
Sample Date:			8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023	5/23/2019	12/8/2019	8/13/2020	12/27/2020
Parameters	**Units**	*ODWS* [1]												
Metals														
Calcium (dissolved)	mg/L	--	66.2	57.8	69.1	68.1	63.1	91.7	59	62.1	-	-	143	92.4
Magnesium (dissolved)	mg/L	--	25.7	24.9	26.6	24.8	26.5	35	24.5	26.1	-	-	33.8	20.3
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	323	304	304	332	295	313	299	297	250	351	469	316
Chloride	mg/L	250 (AO)	27	30	30	29	33	32	31	37	10	15	29	15
Conductivity	uS/cm	--	-	-	641	655	620	590	623	647	-	-	-	-
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	-	**8**	**8**	-	3	**6**	**7**	-	-	-	-
Hardness	mg/L	80-100 (OG)	271	247	282	272	266	373	248	262	252	345	496	315
pH	s.u.	6.5-8.5 (OG)	-	-	7.86	7.92	7.53	7.53	7.98	7.85	-	-	-	-
Phenolics (total)	mg/L	--	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	-	-	-
Field Parameters														
Conductivity, field	uS/cm	--	734	808	811	735	728	NM	646	693	427	830	757	776
pH, field	s.u.	6.5-8.5 (OG)	6.88	6.38	6.47	6.67	6.02	NM	7.27	6.99	8.13	7.88	6.87	6.69
Temperature, field	Deg C	15 (AO)	10.9	9.1	7.7	8.19	11.3	NM	9.27	11.9	11.79	6.21	14.8	4.94

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89
Sample ID:			GW-WARD 1-008	GW-WARD 1-015	GW-WARD 1-005	GW-WARD 1-004	OW2-82	OW2-82	GW-WARD1-19-001	GW-WARD1-19-008	GW-WARD1-19-006	OW2-89	GW-WARD 1-002	GW-WARD 1-004
Sample Date:			5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	69.2	118	92.9	147	65.7	116	-	-	101	95.3	80.1	96.7
Magnesium (dissolved)	mg/L	--	10.2	18.5	17.8	27.5	10.7	33.9	-	-	16	19.9	14.3	18.7
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	250	351	367	402	214	464	285	346	338	360	349	301
Chloride	mg/L	250 (AO)	11	30	22	31	11	36	11	83	18	30	19	30
Conductivity	uS/cm	--	499	682	715	767	414	962	-	-	-	-	713	600
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	**7**	**7**	-	**11**	**7**	**11**	-	-	-	-	**6**	**7**
Hardness	mg/L	80-100 (OG)	1210	370	305	480	208	429	252	403	318	320	259	318
pH	s.u.	6.5-8.5 (OG)	7.9	8.02	7.84	7.44	8.05	7.8	-	-	-	-	8.03	8.04
Phenolics (total)	mg/L	--	<0.002	<0.002	-	0.003	<0.002	<0.002	-	-	-	-	<0.002	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	612	653	526	897	523	1030	529	1050	772	750	695	554
pH, field	s.u.	6.5-8.5 (OG)	7.59	6.91	6.09	7.02	7.25	7.21	7.43	7.42	6.89	6.5	6.78	7.11
Temperature, field	Deg C	15 (AO)	8.5	8.19	14.3	4.57	10.1	11.64	7.38	8.4	13.4	7.09	7.2	10.1

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW2-89	OW2-89	OW2-89	OW2-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89
Sample ID:			**GW-WARD 1-006**	**GW-WARD 1-005**	**OW2-89**	**OW2-89**	**GW-WARD1-19-006**	**GW-WARD1-19-007**	**GW-WARD1-19-009**	**OW3-89**	**GW-WARD 1-003**	**GW-WARD 1-008**	**GW-WARD 1-008**	**OW3-89**
Sample Date:			**6/29/2022**	**12/20/2022**	**5/17/2023**	**11/9/2023**	**5/23/2019**	**12/8/2019**	**8/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**5/17/2023**
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	136	105	114	159	-	-	517	125	351	286	275	200
Magnesium (dissolved)	mg/L	--	25.2	18.5	21.6	28.7	-	-	51.8	18.3	45.3	41.9	37.8	21.8
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	403	365	382	535	658	317	358	347	430	554	491	637
Chloride	mg/L	250 (AO)	22	17	21	36	5	12	**1800**	61	**2000**	**2100**	**2100**	120
Conductivity	uS/cm	--	789	693	735	1100	-	-	-	-	6140	6650	6270	1400
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	**9**	**6**	**10**	-	-	-	-	4	5	-	**6**
Hardness	mg/L	80-100 (OG)	444	338	373	514	699	353	1500	389	1060	886	843	588
pH	s.u.	6.5-8.5 (OG)	7.7	7.39	7.89	7.71	-	-	-	-	7.65	7.86	7.43	7.26
Phenolics (total)	mg/L	--	-	0.006	<0.002	<0.002	-	-	-	-	0.004	<0.002	-	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	614	917	736	1100	1710	748	609	899	4310	5330	559	1410
pH, field	s.u.	6.5-8.5 (OG)	6.09	6.96	7.09	6.95	6.68	7.29	6.25	6.33	6.17	6.77	6.06	6.45
Temperature, field	Deg C	15 (AO)	13.6	5.89	8.43	11.66	8.68	6.67	13.1	5.4	7.7	10.3	12.4	9.55

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW3-89	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW11-92	OW11-92
Sample ID:			**OW3-89**	**GW-WARD1-19-007**	**GW-WARD1-19-013**	**GW-WARD1-19-014**	**OW10-92**	**GW-WARD 1-012**	**GW-WARD 1-006**	**GW-WARD 1-015**	**GW-WARD 1-019**	**OW10-92**	**GW-WARD1-19-014**	**OW11-92**
Sample Date:			**11/9/2023**	**5/23/2019**	**12/8/2019**	**8/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**5/17/2023**	**5/23/2019**	**12/27/2020**
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	94.1	-	-	75.6	63.7	67.7	75.4	79.5	71.9	57.8	-	202
Magnesium (dissolved)	mg/L	--	15.3	-	-	12.7	12.1	10.8	9.94	11.7	12	7.45	-	27
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	263	197	169	230	209	195	242	201	206	177	648	574
Chloride	mg/L	250 (AO)	48	3	9	24	17	7	6	9	17	4	59	60
Conductivity	uS/cm	--	658	-	-	-	-	381	449	415	417	341	-	-
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	4	-	-	-	-	3	3	2	3	2	-	-
Hardness	mg/L	80-100 (OG)	298	211	200	241	209	214	229	247	229	175	702	615
pH	s.u.	6.5-8.5 (OG)	7.74	-	-	-	-	8	8.21	8.05	7.75	8.16	-	-
Phenolics (total)	mg/L	--	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-
Field Parameters														
Conductivity, field	uS/cm	--	719	411	476	-	535	488	534	409	508	369	1790	-
pH, field	s.u.	6.5-8.5 (OG)	7.19	7.66	7.59	NM	6.64	6.71	7.18	7.94	7.12	7.64	6.79	NM
Temperature, field	Deg C	15 (AO)	11.14	10.24	8.63	-	7.94	8.9	11.2	**15.4**	7.15	11.82	9.78	-

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92
Sample ID:			**GW-WARD 1-010**	**GW-WARD 1-002**	**GW-WARD 1-014**	**GW-WARD 1-016**	**OW11-92**	**GW-WARD1-19-012**	**GW-WARD1-19-012**	**GW-WARD1-19-013**	**OW13-92**	**GW-WARD 1-013**	**GW-WARD 1-013**	**GW-WARD 1-012**
Sample Date:			**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**5/17/2023**	**5/23/2019**	**12/8/2019**	**8/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	258	222	227	200	222	-	-	256	183	224	158	220
Magnesium (dissolved)	mg/L	--	27.3	25.7	26.2	27	23.2	-	-	19.6	12.8	16.3	9.45	28.3
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	624	654	665	749	670	788	713	770	734	678	591	751
Chloride	mg/L	250 (AO)	54	52	69	51	40	34	35	41	36	130	66	27
Conductivity	uS/cm	--	1260	1240	1320	1410	1230	-	-	-	-	1470	1220	1370
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	**56**	**37**	**96**	**7**	**61**	-	-	-	-	**8**	**8**	**6**
Hardness	mg/L	80-100 (OG)	757	659	673	609	649	682	642	721	509	626	432	666
pH	s.u.	6.5-8.5 (OG)	7.65	7.58	7.47	7.05	7.15	-	-	-	-	7.36	7.84	7
Phenolics (total)	mg/L	--	0.021	0.036	0.014	-	0.018	-	-	-	-	<0.002	<0.002	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	1440	1430	1280	NM	1310	1790	930	1500	1410	1350	1130	1200
pH, field	s.u.	6.5-8.5 (OG)	6.37	6.25	6.48	NM	6.79	6.72	6.88	6.29	5.84	6.07	6.6	6.48
Temperature, field	Deg C	15 (AO)	9.4	9.13	**16.1**	NM	12.71	8.49	7.55	**15.1**	7.98	8.2	11.1	13.7

Notes:

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OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW13-92	OW13-92	OW13-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92
Sample ID:			GW-WARD 1-010	OW13-92	OW13-92	GW-WARD1-19-011	GW-WARD1-19-009	GW-WARD1-19-012	OW14-92	GW-WARD 1-011	GW-WARD 1-016	GW-WARD 1-013	GW-WARD 1-022	OW14-92
Sample Date:			12/20/2022	5/17/2023	11/9/2023	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	222	1250	118	-	-	271	223	245	218	246	225	250
Magnesium (dissolved)	mg/L	--	25.5	130	10.6	-	-	28	17.7	16.5	12.6	29	18	27.8
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	644	685	384	757	664	791	667	599	602	689	604	787
Chloride	mg/L	250 (AO)	39	56	43	16	21	24	23	20	20	32	44	18
Conductivity	uS/cm	--	1190	1390	845	-	-	-	-	1100	1050	1270	1110	1340
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	**7**	**8**	4	-	-	-	-	**6**	4	**6**	5	**10**
Hardness	mg/L	80-100 (OG)	660	3720	338	726	678	792	629	681	597	734	635	739
pH	s.u.	6.5-8.5 (OG)	7.08	7.29	7.54	-	-	-	-	7.25	7.6	6.95	6.89	7.01
Phenolics (total)	mg/L	--	<0.002	<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	1140	1320	1600	1750	1290	1350	980	1150	965	1210	1430	1340
pH, field	s.u.	6.5-8.5 (OG)	6.68	6.59	6.92	6.63	6.69	6.25	5.89	6.01	6.38	6.39	6.43	6.44
Temperature, field	Deg C	15 (AO)	8.6	9.29	10.99	9.09	9.38	**16.2**	8.51	9.1	11.3	13.7	9.32	10.18

Notes:

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OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW14-92	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13
Sample ID:			OW14-92	GW-WARD1-19-020	GW-WARD1-19-020	GW-WARD1-19-020	OW15R-13	GW-WARD 1-022	GW-WARD 1-020	GW-WARD 1-020	GW-WARD 1-021	GW-WARD 1-023	OW15R-13	OW15R-13
Sample Date:			11/9/2023	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	6/29/2022 Duplicate	12/20/2022	5/17/2023	11/9/2023
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	198	-	-	260	191	195	234	194	193	205	173	141
Magnesium (dissolved)	mg/L	--	11.3	-	-	23.6	15.3	15.9	19.1	20.1	20.3	26.7	18.3	14.1
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	543	740	1140	831	512	878	637	573	646	827	536	509
Chloride	mg/L	250 (AO)	47	18	8	11	10	24	14	13	13	9	10	13
Conductivity	uS/cm	--	1120	-	-	-	-	1560	1070	1050	1150	1100	995	962
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	**10**	-	-	-	-	**12**	**7**	**8**	**10**	**9**	**9**	**8**
Hardness	mg/L	80-100 (OG)	541	637	608	746	540	551	663	568	566	622	507	411
pH	s.u.	6.5-8.5 (OG)	7.41	-	-	-	-	7.38	7.75	7.45	7.4	6.99	7.2	7.63
Phenolics (total)	mg/L	--	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	1570	1570	1170	1236	1080	1740	1150	966	966	1230	-	1320
pH, field	s.u.	6.5-8.5 (OG)	6.71	6.76	6.97	6.28	5.96	5.93	7.38	6.7	6.7	6.57	-	8.81
Temperature, field	Deg C	15 (AO)	11.05	8.69	9.47	**16.5**	9.51	8.9	10.9	15	15	8.87	-	10.57

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).

MAC MAC - Maximum Acceptable Concentration (health related).

AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).

\- Parameter not analyzed / no information available

-- No guideline.

< Parameter detected below the laboratory method detection limit.

NM Not Measured.

36.0 Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-96	OW16A-96	OW16B-92	OW16B-92
Sample ID:			**GW-WARD1-19-013**	**GW-WARD1-19-015**	**OW16A-92**	**GW-WARD 1-001**	**GW-WARD 1-011**	**GW-WARD 1-015**	**OW16A-92**	**OW16A-92**	**GW-WARD1-19-011**	**GW-WARD 1-015**	**GW-WARD1-19-023**	**GW-WARD1-19-024**
Sample Date:			**5/23/2019**	**12/8/2019**	**12/27/2020**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**5/17/2023**	**11/9/2023**	**8/13/2020**	**5/11/2021**	**5/23/2019**	**5/23/2019 Duplicate**
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	-	-	20	21.7	21.5	22.2	195	18.7	21.1	23	-	-
Magnesium (dissolved)	mg/L	--	-	-	9.08	8.85	9.05	9.16	43.5	8.46	9.1	8.85	-	-
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	170	175	182	178	166	160	919	190	190	161	969	924
Chloride	mg/L	250 (AO)	30	31	31	32	36	36	40	30	32	31	52	52
Conductivity	uS/cm	--	-	-	-	424	419	349	1660	400	-	425	-	-
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	-	-	2	2	2	**14**	2	-	3	-	-
Hardness	mg/L	80-100 (OG)	83.4	86.4	87.4	90.6	90.9	93.2	667	81.5	90.3	93.8	1110	1160
pH	s.u.	6.5-8.5 (OG)	-	-	-	8.14	8.02	8.08	7.32	7.88	-	8	-	-
Phenolics (total)	mg/L	--	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	-	-
Field Parameters														
Conductivity, field	uS/cm	--	477	540	554	504	598	445	-	584	545	554	1820	1820
pH, field	s.u.	6.5-8.5 (OG)	7.42	7.77	6.82	7.7	6.34	8.06	-	9.48	7.39	7.47	6.94	6.94
Temperature, field	Deg C	15 (AO)	10.23	10.01	9.62	10.4	13.3	6.61	-	10.61	12.3	9.7	9.34	9.34

Notes:

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MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92
Sample ID:			GW-WARD1-19-023	GW-WARD1-19-024	GW-WARD1-19-021	GW-WARD1-19-023	OW16B-92	OW20-13	GW-WARD 1-018	GW-WARD 1-021	GW-WARD 1-017	GW-WARD 1-018	GW-WARD 1-018	GW-WARD 1-021
Sample Date:			12/8/2019	12/8/2019	8/13/2020	8/13/2020	12/27/2020	12/27/2020	5/11/2021	5/11/2021	11/15/2021	11/15/2021	6/29/2022	12/20/2022
				Duplicate		Duplicate		Duplicate		Duplicate				
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	-	-	216	220	179	182	249	224	249	255	174	198
Magnesium (dissolved)	mg/L	--	-	-	63.2	66.3	45.6	45.4	38.2	37.1	58.5	60.6	26.3	47.8
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	798	685	638	698	845	802	958	930	900	851	832	799
Chloride	mg/L	250 (AO)	37	40	22	23	26	48	40	40	27	27	42	53
Conductivity	uS/cm	--	-	-	-	-	-	-	1880	1800	1600	1530	1740	1470
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	-	-	-	-	-	15	15	9	9	5	13
Hardness	mg/L	80-100 (OG)	830	841	799	823	634	642	780	713	863	887	543	691
pH	s.u.	6.5-8.5 (OG)	-	-	-	-	-	-	7.66	7.54	7.79	7.85	7.41	7.14
Phenolics (total)	mg/L	--	-	-	-	-	-	-	0.002	<0.002	<0.002	<0.002	0.002	0.002
Field Parameters														
Conductivity, field	uS/cm	--	1290	1290	1080	1080	1020	1020	1270	1270	889	889	866	1360
pH, field	s.u.	6.5-8.5 (OG)	7	7	6.57	6.57	6.2	6.2	6.47	6.47	6.64	6.64	5.79	6.68
Temperature, field	Deg C	15 (AO)	8.57	8.57	16.5	16.5	7.09	7.09	8.9	8.9	11.2	11.2	14.3	8.67

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW16B-92	OW16B-92	OW16B-92	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96
Sample ID:			OW16B-92	OW16B-92	Field Dup	GW-WARD1-19-003	GW-WARD1-19-003	GW-WARD1-19-006	GW-WARD1-19-002	OW17A-96	GW-WARD 1-005	GW-WARD 1-009	GW-WARD 1-009	GW-WARD 1-009
Sample Date:			5/17/2023	11/9/2023	11/9/2023	5/23/2019	12/8/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022
Parameters	**Units**	***ODWS*** [1]			Duplicate									
Metals														
Calcium (dissolved)	mg/L	--	17.8	176	161	-	-	-	31.9	30.1	37.2	32.2	35.6	38.5
Magnesium (dissolved)	mg/L	--	8.29	35.1	33.8	-	-	-	18.7	19.1	18.5	16.8	19.2	19.2
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	161	849	779	180	189	190	183	179	168	185	158	176
Chloride	mg/L	250 (AO)	32	51	53	3	8	4	2	4	3	4	4	4
Conductivity	uS/cm	--	415	1750	1610	-	-	-	-	-	519	523	524	502
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	2	**9**	**11**	-	-	-	-	-	2	1	-	1
Hardness	mg/L	80-100 (OG)	78.7	584	542	154	170	162	157	154	169	150	168	175
pH	s.u.	6.5-8.5 (OG)	8.26	7.67	7.61	-	-	-	-	-	8.23	8.18	8.2	8.12
Phenolics (total)	mg/L	--	<0.002	<0.002	<0.002	-	-	-	-	-	<0.002	<0.002	-	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	-	2250	2250	1050	-	665	644	722	7.44	902	978	1500
pH, field	s.u.	6.5-8.5 (OG)	-	6.5	6.5	7.64	-	8.16	7.85	7.26	7.36	7.36	6.86	7.68
Temperature, field	Deg C	15 (AO)	-	11.53	11.53	8.52	-	9.73	11.9	8.8	9.2	10.7	14.2	7.54

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW17A-96	OW17A-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96
Sample ID:			OW17A-96	OW17A-96	GW-WARD1-19-004	GW-WARD1-19-010	GW-WARD1-19-005	OW17B-96	GW-WARD 1-016	GW-WARD 1-012	GW-WARD 1-010	GW-WARD 1-011	OW17B-96	DUP1
Sample Date:			5/17/2023	11/9/2023	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	5/17/2023 Duplicate
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	32.5	36.8	-	-	44	43.7	50.6	48.9	45.4	47.3	42.1	43
Magnesium (dissolved)	mg/L	--	17.7	17.7	-	-	23.1	22.9	23.1	23.3	24.6	23	21.4	23
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	171	171	257	277	234	240	232	256	240	237	228	233
Chloride	mg/L	250 (AO)	3	4	6	6	6	7	6	7	9	9	7	7
Conductivity	uS/cm	--	537	542	-	-	-	-	507	517	524	496	493	348
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	2	**6**	-	-	-	-	2	<1	-	1	3	3
Hardness	mg/L	80-100 (OG)	154	165	203	210	205	203	221	218	215	213	193	202
pH	s.u.	6.5-8.5 (OG)	8.19	8.01	-	-	-	-	7.96	8.31	8.03	8.06	8.15	8.29
Phenolics (total)	mg/L	--	<0.002	<0.002	-	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	609	723	1000	633	628	617	663	615	682	516	542	542
pH, field	s.u.	6.5-8.5 (OG)	6.39	7.07	7.53	7.89	7.86	7.08	7.26	7.54	6.67	7.63	6.69	6.69
Temperature, field	Deg C	15 (AO)	10.75	10.13	8.18	8.63	12.3	8.59	8.3	11.1	12.6	8.16	9.99	9.99

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW17B-96	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13
Sample ID:			**OW17B-96**	**GW-WARD1-19-016**	**GW-WARD1-19-003**	**GW-WARD1-19-001**	**OW18AR-13**	**OW18BR-13**	**GW-WARD 1-006**	**GW-WARD 1-010**	**GW-WARD 1-003**	**GW-WARD 1-003**	**GW-WARD 1-008**	**OW18AR-13**
Sample Date:			**11/9/2023**	**5/23/2019**	**12/8/2019**	**8/13/2020**	**12/27/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**12/20/2022 Duplicate**	**5/17/2023**
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	42.1	-	-	31.3	28.5	35.5	37.7	35.5	35	37.1	35.7	29.7
Magnesium (dissolved)	mg/L	--	20.9	-	-	20.5	20.2	16.3	21.2	20.6	21.7	20.5	20.7	19.5
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	241	194	-	197	183	96	185	197	179	230	247	174
Chloride	mg/L	250 (AO)	8	10	-	6	8	4	10	9	9	7	8	8
Conductivity	uS/cm	--	526	-	-	-	-	-	589	582	563	546	538	567
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	4	-	-	-	-	-	1	1	-	1	1	2
Hardness	mg/L	80-100 (OG)	191	161	-	162	154	156	181	173	177	177	174	154
pH	s.u.	6.5-8.5 (OG)	8.05	-	-	-	-	-	8.28	8.22	8.25	8.18	8.28	8.2
Phenolics (total)	mg/L	--	<0.002	-	-	-	-	-	<0.002	<0.002	-	0.002	<0.002	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	718	562	673	635	650	762	688	593	566	711	711	596
pH, field	s.u.	6.5-8.5 (OG)	7.05	7.93	7.88	7.98	7.68	7.65	7.65	7.64	6.81	7.93	7.93	7.36
Temperature, field	Deg C	15 (AO)	10.28	9.5	9.85	12.6	9.98	9.75	8.9	10.7	12.9	7.68	7.68	12.57

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW18AR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW19A-96	OW19A-96
Sample ID:			**OW18AR-13**	**GW-WARD1-19-018**	**GW-WARD1-19-004**	**GW-WARD1-19-008**	**GW-WARD 1-007**	**GW-WARD 1-011**	**GW-WARD 1-004**	**GW-WARD 1-002**	**OW18BR-13**	**OW18BR-13**	**GW-WARD1-19-017**	**GW-WARD1-19-001**
Sample Date:			**11/9/2023**	**5/23/2019**	**12/8/2019**	**8/13/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**5/17/2023**	**11/9/2023**	**5/23/2019**	**12/8/2019**
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	37.7	-	-	39.8	45.5	41.9	40.4	42	35.5	30.5	-	-
Magnesium (dissolved)	mg/L	--	14.4	-	-	17	16.6	16.3	17.2	16	15.5	18.8	-	-
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	96	92	97	103	93	102	96	99	103	185	140	140
Chloride	mg/L	250 (AO)	4	4	3	2	3	4	7	5	4	8	4	4
Conductivity	uS/cm	--	697	-	-	-	679	683	673	642	678	605	-	-
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	2	-	-	-	<1	1	-	1	2	1	-	-
Hardness	mg/L	80-100 (OG)	154	165	171	170	182	172	172	171	153	154	166	179
pH	s.u.	6.5-8.5 (OG)	7.72	-	-	-	7.97	7.99	8.01	8.04	8.05	7.98	-	-
Phenolics (total)	mg/L	--	<0.002	-	-	-	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	-
Field Parameters														
Conductivity, field	uS/cm	--	921	672	797	730	777	663	618	664	287	823	609	700
pH, field	s.u.	6.5-8.5 (OG)	7	7.95	7.85	7.87	7.6	7.65	6.75	8.02	7.42	7.02	8.03	7.66
Temperature, field	Deg C	15 (AO)	9.86	10.16	9.72	12.2	9.7	10.2	13.1	9.53	12.88	9.89	11.01	8.6

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96
Sample ID:			GW-WARD1-19-003	OW19A-96	GW-WARD 1-004	GW-WARD 1-003	GW-WARD 1-001	GW-WARD 1-007	OW19A-96	OW19A-96	GW-WARD1-19-019	GW-WARD1-19-002	GW-WARD1-19-010	OW19B-96
Sample Date:			8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023	5/23/2019	12/8/2019	8/13/2020	12/27/2020
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	37.3	33.9	40.9	38.5	37.9	39.7	33.4	33.6	-	-	40.1	41.5
Magnesium (dissolved)	mg/L	--	20.8	19.3	19.5	19.3	20.4	19.1	17.5	17.4	-	-	30.3	28.2
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	159	166	137	154	137	152	147	144	256	249	258	242
Chloride	mg/L	250 (AO)	2	5	3	4	5	4	4	5	31	30	31	31
Conductivity	uS/cm	--	-	-	623	636	619	607	645	641	-	-	-	-
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	-	-	1	1	-	1	2	2	-	-	-	-
Hardness	mg/L	80-100 (OG)	179	164	182	175	179	178	155	156	217	222	225	220
pH	s.u.	6.5-8.5 (OG)	-	-	7.89	8.05	8.25	8.18	8.2	7.83	-	-	-	-
Phenolics (total)	mg/L	--	-	-	<0.002	<0.002	-	0.003	<0.002	<0.002	-	-	-	-
Field Parameters														
Conductivity, field	uS/cm	--	676	744	781	718	570	620	-	867	635	760	728	764
pH, field	s.u.	6.5-8.5 (OG)	7.4	7.61	6.64	6.8	7.04	7.86	-	6.92	7.94	7.68	7.45	8.08
Temperature, field	Deg C	15 (AO)	12.8	10.51	10.2	10.01	14.2	9.15	-	9.94	9.12	9.52	12.2	10.43

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13
Sample ID:			GW-WARD 1-014	GW-WARD 1-007	GW-WARD 1-002	GW-WARD 1-006	OW19B-96	OW19B-96	GW-WARD1-19-008	GW-WARD1-19-016	14R	GW-WARD 1-009	GW-WARD 1-014	GW-WARD 1-016
Sample Date:			5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023	5/23/2019	12/8/2019	12/27/2020	5/11/2021	11/15/2021	6/29/2022
Parameters	**Units**	***ODWS*** [1]												
Metals														
Calcium (dissolved)	mg/L	--	46	41.3	41.8	44.8	35.8	37.9	-	-	176	195	122	101
Magnesium (dissolved)	mg/L	--	28.1	27	29.9	29.4	26.5	24.5	-	-	34.6	34.2	19.5	19.8
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	242	265	246	249	235	243	323	388	286	296	358	284
Chloride	mg/L	250 (AO)	30	30	35	35	31	34	**350**	**370**	**620**	**390**	**260**	240
Conductivity	uS/cm	--	664	673	680	658	633	688	-	-	-	1840	1380	1130
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	2	1	-	1	4	1	-	-	-	2	2	2
Hardness	mg/L	80-100 (OG)	230	214	228	233	198	195	321	425	583	628	384	333
pH	s.u.	6.5-8.5 (OG)	7.96	8.27	8.13	8.22	8.16	8.18	-	-	-	8.01	7.99	7.93
Phenolics (total)	mg/L	--	<0.002	<0.002	-	<0.002	<0.002	<0.002	-	-	-	<0.002	0.005	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	789	701	630	659	-	1000	1840	266	2360	1930	1280	1040
pH, field	s.u.	6.5-8.5 (OG)	6.82	7.14	6.74	7.78	-	6.82	7.53	7.34	6.78	6.71	7.16	7.32
Temperature, field	Deg C	15 (AO)	9.6	10.85	12.9	9.23	-	10.14	9.15	6.57	5.7	8.16	10.1	**15.3**

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			OW20-13	OW20-13	OW20-13	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sample ID:			GW-WARD 1-018	OW20-13	OW20-13	GW-WARD1-19-022	GW-WARD1-19-021	GW-WARD1-19-024	B-1	GW-WARD 1-019	GW-WARD 1-019	GW-WARD 1-022	GW-WARD 1-017	FB1
Sample Date:			12/20/2022	5/17/2023	11/9/2023	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023
Parameters	**Units**	***ODWS*** [1]				Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Metals														
Calcium (dissolved)	mg/L	--	125	126	136	-	-	0.08	0.03	0.09	0.18	0.06	<0.01	0.13
Magnesium (dissolved)	mg/L	--	17.7	17.2	19.9	-	-	0.019	0.003	0.009	0.01	0.004	<0.001	0.044
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	376	295	325	6	<2	<2	2	5	2	<2	<2	<2
Chloride	mg/L	250 (AO)	**370**	**350**	**420**	<1	<1	<1	<1	<1	<1	<1	<1	<1
Conductivity	uS/cm	--	1520	1590	1910	-	-	-	-	13	3	3	3	5
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3	3	2	-	-	-	-	<1	<1	<1	<1	<1
Hardness	mg/L	80-100 (OG)	385	385	422	0.18	0.49	0.28	0.08	0.27	0.48	0.15	<0.05	0.5
pH	s.u.	6.5-8.5 (OG)	7.83	7.88	7.88	-	-	-	-	6.02	7.31	5.92	6.32	6.4
Phenolics (total)	mg/L	--	<0.002	<0.002	<0.002	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002
Field Parameters														
Conductivity, field	uS/cm	--	1810	1560	1900	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5 (OG)	6.46	7.4	7.45	-	-	-	-	-	-	-	-	-
Temperature, field	Deg C	15 (AO)	4.7	9.28	11.5	-	-	-	-	-	-	-	-	-

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).

MAC MAC - Maximum Acceptable Concentration (health related).

AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).

\- Parameter not analyzed / no information available

-- No guideline.

< Parameter detected below the laboratory method detection limit.

NM Not Measured.

36.0 Parameter exceeds the ODWS.

Table 5.3

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			**Field Blank**
Sample ID:			**Field Blank**
Sample Date:			**11/9/2023**
Parameters	**Units**	***ODWS*** [1]	**Field Blank**
Metals			
Calcium (dissolved)	mg/L	--	<0.01
Magnesium (dissolved)	mg/L	--	<0.001
General Chemistry			
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	2
Chloride	mg/L	250 (AO)	<1
Conductivity	uS/cm	--	2
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	<1
Hardness	mg/L	80-100 (OG)	<0.05
pH	s.u.	6.5-8.5 (OG)	6.28
Phenolics (total)	mg/L	--	<0.002
Field Parameters			
Conductivity, field	uS/cm	--	-
pH, field	s.u.	6.5-8.5 (OG)	-
Temperature, field	Deg C	15 (AO)	-

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
OG	Operation Guideline (water treatment and distribution).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.4

General Chemistry And Total Metals
Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2
Sample ID:			SW-WARD1-19-002	SW-WARD 1-19-002	POND NO 1	SW-WARD 1-001	SW-WARD 1-001	SW-WARD 1-001	Pond No. 1	SW-WARD1-19-001	SW-WARD 1-19-003	SW-WARD 1-19-002	POND NO 2	SW-WARD 1-002	SW-WARD 1-002	SW-WARD 1-002	SW-WARD1-122022-001	Pond No. 2	Pond No. 2
Sample Date:			5/23/2019	12/8/2019	12/27/2020	5/11/2021	11/15/2021	6/29/2022	5/17/2023	5/23/2019	12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/4/2023
Parameters	**Units**	**PWQO[1]**																	
Metals																			
Aluminum	mg/L	0.075 (a)	0.01	-	0.94	0.163	0.092	0.06	1.04	-	0.214	0.044	0.122	0.045	0.339	0.383	0.174	0.289	0.164
Barium	mg/L	-	0.0915	-	0.0304	0.0651	0.0212	0.0211	0.878	-	0.0161	0.0261	0.0834	0.126	0.0167	0.196	0.0332	0.0114	0.018
Beryllium	mg/L	0.011	<0.000007	-	0.00004	0.000008	0.00001	0.000009	0.000051	-	0.000008	<0.000007	0.00001	<0.000007	0.000009	0.000014	0.000013	0.000022	0.000009
Boron	mg/L	0.2	0.172	-	0.055	0.093	0.034	0.043	0.981	-	0.033	0.055	0.047	0.036	0.027	0.468	0.044	0.038	0.021
Cadmium	mg/L	0.0002	0.000025	-	0.000028	0.000168	0.000064	0.00003	0.000085	-	0.000023	<0.000003	0.0005	0.00001	0.000017	0.000012	0.000019	0.000004	0.000006
Calcium	mg/L	-	-	-	95.5	140	121	33.9	211	-	-	22.7	174	26.1	62.4	78.3	95.8	21.2	59.4
Chromium	mg/L	0.0089 (b)	0.00038	-	0.0018	0.0007	0.00035	0.00027	0.00522	-	0.00047	0.00036	0.00107	0.00022	0.00076	0.00126	0.00031	0.00586	0.00042
Cobalt	mg/L	0.0009	0.0019	-	0.000408	0.000978	0.00162	0.000278	0.006699	-	0.000162	0.00015	0.00175	0.000328	0.000205	0.00191	0.000244	0.000378	0.000165
Copper	mg/L	0.005 (c)	0.0005	-	0.0027	0.0037	0.0015	0.0004	0.0036	-	0.0019	0.0007	0.0008	0.001	0.0011	0.0008	0.001	0.0012	0.0009
Iron	mg/L	0.3	0.813	-	0.797	0.18	1.92	1.55	65	-	0.215	0.204	11	0.31	0.335	4.89	0.292	0.957	0.387
Lead	mg/L	0.025 (d)	0.00005	-	0.00096	0.0003	0.00031	0.00015	0.0015	-	0.00021	0.00005	0.00024	0.00028	0.00023	0.00028	0.00023	0.00049	<0.00009
Magnesium	mg/L	-	26.8	-	27.1	27.6	17.9	28.3	88	-	20.5	26.5	21.2	19.9	17.6	25.1	27.9	19.1	15.6
Manganese	mg/L	-	0.26	-	0.0386	0.0095	0.56	0.0485	0.392	-	0.01213	0.0179	1.07	0.0388	0.03227	0.116	0.0724	0.0961	0.0214
Molybdenum	mg/L	0.04	0.0003	-	0.00035	0.00037	0.00018	0.00006	0.00038	-	0.00056	0.00037	0.00017	0.00013	0.00036	0.00061	0.00036	0.00023	0.0003
Nickel	mg/L	0.025	0.0025	-	0.0015	0.002	0.0011	0.0005	0.0075	-	0.0011	0.0006	0.0016	0.0005	0.0009	0.0042	0.0011	0.0009	0.0006
Silver	mg/L	0.0001	<0.00005	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/L	-	0.521	-	0.588	0.483	0.302	0.254	1.5	-	0.458	0.276	0.476	0.271	0.294	0.413	0.55	0.199	0.3
Titanium	mg/L	-	0.00067	-	0.0273	0.00431	0.00255	0.00196	0.0372	-	0.00739	0.00087	0.00454	0.00126	0.00788	0.0109	0.00449	0.00718	0.00422
Vanadium	mg/L	0.006	0.00022	-	0.00167	0.00046	0.00097	0.00051	0.00509	-	0.00063	0.00025	0.00039	0.00032	0.00096	0.00086	0.00057	0.00104	0.00041
Zinc	mg/L	0.03	0.005	-	0.013	0.011	0.009	0.004	0.015	-	0.004	0.004	0.005	0.006	0.007	0.004	0.007	0.005	0.003
General Chemistry																			
Alkalinity, total (as CaCO3)	mg/L	--	509	486	282	447	366	190	1350	165	261	138	422	132	216	38	346	116	171
Ammonia-N	mg/L	-	-	-	<0.1	2.9	0.5	<0.1	88	<0.1	-	-	0.4	<0.1	<0.1	24.4	<0.1	<0.1	<0.1
Biochemical oxygen demand (BOD)	mg/L	-	-	-	6	14	<4	5	14	<4	-	-	4	5	<4	5	<4	<2	4
Chemical oxygen demand (COD)	mg/L	-	-	-	15	40	12	51	106	10	-	-	14	40	22	75	14	23	27
Chloride	mg/L	-	27	8	11	43	12	28	78	5	11	14	6	7	9	59	23	2	26
Dissolved organic carbon (DOC)	mg/L	-	-	-	-	-	3.6	-	35	-	-	-	-	-	6.5	-	-	8	7
Hardness	mg/L	-	422	-	350	462	377	201	890	171	274	166	521	147	228	299	354	132	213
Nitrate (as N)	mg/L	-	-	-	<0.06	0.34	0.36	<0.06	0.18	<0.06	-	-	0.09	0.15	0.12	0.36	<0.06	<0.06	0.29
Nitrite (as N)	mg/L	-	-	-	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	-	-	<0.03	<0.03	<0.03	0.09	<0.03	<0.03	<0.03
Nitrite/Nitrate	mg/L	-	-	-	<0.06	0.38	0.36	<0.06	<0.06	-	-	-	0.09	0.15	0.12	0.45	<0.06	<0.06	0.29
Phenolics (total)	mg/L	0.001	0.011	<0.005	<0.001	<0.001	<0.001	0.006	0.007	-	<0.003	0.005	<0.001	<0.001	<0.001	0.012	<0.001	<0.001	<0.001
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.7	3.8	<0.5	1.5	86.2	2.8	-	-	0.5	0.5	<0.5	27.3	<0.5	1.5	0.8
Total suspended solids (TSS)	mg/L	-	-	-	-	-	9	-	186	-	-	-	-	-	20	-	-	28	16
Un-ionized ammonia	mg/L	0.02 (g)	-	-	<0.00019	0.00971	0.00078	<0.00087	0.09295	<0.00182	-	-	0.00024	<0.00198	<0.00047	0.04711	<0.0002	<0.0003	<0.01704
Field Parameters																			
Conductivity, field	uS/cm	-	1400	1240	708	1080	729	508	-	338	691	-	1000	360	478	1080	727	375	643
Dissolved oxygen (DO), field	mg/L	<4 (f)	-	3.29	3.26	6.29	8.01	5.9	-	-	3.83	-	3.26	9.74	8.18	3.05	-	6.42	6.5
pH, field	s.u.	6.5-8.5	7.59	7.54	7.13	7.19	6.88	7.29	-	7.79	7.82	NM	6.56	7.93	7.41	6.72	7.3	6.9	9.02
Temperature, field	Deg C	--	12.94	8.23	4.02	9.4	8.71	18.9	-	13.54	2.09	-	5.86	10.5	7.4	16.3	0	16.55	7.68

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
-- No guideline.
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

Table 5.5A

General Chemistry And Total Metals
Groundwater Collection System Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:						GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS
Sample ID:			*Modelled Groundwater Concentrations [2] (Short-term)*	*Modelled Groundwater Concentrations [2] (Long-term)*	*Sewer Use By-Law Criteria [3]*	GCS-WARD1-19-001	GCS-WARD1-19-001	GCS-WARD1-19-001	GCS-PUMP STATION NO. 1 (PS1)	GCS-WARD 1-001	GCS-WARD 1-001	GCS-WARD 1-001	GCS-PUMP STN NO. 1 PS1	GCS-Pump Stn No.1 (PS1)	GCS-Pump Station No.1 PS1
Sample Date:		*ODWS [1]*				5/23/2019	12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023
Parameters	**Units**														
Metals															
Aluminum	mg/L	0.10 (OG)	55.53	56.15	50	0.038	0.007	0.011	0.024	0.027	0.015	0.056	0.036	0.012	0.876
Barium	mg/L	1	0.87	0.57	--	0.0992	0.133	0.0996	0.124	0.105	0.131	0.0966	0.12	0.0801	0.179
Beryllium	mg/L	--	0.01	0.01	--	<0.000007	<0.000007	<0.000007	0.00001	<0.000007	0.00001	0.00001	0.000016	<0.000007	0.000011
Boron	mg/L	5	--	--	--	0.235	0.508	0.24	0.285	0.263	0.198	0.197	0.304	0.181	0.519
Cadmium	mg/L	0.005	0.01	0.01	1	0.000078	0.000328	0.00008	0.00216	0.000051	0.000018	0.000026	0.000067	0.000011	0.00002
Calcium	mg/L	--	746	637	--	-	-	259	241	273	267	233	-	210	204
Chromium	mg/L	0.05	0.12	0.12	5	0.00086	0.00068	0.00112	0.00082	0.00083	0.00079	0.00095	0.00118	0.00081	0.00285
Cobalt	mg/L	--	0.05	0.05	5	0.00135	0.00145	0.0013	0.00122	0.00125	0.000872	0.000769	0.000843	0.000711	0.00369
Copper	mg/L	1.0 (AO)	0.16	0.16	2	0.0004	0.0012	0.0005	0.0017	0.0004	0.0003	0.0004	0.0007	0.0003	0.0024
Iron	mg/L	0.30 (AO)	117.1	106.1	50	**6.6**	**1.07**	**5.47**	**2.62**	**3.53**	**10.5**	**4.61**	**20.6**	**7.13**	**8.41**
Lead	mg/L	0.01	0.4	0.39	5	0.00017	0.00015	0.00084	0.00097	0.00282	0.00017	0.00146	0.00071	<0.00009	0.00061
Magnesium	mg/L	--	310	202	--	36.1	51.1	40.5	42.5	40.4	38.3	37.4	35.4	31.4	74
Manganese	mg/L	0.05 (AO)	2.96	2.7	5	**0.958**	**0.818**	**0.894**	**0.779**	**1.01**	**0.759**	**0.957**	**0.914**	**0.949**	**0.638**
Molybdenum	mg/L	--	0.01	0.01	5	0.00007	0.00017	0.00018	0.00015	0.0001	0.00006	0.00042	0.00014	0.00016	0.0004
Nickel	mg/L	--	0.11	0.11	2	0.0014	0.002	0.0015	0.0023	0.0014	0.0011	0.0013	0.001	0.0009	0.0074
Silver	mg/L	--	0.01	0.01	5	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/L	--	212	133	--	0.931	1.11	1.1	0.995	1.09	0.942	0.925	0.852	0.821	1.79
Titanium	mg/L	--	0.98	0.99	5	0.00151	0.0003	0.00054	0.00095	0.00105	0.00095	0.00225	0.00214	0.0003	0.00507
Vanadium	mg/L	--	0.13	0.12	5	0.00099	0.00044	0.001	0.00077	0.00077	0.00095	0.00068	0.00141	0.00087	0.00294
Zinc	mg/L	5.0 (AO)	1.06	1.06	2	0.007	0.011	0.006	0.013	0.005	0.006	0.007	0.024	0.005	0.075
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	1722	540	--	811	878	804	563	818	712	735	767	717	1020
Ammonia-N	mg/L	--	51.9	31.6	--	25.4	27.2	27.3	21.7	21.7	13.9	14.1	12.2	14.3	54.9
Biochemical oxygen demand (BOD)	mg/L	--	98	115	300	<4	5	<2	7	<4	4	<4	<12	32	13
Chemical oxygen demand (COD)	mg/L	--	1208	1341	--	40	19	43	38	37	31	20	30	31	97
Chloride	mg/L	250 (AO)	256	163	500	31	55	40	140	200	180	97	53	38	170
Hardness	mg/L	80-100 (OG)	1242	428	--	682	844	813	776	849	824	736	717	653	813
Nitrate (as N)	mg/L	10	--	--	--	0.19	0.17	0.51	0.22	0.29	<0.06	0.07	0.08	0.09	<0.06
Nitrite (as N)	mg/L	1	0.1	0.1	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04
Phosphorus	mg/L	--	3.3	3.7	10	0.04	0.03	-	0.1	0.01	0.012	<0.03	<0.03	<0.03	0.66
Total kjeldahl nitrogen (TKN)	mg/L	--	79.49	40.42	--	24.9	29.6	-	22	23.8	13.3	15.8	12.6	14	54.6
Total suspended solids (TSS)	mg/L	--	--	--	300	25	100	16	13	15	32	13	49	19	30
Field Parameters															
Conductivity, field	uS/cm	--	--	--	--	1770	2099	-	1760	2100	1590	1290	1500	-	2320
pH, field	s.u.	6.5-8.5 (OG)	6.9	7	6.0-10.5	7.55	7.22	NM	6.61	6.89	6.77	5.92	6.75	-	7.13
Temperature, field	Deg C	15 (AO)	--	--	--	8.9	8.04	-	7.48	8.4	10.8	12.8	7.54	-	13.6

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

(2) Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).

(3) Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.

OG Operation Guideline (water treatment and distribution).
MAC MAC - Maximum Acceptable Concentration (health related).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
36.0 Parameter exceeds the ODWS.

Table 5.5B

Volatile Organic Compounds
Groundwater Collection System Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:					GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS
Sample ID:			*Modelled Groundwater Concentrations (2) (Short-term)*	*Modelled Groundwater Concentrations (2, (Long-term)*	GCS-WARD1-19-001	GCS-PUMP STATION NO. 1 (PS1)	GCS-WARD 1-001	GCS-WARD 1-001	GCS-WARD 1-001	GCS-PUMP STN NO. 1 PS1	GCS-Pump Stn No.1 (PS1)	GCS-Pump Station No.1 PS1
Sample Date:		*ODWS (1)*			5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023
Parameters	**Units**											
Volatiles												
1,1,1,2-Tetrachloroethane	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	ug/L	--	16.2	14.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	ug/L	14	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (Ethylene dibromide)	ug/L	--	--	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	ug/L	200/3 (MAC/AO)	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	ug/L	5	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/L	5/1 (MAC/AO)	1.5	1	**0.5**	**0.6**	**0.6**	<0.5	**0.7**	**0.6**	**0.6**	<0.5
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	--	--	--	<20	<20	<20	<20	<20	<20	<20	<20
2-Hexanone	ug/L	--	--	--	<20	<20	<20	<20	<20	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	--	--	--	<20	<20	<20	<20	<20	<20	<20	<20
Acetone	ug/L	--	--	--	<30	<30	<30	<30	<30	<30	<30	<30
Benzene	ug/L	1	1.9	1	<0.5	<0.5	<0.5	<0.5	<0.5	**0.6**	<0.5	<0.5
Bromodichloromethane	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane (Methyl bromide)	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon tetrachloride	ug/L	2	--	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	ug/L	80/30 (MAC/AO)	3.6	3.2	**1.1**	**0.8**	**1.2**	**0.6**	**1.2**	**2.1**	**1.6**	<0.5
Chloroethane	ug/L	--	8	1.4	<5	<5	<5	<5	<5	-	-	-
Chloroform (Trichloromethane)	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane (Methyl chloride)	ug/L	--	0.7	0.7	<5	<5	<5	<5	<5	-	-	-
cis-1,2-Dichloroethene	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane (CFC-12)	ug/L	--	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	ug/L	140/1.6 (MAC/AO)	7.5	7.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexane	ug/L	--	--	--	<1	<1	<1	<1	<1	<1	<1	<1
m&p-Xylenes	ug/L	--	11.8	11.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl tert butyl ether (MTBE)	ug/L	--	--	--	<2	<2	<2	<2	<2	<2	<2	<2
Methylene chloride	ug/L	50	0.7	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	ug/L	--	3.6	3.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	ug/L	10	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	ug/L	60/24 (MAC/AO)	54.1	54.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	ug/L	--	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	ug/L	5	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane (CFC-11)	ug/L	--	--	--	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl chloride	ug/L	1	--	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Xylenes (total)	ug/L	90/20 (MAC/AO)	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Notes:

(1)	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
(2)	Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).
OG	Operation Guideline (water treatment and distribution).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
--	No guideline.
<	Parameter detected below the laboratory method detection limit.
NM	Not Measured.
36.0	Parameter exceeds the ODWS.

Table 5.6A

General Chemistry And Total Metals
Leachate Collection System Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:					LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS
Sample ID:					LCS-WARD1-19-001	LCS-WARD1-19-001	LCS-WARD1-19-001	LCS-PUMP STATION NO 2 (PS2)	LCS-WARD 1-001	LCS-WARD 1-001	LCS-WARD1-001	LCS-PUMPSTATION NO.2 (PS2)	LCS-Pump Stn No.2 (PS2)	LCS-Pump Stn No.2 (PS2)
Sample Date:		*ODWS*[1]	*Modelled Leachate Concentrations* [2]	*Sewer Use By-Law Criteria*[3]	5/22/2019	12/8/2019	5/13/2020	12/27/2020	5/12/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023
Parameters	**Units**													
Metals														
Aluminum	mg/L	0.10 (OG)	107	50	0.111	0.22	0.366	4.96	0.081	0.102	0.156	0.245	0.073	0.02
Barium	mg/L	1	1.14	--	0.107	0.156	0.118	0.121	0.113	0.106	0.217	0.491	0.151	0.144
Beryllium	mg/L	--	0.01	--	0.000007	0.000013	<0.000007	0.000017	<0.000007	0.000011	0.000009	0.000015	0.000008	0.000009
Boron	mg/L	5	--	--	0.315	0.403	0.353	0.459	0.403	0.247	0.915	1.71	0.469	0.301
Cadmium	mg/L	0.005	0.01	1	0.00158	0.0005	0.000944	0.000628	0.000031	0.000069	0.000042	0.000037	<0.000003	0.000013
Calcium	mg/L	--	1249	--	-	-	228	221	210	178	134	277	190	262
Chromium	mg/L	0.05	0.228	5	0.00173	0.0029	0.00221	0.00356	0.00156	0.00212	0.00526	0.0102	0.00287	0.00166
Cobalt	mg/L	--	0.089	5	0.00224	0.00267	0.0025	0.00263	0.00246	0.0019	0.00501	0.00898	0.00274	0.00108
Copper	mg/L	1.0 (AO)	0.30	2	0.0017	0.0017	0.0069	0.0153	0.0013	0.001	0.001	0.0027	0.0007	0.0006
Iron	mg/L	0.30 (AO)	213	50	7.67	5.71	4.82	5.67	5.05	11	4.14	18.8	10.2	28.4
Lead	mg/L	0.01	1	5	0.00089	0.00575	0.00189	0.00392	0.00023	0.00342	0.00047	0.00176	0.00024	0.00016
Magnesium	mg/L	--	432	--	63.2	71.6	68.6	80.8	71.3	58.3	87.5	123	61	46
Manganese	mg/L	0.05 (AO)	7.32	5	1.02	0.975	0.777	0.869	0.775	0.951	0.183	0.365	0.521	0.937
Molybdenum	mg/L	--	0.01	5	0.00033	0.00079	0.00041	0.00051	0.00033	0.00034	0.00159	0.00078	0.00035	0.00019
Nickel	mg/L	--	0.20	2	0.0055	0.0049	0.0056	0.006	0.0053	0.0028	0.0119	0.0149	0.0053	0.0014
Phosphorus	mg/L	--	6.0	10	0.259	0.255	0.319	0.267	0.13	0.379	0.462	-	-	-
Silver	mg/L	--	0.02	5	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/L	--	2.88	--	1.41	1.79	1.7	1.6	1.49	1.25	1.58	3.18	1.49	0.968
Titanium	mg/L	--	2.05	5	0.00428	0.00824	0.00627	0.00912	0.00239	0.00403	0.0117	0.0184	0.00352	0.00079
Vanadium	mg/L	--	0.239	5	0.00137	0.00191	0.00162	0.00215	0.00114	0.00187	0.00671	0.0142	0.00278	0.00155
Zinc	mg/L	5.0 (AO)	1.91	2	0.023	0.082	0.05	0.118	0.016	0.017	1.03	0.555	0.114	0.011
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	2620	--	908	990	916	762	878	817	1120	2040	987	796
Ammonia-N	mg/L	--	220	--	30.9	36.8	32.8	33.9	28.1	21.5	96.6	169	57.5	15.1
Biochemical oxygen demand (BOD)	mg/L	--	3000	300	<4	30	19	18	8	<4	14	43	32	7
Chemical oxygen demand (COD)	mg/L	--	4500	--	53	60	68	63	54	48	153	244	75	47
Chloride	mg/L	250 (AO)	1000	500	83	89	99	87	84	42	290	410	120	82
Hardness	mg/L	80-100 (OG)	1393	--	735	854	851	885	-	685	695	1200	737	844
Nitrate (as N)	mg/L	10	20	--	0.17	0.45	1.62	1.23	0.94	0.23	0.14	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.072	--	<0.03	0.04	0.11	0.05	0.08	<0.03	0.37	<0.3	<0.03	<0.03
Phosphorus	mg/L	--	6.0	10	0.03	-	0.24	0.2	-	-	0.15	2.87	0.67	<0.03
Total kjeldahl nitrogen (TKN)	mg/L	--	201	--	31.9	40.4	31.7	34.2	29.6	21	95.9	154	53.9	15.4
Total suspended solids (TSS)	mg/L	--	--	300	34	54	77	40	21	69	17	93	23	73
Field Parameters														
Conductivity, field	uS/cm	--	--	--	2260	2240	-	1710	2120	2320	331	4810	2130000	1760000
pH, field	s.u.	6.5-8.5 (OG)	7.1	6.0-10.5	7.09	7.61	NM	6.82	6.87	7	6.96	6.8	6.42	6.88
Temperature, field	Deg C	15 (AO)	--	--	11.58	10.47	-	8.27	8.8	11.9	16.2	7.26	11.1	12.8

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.
(2) Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).
(3) Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.
OG Operation Guideline (water treatment and distribution).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
-- No guideline.
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
36.0 Parameter exceeds the ODWS.

Table 5.6B

Volatile Organic Compounds
Leachate Collection System Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS
Sample ID:			LCS-WARD1-19-001	LCS-PUMP STATION NO 2 (PS2)	LCS-WARD 1-001	LCS-WARD 1-001	LCS-WARD1-001	LCS-PUMPSTATION NO.2 (PS2)	LCS-Pump Stn No.2 (PS2)	LCS-Pump Stn No.2 (PS2)
Sample Date:			5/13/2020	12/27/2020	5/12/2021	11/15/2021	6/29/2022	12/20/2022	5/17/2023	11/9/2023
Parameters	**Units**	***ODWS*** [1]								
Volatiles										
1,1,1,2-Tetrachloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	ug/L	14	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (Ethylene dibromide)	ug/L	--	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	ug/L	200/3 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	ug/L	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	ug/L	5/1 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	**0.7**	**0.8**	**0.9**
2-Butanone (Methyl ethyl ketone) (MEK)	ug/L	--	<20	<20	<20	<20	<20	<20	<20	<20
2-Hexanone	ug/L	--	<20	<20	<20	<20	<20	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/L	--	<20	<20	<20	<20	<20	<20	<20	<20
Acetone	ug/L	--	<30	<30	<30	<30	<30	<30	<30	<30
Benzene	ug/L	1	<0.5	<0.5	<0.5	<0.5	<0.5	**1.4**	**1.6**	**1.1**
Bromodichloromethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane (Methyl bromide)	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon tetrachloride	ug/L	2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	ug/L	80/30 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	**1.1**	**1.4**	**2.5**
Chloroethane	ug/L	--	<5	<5	<5	<5	<5	-	-	-
Chloroform (Trichloromethane)	ug/L	--	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane (Methyl chloride)	ug/L	--	<5	<5	<5	<5	<5	-	-	-
cis-1,2-Dichloroethene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane (CFC-12)	ug/L	--	<2	<2	<2	<2	<2	<2	<2	<2
Ethylbenzene	ug/L	140/1.6 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2.3**	<0.5
Hexane	ug/L	--	<1	<1	<1	<1	<1	<1	<1	<1
m&p-Xylenes	ug/L	--	<0.5	<0.5	<0.5	<0.5	**0.6**	**2**	**6.6**	<0.5
Methyl tert butyl ether (MTBE)	ug/L	--	<2	<2	<2	<2	<2	<2	<2	<2
Methylene chloride	ug/L	50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	**0.8**	**2.2**	<0.5
Styrene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	ug/L	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	ug/L	60/24 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	<0.5	**3.6**	**2**	<0.5
trans-1,2-Dichloroethene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	ug/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	ug/L	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane (CFC-11)	ug/L	--	<5	<5	<5	<5	<5	<5	<5	<5
Vinyl chloride	ug/L	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Xylenes (total)	ug/L	90/20 (MAC/AO)	<0.5	<0.5	<0.5	<0.5	**0.8**	**2.8**	**8.8**	<0.5

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable. All guidelines are Maximum Acceptable Concentration (health related) unless otherwise stated.

OG Operation Guideline (water treatment and distribution).

AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).

\- Parameter not analyzed / no information available

-- No guideline.

< Parameter detected below the laboratory method detection limit.

NM Not Measured.

36.0 Parameter exceeds the ODWS.

Table 5.7

General Chemistry And Total Metals
Sewage Stabilization Lagoon Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91
Sample ID:			**SSL-WARD1-19-001**	**SSL-WARD1-19-001**	**SSL-WARD1-19-001**	**SG1R-91**	**SSL-WARD 1-001**	**SSL-WARD 1-001**	**SSL-WARD 1-001**	**SSL-WARD1-122022-001**	**SSL Ward 1 -001**	**SG1R-91**
Sample Date:			**5/23/2019**	**12/8/2019**	**5/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**5/17/2023**	**11/9/2023**
Parameters	**Units**	**PWQO[1]**										
Metals												
Calcium	mg/L	-	-	-	66.9	62.2	48.7	62.5	70.3	73.5	79.3	57.9
Lead	mg/L	0.025 (d)	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	18	15.2	15.2	16.6	18.5	16.9	19.1	14.9
General Chemistry												
Alkalinity, total (as CaCO3)	mg/L	--	249	195	218	206	173	211	211	211	245	206
Ammonia-N	mg/L	-	16.3	18.6	18.8	19.2	14.8	14	21.3	17.7	21.5	19.6
Biochemical oxygen demand (BOD)	mg/L	-	10	-	11	15	38	14	33	18	5	28
Chemical oxygen demand (COD)	mg/L	-	47	41	52	37	55	48	98	56	33	54
Chloride	mg/L	-	91	90	110	89	110	69	170	130	130	91
Hardness	mg/L	-	254	217	241	218	184	225	252	253	277	206
Nitrate (as N)	mg/L	-	0.33	0.48	0.25	0.32	0.44	0.55	<0.06	0.5	<0.06	0.24
Nitrite (as N)	mg/L	-	0.1	0.1	0.06	0.06	0.14	0.06	<0.03	0.04	<0.03	0.17
Total kjeldahl nitrogen (TKN)	mg/L	-	17.2	21.1	20.2	22.6	16.9	15	35.2	19.5	21.5	22.6
Un-ionized ammonia	mg/L	0.02 (g)	**0.11198**	**0.08296**	-	0.0121	0.00808	0.01374	**0.11095**	**0.06371**	**0.37217**	**1.01846**
Field Parameters												
Conductivity, field	uS/cm	-	1260	1070	-	9000	970	877	1080	1010	952	835
Dissolved oxygen (DO), field	mg/L	<4 (f)	-	5.47	-	**2.39**	7.41	6.03	**1.03**	-	**1.91**	11.18
pH, field	s.u.	6.5-8.5	7.33	7.54	NM	6.61	**6.32**	6.67	7.03	7.51	7.59	8.43
Temperature, field	Deg C	--	14.56	2.96	-	5.18	11.8	8.99	20.1	1.2	19.03	8.48

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

36.0 Parameter exceeds the PWQO.

Appendices

Appendix A

Environmental Compliance Approvals and Amendments

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

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine Ontario
N2Z 1Z9

for the use and operation of a 4.94 hectare landfilling site within a total site area of 9.11 hectares *all in accordance with the following plans and specifications* as specified in Schedule "A" attached.

Location: Part of lots A and B
Concession "A", Plan 61
Town of Kincardine, County of Bruce

which includes the use of the site only for the disposal *of the following categories of waste (Note: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval)* domestic, commercial and non-hazardous solid industrial wastes *and "other" wastes limited to demolition materials, and sewage sludge from the Town of Kincardine Water Pollution Control Plant.*

The site has also been approved for the transfer and processing (sorting and recycling) of separated fractions of domestic, commercial, and solid non-hazardous industrial waste and subject to the following conditions:

DEFINITION OF TERMS:

For the purpose of this Provisional Certificate of Approval:

1.1 "This Certificate" means Provisional Certificate of Approval No. A-270203 dated September 29, 1994.

1.2 "Director" means any one or more of the persons who from time to time are so designated for the purpose of Section 30 of the Environmental Protection Act;

1.3 "District Manager" means the District Manager of the Owen Sound District Office of the Ontario Ministry of Environment and Energy or such other official of the Ministry as may be assigned the duties of the District Manager of the Owen Sound District;

1.4 "EPA" means The Environmental Protection Act, chapter E.19, R.S.O. 1990;

1.5 "Incident" means an abnormal event or occurrence which may endanger health, cause a nuisance or adversely affect the environment;

1.6 "Ministry" or "MOEE" means the Ontario Ministry of Environment and Energy;

1.7 "Owner" means the Corporation of the Town of Kincardine;

1.8 "Regional Director" means the Regional Director of the Southwestern Region, Ontario Ministry of Environment and Energy or such other official of the Ministry as may be assigned the duties of the Regional Director, Southwestern Region;

1.9 "Design and Operations Report" means the October 1993 Design and Operations Report - Interim Expansion; prepared by Conestoga - Rovers & Associates (item 3 in schedule "A"); and

1.10 "Site" means the landfill site located at part of Lots A and B, Concession "A", Plan 61, Town of Kincardine, County of Bruce.

2. This Provisional Certificate of Approval replaces all Provisional Certificates of Approval and Notices of Amendment identified by No. A-270203 issued under Part V of the EPA.

3. The Owner shall comply with the Conditions and schedules in this Certificate as modified or supplemented by the Director in accordance with the Director's mandate under the EPA. The requirements specified in this Certificate are minimum requirements and do not abrogate the need to take all reasonable steps to avoid violating the provisions of other applicable legislation. If the Director, Regional Director or District Manager identifies an unacceptable environmental problem associated with the Site, the Owner, once aware of the problem, shall immediately take all necessary steps to mitigate or remedy the resulting impacts. Nothing in this condition affects any right of appeal the Owner may otherwise have under the EPA.

4. The requirements of this Certificate are severable. If any requirement of this Certificate to any circumstances is held invalid, the application of that requirement to other circumstances and the remainder of this Provisional Certificate of Approval shall not be affected.

5. The Site shall be operated and maintained in accordance with the Environmental Assessment Board's decision of March 10, 1994, the conditions of this Certificate and the plans and specifications contained in the documents listed in Schedule "A". Should there be any discrepancy between any of the documents listed above, the order of precedence for resolving differences shall be as follows:

   The Environmental Assessment Board Decision EP-93-05 dated March 10, 1994.

   The conditions on the Certificate of Approval;

   The remaining documents in order of their most recent date.

6. The owner shall provide training to all on-site personnel relating to all legal requirements for the operation of the Site.

7. Only wastes generated within the boundaries of the Town of Kincardine shall be accepted for disposal at the Site.

8. The operation of the landfill site shall terminate after the earlier of:

   8.1 (a) five (5) years after the date of this certificate issued in accordance with the Environmental Assessment Board's decision EP-93-05.

   (b) the date on which fill has reached the limits of the approved contours as indicated on the September 1993 "Design and Operation Drawing No. 3, - Final Contour Plan - Interim Expansion";

   (c) the commencement of operation of an alternative waste disposal site in accordance with the Bruce County Waste Management Master Plan.

   8.2 Notwithstanding the above, the period of operation of the landfill may be extended for a further term of up to two years in the event that, at the conclusion of the five year term provided for in condition 8.1 (a), the Director of the Approvals Branch of the Ministry of the Environment and Energy (MOEE) is satisfied that all of the following conditions have been met:

   (a) The environmental assessment for the waste disposal component of the Bruce County Waste Management Master Plan, providing for an undertaking which includes an alternative waste disposal facility or facilities for the Town of Kincardine, has been submitted to the MOEE by December 31, 1995.

(b) At the end of the five year term referred to above an alternative waste disposal facility (or facilities) arising out of the Bruce County Waste Management Master Plan is not available to receive the Town's waste.

(c) Sufficient additional capacity remains in the Valentine Avenue landfill site at the end of the five year term, referred to above, to provide up to two further years of disposal of the Town's waste.

(d) The annual reports filed by the Town with respect to the operation of the landfill, as required by condition 22 of this certificate has established that:

(i) the landfill is operating properly from an environmental protection perspective;

(ii) the conditions of approval in this certificate have been complied with;

(iii) the landfill has been operating in compliance with applicable legislation, regulations and MOEE policies;

(iv) the Bruce County Waste Management Master Plan process is developing in a manner which is satisfactory to MOEE.

9. The Owner shall place a sign at the main entrance to the Site on which is displayed in prominent letters the following information:

- the name of the Site
- the operating authority
- the approved hours of operation
- the hours the Site is open to accept waste from the public
- the telephone number for reporting emergency situations occurring at the Site during non-operating hours

10. The approved hours of operation for the Site are:

Monday through Friday: 8:00 a.m. - 4:30 p.m.

Saturday: 8:00 a.m. - 12 noon.

The above hours of operation may be amended with the written approval of District Manager.

On-site equipment may operate one hour beyond the Site's closing time to complete daily maintenance operations at the Site.

11. During non-operating hours the Site is to be secured against access by unauthorized persons.

12. The following specific conditions must be complied with subject to any variations agreed to or issued by the Director, in writing:

12.1 No waste shall be received from the public for disposal at the Site except during operating hours when the Site is under the supervision of the site attendant or his alternate.

12.2 Weather permitting, each day's deposited waste shall be covered in a manner acceptable to the District Manager so that no waste is exposed to the atmosphere. If an alternative material to soil is to be used as daily cover it must qualify as a non-hazardous waste under R.R.O. 1990 Reg. 347. A minimum of 30 cm. of cover shall be applied to areas where no further landfilling will occur for a period of 30 days or more.

12.3 The burning of wastes at the Site is prohibited.

12.4 Scavenging is prohibited.

13. The Owner shall maintain and use weigh scales to weigh and record all incoming waste at the Site prior to disposal.

14. All construction equipment associated with the development, operation or closure of the Site shall comply with the MOEE Model Municipal Noise By-Law Publication NPC-115. A landfill equipment program shall be implemented with particular attention being given to maintaining and where feasible improving the noise muffling systems on landfill construction equipment. Landfill construction equipment shall be inspected at least annually. Other equipment which may be used at the Site from time to time shall also comply with the MOEE noise abatement standard.

15. On-site roads shall be treated with water or a dust suppressant as required to minimize dust generation.

16. An inspection of the Site and adjacent lands shall be carried out as required to ensure that litter is being adequately controlled on site. Litter from the Site shall be picked up as needed along the Site's perimeter and access road and from adjacent properties.

17. Should an outbreak of vermin or vector occur at the Site, the Owner shall take all steps within the Ministry guidelines to control the outbreak, including the services of a licensed exterminator. Control measures used shall be appropriate for the vermin or vector in question.

18. The Owner shall undertake the monitoring programs contained in the documents listed in Schedule "B" subject to any amendments which the Director may authorize in writing from time to time.

19. Any groundwater monitoring wells that are damaged or whose integrity is in doubt shall be repaired or replaced forthwith.

20. All monitoring wells which form part of any monitoring program shall be properly capped and locked.

21. Wells no longer required for monitoring purposes shall be abandoned in accordance with R.R.O. 1990, Reg. 903.

22. An annual report on the development and operation of the Site, including the monitoring programs, shall be submitted to the Regional Director by April 30th of the year following the calendar year covered by the report. The report shall include, but not be limited to, the following:

- progressive use of the landfill Site
- weight of wastes received and volume deposited on-site
- placement and integrity of final cover
- conformance with development and operation plans
- remaining site capacity
- operational problems encountered and/or complaints received and the remedial action taken
- monitoring program results, data interpretation and recommendations
- a summary of the findings from the annual inspection of the landfill construction equipment.
- the occurrence of any unexpected incident negatively impacting on the Site, describing the nature of the incident, how it was managed and what action has been taken to avoid a recurrence.
- waste deposition locations for the next 12 month period.
- waste diversion programs, results in previous year and future initiatives.
- a summary of what action the Town is aware of that has been taken by the Town or others that would improve, maintain or diminish the condition of the Kincardine Swamp.

23. By 12 months before the Site's expected closure the owner shall submit to the Regional Director for approval a site closure plan. The site closure plan shall include but shall not be limited to, the following matters:

- fencing security and access control;
- final contours, cover and vegetation;
- post closure after use;
- long-term maintenance and monitoring of the Site;
- updated contingency plans to mitigate unacceptable environmental impacts.

24. This Certificate of Approval shall be registered on the title to the lands comprising the Site. No operation shall be carried out at the Site after 60 days of this condition becoming enforceable unless the certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the Site and unless a duplicate registered copy thereof has been returned by the applicant to the Director, Approvals Branch, Ministry of the Environment and Energy.

25. Should the leaf and yard waste composting facility to be established at the Site require a Certificate of Approval under O. Reg. 101/94 s. 34, EPA, an "Application For A Certificate Of Approval For A Waste Disposal Site (Processing)", along with documents supporting the application, shall be submitted to the Director within 60 days of the date of issuance of this Certificate.

26. The Owner shall undertake the monitoring programs and reporting as required by the approvals issued under Ontario Water Resources Act (OWR Act) for the following works pertaining to the Valentine Avenue Landfill Site:

- Storm Water Management Facility
- Leachate Collection System, including Leachate Pumping Station and Forcemain.
- Leachate co-treatment at the Kincardine Waste Water Treatment Plant as included in the Certificate of Approval for the Kincardine W.W.T.P.
- Groundwater Interceptor Drain, including Groundwater Pumping Station and Forcemain.

27. During the period this Certificate is in force, the Owner shall continue to apply reasonable efforts to implement additional waste reduction programs to further reduce the quantity of waste destined for disposal at the Site. It shall also, as a participant in the Bruce County Waste Management Master Plan, actively encourage the other participants to proceed as quickly as possible to bring the Master Plan process to a timely conclusion.

28. The Owner shall maintain the Valentine Avenue Landfill Public Advisory Committee (PAC) to review and provide recommendations on annual operational and monitoring reports, landfill site protocols, proposed end use of the Site and any other information which is pertinent to landfilling operations at the Site. These recommendations, along with any minority positions, may be forwarded to the Owner or the Director for their consideration. The PAC shall not exercise any supervisory, regulatory or approval roles with respect to the operation of the Site. The Owner shall maintain a list of current documents which govern the operation of the Site. The PAC shall be entitled upon request to copies of records and documents in the Owner's possession relevant to the Site, except for such information as the Council of the Owner is entitled to withhold from the public at law.

29. Should the results of the leachate quality monitoring program indicate that the established trigger values for VOCs are exceeded and that the leachate concentrations could detrimentally impact the effluent quality of the Town of Kincardine Waste Water Treatment Plant, the Owner shall immediately undertake to implement the Leachate Disposal Contingency Plan described in Section 7.6.5 of the Design and Operation Report (item 3 of Schedule "A").

30. The Owner shall install one additional bore hole into the St. Joseph till in accordance with the proposal set out in CRA's letter to MOEE (Ferraro to Bye) of February 15, 1994 (item 9 of Schedule "A").

31. The Owner shall utilize methodologies for the placement and compaction of waste that maximize the density of waste hereafter disposed at the Site.

32. The Owner shall actively pursue means for a backyard composting program for multi residential and industrial, commercial and institutional sectors.

33. The Owner shall actively pursue means for the collection and recycling of fine paper, telephone books and box board.

34. The Owner shall actively pursue means for the collection and disposal of household hazardous waste.

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

1. Condition 1 is to clarify the meaning of terms used in this Provisional Certificate of Approval to avoid future misunderstandings.

2. Conditions 2 and 5 are to indicate to the Owner that this Provisional Certificate of Approval replaces all previous Provisional Certificates of Approval and Notices of Amendment issue for the Site. The conditions of this Certificate and the documents listed in schedule "A" shall be used to determine the Site's compliance with the requirements of The Environmental Protection Act. Condition 5 is to avoid future misunderstandings by stating the precedence to be given to documents should there be discrepancies between them.

3. Condition 3 is to clearly indicate to the Owner that compliance with the conditions of this Certificate does not relieve him of his obligation to take all reasonable steps to avoid violating the provisions of other applicable legislation relative to the Site.

4. Condition 4 is to make it clear to the Owner that should one of the conditions of this Certificate in any circumstance be found to be invalid it will not invalidate the application of that condition to other circumstances or affect the validity of the other conditions on the Certificate.

5. Condition 6 is to ensure that personnel involved in the management and operation of the Site receive instructions about the conditions on this Certificate and the documents in schedule "A", as well as other pertinent information necessary to operate the Site in a legal and environmentally safe manner.

6. Condition 7 is to clearly indicate to the Owner that the Site is approved only for the disposal of waste from the Town of Kincardine.

7. Condition 8 is to clearly indicate to the Owner that the term of this Certificate is of limited duration and states the circumstances under which the Certificate expires.

8. Conditions 9 and 10 provides information about the Site to the public so that they may monitor the Site for compliance with the hours of operation and report any violations or unauthorized activities to the Owner or the Ministry.

9. Conditions 11,12,14,15,16,17,18,19,20,21,and 29, are to ensure the site is operated in to responsible manner in order to minimize any adverse impacts on the natural environment or the public.

10. Condition 13 is to provide a record of the waste delivered to the Site for the annual report and also to monitor the success of any additional waste reduction measures undertaken by the Owner to reduce the quantity of waste disposed at the Site.

11. Conditions 22 and 26 are to provide the Ministry with reports on the operation of the Site and ancillary works upon which the Ministry may make an assessment of the Site's performance and, if necessary, recommendations for improvements in its operation.

12. Condition 23 is to provide the Ministry with sufficient time prior to the Site's closure to evaluate the Site Closure Plan in order to ensure it will be carried out in an environmentally safe manner and that the post closure monitoring and site maintenance programs are acceptable.

13. Condition 24 is to ensure that future owners of the land on which the site is located are made aware of the fact that the land has been used as a landfill and that no use may be made of the land within twenty five years from the year in which the land ceased to be so used unless the approval of the Minister for the proposed use has been obtained.

14. Condition 25 is to make the owner aware of Ontario Regulation 101/94 which states the conditions under which an "Application for a Certificate of Approval for a Waste Disposal Site (Processing)" is required to establish and operate a leaf and yard waste composting facility.

15. Conditions 27,32, 33,and 34 are to ensure that the Town of Kincardine continues to exert reasonable efforts to reduce waste and to have a site available to accept its waste when this Certificate expires.

16. Condition 28 states the limits of the Public Advisory Committee's authority with respect to the operation and control of the Site.

17. Condition 30 is to confirm by field investigation the accuracy of the data obtained from well records and other sources which was used to determine the properties of the St. Joseph till in the vicinity of the Site.

18. Condition 31 is to ensure the efficient use of the landfill's capacity by ensuring that the waste is placed and compacted in an acceptable manner.

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

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

In addition to these legal requirements, the Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

DATED AT TORONTO this 29th *day of* September, 1994.

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY

W. Ng, P. ENG.

MAILED ON Sept 30/94

BY _____

SCHEDULE "A"

This Schedule "A" forms part of Provisional Certificate of Approval No. A 270203 dated September 29, 1994.

1. Application for a Certificate of Approval for a Waste Disposal Site (Landfill) dated August 19, 1992.

2. "Hydrogeologic Investigation Report, Valentine Avenue Landfill Site, Kincardine Ontario", (CRA, June 1993).

3. "Design and Operation Report, Interim Expansion, Valentine Avenue Landfill Site, Town of Kincardine" (CRA, October 1993).

4. Drawings number 1 to 12 inclusive titled: "Design and Operations Plans - Interim Expansion Valentine Avenue Landfill Site, Town of Kincardine, (CRA, September 1993).

5. Request for an Exemption to the Environmental Assessment Act, Valentine Avenue Landfill Site Interim Expansion, Town of Kincardine (CRA, August, 1992).

6. Final Draft Report, Proposed Solid Waste Stream Diversion Programs (CRA, May, 1992).

7. Environmental Impact Study, Interim Expansion, Valentine Avenue Landfill Site, Kincardine, Ontario (Ecoplans, July, 1992).

8. "Leachate Treatability Assessment Report" (CRA, November 1993)

9. Letter of February 15, 1994 from CRA to MOEE (Ferraro to Bye) regarding "Proposed St. Joseph Till Borehole Location - Valentine Avenue Landfill Site - Kincardine, Ontario."

10. Environmental Assessment Board's March 10, 1994 decision, EP-93-05, "Town of Kincardine - Valentine Avenue Landfill - Reasons For Decision And Decision".

SCHEDULE "B"

This Schedule "B" forms part of the Provisional Certificate of Approval No. A 270203 dated September 29, 1994.

1. Groundwater monitoring locations will include:

OW1-78	OW2A-91	OW12-92
OW1-82	OW7-91	OW13-92
OW2-82	OW8-91	OW14-92
OW1-89	OW9-91	OW15-92
OW2-89	OW10-92	OW16A-92
OW3-89	OW11-92	OW16B-92

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

2. Leachate monitoring locations will include:

LW1-92 LW2-92

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

3. Surface water monitoring locations will include:

SG1-91

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

4. In addition to the above monitoring locations outlined under Clauses 1, 2 and 3, the following monitoring locations will be incorporated into the monitoring program:

* the groundwater interceptor drain (existing site) pump station manhole No.1 following commissioning of the groundwater interceptor drain;

* the leachate collection system (expansion area) pump station manhole No.2 following initiation of landfilling activities within the approved expansion area;

* storm water management pond No.1 (existing site) following construction of the pond;

* storm water management pond No.2 (expansion area) following construction of the pond; and

* additional groundwater monitoring well nests within the expansion area as the monitoring well nests are installed.

as set out in Table 10.1 and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" of this Certificate.

5. Once two complete water quality monitoring events (consisting of the monitoring outlined in Clauses 1, 2, 3, 4, 6, 7 and 9 herein as revised from time to time) have been undertaken subsequent to the commissioning of the groundwater interceptor drain (existing site) the water quality monitoring network, as outlined under Clause 1, 2, 3 and 4 may be reduced by the elimination of the following monitoring locations from the overall water quality monitoring program upon the Owner receiving written approval of the MOEE District Manager.

Groundwater Monitoring Locations

OW1-82	OW7-91	OW15-92
OW1-89	OW8-91	OW16A-92
OW3-89	OW9-91	
OW2A-91	OW13-92	

as set out in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

Leachate Monitoring Locations

LW1-92

as set out in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

6. Groundwater, surface water and leachate levels will be recorded at the monitoring locations outlined under Clauses 1, 2, 3 and 4, and in addition all other existing groundwater monitoring wells, surface water staff gauges and leachate wells located at the site.

7. Water quality analyses for the following general chemistry parameters will be conducted at all monitoring locations outlined under Clause 1, 2, 3 and 4:

chloride	phenols	field pH
alkalinity	dissolved organic carbon (DOC)	field conductivity
hardness		field temperature

In addition, analyses for metals, volatile organic compounds, biological oxygen demand (BOD), chemical oxygen demand (COD), nitrate, nitrite ammonia and total Kjeldhal nitrogen (TKN) will also be conducted at selected monitoring locations as outlined on the attached Table 1.

8. The water quality monitoring program will be conducted semi-annually by carrying out complete water quality monitoring events in April and October of each year.

9. Landfill gas will be monitored at gas probe nests GP1, GP2 and GP3 as shown in Drawing 1 on Item 4 of Schedule "A" to this Certificate, six times annually in the months of January, February, March, April, July and December for percent methane, pressure and water level.

10. The Owner shall advise the Ministry forthwith of any incidents shown or suggested by the results of any of the monitoring referred to herein as revised from time to time.

11. This Schedule "B" shall be revised to incorporate approved revisions to the water quality monitoring program required from time to time by the Director.

Attached to Schedule "B", Provisional Certificate of Approval No. A 270203

TABLE 1

LONG-TERM MONITORING PROGRAM
ANALYTICAL REQUIREMENTS
VALENTINE AVENUE LANDFILL SITE
KINCARDINE, ONTARIO

Monitoring Location	Analysis Required: General Chemistry	Metals	VOCs	BOD/COD	Nitrogen Cycle
Groundwater					
OW1-78	X			X	X
OW1-82	X				
OW2-82	X				
OW1-89	X				
OW2-89	X				
OW3-89	X			X	X
OW2A-91	X				
OW7-91	X				
OW8-91	X				
OW9-91	X				
OW10-92	X				
OW11-92	X				
OW12-92	X				
OW13-92	X				
OW14-92	X			X	X
OW15-92	X			X	X
OW16A-92	X				
OW16B-92	X			X	X
Proposed Monitoring Well Nests	X				
Leachate					
LW1-92	X	X	X	X	X
LW2-92	X	X	X	X	X
Surface Water					
SG1-91	X			X	X
Groundwater Interceptor Drain					
Pump Station Manhole	X	X	X	X	X
Leachate Collection System					
Pump Station Manhole	X	X	X	X	X
Stormwater Management Ponds					
Existing Site	X				
Interim Expansion Area	X				

Ministry of the Environment

Minister

135 St. Clair Avenue West
Suite 100
Toronto ON M4V 1P5

Ministère de l'Environnement

Ministre

135, avenue St. Clair ouest
Bureau 100
Toronto ON M4V 1P5

Ontario

Ms. Rosaline Graham
Clerk
Corporation of the Town of Kincardine
Municipal Offices
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

Dear Ms. Graham:

With regard to the Valentine Avenue Landfill Environmental Assessment, attached is a signed copy of the Notice of Approval to Proceed with the Undertaking as required by the *Environmental Assessment Act*.

Yours very truly,

Tony Clement
Minister

69237

Attachment

c: The Honourable Helen Johns, MPP
Huron-Bruce

Ontario
Executive Council
Conseil des ministres

Order in Council
Décret

On the recommendation of the undersigned, the Lieutenant Governor, by and with the advice and concurrence of the Executive Council, orders that:

Sur la recommandation du soussigné, le lieutenant-gouverneur, sur l'avis et avec le consentement du Conseil des ministres, décrète ce qui suit :

WHEREAS section 9 of the *Environmental Assessment Act* provides that the Minister of Environment and Energy, with the approval of the Lieutenant Governor in Council, may give approval to proceed with an undertaking, give approval to proceed with an undertaking subject to such conditions as the Minister considers necessary, or refuse to give approval to proceed with the undertaking;

WHEREAS no notices requesting a hearing were received by the Minister of the Environment after the publication of the Notice of Completion of the Review; and

WHEREAS, having considered the purpose of the Act, the approved terms of reference, the environmental assessment of the undertaking, which is the subject of the attached notice, the ministry review of the the environmental assessment and the submission received, the undersigned Minister of the Environment considers that a hearing is unnecessary and is of the opinion that the undertaking should be given approval to proceed, subject to the conditions specified in the attached notice,

THEREFORE, pursuant to the provisions of the *Environmental Assessment Act*, the undertaking which is the subject of the attached notice, be given approval to proceed subject to the said conditions.

Recommended _____
Minister of the Environment

Concurred _____
Chair of Cabinet

Approved
and Ordered OCT 2 0 1999
Date

O.C./Décret 1702/99

_____
Lieutenant Governor

ENVIRONMENTAL ASSESSMENT ACT

SECTION 9

NOTICE OF APPROVAL TO PROCEED WITH THE UNDERTAKING

RE: An Environmental Assessment for the Continued Use of the Town of Kincardine Valentine Avenue Landfill

Proponent: The Corporation of the Town of Kincardine

EA File No.: MU-0083(02)

TAKE NOTICE that the period for requiring a hearing, provided for in the *Notice of Completion of the Review* for the above-noted undertaking, expired on July 5, 1999. I received one submission in support of the undertaking and no requirements for a hearing by the Environmental Assessment Board before the expiration date.

I do not consider it advisable or necessary to hold a hearing. Having considered the purpose of the Act, the approved terms of reference, the environmental assessment, the ministry review and the submission received, I hereby give approval to proceed with the undertaking, subject to conditions set out below.

REASONS:

My reasons for giving approval are:

1. On the basis of the proponent's terms of reference, the environmental assessment and the ministry review, the proponent's conclusion that, on balance, the advantages of this undertaking outweigh its disadvantages appears to be valid.

2. No other beneficial alternative method of implementing the undertaking was identified.

3. On the basis of the proponent's terms of reference, environmental assessment, the review and the conditions of approval, I consider that the construction, operation and

maintenance of the undertaking will be consistent with the purpose of the Act (section 2).

4. The government review team indicated that the environmental impacts of extending the closure date of the landfill will be minimal. The public review of the environmental assessment did not identify any concerns.

CONDITIONS:

This approval is subject to the following Conditions:

1.0 Definitions

For the purpose of these Conditions:

1.1 "Proponent" means The Corporation of the Town of Kincardine

1.2 "MOE" refers the Ministry of the Environment

1.3 "SLC" refers to the Site Liaison Committee

1.4 "EPA" refers to the *Environmental Protection Act*

2.0 General Requirements

2.1 The proponent shall comply with the provisions of the Environmental Assessment, all of which are incorporated herein by reference, except as provided by these conditions and by any requirement of the Part V, *Environmental Protection Act* (EPA), Provisional Certificate of Approval for the site, and any other approvals or permits that may be issued for the site.

2.2 These conditions do not prevent more restrictive conditions being imposed under other statutes.

3.0 Site Liaison Committee

3.1. To ensure that public concerns are addressed and to ensure the inclusion of appropriate mitigation measures the proponent shall make every reasonable effort to establish and maintain a SLC. The SLC may be combined with a public liaison committee which considers waste management issues.

3.2 If a SLC is being established, the mandate for the SLC shall be prepared in consultation with the public and shall be submitted to the Director, Southwestern Region, MOE, for approval, and, when approved, a copy shall be filed with the Public Record. The Director may amend the mandate submitted to him before approving it. If an existing committee is used for reviewing the operation of the landfill site, a copy of the Terms of Reference or mandate for such committee shall be submitted by the proponent to the Director, Southwestern Region, MOE for his information and submitted by the proponent to the Director of the Environmental Assessment and Approvals Branch for filing in the Public Record.

3.3 If a member of the SLC proposes an amendment to the mandate of the Committee and the SLC is unable to agree on the amendment, the member may submit a request to the Director, MOE, Southwestern Region, to amend the mandate. The Director may amend the mandate, after consulting with the members of the SLC.

4.0 PUBLIC RECORD

4.1 Where these conditions require a document to be filed with the Public Record, it shall be provided to the Director or the Environmental Assessment and Approvals Branch, for filing with the Public Record maintained for this undertaking. Additional copies of each document will be provided by the person filing it to the Owen Sound Area Office, MOE; the London Regional Office, MOE; and to any existing Site Liaison Committee.

Dated the 20th day of October, 1999 at TORONTO.

Tony Clement
Minister of the Environment
135 St. Clair Avenue West
12th Floor
Toronto, Ontario
M4V 1P5

Approved by O.C. No. 1702/99

4079
DCC
Nov 2, 2001

Ministry of the Environment
2 St. Clair Avenue West
Floor 12A
Toronto, ON M4V 1L5

Ministère de l'Environnement
2, avenue St. Clair Ouest
Étage 12A
Toronto, ON M4V 1L5

Environmental Assessment and Approvals Branch

Tel: (416) 314-8001
Fax: (416) 314-8452

October 25, 2001

Mr. Jim O'Rourke, Public Works Manager
Municipality of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

Fax No.: (519) 396-8288

Dear Mr. O'Rourke,

Re: Notice of Amendment - Continued Operation
Valentine Avenue Landfill Site, Municipality of Kincardine
Provisional Certificate of Approval No. A270203
MOE Reference No. 9685-4XQHPU

Please find attached a copy of the Notice of Amendment dated October 22, 2001, for the above mentioned Provisional Certificate of Approval. This Notice allows for the continued use and operation of the above waste disposal site in accordance with the Order in Council for the Province of Ontario No. 1702/99 dated October 20, 1999 which approved the proposed undertaking for the continued use of this site for final waste disposal under the Environmental Assessment Act.

If you have any questions and/or comments on the above, please feel free to contact me at (416) 314-8316.

Sincerely,

John A. Kaasalainen, P.Eng.
Senior Engineer - Waste Unit

Attachment - Notice of Amendment

cc: Donald Campbell, P.Eng. - CRA (Fax No. 519-884-0525) ✓
Ian Mitchell, MOE Owen Sound (Fax No. 519-371-2905)

Ontario

Ministry of the Environment | Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A270203
Notice No. 1

Corporation of the Municipality of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

Site Location: Lot A, Lot B, Concession A, Plan 61; Valentine Avenue Landfill Site
Lot A& B, Concession A, Plan 61; Valentine Ave. Landfill
Kincardine Municipality, County of Bruce

You are hereby notified that I have amended Provisional Certificate of Approval No. A270203 issued on September 29, 1994 for the continued use and operation of a 4.94 hectare landfilling site within a total site area of 9.11 hectares, as follows:

All in Accordance with the following plans and specifications which are added to the Schedule "A":

11. The Application for a Provisional Certificate of Approval for a Waste Disposal Site dated June 7, 2001 and signed by Mr. Jim O'Rourke, Manager of Public Works for the Corporation of the Municipality of Kincardine.

12. The covering letter and supporting documentation dated May 29, 2001 from Mr. Donald Campbell, P.Eng. of Conestoga-Rovers & Associates to Mr. Michael Williams, Director, Environmental Assessment and Approvals Branch, Ministry of the Environment requesting an amendment to the Certificate to allow for the continued use of the waste disposal site.

13. The Order in Council for the Province of Ontario 1702/99 dated October 20, 1999 approving the proposed undertaking for the continued use of this site for final waste disposal under the Environmental Assessment Act.

The Provisional Certificate of Approval No. A270203 is amended as follows:

1. Condition 5 of the Provisional Certificate of Approval is revoked and replaced with the following:

   5. The site shall be operated and maintained in accordance with the Order in Council for the Province of Ontario dated October 20, 1999, the Environmental Assessment Board's decision of March 10, 1994, the conditions of this Certificate and the plans and specifications contained in the documents listed in Schedule "A". Should there be any discrepancy between any of the documents listed above, the order of precedence for resolving differences shall be as follows:

The Order in Council for the Province of Ontario 1702/99 dated October 20, 1999;

The Environmental Assessment Board Decision EP-93-05 dated March 10, 1994;

The conditions on the Provisional Certificate of Approval; and

The documents listed in Schedule "A" in the order of their most recent date.

2. Condition 8 of the Provisional Certificate of approval is revoked and replaced with the following:

8. The operation of the landfill site shall terminate the day following the date on which fill has reached the limits of the approved contours as indicated on the September 1993 "Design and Operation Drawing No. 3, Final Contour Plan - Interim Expansion", Item 4 of Schedule "A".

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

The reason for this amendment to the Certificate of Approval is to allow for the continued use of the waste disposal site to allow for the full utilization of the approved capacity beyond the originally approved 5 year interim expansion time limit.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A270203 dated September 29, 1994, as amended.

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

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

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

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

DATED AT TORONTO this 22nd day of October, 2001

THIS NOTICE WAS MAILED
ON Oct. 30, 2001
JC
(Signed)

Ian Parrott, P.Eng.
Director
Section 39, *Environmental Protection Act*

JK/
c: District Manager, MOE Owen Sound
Donald Campbell, Conestoga-Rovers & Associates ✓

Properties

PIN 33315 - 0013 LT

Description PT LT A, B CON A KINCARDINE AS IN R137866 & R301354; KINCARDINE

Address KINCARDINE

Party From(s)

Name THE CORPORATION OF THE TOWN OF KINCARDINE

Address for Service 1475 Concession 5
R.R. #5
Kincardine, Ontario
N2Z 2X6

This document is not authorized under Power of Attorney by this party.

This document is being authorized by a municipal corporation Gagan Sandhu-Director of Public Works..

Party To(s) *Capacity* *Share*

Name MINISTRY OF ENVIRONMENT AND ENERGY

Address for Service 2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

Statements

Schedule: See Schedules

Signed By

George Charles Magwood 215 Durham Street, Box 880
Walkerton
N0G 2V0 acting for Party From(s) Signed 2013 09 19

Tel 519-881-3230

Fax 519-881-3595

I have the authority to sign and register the document on behalf of the Party From(s).

Submitted By

Magwood Van De Vyvere & Grove-McClement LLP 215 Durham Street, Box 880
Walkerton
N0G 2V0 2013 09 19

Tel 519-881-3230

Fax 519-881-3595

Fees/Taxes/Payment

Statutory Registration Fee $60.00

Total Paid $60.00

File Number

Party From Client File Number : 15829

STATEMENTS

I, George C. Magwood, solicitor, state:

1. That the attached Provisional Certificate of Approval for a Waste Disposal Site No. A 270203 dated September 29, 1994 affects all of the lands described in PIN 33315-0013 (LT).

2. This statement is made for no improper purpose.

George C. Magwood

Ontario

Ministry of Environment and Energy

Ministere de l'Environnement et de l'Énergie

PROVISIONAL CERTIFICATE OF APPROVAL
FOR A WASTE DISPOSAL SITE
NO. A 270203

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

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine Ontario
N2Z 1Z9

for the use and operation of a 4.94 hectare landfilling site within a total site area of 9.11 hectares *all in accordance with the following plans and specifications* as specified in Schedule "A" attached.

Location: Part of lots A and B
Concession "A", Plan 61
Town of Kincardine, County of Bruce

which includes the use of the site only for the disposal *of the following categories of waste (Note: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval)* domestic, commercial and non-hazardous solid industrial wastes *and "other" wastes limited to demolition materials, and sewage sludge from the Town of Kincardine Water Pollution Control Plant.*

The site has also been approved for the transfer and processing (sorting and recycling) of separated fractions of domestic, commercial, and solid non-hazardous industrial waste and subject to the following conditions:

DEFINITION OF TERMS:

For the purpose of this Provisional Certificate of Approval:

1.1 "This Certificate" means Provisional Certificate of Approval No. A-270203 dated September 29, 1994.

1.2 "Director" means any one or more of the persons who from time to time are so designated for the purpose of Section 30 of the Environmental Protection Act;

1.3 "District Manager" means the District Manager of the Owen Sound District Office of the Ontario Ministry of Environment and Energy or such other official of the Ministry as may be assigned the duties of the District Manager of the Owen Sound District;

1.4 "EPA" means The Environmental Protection Act, chapter E.19, R.S.O. 1990;

1.5 "Incident" means an abnormal event or occurrence which may endanger health, cause a nuisance or adversely affect the environment;

1.6 "Ministry" or "MOEE" means the Ontario Ministry of Environment and Energy;

1.7 "Owner" means the corporation of the Town of Kincardine;

1.8 "Regional Director" means the Regional Director of the Southwestern Region, Ontario Ministry of Environment and Energy or such other official of the Ministry as may be assigned the duties of the Regional Director, Southwestern Region;

1.9 "Design and Operations Report" means the October 1993 Design and Operations Report - Interim Expansion; prepared by Conestoga - Rovers & Associates (item 3 in schedule "A"); and

1.10 "Site" means the landfill site located at part of Lots A and B, Concession "A", Plan 61, Town of Kincardine, County of Bruce.

2. This Provisional Certificate of Approval replaces all Provisional Certificates of Approval and Notices of Amendment identified by No. A-270203 issued under Part V of the EPA.

3. The Owner shall comply with the Conditions and schedules in this Certificate as modified or supplemented by the Director in accordance with the Director's mandate under the EPA. The requirements specified in this Certificate are minimum requirements and do not abrogate the need to take all reasonable steps to avoid violating the provisions of other applicable legislation. If the Director, Regional Director or District Manager identifies an unacceptable environmental problem associated with the Site, the Owner, once aware of the problem, shall immediately take all necessary steps to mitigate or remedy the resulting impacts. Nothing in this condition affects any right of appeal the Owner may otherwise have under the EPA.

4. The requirements of this Certificate are severable. If any requirement of this Certificate to any circumstances is held invalid, the application of that requirement to other circumstances and the remainder of this Provisional Certificate of Approval shall not be affected.

5. The Site shall be operated and maintained in accordance with the Environmental Assessment Board's decision of March 10, 1994, the conditions of this Certificate and the plans and specifications contained in the documents listed in Schedule "A". Should there be any discrepancy between any of the documents listed above, the order of precedence for resolving differences shall be as follows:

The Environmental Assessment Board Decision EP-93-05 dated March 10, 1994.

The conditions on the Certificate of Approval;

The remaining documents in order of their most recent date.

6. The owner shall provide training to all on-site personnel relating to all legal requirements for the operation of the Site.

7. Only wastes generated within the boundaries of the Town of Kincardine shall be accepted for disposal at the Site.

8. The operation of the landfill site shall terminate after the earlier of:

8.1 (a) five (5) years after the date of this certificate issued in accordance with the Environmental Assessment Board's decision EP-93-05.

(b) the date on which fill has reached the limits of the approved contours as indicated on the September 1993 "Design and Operation Drawing No. 3, - Final Contour Plan - Interim Expansion";

(c) the commencement of operation of an alternative waste disposal site in accordance with the Bruce County Waste Management Master Plan.

8.2 Notwithstanding the above, the period of operation of the landfill may be extended for a further term of up to two years in the event that, at the conclusion of the five year term provided for in condition 8.1 (a), the Director of the Approvals Branch of the Ministry of the Environment and Energy (MOEE) is satisfied that all of the following conditions have been met:

(a) The environmental assessment for the waste disposal component of the Bruce County Waste Management Master Plan, providing for an undertaking which includes an alternative waste disposal facility or facilities for the Town of Kincardine, has been submitted to the MOEE by December 31, 1995.

(b) At the end of the five year term referred to above an alternative waste disposal facility (or facilities) arising out of the Bruce County Waste Management Master Plan is not available to receive the Town's waste.

(c) Sufficient additional capacity remains in the Valentine Avenue landfill site at the end of the five year term, referred to above, to provide up to two further years of disposal of the Town's waste.

(d) The annual reports filed by the Town with respect to the operation of the landfill, as required by condition 22 of this certificate has established that:

(i) the landfill is operating properly from an environmental protection perspective;

(ii) the conditions of approval in this certificate have been complied with;

(iii) the landfill has been operating in compliance with applicable legislation, regulations and MOEE policies;

(iv) the Bruce County Waste Management Master Plan process is developing in a manner which is satisfactory to MOEE.

9. The Owner shall place a sign at the main entrance to the Site on which is displayed in prominent letters the following information:

- the name of the Site
- the operating authority
- the approved hours of operation
- the hours the Site is open to accept waste from the public
- the telephone number for reporting emergency situations occurring at the Site during non-operating hours

10. The approved hours of operation for the Site are:

Monday through Friday: 8:00 a.m. - 4:30 p.m.

Saturday: 8:00 a.m. - 12 noon.

The above hours of operation may be amended with the written approval of District Manager.

On-site equipment may operate one hour beyond the Site's closing time to complete daily maintenance operations at the Site.

11. During non-operating hours the Site is to be secured against access by unauthorized persons.

12. The following specific conditions must be complied with subject to any variations agreed to or issued by the Director, in writing:

12.1 No waste shall be received from the public for disposal at the Site except during operating hours when the Site is under the supervision of the site attendant or his alternate.

12.2 Weather permitting, each day's deposited waste shall be covered in a manner acceptable to the District Manager so that no waste is exposed to the atmosphere. If an alternative material to soil is to be used as daily cover it must qualify as a non-hazardous waste under R.R.O. 1990 Reg. 347. A minimum of 30 cm. of cover shall be applied to areas where no further landfilling will occur for a period of 30 days or more.

12.3 The burning of wastes at the Site is prohibited.

12.4 Scavenging is prohibited.

13. The Owner shall maintain and use weigh scales to weigh and record all incoming waste at the Site prior to disposal.

14. All construction equipment associated with the development, operation or closure of the Site shall comply with the MOEE Model Municipal Noise By-Law Publication NPC-115. A landfill equipment program shall be implemented with particular attention being given to maintaining and where feasible improving the noise muffling systems on landfill construction equipment. Landfill construction equipment shall be inspected at least annually. Other equipment which may be used at the Site from time to time shall also comply with the MOEE noise abatement standard.

15. On-site roads shall be treated with water or a dust suppressant as required to minimize dust generation.

16. An inspection of the Site and adjacent lands shall be carried out as required to ensure that litter is being adequately controlled on site. Litter from the Site shall be picked up as needed along the Site's perimeter and access road and from adjacent properties.

17. Should an outbreak of vermin or vector occur at the Site, the Owner shall take all steps within the Ministry guidelines to control the outbreak, including the services of a licensed exterminator. Control measures used shall be appropriate for the vermin or vector in question.

18. The Owner shall undertake the monitoring programs contained in the documents listed in Schedule "B" subject to any amendments which the Director may authorize in writing from time to time.

19. Any groundwater monitoring wells that are damaged or whose integrity is in doubt shall be repaired or replaced forthwith.

20. All monitoring wells which form part of any monitoring program shall be properly capped and locked.

21. Wells no longer required for monitoring purposes shall be abandoned in accordance with R.R.O. 1990, Reg. 903.

22. An annual report on the development and operation of the Site, including the monitoring programs, shall be submitted to the Regional Director by April 30th of the year following the calendar year covered by the report. The report shall include, but not be limited to, the following:

- progressive use of the landfill Site
- weight of wastes received and volume deposited on-site
- placement and integrity of final cover
- conformance with development and operation plans
- remaining site capacity
- operational problems encountered and/or complaints received and the remedial action taken
- monitoring program results, data interpretation and recommendations
- a summary of the findings from the annual inspection of the landfill construction equipment.
- the occurrence of any unexpected incident negatively impacting on the Site, describing the nature of the incident, how it was managed and what action has been taken to avoid a recurrence.
- waste deposition locations for the next 12 month period.
- waste diversion programs, results in previous year and future initiatives.
- a summary of what action the Town is aware of that has been taken by the Town or others that would improve, maintain or diminish the condition of the Kincardine Swamp.

23. By 12 months before the Site's expected closure the owner shall submit to the Regional Director for approval a site closure plan. The site closure plan shall include but shall not be limited to, the following matters:

- fencing security and access control;
- final contours, cover and vegetation;
- post closure after use;
- long-term maintenance and monitoring of the Site;
- updated contingency plans to mitigate unacceptable environmental impacts.

24. This Certificate of Approval shall be registered on the title to the lands comprising the Site. No operation shall be carried out at the Site after 60 days of this condition becoming enforceable unless the certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the Site and unless a duplicate registered copy thereof has been returned by the applicant to the Director, Approvals Branch, Ministry of the Environment and Energy.

25. Should the leaf and yard waste composting facility to be established at the Site require a Certificate of Approval under O. Reg. 101/94 s. 34, EPA, an "Application For A Certificate Of Approval For A Waste Disposal Site (Processing)", along with documents supporting the application, shall be submitted to the Director within 60 days of the date of issuance of this Certificate.

26. The Owner shall undertake the monitoring programs and reporting as required by the approvals issued under Ontario Water Resources Act (OWR Act) for the following works pertaining to the Valentine Avenue Landfill Site:

- Storm Water Management Facility
- Leachate Collection System, including Leachate Pumping Station and Forcemain.
- Leachate co-treatment at the Kincardine Waste Water Treatment Plant as included in the Certificate of Approval for the Kincardine W.W.T.P.
- Groundwater Interceptor Drain, including Groundwater Pumping Station and Forcemain.

27. During the period this Certificate is in force, the Owner shall continue to apply reasonable efforts to implement additional waste reduction programs to further reduce the quantity of waste destined for disposal at the Site. It shall also, as a participant in the Bruce County Waste Management Master Plan, actively encourage the other participants to proceed as quickly as possible to bring the Master Plan process to a timely conclusion.

28. The Owner shall maintain the Valentine Avenue Landfill Public Advisory Committee (PAC) to review and provide recommendations on annual operational and monitoring reports, landfill site protocols, proposed end use of the Site and any other information which is pertinent to landfilling operations at the Site. These recommendations, along with any minority positions, may be forwarded to the Owner or the Director for their consideration. The PAC shall not exercise any supervisory, regulatory or approval roles with respect to the operation of the Site. The Owner shall maintain a list of current documents which govern the operation of the Site. The PAC shall be entitled upon request to copies of records and documents in the Owner's possession relevant to the Site, except for such information as the Council of the Owner is entitled to withhold from the public at law.

29. Should the results of the leachate quality monitoring program indicate that the established trigger values for VOCs are exceeded and that the leachate concentrations could detrimentally impact the effluent quality of the Town of Kincardine Waste Water Treatment Plant, the Owner shall immediately undertake to implement the Leachate Disposal Contingency Plan described in Section 7.6.5 of the Design and Operation Report (item 3 of Schedule "A").

30. The Owner shall install one additional bore hole into the St. Joseph till in accordance with the proposal set out in CRA's letter to MOEE (Ferraro to Bye) of February 15, 1994 (item 9 of Schedule "A").

31. The Owner shall utilize methodologies for the placement and compaction of waste that maximize the density of waste hereafter disposed at the Site.

32. The Owner shall actively pursue means for a backyard composting program for multi residential and industrial, commercial and institutional sectors.

33. The Owner shall actively pursue means for the collection and recycling of fine paper, telephone books and box board.

34. The Owner shall actively pursue means for the collection and disposal of household hazardous waste.

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

1. Condition 1 is to clarify the meaning of terms used in this Provisional Certificate of Approval to avoid future misunderstandings.

2. Conditions 2 and 5 are to indicate to the Owner that this Provisional Certificate of Approval replaces all previous Provisional Certificates of Approval and Notices of Amendment issue for the Site. The conditions of this Certificate and the documents listed in schedule "A" shall be used to determine the Site's compliance with the requirements of The Environmental Protection Act. Condition 5 is to avoid future misunderstandings by stating the precedence to be given to documents should there be discrepancies between them.

3. Condition 3 is to clearly indicate to the Owner that compliance with the conditions of this Certificate does not relieve him of his obligation to take all reasonable steps to avoid violating the provisions of other applicable legislation relative to the Site.

4. Condition 4 is to make it clear to the Owner that should one of the conditions of this Certificate in any circumstance be found to be invalid it will not invalidate the application of that condition to other circumstances or affect the validity of the other conditions on the Certificate.

5. Condition 6 is to ensure that personnel involved in the management and operation of the Site receive instructions about the conditions on this Certificate and the documents in schedule "A", as well as other pertinent information necessary to operate the Site in a legal and environmentally safe manner.

6. Condition 7 is to clearly indicate to the Owner that the Site is approved only for the disposal of waste from the Town of Kincardine.

7. Condition 8 is to clearly indicate to the Owner that the term of this Certificate is of limited duration and states the circumstances under which the Certificate expires.

8. Conditions 9 and 10 provides information about the Site to the public so that they may monitor the Site for compliance with the hours of operation and report any violations or unauthorized activities to the Owner or the Ministry.

9. Conditions 11,12,14,15,16,17,18,19,20,21,and 29, are to ensure the site is operated in to responsible manner in order to minimize any adverse impacts on the natural environment or the public.

10. Condition 13 is to provide a record of the waste delivered to the Site for the annual report and also to monitor the success of any additional waste reduction measures undertaken by the Owner to reduce the quantity of waste disposed at the Site.

11. Conditions 22 and 26 are to provide the Ministry with reports on the operation of the Site and ancillary works upon which the Ministry may make an assessment of the Site's performance and, if necessary, recommendations for improvements in its operation.

12. Condition 23 is to provide the Ministry with sufficient time prior to the Site's closure to evaluate the Site Closure Plan in order to ensure it will be carried out in an environmentally safe manner and that the post closure monitoring and site maintenance programs are acceptable.

13. Condition 24 is to ensure that future owners of the land on which the site is located are made aware of the fact that the land has been used as a landfill and that no use may be made of the land within twenty five years from the year in which the land ceased to be so used unless the approval of the Minister for the proposed use has been obtained.

14. Condition 25 is to make the owner aware of Ontario Regulation 101/94 which states the conditions under which an "Application for a Certificate of Approval for a Waste Disposal Site (Processing)" is required to establish and operate a leaf and yard waste composting facility.

15. Conditions 27,32, 33,and 34 are to ensure that the Town of Kincardine continues to exert reasonable efforts to reduce waste and to have a site available to accept its waste when this Certificate expires.

16. Condition 28 states the limits of the Public Advisory Committee's authority with respect to the operation and control of the Site.

17. Condition 30 is to confirm by field investigation the accuracy of the data obtained from well records and other sources which was used to determine the properties of the St. Joseph till in the vicinity of the Site.

18. Condition 31 is to ensure the efficient use of the landfill's capacity by ensuring that the waste is placed and compacted in an acceptable manner.

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

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

In addition to these legal requirements, the Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario,
M4S 1H2

DATED AT TORONTO this 29th *day of* September, 1994.

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY

W. Ng, P. ENG.

MAILED ON Sept 30/94

BY _____

SCHEDULE "A"

This Schedule "A" forms part of Provisional Certificate of Approval No. A 270203 dated September 29, 1994.

1. Application for a Certificate of Approval for a Waste Disposal Site (Landfill) dated August 19, 1992.

2. "Hydrogeologic Investigation Report, Valentine Avenue Landfill Site, Kincardine Ontario", (CRA, June 1993).

3. "Design and Operation Report, Interim Expansion, Valentine Avenue Landfill Site, Town of Kincardine" (CRA, October 1993).

4. Drawings number 1 to 12 inclusive titled: "Design and Operations Plans - Interim Expansion Valentine Avenue Landfill Site, Town of Kincardine, (CRA, September 1993).

5. Request for an Exemption to the Environmental Assessment Act, Valentine Avenue Landfill Site Interim Expansion, Town of Kincardine (CRA, August, 1992).

6. Final Draft Report, Proposed Solid Waste Stream Diversion Programs (CRA, May, 1992).

7. Environmental Impact Study, Interim Expansion, Valentine Avenue Landfill Site, Kincardine, Ontario (Ecoplans, July, 1992).

8. "Leachate Treatability Assessment Report" (CRA, November 1993)

9. Letter of February 15, 1994 from CRA to MOEE (Ferraro to Bye) regarding "Proposed St. Joseph Till Borehole Location - Valentine Avenue Landfill Site - Kincardine, Ontario."

10. Environmental Assessment Board's March 10, 1994 decision, EP-93-05, "Town of Kincardine - Valentine Avenue Landfill - Reasons For Decision And Decision".

SCHEDULE "B"

This Schedule "B" forms part of the Provisional Certificate of Approval No. A 270203 dated September 29, 1994.

1. Groundwater monitoring locations will include:

OW1-78	OW2A-91	OW12-92
OW1-82	OW7-91	OW13-92
OW2-82	OW8-91	OW14-92
OW1-89	OW9-91	OW15-92
OW2-89	OW10-92	OW16A-92
OW3-89	OW11-92	OW16B-92

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

2. Leachate monitoring locations will include:

LW1-92 LW2-92

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

3. Surface water monitoring locations will include:

SC1-91

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

4. In addition to the above monitoring locations outlined under Clauses 1, 2 and 3, the following monitoring locations will be incorporated into the monitoring program:

   * the groundwater interceptor drain (existing site) pump station manhole No.1 following commissioning of the groundwater interceptor drain;

* the leachate collection system (expansion area) pump station manhole No.2 following initiation of landfilling activities within the approved expansion area;

* storm water management pond No.1 (existing site) following construction of the pond;

* storm water management pond No.2 (expansion area) following construction of the pond; and

* additional groundwater monitoring well nests within the expansion area as the monitoring well nests are installed.

as set out in Table 10.1 and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" of this Certificate.

5. Once two complete water quality monitoring events (consisting of the monitoring outlined in Clauses 1, 2, 3, 4, 6, 7 and 9 herein as revised from time to time) have been undertaken subsequent to the commissioning of the groundwater interceptor drain (existing site) the water quality monitoring network, as outlined under Clause 1, 2, 3 and 4 may be reduced by the elimination of the following monitoring locations from the overall water quality monitoring program upon the Owner receiving written approval of the MOEE District Manager.

Groundwater Monitoring Locations

OW1-82	OW7-91	OW15-92
OW1-89	OW8-91	OW16A-92
OW3-89	OW9-91	
OW2A-91	OW13-92	

as set out in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

Leachate Monitoring Locations

LW1-92

as set out in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

6. Groundwater, surface water and leachate levels will be recorded at the monitoring locations outlined under Clauses 1, 2, 3 and 4, and in addition all other existing groundwater monitoring wells, surface water staff gauges and leachate wells located at the site.

7. Water quality analyses for the following general chemistry parameters will be conducted at all monitoring locations outlined under Clause 1, 2, 3 and 4:

chloride	phenols	field pH
alkalinity	dissolved organic carbon (DOC)	field conductivity
hardness		field temperature

In addition, analyses for metals, volatile organic compounds, biological oxygen demand (BOD), chemical oxygen demand (COD), nitrate, nitrite ammonia and total Kjeldhal nitrogen (TKN) will also be conducted at selected monitoring locations as outlined on the attached Table 1.

8. The water quality monitoring program will be conducted semi-annually by carrying out complete water quality monitoring events in April and October of each year.

9. Landfill gas will be monitored at gas probe nests GP1, GP2 and GP3 as shown in Drawing 1 on Item 4 of Schedule "A" to this Certificate, six times annually in the months of January, February, March, April, July and December for percent methane, pressure and water level.

10. The Owner shall advise the Ministry forthwith of any incidents shown or suggested by the results of any of the monitoring referred to herein as revised from time to time.

11. This Schedule "B" shall be revised to incorporate approved revisions to the water quality monitoring program required from time to time by the Director.

Attached to Schedule "B", Provisional Certificate of Approval No. A 270203

TABLE 1

LONG-TERM MONITORING PROGRAM
ANALYTICAL REQUIREMENTS
VALENTINE AVENUE LANDFILL SITE
KINCARDINE, ONTARIO

	Analysis Required				
Monitoring Location	**General Chemistry**	**Metals**	**VOCs**	**BOD/COD**	**Nitrogen Cycle**
Groundwater					
OW1-76	X			X	X
OW1-82	X				
OW2-82	X				
OW1-89	X				
OW2-89	X				
OW3-89	X			X	X
OW2A-91	X				
OW7-91	X				
OW8-91	X				
OW9-91	X				
OW10-92	X				
OW11-92	X				
OW12-92	X				
OW13-92	X				
OW14-92	X			X	X
OW15-92	X			X	X
OW16A-92	X				
OW16B-92	X			X	X
Proposed Monitoring Well Nests	X				
Leachate					
LW1-92	X	X	X	X	X
LW2-92	X	X	X	X	X
Surface Water					
SG1-91	X			X	X
Groundwater Interceptor Drain					
Pump Station Manhole	X	X	X	X	X
Leachate Collection System					
Pump Station Manhole	X	X	X	X	X
Stormwater Management Ponds					
Existing Site	X				
Interim Expansion Area	X				

Ontario ServiceOntario

PARCEL REGISTER (ABBREVIATED) FOR PROPERTY

LAND
REGISTRY
OFFICE #3

33315-0013 (LT)

* CERTIFIED BY LAND REGISTRAR IN ACCORDANCE WITH LAND TITLES A(

PROPERTY DESCRIPTION: PT LT A, B CON A KINCARDINE AS IN R137866 & R301354; KINCARDINE

PROPERTY REMARKS:

ESTATE/QUALIFIER:
FEE SIMPLE
LT CONVERSION QUALIFIED

RECENTLY:
FIRST CONVERSION FROM BOOK

OWNERS' NAMES
THE CORPORATION OF THE TOWN OF KINCARDINE

CAPACITY SHARE
ROWN

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM
** PRINTOUT INCLUDES ALL DOCUMENT TYPES AND DELETED INSTRUMENTS SINCE: 2006/11/17 **				
**SUBJECT, ON FIRST REGISTRATION UNDER THE LAND TITLES ACT, TO:				
**	SUBSECTION 44(1) OF THE LAND TITLES ACT, EXCEPT PARAGRAPH 11, PARAGRAPH 14, PROVINCIAL SUCCESSION DUTIES			
**	AND ESCHEATS OR FORFEITURE TO THE CROWN.			
**	THE RIGHTS OF ANY PERSON WHO WOULD, BUT FOR THE LAND TITLES ACT, BE ENTITLED TO THE LAND OR ANY PART OF			
**	IT THROUGH LENGTH OF ADVERSE POSSESSION, PRESCRIPTION, MISDESCRIPTION OR BOUNDARIES SETTLED BY			
**	CONVENTION.			
**	ANY LEASE TO WHICH THE SUBSECTION 70(2) OF THE REGISTRY ACT APPLIES.			
**DATE OF CONVERSION TO LAND TITLES: 2006/11/20 **				
R137866	1976/07/13	TRANSFER	$2	
R137867	1976/07/13	CHARGE	$30,000	
R137883	1976/07/13	AGREEMENT		
R181361	1980/10/15	CERTIFICATE		
3R6067	1994/02/10	PLAN REFERENCE		
R301354	1994/02/14	TRANSFER	$143,534	
R302790	1994/04/15	BYLAW		
R302791	1994/04/15	BYLAW		
BR79844	2013/09/19	CERTIFICATE		THE CORPORATION OF THE TOWN OF KINCARDINE

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WIT
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

Ontario ServiceOntario

LAND
REGISTRY
OFFICE #3

PARCEL REGISTER (ABBREVIATED) FOR PROPERTY

33315-0013 (LT)

* CERTIFIED BY LAND REGISTRAR IN ACCORDANCE WITH LAND TITLES ACT

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM
REMARKS: PROVISIONAL CERTIFICATE OF APPROVAL FOR WASTE DISPOSAL SITE				

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

Ontario

Ministry of the Environment **Ministère de l'Environnement**

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A270203
Notice No. 1

Corporation of the Municipality of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

Site Location: Lot A, Lot B, Concession A, Plan 61; Valentine Avenue Landfill Site
Lot A& B, Concession A, Plan 61; Valentine Ave. Landfill
Kincardine Municipality, County of Bruce

You are hereby notified that I have amended Provisional Certificate of Approval No. A270203 issued on September 29, 1994 for the continued use and operation of a 4.94 hectare landfilling site within a total site area of 9.11 hectares, as follows:

All in Accordance with the following plans and specifications which are added to the Schedule "A":

11. The Application for a Provisional Certificate of Approval for a Waste Disposal Site dated June 7, 2001 and signed by Mr. Jim O'Rourke, Manager of Public Works for the Corporation of the Municipality of Kincardine.

12. The covering letter and supporting documentation dated May 29, 2001 from Mr. Donald Campbell, P.Eng. of Conestoga-Rovers & Associates to Mr. Michael Williams, Director, Environmental Assessment and Approvals Branch, Ministry of the Environment requesting an amendment to the Certificate to allow for the continued use of the waste disposal site.

13. The Order in Council for the Province of Ontario 1702/99 dated October 20, 1999 approving the proposed undertaking for the continued use of this site for final waste disposal under the Environmental Assessment Act.

The Provisional Certificate of Approval No. A270203 is amended as follows:

1. Condition 5 of the Provisional Certificate of Approval is revoked and replaced with the following:

5. The site shall be operated and maintained in accordance with the Order in Council for the Province of Ontario dated October 20, 1999, the Environmental Assessment Board's decision of March 10, 1994, the conditions of this Certificate and the plans and specifications contained in the documents listed in Schedule "A". Should there be any discrepancy between any of the documents listed above, the order of precedence for resolving differences shall be as follows:

The Order in Council for the Province of Ontario 1702/99 dated October 20, 1999;

The Environmental Assessment Board Decision EP-93-05 dated March 10, 1994;

The conditions on the Provisional Certificate of Approval; and

The documents listed in Schedule "A" in the order of their most recent date.

2. Condition 8 of the Provisional Certificate of approval is revoked and replaced with the following:

8. The operation of the landfill site shall terminate the day following the date on which fill has reached the limits of the approved contours as indicated on the September 1993 "Design and Operation Drawing No. 3, Final Contour Plan - Interim Expansion", Item 4 of Schedule "A".

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

The reason for this amendment to the Certificate of Approval is to allow for the continued use of the waste disposal site to allow for the full utilization of the approved capacity beyond the originally approved 5 year interim expansion time limit.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No.A270203 dated September 29, 1994, as amended.

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

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

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

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

DATED AT TORONTO this 22nd day of October, 2001

Ian Parrott, P.Eng.
Director
Section 39, *Environmental Protection Act*

JK/

c: District Manager, MOE Owen Sound
Donald Campbell, Conestoga-Rovers & Associates

Ministry of the Environment and Energy | Ministère de l'Environnement et de l'Énergie

JUL 2 8 1993

CERTIFICATE OF APPROVAL
MUNICIPAL SEWAGE
NUMBER 3-0408-93-006

The Applicant:

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

The Applicant has applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Groundwater collection and pumping system to be constructed on Parts of Lots "A" and "B", Concession "A", to provide positive hydraulic containment of groundwater containing leachate on the southern and western limits of the existing Valentine Avenue Landfill Area (ELA) and the area located between the eastern wastewater stabilization lagoon and the ELA, consisting of:

Ground Water and Leachate Pumping Station

construction of a 1.5 m diameter precast concrete pumping station, equipped with a 3.0 L/s submersible pump, piping and a forcemain discharging the groundwater/leachate to the Town of Kincardine Sewage Treatment Plant (wastewater stabilization lagoons) inlet works;

together with associated appurtenances, piping, electrical and control systems all in accordance with the Design Brief prepared by Conestoga-Rovers Associates Limited, Consulting Engineers.

The Applicant is hereby notified that this approval is issued subject to the following terms and conditions outlined below:

TERMS AND CONDITIONS

For the purpose of this Certificate of Approval:

a. "the Director" means any Ministry employee within the Environmental Planning and Prevention Division of the Ministry appointed by the Minister pursuant to Section 5 of the Ontario Water Resources Act as a Director for the purposes of Sections 7, 52, 53, 54, 55, and 56 of said Act;

b. "the Regional Director" means the Regional Director of the Southwestern Region of the Ministry of Environment and Energy;

c. "the District Officer" means the District Officer of the Owen Sound District Office of the Ministry of Environment and Energy's Southwestern Region;

d. "Certificate" means a Certificate of Approval issued in accordance with Section 53 of the Ontario Water Resources Act;

e. "Ministry" means the Ministry of Environment and Energy for the Province of Ontario;

f. "the Owner" means The Town of Kincardine, and includes its successors and assignees;

g. "operating authority" means the Owner or the designated agent of the Owner;

No portion of the works shall be constructed and no tenders for construction accepted on any portion of the works until final plans, specifications and supporting data are submitted to and approved by the Director.

MONITORING AND REPORTING

The operating authority shall carry out and maintain a routine sampling and analysis program as outlined in the Ministry Policy No. 08-06. Adequate number of samplers shall be installed. Sampling locations shall be established to the satisfaction of the District Officer:

(1) Grab samples of the ground water and leachate from the pumping station discharge pipework shall be collected at least monthly at the pumping station and analyzed for at least for the following parameters and heavy metals as listed in Table 4A of Water Management - Goals, Policies, Objectives and Implementation Procedures of the Ministry of the Environment (Blue Book):

BOD_5
Suspended Solids
Free Ammonia as Nitrogen
Total Kjeldahl Nitrogen (TKN)
Total phosphorous

(2) Flow monitoring devices and recorders shall be installed, maintained and operated to measure the quantity of ground water/leachate being conveyed by the sewage pumping station.

Following review of any of the analytical results or any of the reports required by Condition No. 5 of this Certificate, the District Officer may alter the frequencies and location of sampling and parameters for analysis required by this Certificate.

The Owner shall prepare and submit a performance report to the Regional Director on an annual basis. The reports shall contain, but shall not be limited to, the following information in a format acceptable to the District Officer:

(a) a summary of all monitoring reports submitted in the reporting period including the volume and duration of the ground water/leachate pumped to the sewage treatment plant;

(b) a comprehensive interpretation of all monitoring data and analytical data collected relative to the works during the reporting period;

(c) review the sewage treatment plant performance data and assess the impact of treating ground water/leachate during the reporting period.

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

Condition No. 1 is included to define terms used in this Certificate of Approval.

Condition No. 2 is imposed to make the Owner aware that the Director approves in principle the proposed works and is of the opinion that they may be carried out on the basis of sound engineering and environmental principles, notwithstanding that sufficient detailed designs of the works have not been submitted to the Director for a final technical determination.

Condition Nos. 3, 4 and 5 are imposed to determine the performance of the ground water/leachate pumping facility and assess any adverse impact on the sewage treatment plant from treating groundwater/leachate.

**his Certificate of Approval is to be read in conjunction with the EPA
ertificate of Approval No. A270203 issued for the groundwater and leachate
nterceptor system for the Valentine Avenue Landfill Site.**

The Applicant may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

The name of the appellant;
The address of the appellant;
The Certificate of Approval number;
The date of the Certificate of Approval;
The name of the Director;
The municipality within which the sewage works are located;

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

This Notice must be served upon:

he Secretary,
nvironmental Appeal Board,
12 St. Clair Avenue West,
ui 502,
oronto, Ontario.
I4V 1N3

AND

The Director,
Section 53, Ontario Water Resources Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

he above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

ATED AT TORONTO this 21st *day of* July, 1993.

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY
W. GREGSON, P. ENG.

MAILED ON JUL 2 2 1993

BY _____

:tn: Mr. R. Shaw, Clerk, Town of Kincardine
:: Mr. W. Page, MOEE, Owen Sound District Officer
Mr. G.D. Ferraro, P. Eng., Conestoga-Rovers & Associates Limited

I/ n

Ministry of Environment and Energy

Ministère de l'Environnement et de l'Énergie

Ontario

AMENDMENT : *CERTIFICATE OF APPROVAL*
SEWAGE
NUMBER 3-0408-93-006

NOTICE

Rec'd CRA

AUG 2 6 1993

To the Applicant:

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

The Applicant is hereby notified that Condition No. 2 of the Certificate of Approval No. 3-0408-93-006 dated July 21, 1993, for the ground water/leachate collection system at the existing Valentine Avenue Landfill Area located in the Town of Kincardine, is hereby amended to permit construction the works described in the Certificate of Approval No. 3-0408-93-006.

REASON

The reason for this amendment is that final plans and specifications received from Conestoga-Rovers & Associates Limited, Consulting Engineers, were found to be in accordance with this Ministry's requirements.

This Notice shall constitute part of approval issued under Certificate of Approval No. 3-0408-93-006 dated July 21, 1993.

The Applicant may by written notice served upon me and the Environmental Appeal Board within days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

The name of the appellant;
The address of the appellant;
The Certificate of Approval number;
The date of the Certificate of Approval;
The name of the Director;
The municipality within which the sewage works are located;

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
2 St. Clair Avenue West,
Floor 12,
Toronto, Ontario.
M4V 1N3

AND

The Director,
Section 53, Ontario Water Resources Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

NOTICE

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

You are hereby notified that the approval issued under Certificate of Approval No. 3-0408-93-006 dated July 21, 1993 for the ground water/leachate collection system at the existing Valentine Avenue landfill site located in the Town of Kincardine is hereby amended to permit construction of the following works:

installation of a valve chamber and associated appurtenances for the ground water/leachate collection system;

relocation of the ground water/leachate collection system discharge point from the existing sanitary forcemain at the Kincardine Waste Water Treatment Plant (WWTP) inlet works directly to the WWTP aeration basin,

in accordance with the submission prepared by Conestoga-Rovers & Associates Limited, Consulting Engineers.

This Notice shall constitute part of the approval issued under Certificate of Approval No. 3-0408-93-006 dated July 21, 1993.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

The name of the appellant;
The address of the appellant;
The Certificate of Approval number;
The date of the Certificate of Approval;
The name of the Director;
The municipality within which the sewage works are located;

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

This Notice must be served upon:

The Secretary,
Environmental Appeal Board,
1[illegible] St. Clair Avenue West,
Su[illegible]e 502,
Toronto, Ontario.
M4V 1N3

AND

The Director,
Section 53, Ontario Water Resources Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 22nd *day of* November 1994

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY
M. DHALLA, P. ENG.

MAILED ON _____

BY _____

M/pm

t[illegible]
c

-Mr. R.R. Shaw, Clerk, Town of Kincardine
-District Manager, MOEE Owen Sound District Office
-Conestoga-Rovers & Assoc. Ltd.

Ministry of Environment and Energy

Ministère de l'Environnement et de l'Énergie

AMENDMENT TO CERTIFICATE OF APPROVAL
SEWAGE
NUMBER 3-0408-93-006

ec'd CRA

T 0 2 1995

NOTICE

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

You are hereby notified that the approval issued to you under Certificate of Approval No. -0408-93-006 dated July 21, 1993 for the ground water/leachate collection system at the existing Valentine enue landfill Area located in the Town of Kincardine, is hereby amended as follows:

eplacement of the existing leachate pump with a submersible pump rated at .8 l/sec (75 USgpm) at 13.1 m TDH including appurtenances,

ason

he above amendment is in response to the ongoing operational problems perienced with the existing leachate pump, all in accordance with the mission prepared by Conestoga-Rovers & Associates Limited, Consulting ngineers.

his Notice shall constitute part of the approval issued under Certificate of pproval No. 3-0408-93-006 dated July 21, 1993.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, amended, you may by written notice served upon me and the Environmental Appeal Board within 15 days te receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, ovides that the Notice requiring the hearing shall state:

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

The Notice should also include:

The name of the appellant;
The address of the appellant;
The Certificate of Approval number;
The date of the Certificate of Approval;
The name of the Director;
The municipality within which the sewage works are located;

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

This Notice must be served upon:

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

AND

The Director,
Section 53, *Ontario Water Resources Act*,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 27th *day of* September, 1995

THIS IS A TRUE COPY OF THE ORIGINAL NOTICE OF AMENDMENT SIGNED BY M. DHALLA, P. ENG.

MAILED ON SEP 28 1995

BY _____

GM/fn

Attn: -Mr. R.R. Shaw, Clerk, Town of Kincardine
cc: -District Manager, MOEE Owen Sound District Office
-W. Cooley, P. Eng., Conestoga-Rovers & Associates

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

u have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

achate pumping system to be constructed on Parts of Lots "A" and "B", ncession "A", Plan 61, Town of Kincardine, serving Interim Expansion Area the Valentine Avenue Landfill Site, consisting of:

achate Pumping Station and forcemain

.5 m diameter precast concrete pumping station, equipped with a 2.8 L/s mmersible pump, piping and a 75mm diameter forcemain connecting to an isting leachate forcemain discharging to the Town of Kincardine Sewage atment Plant (Wastewater stabilization lagoons);

gether with associated appurtenances, valve chamber, piping, electrical and ntrol systems all in accordance with final plans prepared by Conestoga-ers & Associates Limited.

You are hereby notified that this approval is issued subject to the following terms and conditions ti ned below:

MS AND CONDITIONS

GENERAL

For the purpose of this Certificate of Approval:

(a) "the Director" means any Ministry employee appointed by the Minister pursuant to Section 5 of the Ontario Water Resources Act;

(b) "the Regional Director" means the Regional Director of the Southwestern Region of the Ministry of Environment and Energy;

(c) "the District Manager" means the District Manager of the Owen Sound District Office of the Ministry of Environment and Energy's Southwestern Region;

(d) "Certificate" means a Certificate of Approval issued in accordance with Section 53 of the Ontario Water Resources Act;

(e) "Ministry" means the Ministry of Environment and Energy;

(f) "Owner" means The Town of Kincardine, and includes its successors and assignees;

(g) "operating authority" means the Owner or the designated agent of the Owner;

2. MONITORING

2.1 The operating authority shall carry out and maintain a routine sampling and analyses program. Sampling locations shall be established to the satisfaction of the District Manager:

(a) Grab samples of the leachate from the pumping station discharge pipework shall be collected at least monthly and analyzed for Metals and General Chemistry parameters outlined below:

Metals: VOCs, BOD_5, COD, Suspended Solids, Total phosphorus, nitrate, nitrite, ammonia and total Kjeldahl nitrogen.

General Chemistry parameters: chloride, alkalinity, hardness, phenols, dissolved organic carbon (DOC), field pH, field conductivity and field temperature.

(b) Flow monitoring devices and recorders shall be installed, maintained and operated to measure the quantity of leachate being conveyed by the leachate pumping station.

2.2 Following review of any of the analytical results or any of the reports required by Condition No. 3 (Reporting), the District Manager may alter the frequencies and location of sampling and parameters for analyses required by this Certificate.

3. REPORTING

3.1 The Owner shall prepare and submit a performance report to the Regional Director on an annual basis. The reports shall contain, but shall not be limited to, the following information in a format acceptable to the District Manager:

(a) a summary of all monitoring reports submitted in the reporting period including the volume and duration of the leachate pumped to the sewage treatment plant;

(b) a comprehensive interpretation of all monitoring data and analytical data collected relative to the works during the reporting period;

(c) review the sewage treatment plant performance data and assess the impact of treating leachate during the reporting period;

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

- Condition No. 1 is included to define terms used in this Certificate of Approval.

- Condition Nos. 2 and 3 are imposed to determine the performance of the leachate pumping facility and assess any adverse impact on the sewage treatment plant from treating leachate.

This Certificate of Approval is to be read in conjunction with Certificate of Approval No. 3-0408-93-006 issued for the ground water collection and pumping system for Valentine Avenue Landfill Site.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

4. The name of the appellant;
5. The address of the appellant;
6. The Certificate of Approval number;
7. The date of the Certificate of Approval;
8. The name of the Director;
9. The municipality within which the sewage works are located;

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

This Notice must be served upon:

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

AND

The Director,
Section 53, Ontario Water Resources Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 29th *day of* June, 1994

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY
W. GREGSON, P. ENG.

MAILED ON JUN 30 1994

BY fn

CM/fn

Attn: -Mr. R.R. Shaw, Clerk, Town of Kincardine
cc: -District Manager, MOEE Owen Sound District Office
-Mr. G.D. Ferraro, P. Eng., Conestoga-Rovers & Associates Limited

NOTICE

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine, Ontario
N2Z 1Z9

You are hereby notified that the approval issued under Certificate of Approval No. 3-0354-94-006 dated June 29, 1994 for the construction of a leachate pumping station on Parts of Lots "A" and "B", Concession A, Town of Kincardine, serving Interim Expansion Area of the Valentine Avenue Landfill Site is hereby amended to include the following works:

Leachate Pumping Station and Forcemain

- replacement of existing submersible leachate pump with a new 4.1 L/s capacity submersible pump and modification of discharge piping and guide rail system;

- in accordance with the design brief submitted by Conestoga-Rovers & Associates, Consulting Engineers.

The reason for this amendment is as follows:

The reason for this amendment is to increase the pumping velocity to assist in the prevention/removal of heavy iron/calcium precipitate within the pump seal assembly. The Ministry has reviewed the design brief submitted for the above works and is satisfied that the proposed pump replacement is in accordance with the Ministry requirements.

This Notice shall constitute part of Certificate of Approval No. 3-0354-94-006 dated June 29, 1994.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, provides that the Notice requiring the hearing shall state:

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

The Notice should also include:

- The name of the appellant;
- The address of the appellant;
- The Certificate of Approval number;

6. *The date of the Certificate of Approval;*
The name of the Director;
The municipality within which the sewage works are located;

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

This Notice must be served upon:

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

AND

The Director,
Section 53, *Ontario Water Resources Act,*
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 13th *day of* March, 1997.

THIS IS A TRUE COPY OF THE
ORIGINAL NOTICE MAILED
ON March 17/97
SIGNED

M. Dhalla, P.Eng.,
Director,
Section 53,
Ontario Water Resources Act.

FL/ba

Attn: -Ms. Maureen A. Couture, Clerk, Town of Kincardine
cc: -District Manager, MOEE Barrie District Office
-Mr. Wayne Cooley, P.Eng., Conestoga-Rovers & Associates

Ontario

4074
Dec

MAY 2 2001

June 8, 2001

Ministry of the Environment
Ministère de l'Environnement

54 Cedar Pointe Drive
Unit 1203
Barrie ON L4N 5R7
tel: (705) 739 6441
fax: (705) 739 6489

54 Cedar Pointe Drive
Bureau 1203
Barrie ON L4N 5R7

May 17, 2001

Mr. John deRosenroll, Administrator
Municipality of Kincardine
707 Queen Street
Kincardine, ON, N2Z 1Z9

Dear Mr deRosenroll:

Re: Leachate Collection System, Annual Monitoring
Valentine Avenue Landfill Site, Kincardine
MOE File: SI BR KB CA 410

The 2000 Performance Report for the Valentine Avenue Landfill Leachate Collection System (LCS) recommends that the LCS monitoring program be amended from monthly to a quarterly frequency (i.e. January, April, July and October).

Monitoring data collected monthly since late 1997 provides baseline analytical data for the leachate.

In accordance with condition 2.2 of Certificate of Approval No. 3-0354-94-006, the Valentine Avenue Landfill Leachate Collection System monitoring program is altered from monthly to quarterly sampling frequency.

If you have any questions, please contact Ian Mitchell at (519) 371-2901.

Yours truly,

D.C. (Don) Beckett
District Manager
Barrie/Owen Sound District
Southwestern Region

cc. Ian Mitchell/Larry Struthers, MOE, Owen Sound
Don Campbell, Conestoga Rivers & Associates, Waterloo

Appendix B

Landfill Cap Inspections

Appendix B.1

July 2014 Inspection

Kincardine Ward 1 Landfill - Final Cover Inspection

Date on Inspection: July 31, 2014
Inspected Conducted by: Jim Yardley, Conestoga-Rovers & Associates (CRA)

Final Cover Placement Overview:

- Final Cover placement of the Expansion Landfill Area (ELA) commenced in 2010 and was conducted annually as areas of the ELA reached final grade.
- Final cover placement of the ELA was completed in the summer of 2013.
- Inspection of the final cover in the fall of 2013 indicated several areas where erosion had occurred and required repair.
- Repair of the final cover (placement of additional clay, topsoil, and seed) was completed in the spring of 2014

Inspection Requirements:

- Approved closure plan requires quarterly visual inspections of the final cover for the initial 2 years post-closure and annual inspections for the next 3 years.
- The final cover inspection program is to be reviewed in the 5th year of the program.
- The visual inspection is to ensure that vegetation has been established on the final cover and that erosion of the final cover is not occurring.

Inspection Notes and Comments:

- This is the initial inspection of the ELA final cover.
- The ELA final cover was traversed by the inspector.
- Erosion areas were not encountered or noted in the ELA final cover.
- Repair areas completed in the spring of 2014 do not show signs of erosion. Vegetation is being established on these areas, but at the time of inspection had not fully developed.
- The cover placed in 2013 and prior, and that are not related to the repaired areas, has a strong vegetative growth.
- Photos of the ELA cover are attached.

Inspection Recommendations:

- The next inspections should occur in early September and the then in mid- November of 2014.
- After the early September 2014 inspection, re-seeding should be conducted of the areas that have weak vegetation cover. The areas should be hand seeded with a standard road side seed mixture. Topsoil should be applied as required.

Attachments:

1) Figure 4.1 of the Closure Report
2) Selected photos of ELA final cover

Photo 1 - From southwest corner of ELA looking north. Shows vegetation growth in cover. In foreground is the edge of the repaired area.

Photo 2 - Looking northeast at edge of repair area by MH7. Light green is reinforcement matting. Good vegetation growth below mat.

Photo 3 - At northeast corner of ELA looking southwest. Show strong vegetation growth along the slope.

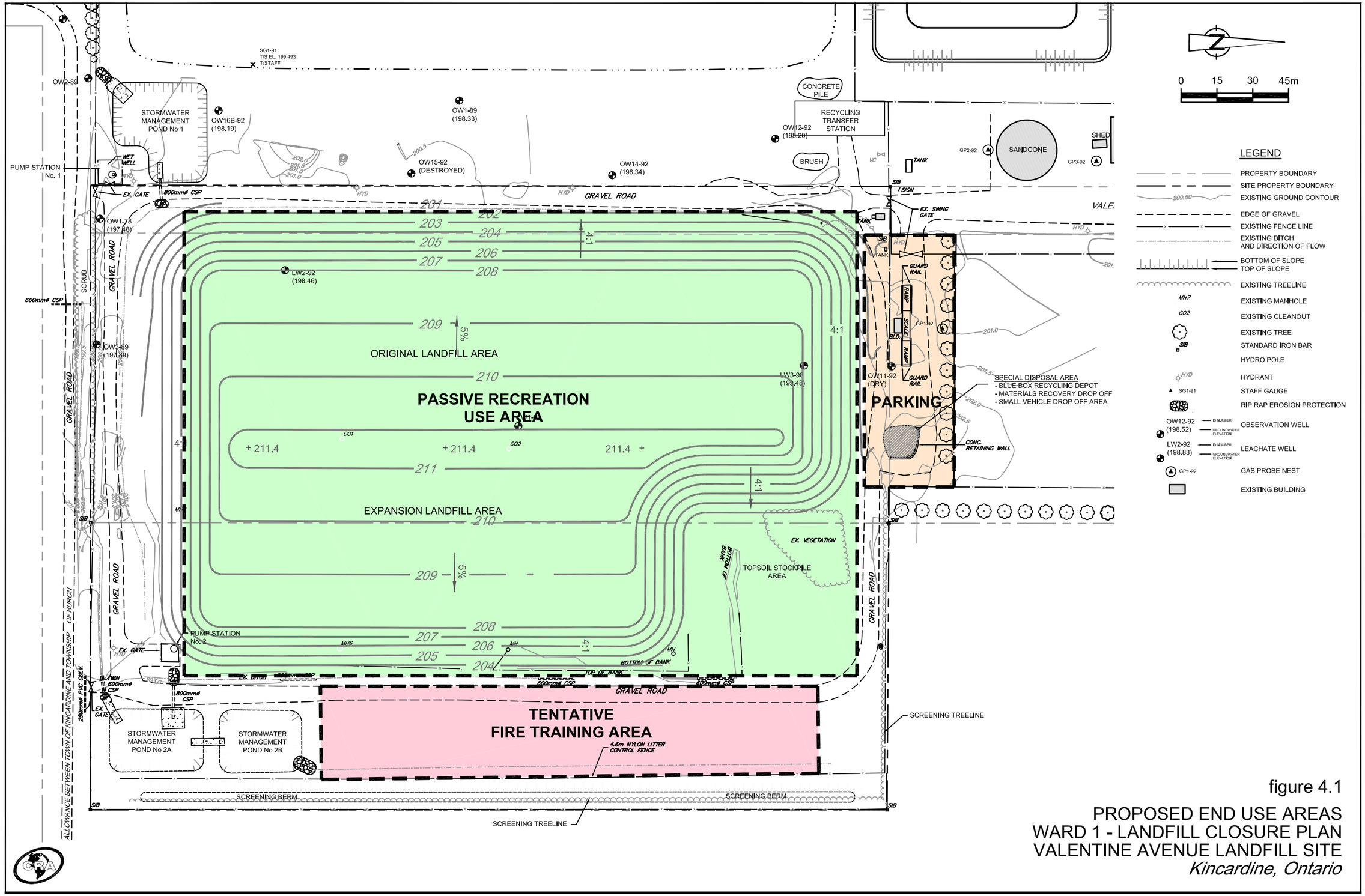


figure 4.1

PROPOSED END USE AREAS
WARD 1 - LANDFILL CLOSURE PLAN
VALENTINE AVENUE LANDFILL SITE
Kincardine, Ontario

Appendix B.2

October 2014 Inspection

Kincardine Ward 1 Landfill –Final Cover Inspection

Date of Inspection: October 7 2014
Inspected Conducted by: Don Huston, Municipality of Kincardine
Inspection Notes and Comments:

- There was no erosion areas encountered during inspections
- The repairs that were completed in the spring do not show signs of erosion.
- Strong vegetation is being established on majority these areas.
- There is one small area that has lighter growth near the southeast manhole
- The ditch by the south east manhole has water backed up at the culvert and a contractor has been notified to clean end of the culvert out to let water flow.
- Photos of the ELA cover are attached

Inspection Recommendations:

- The next inspection should occur in mid- November of 2014
- Re-seeding should be conducted of the area of the weak vegetation and a straw erosion mat for the winter and for spring run off

Attachments:

1. Selected photos of the final cover

Site Photographs

Photo 1 – Southeast corner looking north. Show strong vegetation growth along the slope

Photo 2 – Southeast corner manhole looking north lighter vegetation growth on the west side of the manhole with no signs of erosion

Site Photographs

Photo 3 – Southeast corner looking north. Show strong vegetation growth along the slope

Photo 4 – between south end manhole and middle manhole looking south ditch filled with water culvert blocked (will be cleaning culvert ends out Mid Oct 2014)

Site Photographs

Photo 5 – Southeast corner of concrete pad

Photo 6 – Northeast corner of concrete pad

Photo 7 – at manhole on the northeast side looking south. Strong vegetation growth no signs of erosion

Photo 8 – At manhole on the northeast side looking south. Strong vegetation growth under and through the matting no signs of erosion. Light green is reinforcement matting

Site Photographs

Photo- 9 at the northeast corner looking southwest up the slope. Strong vegetation growth no signs of erosion.

Appendix B.3

November 2014 Cap Repair

Molenhuis, Allan

From: Yardley, Jim
Sent: Tuesday, April 28, 2015 11:49 AM
To: Molenhuis, Allan
Cc: Project Email Filing
Subject: Cap repair - ward 1 Nov 11 2014 ~COR-004074~
Attachments: ward 1 Nov 11 2014.jpeg

-----Original Message-----
From: Don Huston - Municipality of Kincardine [mailto:dhustonkpwd@bmts.com]
Sent: Monday, December 01, 2014 3:46 PM
To: Yardley, Jim
Cc: JRoppel@kincardine.net
Subject: Emailing: ward 1 Nov 11 2014

Jim

On Nov 11 2104 crews placed straw matting down on the side hill at the Ward 1 landfill on the east side near the south corner where growth was light

Don Huston CRS-I
Manager of Operations
Municipality of Kincardine
Phone 519-396-3468 ext 120
Fax 519-396-1430
www.kincardine.net

Your message is ready to be sent with the following file or link attachments:

ward 1 Dec 11 2014

Appendix B.4

October 2015 Inspection

Kincardine Ward 1 Landfill –Final Cover Inspection

Date of Inspection: October 30, 2015
Inspected Conducted by: Dan Turner, GHD

Final Cover Placement Overview:

- Final Cover placement of the Expansion Landfill Area (ELA) commenced in 2010 and was conducted annually as areas of the ELA reached final grade.
- Final cover placement of the ELA was completed in the summer of 2013.
- Inspection of the final cover in the fall of 2013 indicated several areas where erosion had occurred and required repair.
- Repair of the final cover (placement of additional clay, topsoil, and seed) was completed in the spring of 2014

Inspection Requirements:

- Approved closure plan requires quarterly visual inspections of the final cover for the initial 2 years post-closure and annual inspections for the next 3 years.
- The final cover inspection program is to be reviewed in the 5th year of the program.
- The visual inspection is to ensure that vegetation has been established on the final cover and that erosion of the final cover is not occurring.

Inspection Notes and Comments:

- The ELA final cover was previously inspected by Municipality staff on May 29, 2015. A detailed site walk was completed and vegetation growth on sideslopes was noted to be strong.
- The ELA final cover was traversed by the inspector on October 30, 2015.
- Strong vegetation growth was noted across the top of the final cover and along the west, north, and south sideslopes.
- Strong vegetation growth was noted across the majority of the east sideslope. One area of the east sideslope, approximately 14 m by 10 m, near the southeast corner showed weak vegetation growth and minor cracking.
- Repair areas completed in the spring of 2014 do not show signs of erosion. Vegetation was well established on previous repair areas with the exception of the weak vegetation area identified above.
- Erosion areas were not encountered or noted in the ELA final cover.
- Photos of the ELA cover are attached.

Site Photographs

Inspection Recommendations:

- The next annual inspection should occur in summer of 2016.
- After the summer 2016 inspection, re-seeding should be conducted in the area that has weak vegetation cover. The areas should be hand seeded with a standard road side seed mixture. Topsoil should be applied as required.

Attachments:

1. Figure 4.1 of the Closure Report
2. Selected photos of ELA final cover

Site Photographs

Photo 1 – West sideslope vegetation growth from southwest corner, looking north

Photo 2 – Poor vegetation growth on east sideslope, near southeast corner

Photo 3 – Minor cracks at area of weak vegetation growth on east sideslope

Photo 4 – Strong vegetation growth on top of final cover

Photo 5 – Strong vegetation growth on repair areas on east sideslope

Appendix C

MECP Correspondence

Appendix C.1

MECP Comments on the 2012 Annual Report

4074-10

Rec'd CRA
FEB 03 2014

Ministry of the Environment
Southwestern Region
Owen Sound District Office
3rd Flr
101 17th St
Owen Sound ON N4K 0A5
Fax: (519)371-2905
Tel: (519) 371-6191

Ministère de l'Environnement
Direction régionale du Sud-Ouest
Bureau du district d'Owen Sound
101 rue 17th, 3ème étage
Owen Sound ON N4K 0A5
Télécopieur: (519)371-2905
Tél:(519) 371-6191

Ontario

January 30, 2014

Mr. Gagan Sandhu
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Dear Mr. Sandhu

RE: 2012 Annual Monitoring Report, Kincardine Ward 1 Landfill Site

We have received a copy of the report titled "2012 Annual Monitoring Report, Ward 1 Landfill Site, Groundwater Collection System and Leachate Collection System Environmental Monitoring Programs", prepared by Conestoga-Rover & Associates, dated June 2013. Our Regional Hydrogeologist has reviewed the report and provides the following comments.

Please note that this review does not include an exhaustive auditing of the accuracy of the reported data presented in the above documents. The purpose of this review is to comment on the results of the groundwater monitoring programs conducted in the years 2009 to 2012.

In November 2011 the site ceased receiving waste. The site closure activities began in 2010 and proceeded with placing final cover over the recently active filling area. Most site closure activities were completed by the end of 2012. The rest were expected to be completed in 2013.

1. The reports state that monitors OW14-92 and OW15-92 were destroyed, and that OW18A-96 and OW18B-96 cannot be sampled. The reports recommend abandonment and replacement of these monitors. These monitors should be sampled as required by the ECA or decommissioned in accordance with the O. Reg. 903. It is understood that the monitors were abandoned in the fall of 2013 and that this work will be documented in the 2013 annual report.

2. The results of hydraulic monitoring indicate that the shallow groundwater flows predominantly towards the northwest. The water levels measured in the nested monitors OW16A-96 and OW16B-96 indicate weak to moderate downward vertical gradients. OW14-92 and OW15-92 should be replaced to assess the effectiveness of Groundwater Collection System (GCS) hydraulic capture.

3. The results for leachate monitors indicate that the concentrations are within their historical ranges. The results also indicate that the leachate strength in monitor LW2-92 continued decreasing. This decrease is forecast to continue after the closure. A number of VOC parameters were detected at low levels in the leachate monitors though there were a few measurements above ODWS.

4. The water quality continued to show moderately elevated levels of leachate indicators. Chloride concentrations in the downgradient southern boundary monitor OW1-78 and in monitor OW11-92 located close to the old landfill toe continued to show elevated levels, exceeding the Reasonable Use Guidelines (RUG) concentration.

5. The report states that landfill gas was not detected in 2009, 2011 or 2012 by any of the gas probes. The historical and recent results are listed in Table 5.9 of the 2012 report. All of the reported values are zeros. These results may not be accurate. The reports did not provide any information on the construction details of the gas probes or the monitoring equipment (i.e. the gas detector model, its accuracy and method of calibration). Instruments should be checked and calibrated before and after monitoring. In the future the proponent should also measure oxygen to help assess the reliability of the measured methane concentrations.

6. The total volumes in cubic metres of groundwater and leachate extracted and discharged to the Municipality's Waste Water Treatment Plant are reported as follows:

Year	2009	2010	2011	2012
GCS	12,523	9,745	12,422.5	16,914.5
LCS	6,692	3,552	4,639.9	2,814.7

The volume of groundwater extracted in 2012 increased over that in previous years. With this groundwater increase, the water quality outside the GCS continued to show non-compliance in monitor OW1-78. The 2012 report recommended review of performance and operation of GCS to ensure site compliance with respect to the RUG along the southern site boundary. We support this recommendation.

The volumes of extracted leachate decreased significantly in 2009 compared to the 14,366 m^3 pumped in 2008. Since then it has continued to decrease except for a slight increase in 2011. This decline is attributed to progressive capping of the filled areas.

7. Following are editorial comments that can be considered in future reporting.

   - The maps should be reproduced in a format that clearly display features discussed in the report. For example two important features, the GCS and LCS are described in the 2012 report and not clearly shown in figure 1.2. Also all features in this figure are labelled with small fonts and some are in pale colours which made it very difficult for the reviewer to identify these features.

- In the site plan legend (figure 1.2) two dashed lines are described as property boundary and site property boundary. The difference between these boundaries is not clear. Future reports must include a map that shows the approved site boundary and the boundary of the filled area.

- It would be beneficial to enhance the conceptual site model by updating the hydrogeological cross-section (figure 1.3 in the 2012 report) to include data from the expanded landfill area (ELA).

- Figure 6.1 in the 2012 report is difficult to interpret as it contains too much data. Or hydrogeologist recommends displaying the data in this graph in more than one graph.

- A reference list including full citations for all reports referenced in the text must be added to the report.

- The construction details and borehole logs for all monitors should be appended to the report.

- For ease of review of future reports, copy of the full report in PDF, site maps in a georeferenced CAD files and all monitoring data in EXCEL files should be included in the submission.

At this time the main concerns with this site are the continued exceedances of the RUG for chloride in monitor MW1-78 and the potential off-site impact along the southern boundary of the site. As such, a plan to mitigate this impact should be considered. Based on our review of the reports we agree with the recommendations provided in the 2012 report.

If you have any questions concerning this letter, please contact the undersigned at (519) 371-6191.

Yours truly,

Ian Mitchell , P.Eng.
District Engineer
Owen Sound District Office

File Storage Number: SI BR KB CA 610

cc. Jim Bromley, MOE, Owen Sound
Jim Yardley, Conestoga-Rovers, Waterloo

Appendix C.2

Response to the 2013 Landfill Inspection

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

January 20, 2013 Reference No. 004074

Mr. Laszlo Barti
Ministry of the Enviornment
Owen Sound District Office
3rd Floor
101 17th Street East
Owen Sound, Ontario
N4K 0A5

Dear Mr. Laszlo:

Re: Response to Closed Waste Disposal Site Inspection Report
Dated September 20, 2013
ECA A270203
Kincardine Ward 1 Landfill Site, Kincardine, Ontario

1.0 Introduction

The Municipality of Kincardine (Municipality) has requested Conestoga-Rovers & Associates (CRA) to provide a response to your email of December 20, 2013 and the associated Closed Waste Disposal Site Inspection Report that relates to the inspection conducted on August 14, 2013 and that you signed on September 20, 2013. Section 2 of this letter provides a summary of the requested action items identified in Section 5 of the Inspection Report followed by responses to each item. Section 3 of this letter provides a summary of findings identified in Section 6 of the Inspection Report followed by the responses to each item.

2.0 Section 5.0 - Action Items and Responses

2.1 Action Items

Section 5.0 requested the following actions be completed:

1. Prepare an action plan including reasonable timelines regarding the following:
   a. Completion of the final cover, it has not been completed
   b. Implementation of erosion control measures at the east side of the landfill mound
   c. Establishment of a proper vegetative cover on the eroding easterly slope of the final cover
   d. Decommissioning of destroyed/ damaged monitoring wells and replacement of the abandoned well in more suitable permanent locations
2. Register the landfill ECA on title as required by Condition 24 of the ECA.

2.2 Response to Action Items

Item 1a and 1c - Completion of Final Cover: The final cover placement (clay, topsoil and seeding) was completed in the spring/summer of 2013. Several areas of the final cover that were completed have erosion gullies that occur during 2013, while other areas indicate that the vegetation catch is low or unacceptable. The erosion areas are located on the eastern slope and the weak catch of vegetation; occur in several locations across the recently placed final cover.

In accordance with Section 5.1 and 7.6 of the Ward 1 Closure Plan, in the spring of 2014 (May-June), subject to appropriate weather conditions, the eroded sections of the final cover will be re-graded and additional clay placed as required, topsoil will be placed as per the Closure Plan, and the remediated areas seeded. For the areas of that have weak vegetation catch, topsoil will be added as required and the areas re-seeded during the spring 2014 period.

Item 1b - Implementation of erosion control measures at the east side of the landfill mound: The majority of the landfill cover on the east side of the landfill mound has a good vegetation catch. As such, silt fencing will not be installed at the toe of the slope. Prior to the proposed remediation work of the erosion areas, a straw bale check dam will be installed at the downstream end of the eastern slope of the ditch (prior to the storm water pond entrance) to minimize the potential for sediment to reach the storm water pond. Once the vegetation has been established, the straw bale check dam will be removed.

During the quarterly inspection program, the eastern ditch will be assessed with regard to sedimentation impacts and if required, it will be recommended that the sediment be removed. The recommendation for removal of sediment, if required, would be completed once vegetation has been established on the recently remediated areas.

Item 1d - Decommission/ Replacement of Monitoring Wells: The abandonment, replacement and repair of monitoring wells was completed at the Site in September of 2013. The abandonment, replacement and repair of the monitoring wells will be documented in the 2013 Annual Report for the Site.

Item 2 - Registration of the ECA on Title: The ECA was registered on title on September 19, 2013. Attachment 1 provides documentation that confirms registration of the ECA on title.

3.0 Section 6.0 - Findings and Responses

3.1 Findings

The following comments were provided in Section 6.0:

1. Provide records of quarterly inspections of the final cover
2. Prepare and submit a training plan for staff as per ECA Condition 6
3. Prepare and submit a maintenance program for all aspects of the landfill operation
4. Prepare and submit a detailed report regarding the actions taken to address the 2012 Annual Report Recommendations.

3.2 Responses

Item 1 - Quarterly Inspections: Quarterly inspections of the landfill cover will commence in 2014. As per the Closure Plan, the quarterly inspections will occur for a two year period (2014 and 2015). The quarterly inspections will be documented in the Annual Reports. As per the Closure Plan, at the end of the two year period, the inspections will be conducted annually. The inspection program will be added to the monitoring program for the landfill that is documented in the Annual Report. The inspections will be focused on the cover and vegetation status.

Item 2 - Training Plan: The training program for the landfill staff will be reviewed by the Municipality. The training program will be update as required to address the issues identified by the MOE as well as the requirements noted in each of the ECAs for the other Municipal landfill sites. The proposed schedule for this task is to review the training program and develop a revised training program during the first half of 2014 and then conduct a training session during the third quarter of 2014.

Item 3 - Maintenance Program: The maintenance programs for the operating components of the closed landfill (mainly leachate pumping system and the groundwater collection system will be reviewed and updated during the first half of 2014 by the Municipality. The maintenance programs will be adjusted as required. A summary of the maintenance program will be added to the Annual Report.

Item 4 - 2012 Annual Report Recommendations: The actions related to the 2012 Annual Report recommendations will be documented and updated in the 2013 Annual Report. The Site Operations section of the Annual Report will be revised to focus on the closure operations and related work items.

The responses provide a general outline of the work to be completed related to the MOE inspection. Responses to the various items will be documented in the Annual Report that covers the year of the work. The Municipality's intent is to have the Annual Report document work completed at the Site.

CONESTOGA-ROVERS & ASSOCIATES

January 20, 2014 Reference No. 004074

Should you have any questions with regard to the work, please do not hesitate to call.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

James R. Yardley, P.Eng.

JY/mg/1

cc: Murray Clarke, Municipality of Kincardine
Don Houston, Municipality of Kincardine
Jean Roppel, Municipality of Kincardine
Alan Molenhuis, CRA

Attachment A

Properties

PIN 33315 - 0013 LT

Description PT LT A, B CON A KINCARDINE AS IN R137866 & R301354; KINCARDINE

Address KINCARDINE

Party From(s)

Name THE CORPORATION OF THE TOWN OF KINCARDINE

Address for Service 1475 Concession 5
R.R. #5
Kincardine, Ontario
N2Z 2X6

This document is not authorized under Power of Attorney by this party.

This document is being authorized by a municipal corporation Gagan Sandhu-Director of Public Works..

Party To(s) *Capacity* *Share*

Name MINISTRY OF ENVIRONMENT AND ENERGY

Address for Service 2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

Statements

Schedule: See Schedules

Signed By

George Charles Magwood 215 Durham Street, Box 880
Walkerton
N0G 2V0 acting for Party From(s) Signed 2013 09 19

Tel 519-881-3230

Fax 519-881-3595

I have the authority to sign and register the document on behalf of the Party From(s).

Submitted By

Magwood Van De Vyvere & Grove-McClement LLP 215 Durham Street, Box 880
Walkerton
N0G 2V0 2013 09 19

Tel 519-881-3230

Fax 519-881-3595

Fees/Taxes/Payment

Statutory Registration Fee $60.00

Total Paid $60.00

File Number

Party From Client File Number : 15829

STATEMENTS

I, George C. Magwood, solicitor, state:

1. That the attached Provisional Certificate of Approval for a Waste Disposal Site No. A 270203 dated September 29, 1994 affects all of the lands described in PIN 33315-0013 (LT).

2. This statement is made for no improper purpose.

George C. Magwood

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

The Corporation of the Town of Kincardine
707 Queen Street
Kincardine Ontario
N2Z 1Z9

for the use and operation of a 4.94 hectare landfilling site within a total site area of 9.11 hectares *all in accordance with the following plans and specifications* as specified in Schedule "A" attached.

Location: Part of lots A and B
Concession "A", Plan 61
Town of Kincardine, County of Bruce

which includes the use of the site only for the disposal *of the following categories of waste (Note: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval)* domestic, commercial and non-hazardous solid industrial wastes *and "other" wastes limited to demolition materials, and sewage sludge from the Town of Kincardine Water Pollution Control Plant.*

The site has also been approved for the transfer and processing (sorting and recycling) of separated fractions of domestic, commercial, and solid non-hazardous industrial waste and subject to the following conditions:

DEFINITION OF TERMS:

For the purpose of this Provisional Certificate of Approval:

1.1 "This Certificate" means Provisional Certificate of Approval No. A-270203 dated September 29, 1994.

1.2 "Director" means any one or more of the persons who from time to time are so designated for the purpose of Section 30 of the Environmental Protection Act;

1.3 "District Manager" means the District Manager of the Owen Sound District Office of the Ontario Ministry of Environment and Energy or such other official of the Ministry as may be assigned the duties of the District Manager of the Owen Sound District;

1.4 "EPA" means The Environmental Protection Act, chapter E.19, R.S.O. 1990;

1.5 "Incident" means an abnormal event or occurrence which may endanger health, cause a nuisance or adversely affect the environment;

1.6 "Ministry" or "MOEE" means the Ontario Ministry of Environment and Energy;

1.7 "Owner" means the corporation of the Town of Kincardine;

1.8 "Regional Director" means the Regional Director of the Southwestern Region, Ontario Ministry of Environment and Energy or such other official of the Ministry as may be assigned the duties of the Regional Director, Southwestern Region;

1.9 "Design and Operations Report" means the October 1993 Design and Operations Report - Interim Expansion; prepared by Conestoga - Rovers & Associates (item 3 in schedule "A"); and

1.10 "Site" means the landfill site located at part of Lots A and B, Concession "A", Plan 61, Town of Kincardine, County of Bruce.

2. This Provisional Certificate of Approval replaces all Provisional Certificates of Approval and Notices of Amendment identified by No. A-270203 issued under Part V of the EPA.

3. The Owner shall comply with the Conditions and schedules in this Certificate as modified or supplemented by the Director in accordance with the Director's mandate under the EPA. The requirements specified in this Certificate are minimum requirements and do not abrogate the need to take all reasonable steps to avoid violating the provisions of other applicable legislation. If the Director, Regional Director or District Manager identifies an unacceptable environmental problem associated with the Site, the Owner, once aware of the problem, shall immediately take all necessary steps to mitigate or remedy the resulting impacts. Nothing in this condition affects any right of appeal the Owner may otherwise have under the EPA.

4. The requirements of this Certificate are severable. If any requirement of this Certificate to any circumstances is held invalid, the application of that requirement to other circumstances and the remainder of this Provisional Certificate of Approval shall not be affected.

5. The Site shall be operated and maintained in accordance with the Environmental Assessment Board's decision of March 10, 1994, the conditions of this Certificate and the plans and specifications contained in the documents listed in Schedule "A". Should there be any discrepancy between any of the documents listed above, the order of precedence for resolving differences shall be as follows:

The Environmental Assessment Board Decision EP-93-05 dated March 10, 1994.

The conditions on the Certificate of Approval;

The remaining documents in order of their most recent date.

6. The owner shall provide training to all on-site personnel relating to all legal requirements for the operation of the Site.

7. Only wastes generated within the boundaries of the Town of Kincardine shall be accepted for disposal at the Site.

8. The operation of the landfill site shall terminate after the earlier of:

8.1 (a) five (5) years after the date of this certificate issued in accordance with the Environmental Assessment Board's decision EP-93-05.

(b) the date on which fill has reached the limits of the approved contours as indicated on the September 1993 "Design and Operation Drawing No. 3, - Final Contour Plan - Interim Expansion";

(c) the commencement of operation of an alternative waste disposal site in accordance with the Bruce County Waste Management Master Plan.

8.2 Notwithstanding the above, the period of operation of the landfill may be extended for a further term of up to two years in the event that, at the conclusion of the five year term provided for in condition 8.1 (a), the Director of the Approvals Branch of the Ministry of the Environment and Energy (MOEE) is satisfied that all of the following conditions have been met:

(a) The environmental assessment for the waste disposal component of the Bruce County Waste Management Master Plan, providing for an undertaking which includes an alternative waste disposal facility or facilities for the Town of Kincardine, has been submitted to the MOEE by December 31, 1995.

(b) At the end of the five year term referred to above an alternative waste disposal facility (or facilities) arising out of the Bruce County Waste Management Master Plan is not available to receive the Town's waste.

(c) Sufficient additional capacity remains in the Valentina Avenue landfill site at the end of the five year term, referred to above, to provide up to two further years of disposal of the Town's waste.

(d) The annual reports filed by the Town with respect to the operation of the landfill, as required by condition 22 of this certificate has established that:

(i) the landfill is operating properly from an environmental protection perspective;

(ii) the conditions of approval in this certificate have been complied with;

(iii) the landfill has been operating in compliance with applicable legislation, regulations and MOEE policies;

(iv) the Bruce County Waste Management Master Plan process is developing in a manner which is satisfactory to MOEE.

9. The Owner shall place a sign at the main entrance to the Site on which is displayed in prominent letters the following information:

- the name of the Site
- the operating authority
- the approved hours of operation
- the hours the Site is open to accept waste from the public
- the telephone number for reporting emergency situations occurring at the Site during non-operating hours

10. The approved hours of operation for the Site are:

Monday through Friday: 8:00 a.m. - 4:30 p.m.

Saturday: 8:00 a.m. - 12 noon.

The above hours of operation may be amended with the written approval of District Manager.

On-site equipment may operate one hour beyond the Site's closing time to complete daily maintenance operations at the Site.

11. During non-operating hours the Site is to be secured against access by unauthorized persons.

12. The following specific conditions must be complied with subject to any variations agreed to or issued by the Director, in writing:

12.1 No waste shall be received from the public for disposal at the Site except during operating hours when the Site is under the supervision of the site attendant or his alternate.

12.2 Weather permitting, each day's deposited waste shall be covered in a manner acceptable to the District Manager so that no waste is exposed to the atmosphere. If an alternative material to soil is to be used as daily cover it must qualify as a non-hazardous waste under R.R.O. 1990 Reg. 347. A minimum of 30 cm. of cover shall be applied to areas where no further landfilling will occur for a period of 30 days or more.

12.3 The burning of wastes at the Site is prohibited.

12.4 Scavenging is prohibited.

13. The Owner shall maintain and use weigh scales to weigh and record all incoming waste at the Site prior to disposal.

14. All construction equipment associated with the development, operation or closure of the Site shall comply with the MOEE Model Municipal Noise By-Law Publication NPC-115. A landfill equipment program shall be implemented with particular attention being given to maintaining and where feasible improving the noise muffling systems on landfill construction equipment. Landfill construction equipment shall be inspected at least annually. Other equipment which may be used at the Site from time to time shall also comply with the MOEE noise abatement standard.

15. On-site roads shall be treated with water or a dust suppressant as required to minimize dust generation.

16. An inspection of the Site and adjacent lands shall be carried out as required to ensure that litter is being adequately controlled on site. Litter from the Site shall be picked up as needed along the Site's perimeter and access road and from adjacent properties.

17. Should an outbreak of vermin or vector occur at the Site, the Owner shall take all steps within the Ministry guidelines to control the outbreak, including the services of a licensed exterminator. Control measures used shall be appropriate for the vermin or vector in question.

18. The Owner shall undertake the monitoring programs contained in the documents listed in Schedule "B" subject to any amendments which the Director may authorize in writing from time to time.

19. Any groundwater monitoring wells that are damaged or whose integrity is in doubt shall be repaired or replaced forthwith.

20. All monitoring wells which form part of any monitoring program shall be properly capped and locked.

21. Wells no longer required for monitoring purposes shall be abandoned in accordance with R.R.O. 1990, Reg. 903.

22. An annual report on the development and operation of the Site, including the monitoring programs, shall be submitted to the Regional Director by April 30th of the year following the calendar year covered by the report. The report shall include, but not be limited to, the following:

- progressive use of the landfill Site
- weight of wastes received and volume deposited on-site
- placement and integrity of final cover
- conformance with development and operation plans
- remaining site capacity
- operational problems encountered and/or complaints received and the remedial action taken
- monitoring program results, data interpretation and recommendations
- a summary of the findings from the annual inspection of the landfill construction equipment.
- the occurrence of any unexpected incident negatively impacting on the Site, describing the nature of the incident, how it was managed and what action has been taken to avoid a recurrence.
- waste deposition locations for the next 12 month period.
- waste diversion programs, results in previous year and future initiatives.
- a summary of what action the Town is aware of that has been taken by the Town or others that would improve, maintain or diminish the condition of the Kincardine Swamp.

23. By 12 months before the Site's expected closure the owner shall submit to the Regional Director for approval a site closure plan. The site closure plan shall include but shall not be limited to, the following matters:

- fencing security and access control;
- final contours, cover and vegetation;
- post closure after use;
- long-term maintenance and monitoring of the Site;
- updated contingency plans to mitigate unacceptable environmental impacts.

24. This Certificate of Approval shall be registered on the title to the lands comprising the Site. No operation shall be carried out at the Site after 60 days of this condition becoming enforceable unless the certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the Site and unless a duplicate registered copy thereof has been returned by the applicant to the Director, Approvals Branch, Ministry of the Environment and Energy.

25. Should the leaf and yard waste composting facility to be established at the Site require a Certificate of Approval under O. Reg. 101/94 s. 34, EPA, an "Application For A Certificate Of Approval For A Waste Disposal Site (Processing)", along with documents supporting the application, shall be submitted to the Director within 60 days of the date of issuance of this Certificate.

26. The Owner shall undertake the monitoring programs and reporting as required by the approvals issued under Ontario Water Resources Act (OWR Act) for the following works pertaining to the Valentine Avenue Landfill Site:

- Storm Water Management Facility
- Leachate Collection System, including Leachate Pumping Station and Forcemain.
- Leachate co-treatment at the Kincardine Waste Water Treatment Plant as included in the Certificate of Approval for the Kincardine W.W.T.P.
- Groundwater Interceptor Drain, including Groundwater Pumping Station and Forcemain.

27. During the period this Certificate is in force, the Owner shall continue to apply reasonable efforts to implement additional waste reduction programs to further reduce the quantity of waste destined for disposal at the Site. It shall also, as a participant in the Bruce County Waste Management Master Plan, actively encourage the other participants to proceed as quickly as possible to bring the Master Plan process to a timely conclusion.

28. The Owner shall maintain the Valentine Avenue Landfill Public Advisory Committee (PAC) to review and provide recommendations on annual operational and monitoring reports, landfill site protocols, proposed end use of the Site and any other information which is pertinent to landfilling operations at the Site. These recommendations, along with any minority positions, may be forwarded to the Owner or the Director for their consideration. The PAC shall not exercise any supervisory, regulatory or approval roles with respect to the operation of the Site. The Owner shall maintain a list of current documents which govern the operation of the Site. The PAC shall be entitled upon request to copies of records and documents in the Owner's possession relevant to the Site, except for such information as the Council of the Owner is entitled to withhold from the public at law.

29. Should the results of the leachate quality monitoring program indicate that the established trigger values for VOCs are exceeded and that the leachate concentrations could detrimentally impact the effluent quality of the Town of Kincardine Waste Water Treatment Plant, the Owner shall immediately undertake to implement the Leachate Disposal Contingency Plan described in Section 7.6.5 of the Design and Operation Report (item 3 of Schedule "A").

30. The Owner shall install one additional bore hole into the St. Joseph till in accordance with the proposal set out in CRA's letter to MOEE (Ferraro to Bye) of February 15, 1994 (item 9 of Schedule "A").

31. The Owner shall utilize methodologies for the placement and compaction of wastes that maximize the density of waste hereafter disposed at the Site.

32. The Owner shall actively pursue means for a backyard composting program for multi residential and industrial, commercial and institutional sectors.

33. The Owner shall actively pursue means for the collection and recycling of fine paper, telephone books and box board.

34. The Owner shall actively pursue means for the collection and disposal of household hazardous waste.

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

1. Condition 1 is to clarify the meaning of terms used in this Provisional Certificate of Approval to avoid future misunderstandings.

2. Conditions 2 and 5 are to indicate to the Owner that this Provisional Certificate of Approval replaces all previous Provisional Certificates of Approval and Notices of Amendment issue for the Site. The conditions of this Certificate and the documents listed in schedule "A" shall be used to determine the Site's compliance with the requirements of The Environmental Protection Act. Condition 5 is to avoid future misunderstandings by stating the precedence to be given to documents should there be discrepancies between them.

3. Condition 3 is to clearly indicate to the Owner that compliance with the conditions of this Certificate does not relieve him of his obligation to take all reasonable steps to avoid violating the provisions of other applicable legislation relative to the Site.

4. Condition 4 is to make it clear to the Owner that should one of the conditions of this Certificate in any circumstance be found to be invalid it will not invalidate the application of that condition to other circumstances or affect the validity of the other conditions on the Certificate.

5. Condition 6 is to ensure that personnel involved in the management and operation of the Site receive instructions about the conditions on this Certificate and the documents in schedule "A", as well as other pertinent information necessary to operate the Site in a legal and environmentally safe manner.

6. Condition 7 is to clearly indicate to the Owner that the Site is approved only for the disposal of waste from the Town of Kincardine.

7. Condition 8 is to clearly indicate to the Owner that the term of this Certificate is of limited duration and states the circumstances under which the Certificate expires.

8. Conditions 9 and 10 provides information about the Site to the public so that they may monitor the Site for compliance with the hours of operation and report any violations or unauthorized activities to the Owner or the Ministry.

9. Conditions 11,12,14,15,16,17,18,19,20,21,and 29, are to ensure the site is operated in to responsible manner in order to minimize any adverse impacts on the natural environment or the public.

10. Condition 13 is to provide a record of the waste delivered to the Site for the annual report and also to monitor the success of any additional waste reduction measures undertaken by the Owner to reduce the quantity of waste disposed at the Site.

11. Conditions 22 and 26 are to provide the Ministry with reports on the operation of the Site and ancillary works upon which the Ministry may make an assessment of the Site's performance and, if necessary, recommendations for improvements in its operation.

12. Condition 23 is to provide the Ministry with sufficient time prior to the Site's closure to evaluate the Site Closure Plan in order to ensure it will be carried out in an environmentally safe manner and that the post closure monitoring and site maintenance programs are acceptable.

13. Condition 24 is to ensure that future owners of the land on which the site is located are made aware of the fact that the land has been used as a landfill and that no use may be made of the land within twenty five years from the year in which the land ceased to be so used unless the approval of the Minister for the proposed use has been obtained.

14. Condition 25 is to make the owner aware of Ontario Regulation 101/94 which states the conditions under which an "Application for a Certificate of Approval for a Waste Disposal Site (Processing)" is required to establish and operate a leaf and yard waste composting facility.

15. Conditions 27,32, 33,and 34 are to ensure that the Town of Kincardine continues to exert reasonable efforts to reduce waste and to have a site available to accept its waste when this Certificate expires.

16. Condition 28 states the limits of the Public Advisory Committee's authority with respect to the operation and control of the Site.

17. Condition 30 is to confirm by field investigation the accuracy of the data obtained from well records and other sources which was used to determine the properties of the St. Joseph till in the vicinity of the Site.

18. Condition 31 is to ensure the efficient use of the landfill's capacity by ensuring that the waste is placed and compacted in an acceptable manner.

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

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

In addition to these legal requirements, the Notice should also include:

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

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

This Notice must be served upon:

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

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario,
M4S 1H2

DATED AT TORONTO this 29th *day of* September, 1994.

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY

W. Ng, P. ENG.

MAILED ON Sept 30/94

BY _____

SCHEDULE "A"

This Schedule "A" forms part of Provisional Certificate of Approval No. A 270203 dated September 29, 1994.

1. Application for a Certificate of Approval for a Waste Disposal Site (Landfill) dated August 19, 1992.

2. "Hydrogeologic Investigation Report, Valentine Avenue Landfill Site, Kincardine Ontario", (CRA, June 1993).

3. "Design and Operation Report, Interim Expansion, Valentine Avenue Landfill Site, Town of Kincardine" (CRA, October 1993).

4. Drawings number 1 to 12 inclusive titled: "Design and Operations Plans - Interim Expansion Valentine Avenue Landfill Site, Town of Kincardine, (CRA, September 1993).

5. Request for an Exemption to the Environmental Assessment Act, Valentine Avenue Landfill Site Interim Expansion, Town of Kincardine (CRA, August, 1992).

6. Final Draft Report, Proposed Solid Waste Stream Diversion Programs (CRA, May, 1992).

7. Environmental Impact Study, Interim Expansion, Valentine Avenue Landfill Site, Kincardine, Ontario (Ecoplans, July, 1992).

8. "Leachate Treatability Assessment Report" (CRA, November 1993)

9. Letter of February 15, 1994 from CRA to MOEE (Ferraro to Bye) regarding "Proposed St. Joseph Till Borehole Location - Valentine Avenue Landfill Site - Kincardine, Ontario."

10. Environmental Assessment Board's March 10, 1994 decision, EP-93-05, "Town of Kincardine - Valentine Avenue Landfill - Reasons For Decision And Decision".

SCHEDULE "B"

This Schedule "B" forms part of the Provisional Certificate of Approval No. A 270203 dated September 29, 1994.

1. Groundwater monitoring locations will include:

OW1-78	OW2A-91	OW12-92
OW1-82	OW7-91	OW13-92
OW2-82	OW8-91	OW14-92
OW1-89	OW9-91	OW15-92
OW2-89	OW10-92	OW16A-92
OW3-89	OW11-92	OW16B-92

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

2. Leachate monitoring locations will include:

LW1-92 LW2-92

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

3. Surface water monitoring locations will include:

SG1-91

as set out in Figure 10.1 and Table 10.1, and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

4. In addition to the above monitoring locations outlined under Clauses 1, 2 and 3, the following monitoring locations will be incorporated into the monitoring program:

   * the groundwater interceptor drain (existing site) pump station manhole No.1 following commissioning of the groundwater interceptor drain;

* the leachate collection system (expansion area) pump station manhole No.2 following initiation of landfilling activities within the approved expansion area;

* storm water management pond No.1 (existing site) following construction of the pond;

* storm water management pond No.2 (expansion area) following construction of the pond; and

* additional groundwater monitoring well nests within the expansion area as the monitoring well nests are installed.

as set out in Table 10.1 and in Section 10.1 of Volume 1 of Item 2 in Schedule "A" of this Certificate.

5. Once two complete water quality monitoring events (consisting of the monitoring outlined in Clauses 1, 2, 3, 4, 6, 7 and 9 herein as revised from time to time) have been undertaken subsequent to the commissioning of the groundwater interceptor drain (existing site) the water quality monitoring network, as outlined under Clause 1, 2, 3 and 4 may be reduced by the elimination of the following monitoring locations from the overall water quality monitoring program upon the Owner receiving written approval of the MOEE District Manager.

Groundwater Monitoring Locations

OW1-82	OW7-91	OW15-92
OW1-89	OW8-91	OW16A-92
OW3-89	OW9-91	
OW2A-91	OW13-92	

as set out in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

Leachate Monitoring Locations

LW1-92

as set out in Section 10.1 of Volume 1 of Item 2 in Schedule "A" to this Certificate.

6. Groundwater, surface water and leachate levels will be recorded at the monitoring locations outlined under Clauses 1, 2, 3 and 4, and in addition all other existing groundwater monitoring wells, surface water staff gauges and leachate wells located at the site.

7. Water quality analyses for the following general chemistry parameters will be conducted at all monitoring locations outlined under Clause 1, 2, 3 and 4:

chloride	phenols	field pH
alkalinity	dissolved organic carbon (DOC)	field conductivity
hardness		field temperature

In addition, analyses for metals, volatile organic compounds, biological oxygen demand (BOD), chemical oxygen demand (COD), nitrate, nitrite ammonia and total Kjeldhal nitrogen (TKN) will also be conducted at selected monitoring locations as outlined on the attached Table 1.

8. The water quality monitoring program will be conducted semi-annually by carrying out complete water quality monitoring events in April and October of each year.

9. Landfill gas will be monitored at gas probe nests GP1, GP2 and GP3 as shown in Drawing 1 on Item 4 of Schedule "A" to this Certificate, six times annually in the months of January, February, March, April, July and December for percent methane, pressure and water level.

10. The Owner shall advise the Ministry forthwith of any incidents shown or suggested by the results of any of the monitoring referred to herein as revised from time to time.

11. This Schedule "B" shall be revised to incorporate approved revisions to the water quality monitoring program required from time to time by the Director.

Attached to Schedule "B", Provisional Certificate of Approval No. A 270203

TABLE 1

LONG-TERM MONITORING PROGRAM
ANALYTICAL REQUIREMENTS
VALENTINE AVENUE LANDFILL SITE
KINCARDINE, ONTARIO

Monitoring Location	Analysis Required: General Chemistry	Metals	VOCs	BOD/COD	Nitrogen Cycle
Groundwater					
OW1-76	X			X	X
OW1-82	X				
OW2-82	X				
OW1-89	X				
OW2-89	X				
OW3-89	X			X	X
OW2A-91	X				
OW7-91	X				
OW8-91	X				
OW9-91	X				
OW10-92	X				
OW11-92	X				
OW12-92	X				
OW13-92	X				
OW14-92	X			X	X
OW15-92	X			X	X
OW16A-92	X				
OW16B-92	X			X	X
Proposed Monitoring Well Nests	X				
Leachate					
LW1-92	X	X	X	X	X
LW2-92	X	X	X	X	X
Surface Water					
SG1-91	X			X	X
Groundwater Interceptor Drain					
Pump Station Manhole	X	X	X	X	X
Leachate Collection System					
Pump Station Manhole	X	X	X	X	X
Stormwater Management Ponds					
Existing Site	X				
Interim Expansion Area	X				

Ontario ServiceOntario

PARCEL REGISTER (ABBREVIATED) FOR PROPERTY

LAND
REGISTRY
OFFICE #3

33315-0013 (LT)

* CERTIFIED BY LAND REGISTRAR IN ACCORDANCE WITH LAND TITLES AC

PROPERTY DESCRIPTION: PT LT A, B CON A KINCARDINE AS IN R137866 & R301354; KINCARDINE

PROPERTY REMARKS:

ESTATE/QUALIFIER:
FEE SIMPLE
LT CONVERSION QUALIFIED

RECENTLY:
FIRST CONVERSION FROM BOOK

OWNERS' NAMES
THE CORPORATION OF THE TOWN OF KINCARDINE

CAPACITY SHARE
ROWN

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM
** PRINTOUT INCLUDES ALL DOCUMENT TYPES AND DELETED INSTRUMENTS SINCE: 2006/11/17 **				
**SUBJECT, ON FIRST REGISTRATION UNDER THE LAND TITLES ACT, TO:				
** SUBSECTION 44(1) OF THE LAND TITLES ACT, EXCEPT PARAGRAPH 11, PARAGRAPH 14, PROVINCIAL SUCCESSION DUTIES				
** AND ESCHEATS OR FORFEITURE TO THE CROWN.				
** THE RIGHTS OF ANY PERSON WHO WOULD, BUT FOR THE LAND TITLES ACT, BE ENTITLED TO THE LAND OR ANY PART OF				
** IT THROUGH LENGTH OF ADVERSE POSSESSION, PRESCRIPTION, MISDESCRIPTION OR BOUNDARIES SETTLED BY				
** CONVENTION.				
** ANY LEASE TO WHICH THE SUBSECTION 70(2) OF THE REGISTRY ACT APPLIES.				
**DATE OF CONVERSION TO LAND TITLES: 2006/11/20 **				
R137866	1976/07/13	TRANSFER	$2	
R137867	1976/07/13	CHARGE	$30,000	
R137883	1976/07/13	AGREEMENT		
R181361	1980/10/15	CERTIFICATE		
3R6067	1994/02/10	PLAN REFERENCE		
R301354	1994/02/14	TRANSFER	$143,534	
R302790	1994/04/15	BYLAW		
R302791	1994/04/15	BYLAW		
BR79844	2013/09/19	CERTIFICATE		THE CORPORATION OF THE TOWN OF KINCARDINE

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WIT
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

Ontario ServiceOntario

PARCEL REGISTER (ABBREVIATED) FOR PROPERTY

LAND
REGISTRY
OFFICE #3

33315-0013 (LT)

* CERTIFIED BY LAND REGISTRAR IN ACCORDANCE WITH LAND TITLES ACT

REG. NUM.	DATE	INSTRUMENT TYPE	AMOUNT	PARTIES FROM
REMARKS: PROVISIONAL CERTIFICATE OF APPROVAL FOR WASTE DISPOSAL SITE				

NOTE: ADJOINING PROPERTIES SHOULD BE INVESTIGATED TO ASCERTAIN DESCRIPTIVE INCONSISTENCIES, IF ANY, WITH
NOTE: ENSURE THAT YOUR PRINTOUT STATES THE TOTAL NUMBER OF PAGES AND THAT YOU HAVE PICKED THEM ALL UP.

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

October 30, 2013 Reference No. 004074

Mr. Rick Chappell
District Manager
Owen Sound District Office
Ministry of the Environment
101 17th Street East
Owen Sound, Ontario
N4K 0A5

Dear Mr. Chappell

Re: Request for Extension to Provincial Office's Order
at Bruce Energy Centre Wastewater Treatment Plant
Kincardine Waste Management Centre, Kincardine, Ontario
Order No. 3462-936RCH-1

1.0 Background

The Municipality of Kincardine (Municipality) was issued Provincial Officer's Order 3462-936RCH on December 21, 2012 that allowed for the transfer of municipal leachate from the Kincardine Waste Management Centre (KWMC) to the Bruce Energy Centre Wastewater Treatment Plant (BEC WWTP) at a rate of 40 m^3/day (Item No. 6) and until April 30, 2013 (Item No. 1). The Provincial Officer's Order was amended by 3462-936RCH-1 by extending the date of the initial order to October 31, 2013. In addition, Provincial Officer's Order No. 0016-99XPLY dated July 26, 2013 increased the maximum daily transfer rate to 46 m^3/day to be consistent with three full truck loads.

The leachate levels at the Site have been reduced to a point at which the monthly amount of leachate removed and disposed at the BEC WWTP and Kincardine WWTP is similar to the amount of leachate that is generated. This has allowed the transfer of leachate during extended dry periods to have the daily leachate transfer reduced. Testing of the BEC WWTP as per the Order has not indicated any issues with the acceptance of the leachate. During a period in the summer when the Kincardine WWTP had issues with dissolved oxygen levels, leachate transfer to the Kincardine WWTP ceased until the DO levels returned to an acceptable level.

In addition, the Municipality has applied for an amendment to the BEC WWTP Environmental Compliance Approval (ECA) to allow leachate to be accepted for the long-term through MH2 and appropriate amendments to MH2 to allow the safe and efficient transfer of leachate for the longer term. The application for amendment of the BEC WWTP was submitted to the Ministry of the Environment on July 4, 2013. At this point, the Municipality has not received approval of the requested amendment nor

have comments been received on the amendment request from the MOE. The ECA amendment reference number is 1940-99MKCZR.

The Municipality is currently preparing a design of an on-site leachate treatment facility at KWMC and is proposing to submit the ECA application at the end of 2013 or early 2014.

The following provides an overview of the documents provided to-date on this matter:

- Provincial Officer's Order dated 0016-99XPLY dated July 26, 2013
- ECA Amendment Application dated July 4, 2013 for BEC WWTP
- Provincial Officer's Order 3462-936RCH-1 dated April 30, 2013
- April 25, 2013 CRA Letter to Jim Bromley (MOE) regarding Request for Extension and Alteration to Provincial Officer's Order
- Provincial Officer's Order 3462-936RCH dated December 21, 2012
- December 20, 2012 CRA Letter to Rick Chappell (MOE) regarding Request for Emergency Approval for Disposal of KWMC Leachate

2.0 Request and Rationale

The Municipality is requesting that Provincial Officer's Order 3462-936RCH-1 be extended for 4 months from October 31, 2013 to February 28, 2014.

The rationale for the time extension is that the Municipality has requested ECA approval for the noted item and is awaiting approval from the MOE. The extension of 4 months is deemed reasonable to complete the approval process.

CONESTOGA-ROVERS & ASSOCIATES

Please do not hesitate to contact the undersigned should you have any questions with regard to the request.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

James R. Yardley, P. Eng.

JY/mg/4

cc: Gagan Sandhu, Municipality of Kincardine
Shamus Anderson, Municipality of Kincardine
Ian Mitchell, MOE Owen Sound Area Office

Ministry of the Environment
Southwestern Region
Owen Sound District Office
3rd Flr
101 17th St
Owen Sound ON N4K 0A5
Fax: (519)371-2905
Tel: (519) 371-6191

Ministère de l'Environnement
Direction régionale du Sud-Ouest
Bureau du district d'Owen Sound
101 rue 17th, 3ème étage
Owen Sound ON N4K 0A5
Télécopieur: (519)371-2905
Tél:(519) 371-6191

Ontario

June 30, 2011

Rec'd. CRA
JUL 0 6 2011

Mr. Jim O'Rourke
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Via mail and fax (519) 396-8288

Dear Mr. O'Rourke,

RE: Kincardine Ward 1 Landfill Site reports

We have received the report titled "2010 Annual Report, Kincardine Ward 1 Landfill Site, Groundwater Collection System and Leachate Collection System Environmental Monitoring Programs", prepared by Conestoga-Rovers & Associates and dated May 2011.

The single document covers the reporting requirements in the leachate collection system and groundwater collection system sewage Certificates of Approval (CofA # 3-0354-94-006 and 3-0408-93-006 respectively) as well in the waste disposal site CofA # A270203. While we recognize that there may be some overlap in the content of the reports for the three CofAs, the ministry requests that the report for the waste disposal site be a separate document from the leachate and groundwater collection systems report.

The 2010 monitoring program for the landfill site is to include landfill gas monitoring, however the report states that landfill gas monitoring was not completed during 2010 because the Municipality's gas meter was not working. This is non-compliance with CofA # A270203 which identifies the requirement for landfill gas monitoring under item 9 of Schedule "B". Please submit to this office by **July 22, 2011** written confirmation that landfill gas monitoring has resumed for 2011 as required by CofA # A270203.

If you have any questions concerning this letter, please contact me at (519) 371-6191.

Yours truly,

Ian Mitchell , P.Eng.
District Engineer
Owen Sound District Office

Yardley, Jim

From: Mitchell, Ian (ENE) [ian.mitchell@ontario.ca]
Sent: Tuesday, August 09, 2011 8:21 AM
To: orourke@kincardine.net
Cc: Yardley, Jim; Bromley, Jim (ENE)
Subject: Ward 1 Landfill monitoring

Hello Jim

In a letter dated June 30, 2011 that I faxed to you I noted that 2010 monitoring program for the Ward 1 landfill site is to include landfill gas monitoring, however the 2010 report for the site states that landfill gas monitoring was not completed during 2010 because the Municipality's gas meter was not working. This is non-compliance with CofA # A270203 which identifies the requirement for landfill gas monitoring under item 9 of Schedule "B". I requested that written confirmation be submitted to our office by July 22, 2011 that landfill gas monitoring has resumed for 2011 as required by CofA # A270203.

We do not seem to have received a response to this letter. Your prompt response to this issue is appreciated.

Ian Mitchell
District Engineer
Owen Sound District
Phone (519) 371-6191
Fax (519) 371-2905
ian.mitchell@ontario.ca

Ontario

Ministry of the Environment
Ministère de l'Environnement

Provincial Officer's Order

Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA)
Ontario Water Resources Act, R.S.O. 1990, c. O.40 (OWRA)
Pesticides Act, R.S.O. 1990, c. P.11 (PA)
Safe Drinking Water Act, 2002, S.O. 2002, c.32 (SDWA)
Nutrient Management Act, 2002, S.O. 2002, c.4 (NMA)

Order Number
6770-9CXRKH

Incident Report No.
0108-936QF6

To: The Corporation of the Municipality of Kincardine
Rural Route 5
1475 Concession 5
Kincardine, Ontario, N2Z 2X6
Canada

Site: Lot: LR 11-14, Concession: 3
Kincardine, County of Bruce

437 Sideroad 15 North
Lot: 15, Concession: 5
Kincardine, County of Bruce

Pursuant to my authority under OWRA Section 16.3, I order you to do the following:

Work Ordered

Item No. 1 **Compliance Date** 2014/02/28
(YYYY/MM/DD)

see attached

BEC STP 2.pdf

A. While this Order is in effect, a copy or copies of this order shall be posted in a conspicuous place.

B. While this Order is in effect, report in writing, to the District or Area office, any significant changes of operation, emission, ownership, tenancy or other legal status of the facility or operation.

C. Unless otherwise specified, all requirements of this Order are effective upon service of

this Order.

See attached schedule for Order.

This Order amends and constitutes part of Provincial Officer Order Number 3462-936RCH, issued on 2013/01/02.

This Order is being issued for the reasons set out in the annexed Provincial Officers Report which forms part of this Order.

Issued at Owen Sound this 30th day of October, 2013.

Helmut Pfeiffer
Badge No: 175
Owen Sound District Office
Tel: (519) 371-5543

APPEAL/REVIEW INFORMATION

REQUEST FOR REVIEW

You may request that this order be reviewed by the Director. Your request must be made in writing (or orally with written confirmation) within seven days of service of this order and sent by mail or fax to the Director at the address below. In the written request or written confirmation you must,

- specify the portions of this order that you wish to be reviewed;
- include any submissions to be considered by the Director with respect to issuance of the order to you or any other person , and with respect to the contents of the order;
- apply for a stay of this order, if necessary; and provide an address for service by one of the following means:
  1. mail 2. fax

The Director may confirm, alter or revoke this order. If this order is revoked by the Director, you will be notified in writing. If this order is confirmed or amended by order of the Director, the Director's order will be served upon you. The Director's order will include instructions for requiring a hearing before the Environmental Review Tribunal.

DEEMED CONFIRMATION OF THIS ORDER

If you do not receive oral or written notice of the Director's decision within seven days of receipt of your request, this order is deemed to be confirmed by order of the Director and deemed to be served upon you.

You may require a hearing before the Environmental Review Tribunal if, within 15 days of service of the confirming order deemed to have been made by the Director, you serve written notice of your appeal on the Environmental Review Tribunal and the Director. Your notice must state the portions of the order for which a hearing is required and the grounds on which you intend to rely at the hearing. Except by leave of the Environmental Review Tribunal , you are not entitled to appeal a portion of the order or to rely on grounds of appeal that are not stated in the notice requiring the hearing. Unless stayed by the Environmental Review Tribunal , the order is effective from the date of service.

Written notice requiring a hearing must be served personally, by mail or facsimile on the following:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5
Fax: (416) 314-4506
Email: ERTTribunalsecretary@ontario.ca

and

Director (Provincial Officer Orders)
Ministry of the Environment
Owen Sound District Office
3rd Flr
101 17th St
Owen Sound ON N4K 0A5
Fax: (519)371-2905
Tel:

Where service is made by mail, it is deemed to be made on the fifth day after the date of mailing and the time for requiring a hearing is not extended by choosing service by mail.

Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal by:

Tel: (416) 314-4600 Fax: (416) 314-4506 www.ert.gov.on.ca

FOR YOUR INFORMATION

- Unless stayed by the Director or the Environmental Review Tribunal , this order is effective from the date of service. Non-compliance with the requirements of this order constitutes an offence.
- The requirements of this order are minimum requirements only and do not relieve you from complying with the following:
  - any applicable federal legislation;
  - any applicable provincial requirements that are not addressed in the order; and
  - any applicable municipal law.
- The requirements of this order are severable. If any requirement of this order or the application of any requirement to any circumstance is held invalid, the application of such requirement to other circumstances and the remainder of the order are not affected.
- Further orders may be issued in accordance with the legislation as circumstances require.
- The procedures to request a review by the Director and other information provided above are intended as a guide. The legislation should be consulted for additional details and accurate reference.

Ministry of the Environment
Ministere de l'Environnement

Ontario

Provincial Officer's Amending Order

EnvironmentalProtection Act, R.S.O.1990, c.E 19 (EPA)
Ontario Water Resources Act, R.S.O.1990, c. 0. 40 (OWRA)
Pesticides Act,R.S.O.1990, c. P11(PA)
Safe DrinkingWater Act, S.O. 2002, c.32 (SDWA)
Nutrient Management Act, 2002,S.O. 2002, c.4

Order Number
6770-9CXRKH

Incident Report No.
1178-9CXRHY

To: The Corporation of the Municipality of Kincardine
1475 Concession 5
RR#5
Kincardine, ON
N2Z2X6

Site: Bruce Energy Centre Sewage Treatment Plant
Part 5, Plan 3R-7015, Lake Range Lot Nos. 11 to 14 of Concession 3
Municipality of Kincardine, County of Bruce

Pursuant to my authority under subsection 16.3(1) of the OWRA, I order that Item Number 6 of Provincial Officer's Order No. 3462-936RCH, issued by Jim Bromley on December 21, 2012 to the Corporation of the Municipality of Kincardine, be amended to read as follows:

Work Ordered

Item No.2

Absent prior termination or extension of this Order by the undersigned Provincial Officer, this Order expires February 28, 2014.

General

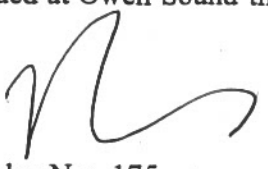
The above amendment takes effect immediately upon the signing of this amending order by Provincial Office Helmut Pfeiffer. All other Items of Provincial Officer's Order No. 3462-936RCH remain in effect.

Reasons:

An October 30, 2013 request from Mr. Jim Yardley, Consulting Engineer, Conestoga-Rovers & Associates, on behalf of the Municipality of Kincardine, requested an extension from October 31, 2013 to February 28, 2014.

I am satisfied that extension provided by this amending order is necessary in the circumstances and is protective of the public interest.

Issued at Owen Sound this 30th day of October 2013.



Badge No: 175
Owen Sound District Office
Tel: (519) 371-5543

APPEAL/REVIEW INFORMATION

REQUEST FOR REVIEW

You may request that this order be reviewed by the Director. Your request must be made in writing (or orally with written confirmation) within seven days of service of this order and sent by mail or fax to the Director at the address below. In the written request or written confirmation you must,

specify the portions of this order that you wish to be reviewed;

include any submissions to be considered by the Director with respect to issuance of the order to you or any other person and with respect to the contents of the order;

apply for a stay of this order, if necessary; and provide an address for service by one of the following means:

1. mail 2. fax

The Director may confirm, alter or revoke this order. If this order is revoked by the Director, you will be notified in writing. If this order is confirmed or amended by order of the Director, the Director's order will be served upon you. The Director's order will include instructions for requiring a hearing before the Environmental Review Tribunal.

DEEMED CONFIRMATION OF THIS ORDER

If you do not receive oral or written notice of the Director's decision within seven days of receipt of your request, this order is deemed to be confirmed by order of the Director and deemed to be served upon you.

You may require a hearing before the Environmental Review Tribunal if, within 15 days of service of the confirming order deemed to have been made by the Director, you serve written notice of your appeal on the Environmental Review Tribunal and the Director. Your notice must state the portions of the order for which a hearing is required and the grounds on which you intend to rely at the hearing. Except by leave of the Environmental Review Tribunal, you are not entitled to appeal a portion ofthe order or to rely on grounds of appeal that are not stated in the notice requiring the hearing. Unless stayed by the Environmental Review Tribunal , the order is effective from the date of service.

Written notice requiring a hearing must be served personally or by mail upon:

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

and

Director (Provincial Officer Orders)
Ministry ofthe Environment
Owen Sound District Office
101 – 17th Street East
Owen Sound, ON, N4K OA5
Fax: (519) 371-2905
Phone (519) 371-2901

Where service is made by mail, it is deemed to be made on the fifth day after the date of mailing and the time for requiring a hearing is not extended by choosing service by mail.

Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal by:

Tel: (416) 314-4600 Fax: (416) 314-3717 www.ert.gov.on.ca

FOR YOUR INFORMATION

Unless stayed by the Director or the Environmental Review Tribunal , this order is effective from the date of service. Non-compliance with the requirements of this order constitutes an offence.

The requirements of this order are minimum requirements only and do not relieve you from complying with the following:

any applicable federal legislation;

any applicable provincial requirements that are not addressed in the order; and

any applicable municipal law.

The requirements of this order arc severable. If any requirement of this order or the application of any requirement to any circumstance is held invalid, the application of such requirement to other circumstances and the remainder of the order are not affected.

Further orders may be issued in accordance with the legislation as circumstances require.

The procedures to request a review by the Director and other information provided above an: intended as a guide. The legislation should be consulted for additional details and accurate reference.

Nash, Sheryl

From: Yardley, Jim
Sent: Monday, January 20, 2014 4:35 PM
To: laszlo.barti@ontario.ca
Cc: MClarke@Kincardine.net; dhustonkpwd@bmts.com; JRoppel@kincardine.net; LisaAmbeau@kincardine.net; Molenhuis, Allan; Project Email Filing
Subject: RE: MOE Inspection Report - Closed Ward 1(Valentine Avenue) Landfill Site ~COR-004074-10~
Attachments: 004074Barti-1 Response to Closed Waste Disposal Site Inspection Report.pdf

Laszlo,

Please find attached the response letter for the Municipality of Kincardine in regards to the Closed Ward 1 Landfill Site. Sorry for the delay in getting this to you.

Should you have any questions, regarding the contents of the letter, please do not hesitate to give me a call.

Jim

Jim Yardley, P.Eng.
Conestoga-Rovers & Associates (CRA)
651 Colby Drive, Waterloo, ON N2V 1C2
Phone: 519-884-0510 or 519-884-7780 Ext**. 6234 (NEW EXT)**
Fax: 519-884-0525 **Cell:** 226-338-1919
E-mail: jyardley@CRAworld.com
www.CRAworld.com
Think before you print. **Perform every task the safe way, every time.**

From: MClarke@Kincardine.net [mailto:MClarke@Kincardine.net]
Sent: Friday, December 20, 2013 1:35 PM
To: LisaAmbeau@kincardine.net; JRoppel@kincardine.net; dhustonkpwd@bmts.com; Yardley, Jim
Subject: Fw: MOE Inspection Report - Closed Ward 1(Valentine Avenue) Landfill Site

Hi all,
See the message below regarding compliance with MOE's inspection of the closed Ward 1 landfill. Could I get some help with this?

Murray Clarke
Chief Administrative Officer
Municipality of Kincardine
519-396-3018

www.kincardine.net
----- Forwarded by Murray Clarke/Kincardine on 20/12/2013 01:33 PM -----

"Barti, Laszlo (ENE)" <Laszlo.Barti@ontario.ca>

20/12/2013 01:21 PM

To "cao@kincardine.net" <cao@kincardine.net>
cc
Subject MOE Inspection Report - Closed Ward 1(Valentine Avenue) Landfill Site

Mr. Clarke,
A review of Mr. Gagan Sandhu's email addressing the MOE Inspection Report 3077-96PRDT (see attached) requirements, revealed that several action items have not been addressed and/or were not properly addressed. Please find listed below the actions that the Municipality of Kincardine is required to complete and the timelines for completion.
Section 5.0 of the Inspection Report 3077-96PRDT

- By January 15, 2014, provide timelines for the action items listed under Section 5.0.

Section 6.0 of theInspection Report 3077-96PRDT
The Municipality was required to address the following action items:

- Provide records of the quarterly inspections of the final cover to the undersigned for review.
- In accordance with Condition 6 of the ECA the Owner shall prepare and submit a training plan to the MOE Owen Sound District Office to attention of the undersigned.
- Prepare and submit to the MOE Owen Sound District Office to attention of the undersigned a maintenance program that involves all aspects of the Landfill operation.
- Prepare and submit to the MOE Owen Sound District Office to attention of the undersigned a detailed report regarding actions taken to address the 2012 Annual Report recommendations.

The Municipality's response was as follows:

- The LCS, GCS and pumping stations are monitored by certified water and waste water operators. Further, the landfill is closed and only trained staff performs the rounds, as necessary. The training plan covers sending the relevant staff for relevant training sessions (water, wastewater and landfill training). In-House training is also provided, as required.
- The Landfill Closure Plan (from 2009), annual landfill monitoring report, annual report for Kincardine Wastewater Treatment Plant collectively covers the maintenance/monitoring program for the closed Landfill. The review of GCS will be captured in the annual 2013 landfill monitoring report.

In summary:

- No records of landfill inspections were provided to be reviewed by the MOE.
- No training plan was submitted to the MOE OSDO.
- No maintenance program was provided to the MOE OSDO. Several documents are listed as source of the maintenance/monitoring program of the landfill.
- No specifics were provided regarding the intent of the Municipality towards the recommendations of the 2012 Annual Report.
- By January 15, 2014, please submit to the MOE OSDO a formal letter along with the relevant documentation that addresses in detail all the action items listed above.

If you have any questions or concerns regarding the Inspection Report 3077-96PRDT, please contact me at your convenience.
Regards,

Laszlo Barti
Provincial Officer
Ministry of the Environment, Operations Division
Southwestern Region, Owen Sound District Office

101 – 17th Street East, Owen Sound ON N4K 0A5
T: 519.371.3152, 1.800.265.3783
F: 519.371.2905
laszlo.barti@ontario.ca
www.ene.gov.on.ca

Please consider the environment before printing.

From: GSandhu@Kincardine.net [mailto:GSandhu@Kincardine.net]
Sent: October 18, 2013 4:29 PM
To: Barti, Laszlo (ENE)
Cc: jroppel@kincardine.net; lambeau@kincardine.net
Subject: Re: MOE Inspection Report - Closed Ward 1(Valentine Avenue) Landfill Site

Good afternoon Laszlo,

The following summarise the actions to date regarding Section 5.0 and 6.0 of your inspection report:

Section 5.0

The Ward 1 Landfill closed for waste receipt in November of 2011. The final cover and cap was applied during the summer of 2012 with some sections completed in 2013. The following provides the actions to date and the action plan:

- Monitoring wells that were recommended for repair, abandonment or replacement were completed this fall. The records regarding the work completed will be documented in the 2013 Annual Report for the Site.
- The landfill cap/cover has been vegetated and the vegetation has successfully caught on the majority of the landfill. The following are recommended repair programs for the areas where vegetation has not been successfully established (easterly slope of the Landfill mound):

1. In areas where the topsoil is present but vegetation has not grown – these areas will be re-seeded. The addition of a thin layer of topsoil will assist with the vegetation catch in these areas.
2. In areas where the topsoil has eroded – the topsoil layer will be replaced and the area re-seeded
3. In areas where erosion has eroded the clay cap – the area will be scarified, a lift of clay placed and compacted, the topsoil re-applied and the area re-seeded.
4. A silt fence will be erected at the base of the east side of the Landfill mound until the vegetation has been fully established.
5. In 2014, the recently placed cap will be cut at least once during the year to assist with the thickening of the vegetation on the Site. Care will be taken to avoid the rutting of the cover by the mowing equipment.

- The Certiuficate of Approval has been registered on the Title of the Landfill

Section 6.0

- The LCS, GCS and pumping stations are monitored by certified water and waste water operators. Further, the landfill is closed and only trained staff performs the rounds, as necessary. The training plan covers sending the relevant staff for relevant training sessions (water, wastewater and landfill training). In-House training is also provided, as required.
- The Landfill Closure Plan (from 2009), annual landfill monitoring report, annual report for Kincardine Wastewater Treatment Plant collectively covers the the maintenance/monitoring program for the closed Landfill. The review of GCS will be captured in the annual 2013 landfill monitoring report.

If I have addressed your inspection report adequately, please let me know and I will send you a formal letter along with the relevant documentation.

Thanx.

Gagan Sandhu
Director of Public Works
Municipality of Kincardine
1475 Concession 5, RR5
Kincardine, ON N2Z 2X6

Ph: 519-396-3468 ext. 120
Fax: 519-396-1430
Please visit www.kincardine.net

"Barti, Laszlo (ENE)" <Laszlo.Barti@ontario.ca>

24/09/2013 09:11 AM

To "dirpw@kincardine.net" <dirpw@kincardine.net>
cc "jroppel@kincardine.net" <jroppel@kincardine.net>, "lambeau@kincardine.net" <lambeau@kincardine.net>
Subject MOE Inspection Report - Closed Ward 1(Valentine Avenue) Landfill Site

Mr. Sandhu,

Attached for your review is a copy of the Closed Waste Disposal Site Inspection Report prepared to document the findings of the Ministry of the Environment (MOE) inspection performed on August 14, 2013, at the Ward 1(Valentine Avenue) Landfill Site.
The purpose of this pro-active inspection was to assess compliance of the operation of the site in relation to the terms and conditions of its Environmental Compliance Approval A270203, any relevant control documents, MOE legislation and to confirm conformance with the MOE waste-related policies and guidelines. Please refer to the attached inspection report for details. You will see in Section 5.0 and 6.0 the actions that you are required to perform within specified timelines.
If you have any questions or concerns regarding this inspection report, please contact me at your convenience.
Regards,

Laszlo Barti
Provincial Officer
Ministry of the Environment, Operations Division
Southwestern Region, Owen Sound District Office
101 – 17th Street East, Owen Sound ON N4K 0A5
T: 519.371.3152, 1.800.265.3783
F: 519.371.2905
laszlo.barti@ontario.ca
www.ene.gov.on.ca

Please consider the environment before printing.

From: Yardley, Jim
Sent: Friday, October 18, 2013 2:29 PM
To: Gagan Sandhu
Cc: Project Email Filing
Subject: Ward 1 Landfill Site Visit and Inspection - October 15, 2013 ~COR-004074~

Gagan,

On Tuesday, October 15, 2013 a site visit and inspection was conducted on the closed Ward 1 Landfill.

The Ward 1 Landfill closed for waste receipt in November of 2011. The final cover and cap was applied during the summer of 2012 with some sections completed in the spring of 2013. The following provides the inspection notes:

- Monitoring wells that were recommended for repair, abandonment or replacement were completed this fall. The records regarding the work completed will be documented in the 2013 Annual Report for the Site.
- The landfill cap/cover has been vegetated and the vegetation has successfully caught on the majority of the landfill. Several areas were noted to require repair, especially along the eastern side slope. The repair of the areas depend on the area. The following are recommended repair programs for the areas:
    - In areas where the topsoil is present but vegetation has not grown – these areas should be re-seeded. The addition of a thin layer of topsoil may assist with the vegetation catch in these areas
    - In areas where the topsoil has eroded – the topsoil layer should be replaced and the area re-seeded
    - In areas where erosion has eroded the clay cap – the area should be scarified, a lift of clay placed and compacted, the topsoil re-applied and the area re-seeded.
- In 2014, the recently placed cap should be cut at least once during the year to assist with the thickening of the vegetation on the Site. Care should be taken to avoid the rutting of the cover by the mowing equipment.
- Cleaning of the buffer area should continue. The cleaning should include the removal of any litter or residual materials. Areas that previously had stockpiles should be graded and vegetated. The grading will ensure that future use of buffer zone are not impacted by sudden or unexpected difference in surface topography.
- Once the cover vegetation has been fully established, the on-site ditches should be assessed to determine zones of the ditches that have accumulated sediment that is impacting the flow of water within the ditch.

With regard to future work at the Site, a topographic survey of the Site will be conducted this fall and an updated existing conditions plan will be developed for the Site. This will be included in the annual report.

Based on the MOE comments, it is recommended that an inspection check list is prepared for the Site.

Should you have any questions, please let me know.

Jim

Jim Yardley, P.Eng.
Conestoga-Rovers & Associates (CRA)
651 Colby Drive, Waterloo, ON N2V 1C2
Phone: 519-884-0510 or 519-884-7780 Ext. 2269
Fax: 519-884-0525 **Cell:** 226-338-1919
E-mail: jyardley@CRAworld.com
www.CRAworld.com
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Appendix C.3

MECP Comments on the 2013 Annual Report (July 7, 2014)

Ministry of the Environment
Southwestern Region
Owen Sound District Office
3rd Flr
101 17th St
Owen Sound ON N4K 0A5
Fax: (519)371-2905
Tel: (519) 371-6191

Ministère de l'Environnement
Direction régionale du Sud-Ouest
Bureau du district d'Owen Sound
101 rue 17th, 3ème étage
Owen Sound ON N4K 0A5
Télécopieur: (519)371-2905
Tél:(519) 371-6191

Ontario

July 7, 2014

Mr. Don Huston
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Dear Mr. Huston,

RE: 2013 Annual Monitoring Report, Kincardine Ward 1 Landfill Site

We have received a copy of the report titled "2013 Annual Monitoring Report, Ward 1 Landfill Site, Groundwater Collection System and Leachate Collection System Environmental Monitoring Programs", prepared by Conestoga-Rovers & Associates, dated April 2014.

The report states that landfill gas monitoring was not undertaken by Municipal staff during 2013. The monitoring program contained in the "Ward 1 Landfill Closure Plan" dated November 16, 2009, includes annual landfill gas monitoring. This closure plan was approved by the Ministry in accordance with Condition 23 of Environmental Compliance Approval (ECA) # A270203 in a letter dated November 15, 2010. Failure to conducted monitoring in accordance with the approved monitoring program is non-compliance with the requirements of an ECA. The Municipality must ensure that all annual monitoring is conducted as required under the ECA and current approved monitoring plan.

If you have any questions concerning this letter, please contact the undersigned at (519) 371-6191.

Yours truly,

Ian Mitchell , P.Eng.
District Engineer
Owen Sound District Office

File Storage Number: SI BR KB CA 610

cc. Jim Bromley, MOE, Owen Sound
Jim Yardley, Conestoga-Rovers, Waterloo

Appendix C.4

MECP Comments on the 2013 Annual Report (July 9, 2014)

Ministry of the Environment
Southwestern Region
Owen Sound District Office
3rd Flr
101 17th St
Owen Sound ON N4K 0A5
Fax: (519)371-2905
Tel: (519) 371-6191

Ministère de l'Environnement
Direction régionale du Sud-Ouest
Bureau du district d'Owen Sound
101 rue 17th, 3ème étage
Owen Sound ON N4K 0A5
Télécopieur: (519)371-2905
Tél:(519) 371-6191

Ontario

July 9, 2014

Mr. Don Huston
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Dear Mr. Huston,

RE: 2013 Annual Monitoring Report, Kincardine Ward 1 Landfill Site

Further to my letter to you dated July 7, 2014, regarding the Ward 1 Landfill Site, our surface water evaluator has reviewed the 2013 Annual Monitoring Report for this site and provides the following comments:

Final capping and closure of the landfill occurred in 2013 (page 2). The ECA requires monitoring of two surface water locations for the site. The on-site infiltration pond (SWP 1) and the perimeter ditch Stormwater pond (which does have off site discharge) SWP2. The consultant identifies continued minor impact to SWP 2 but notes that now that the landfill is completely closed and capped that improvement is anticipated. We support this position.

Section 2.5.1 of the report notes that MOE comments with respect to the 2012 report had not been received at the time of writing this report and states that any outstanding comments will be addressed in a separate cover once received. The Ministry's letter dated February 21, 2014 contained our surface water review comments on the 2012 report and suggested concentration vs. time graphs for the surface water sample point SWP2 similar to those provided in Tables Series 5 and 6 of this report.

The consultant does not propose any changes to the existing surface water monitoring program. ECA A270203 requires phenols to be sampled for the stormwater ponds as per item 7 and Table 1 of Schedule B yet Phenols is not presented within Table 5.4 of the annual report. The consultant should provide clarification regarding phenols monitoring.

If you have any questions concerning this letter, please contact the undersigned at (519) 371-6191.

Yours truly,

Ian Mitchell

Ian Mitchell , P.Eng.
District Engineer
Owen Sound District Office

Appendix C.5

MECP Comments on the 2013 Annual Report (October 1, 2014)

4074

Ministry of the Environment and Climate Change
Southwestern Region
Owen Sound District Office
3rd Flr
101 17th St
Owen Sound ON N4K 0A5
Fax: (519) 371-2905
Tel: (519) 371-6191

Ministère de l'Environnement et de l'Action en matière de changement climatique
Direction régionale du Sud-Ouest
Bureau du district d'Owen Sound
101 rue 17th, 3ème étage
Owen Sound ON N4K 0A5
Télécopieur: (519) 371-2905
Tél:(519) 371-6191

Ontario

October 1, 2014

Mr. Don Huston
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Dear Mr. Huston,

RE: 2013 Annual Monitoring Report, Kincardine Ward 1 Landfill Site

Further to my letter to you dated July 9, 2014, regarding the Ward 1 Landfill Site, our regional hydrogeologist has reviewed the 2013 Annual Monitoring Report for this site and provides the following comments:

1. The site closure activities continued in 2013 and additional minor capping repairs are scheduled for 2014. In September 2013 a drilling program was undertaken to repair the monitoring network. Three minoring wells (OW15R-13, OW18AR-13 and OW18BR-13) were installed to replace damaged monitors and one new monitor (OW20-13) was installed to enhance the existing monitoring network. The program also included abandonment of two damaged monitors and rehabilitation of monitor OW14-92.

2. The water level measurements continued to show that the groundwater flow in the site vicinity is towards the northwest. Water levels measured in 2013 at monitors installed in close proximity to the Groundwater Collection System show that hydraulic capturing is occurring.

3. The analytical results for leachate monitors are within their historical ranges with the exception of low levels of chloride measured in the fall of 2013. These levels are far below the historical ranges and it is unclear if this due to analysis error or natural conditions. Low levels of VOCs continued to be detected in both leachate monitors. The overall quality of leachate show decreasing trends.

4. The groundwater quality in the landfill vicinity indicates moderately elevated leachate impact. The 2013 results are consistent with the historical results. No evidence of leachate impact to water quality in the till aquitard is noted.

5. With respect to site compliance with the Reasonable Use Guideline (RUG), the 2013 monitoring results indicates that chloride levels in monitor MW1-78 decreased to levels just below the criteria (138 mg/L). Exceedance of the RUG for chloride continued to be noted at monitor MW11-92 and an exceedance at monitor MW12-92 was noted in the fall monitoring event.

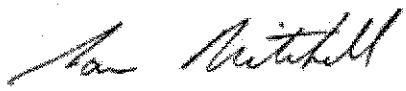
6. It is reported that landfill gas monitoring was not undertaken by municipal staff during 2013 and CRA conducted gas monitoring on May and October. The results show no detection of landfill gas. No information is provided (i.e. gas monitors construction details, water levels, gas detector, gases measured) on the current and previous report to assess the validity of these results.

7. In page 7, Section 2.5.1, the report states that MOE comments on the 2011 and 2012 reports were not received by the Municipality and/or the consultant. Based on our records a review for the years 2009 to 2012 monitoring reports was prepared and sent by the District Office in a letter dated January 30, 2014 to the Municipality of Kincardine. These comments should be addressed in the next monitoring report.

Based on overall assessment of the groundwater monitoring results, the site has minor impact to the shallow groundwater. With completion of closure activities and post closure maintenance the landfill leachate impact is expected to decrease. We concur with the report's recommendations to continue the existing groundwater monitoring program. Future reports should include a response to MOEEC comments on previous reports.

If you have any questions concerning this letter, please contact the undersigned at (519) 371-6191.

Yours truly,



Ian Mitchell , P.Eng.
District Engineer
Owen Sound District Office

File Storage Number: SI BR KB CA 610

cc. Jim Bromley, MOE, Owen Sound
Jim Yardley, Conestoga-Rovers, Waterloo
Husein Awad, MOE, London

Appendix C.6

MECP Comments on the 2015 Annual Report (June 3, 2016)

Ministry of the Environment and Climate Change
Southwestern Region
Owen Sound District Office
3rd Flr
101 17th St
Owen Sound ON N4K 0A5
Fax: (519) 371-2905
Tel: (519) 371-6191

Ministère de l'Environnement et de l'Action en matière de changement climatique
Direction régionale du Sud-Ouest
Bureau du district d'Owen Sound
101 rue 17th, 3ème étage
Owen Sound ON N4K 0A5
Télécopieur: (519) 371-2905
Tél:(519) 371-6191

Ontario

June 3, 2016

Mr. Adam Weishar
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Dear Mr. Weishar,

RE: 2015 Annual Monitoring Report, Kincardine Ward 1 Landfill

We have received a copy of the report titled "2015 Annual Report, Kincardine Ward 1 Landfill Site, Groundwater Collection System and Leachate Collection System Environmental Monitoring Programs", prepared by GHD Limited, dated April 29, 2016. A copy of the report was forwarded to our regional technical support section and comments from our regional surface water specialist concerning the surface water aspects of the landfill monitoring presented in the report are as follows:

The report states that the surface water discharge point, Pond # 2 (SWP2) continues to show some leachate impact although pond water quality has improved since the landfill closed. The ministry concurs, however, the elevated iron and aluminum in the unfiltered water samples in 2015 may be due to TSS. If TSS is not monitored in the storm water pond then the consultant should at least make an observation on the visual turbidity of the sampled water to help interpret elevated iron and aluminum results.

No upward trends over time were evident for the monitored variables listed in Table 5.4. The table has a footnote regarding unionized ammonia but ammonia data are not included. Also, time series graphs for the pond chemistry data or at least the leachate indicators are not included but should be. Overall, the ministry does not see any evidence of impairment or potential impairment of water quality assuming low levels of ammonia at SWP2 if this variable is monitored there.

If you have any questions concerning this letter, please contact me at (519) 371-6191.

Yours truly,

Ian Mitchell

Ian Mitchell , P.Eng.
District Engineer
Owen Sound District Office

Appendix C.7

MECP Comments on the 2020 Annual Report (January 10, 2022)

Ministry of the Environment, Conservation & Parks

Owen Sound District Office
101 17th Street East, 3rd Floor
Owen Sound ON N4K 0A5
Tel.: 519-371-2901
Fax.: 519-371-2905

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

Bureau de district d'Owen Sound
101 17ème rue Est, 3e étage
Owen Sound ON N4K 0A5
Tél. : 519-371-2901
Téléc. : 519-371-2905

Ontario

January 10, 2022

Mr. Adam Weishar
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Via email: aweishar@kincardine.ca

Dear Mr. Weishar:

Re: 2020 Annual Monitoring Report, Kincardine Ward 1 (Valentine) Landfill Site
MOE File SI BR KB CA 610

We have received a copy of the report titled "2020 Annual Monitoring Report, Kincardine Ward 1 Landfill Site, Groundwater Collection System and Leachate Collection System Environmental Monitoring Programs", prepared by GHD Limited, dated April 30, 2021. A copy of the report was forwarded to our regional technical support section and comments from our regional surface water specialist concerning the surface water aspects of the landfill monitoring presented in the report are as follows:

Previous surface water reviews suggested that TSS monitoring be completed on the ponds to determine if elevated leachate parameters corresponded to elevated TSS values, as well as asking for concentration vs. time graphs for surface water indicators. Neither suggestion was completed or discussed in the 2020 report. Both suggestions are still valid and should be considered and discussed in the next report prepared for the Ministry. Otherwise, continued sampling as per the ECA and Ponds 1 and 2 is recommend.

If you have any questions concerning this letter, please contact the undersigned at (519) 374-1388.

Yours truly,

Ian Mitchell
District Engineer
Owen Sound District

cc. Alison Munro, MECP, London
Allan Molenhuis, GHD, Waterloo, allan.molenhuis@ghd.com
Lisa Hines, MECP, Owen Sound

Appendix D

QA/QC Verification Table

Appendix D

QA/QC Data Verification Table
2023 Annual Monitoring Report
Ward 1 Landfill Site
Municipality of Kincardine, Ontario

Sample Location:		OW16B-92	OW16B-92		OW17B-96	OW17B-96		Field Blank	Field Blank
Sample ID:		OW16B-92	Field Dup	RPD	OW17B-96	DUP1	RPD	FB1	Field Blank
Sample Date:		11/9/2023	11/9/2023		5/17/2023	5/17/2023		5/17/2023	11/9/2023
			Duplicate			Duplicate		Field Blank	Field Blank
Parameters	**Units**								
Metals									
Calcium	mg/L	176	161	9%	42.1	43	2%	0.13	<0.01
Magnesium	mg/L	35.1	33.8	4%	21.4	23	7%	0.044	<0.001
General Chemistry									
Alkalinity, total (as CaCO3)	mg/L	849	779	9%	228	233	2%	<2	2
Ammonia-N	mg/L	32.1	32.4	1%	-	-	-	-	<0.1
Biochemical oxygen demand (BOD)	mg/L	5	5	0%	-	-	-	-	<2
Chemical oxygen demand (COD)	mg/L	52	44	17%	-	-	-	-	10
Chloride	mg/L	51	53	4%	7	7	0%	<1	<1
Conductivity	µS/cm	1750	1610	8%	493	348	34%	5	2
Dissolved organic carbon (DOC)	mg/L	9	11	20%	3	3	0%	<1	<1
Hardness	mg/L	584	542	7%	193	202	5%	0.5	<0.05
Nitrate (as N)	mg/L	<0.06	<0.06	0%	-	-	-	-	<0.06
Nitrite (as N)	mg/L	<0.03	<0.03	0%	-	-	-	-	<0.03
pH, lab	none	7.67	7.61	1%	8.15	8.29	2%	6.4	6.28
Phenolics (total)	mg/L	<0.002	<0.002	0%	<0.002	<0.002	0%	<0.002	<0.002
Total kjeldahl nitrogen (TKN)	mg/L	33.1	33.2	0%	-	-	-	-	0.6
Field Parameters									
Conductivity, field	µS/cm	2250	2250	-	542	542	-	-	-
pH, field	s.u.	6.5	6.5	-	6.69	6.69	-	-	-
Temperature, field	°C	11.53	11.53	-	9.99	9.99	-	-	-

Notes:

RPD Relative Percent Difference

Appendix E

Stratigraphic and Instrumentation Logs

MONITORING WELL: OW1-78

Depth (m)	*Elevation (m AMSL)*	*Stratigraphic Description*
0 - 3.96	200.42 - 196.46	Medium Sand
3.96 - 4.57	196.46 - 195.85	Stiff grey-brown clay

Piezometer Length:	5.29 m
Top of Piezometer Elevation:	201.14 m AMSL
Ground Elevation:	200.42 m AMSL

MONITORING WELL: OW2-78

Depth (m)	*Elevation (m AMSL)*	*Stratigraphic Description*
0 - 3.96	200.50 - 196.54	Medium Sand
3.96 - 7.62	196.54 - 192.88	Stiff grey-brown clay

Piezometer Length:	8.23 m
Top of Piezometer Elevation:	201.11 m AMSL
Ground Elevation:	200.50 m AMSL

MONITORING WELL: OW1-82

Depth (m)	*Elevation (m AMSL)*	*Stratigraphic Description*
0 - 3.34	198.79 - 197.86	Sand

Piezometer Length:	1.86 m
Top of Piezometer Elevation:	199.72 m AMSL
Ground Elevation:	198.79 m AMSL

MONITORING WELL: OW2-82

Depth (m)	*Elevation (m AMSL)*	*Stratigraphic Description*
0 - 3.66	--	Sand

Piezometer Length:	--
Top of Piezometer Elevation:	199.55 m AMSL
Ground Elevation:	--

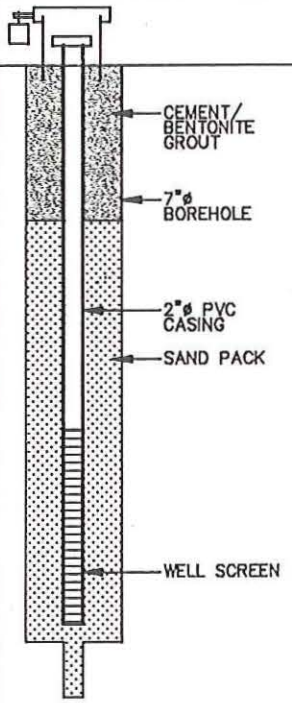
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-1)

PROJECT NAME: KINCARDINE LANDFILL
PROJECT NO.: 133
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

HOLE DESIGNATION: OW1-89
DATE COMPLETED: SEPTEMBER 14, 1989
DRILLING METHOD: 3 1/4" ID HSA
CRA SUPERVISOR: S. ANDERSON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*659.56* *656.9*				
2.5	SP(SAND), some silt, fine grained, brown, dry	*654.4*		1SS	X	17
5.0	Moist becoming wet at 5.75 ft. BGS	*651.9*		2SS	X	9
7.5				3SS	X	12
10.0				4SS	X	12
12.5						
15.0				5SS	X	17
17.5	END OF HOLE @ 16.5 FT. BGS	*640.4*				
20.0						
22.5						
25.0						
27.5						
30.0						
32.5						



SCREEN DETAILS:
Screened Interval:
9.5' to 14.5' BGS
Length - 5'
Diameter - 2"
Slot # 10
Material - PVC
Sand pack interval:
4.0' to 16.5' BGS
Material - Native/ Clean Silica

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-2)

PROJECT NAME: KINCARDINE LANDFILL
PROJECT NO.: 133
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

HOLE DESIGNATION: OW2-89
DATE COMPLETED: SEPTEMBER 15, 1989
DRILLING METHOD: 3 1/4" ID HSA
CRA SUPERVISOR: S. ANDERSON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	656.65				
	GROUND SURFACE	654.0				
2.5	SP(SAND), fine grained, dark brown, moist	651.5	CEMENT/BENTONITE GROUT; 7"ø BOREHOLE	1SS		8
5.0	Fine to medium grained, wet	649.0	SAND PACK; 2"ø PVC CASING	2SS		9
7.5						
10.0				3SS		14
12.5			WELL SCREEN	4SS		10
15.0						
	CL(CLAY), some angular fragment, gray, moist	638.0	BENTONITE SEAL			
17.5				5SS		39
20.0						
22.5						
25.0				6SS		26
	END OF HOLE @ 26.5 FT. BGS	627.5				
27.5						
30.0						
32.5						

SCREEN DETAILS:
Screened Interval:
9.5' to 14.5' BGS
Length - 5'
Diameter - 2"
Slot # 10
Material - PVC
Sand pack interval:
3.0' to 16.0' BGS
Material - Native/
Clean Silica

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

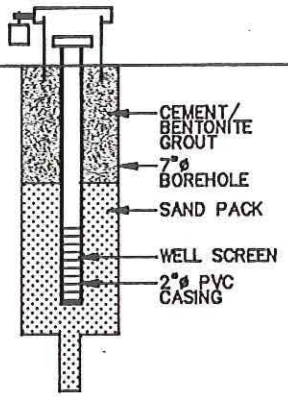
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-3)

PROJECT NAME: KINCARDINE LANDFILL
PROJECT NO.: 133
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

HOLE DESIGNATION: OW3-89
DATE COMPLETED: SEPTEMBER 15, 1989
DRILLING METHOD: 3 1/4" ID HSA
CRA SUPERVISOR: S. ANDERSON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	657.54 654.5				
	OL(TOPSOIL), sandy	654.2				
2.5	SP(SAND), some silt, medium grained, brown, dry			1SS	X	9
	Moist at 4.0 ft. BGS	650.5		2SS	X	7
5.0	Little silt, wet, clay at tip	649.5		3SS	X	6
7.5	CL(CLAY), silt, angular granules, moist			4SS	X	17
	END OF HOLE @ 8.5 FT. BGS	646.0				
10.0						
12.5						
15.0						
17.5						
20.0						
22.5						
25.0						
27.5						
30.0						
32.5						

SCREEN DETAILS:
Screened Interval:
4.2' to 6.2' BGS
Length - 2'
Diameter - 2"
Slot # 4 Per Inch
Material - PVC
Sand pack interval:
3.0' to 8.5' BGS
Material - Native/ Clean Silica

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-4)

PROJECT NAME: KINCARDINE LANDFILL
PROJECT NO.: 133
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

HOLE DESIGNATION: BH1-89
DATE COMPLETED: SEPTEMBER 13, 1989
DRILLING METHOD: 3 1/4" ID HSA
CRA SUPERVISOR: S. ANDERSON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	SP(SAND), little silt, fine grained, brown		7"ø BOREHOLE	1SS		2
2.5	CL(CLAY), silty, little sand, angular granules, hard, gray, dry	-2.0	CEMENT/ BENTONITE GROUT	2SS		35
5.0				3SS		36
7.5				4SS		59
10.0	Some silt, moist	-10.0		5SS		48
12.5	CH(CLAY), some silt, plastic, moist to wet	-13.0				
15.0				6SS		24
17.5						
20.0						
22.5						
25.0	No silt, wet	-25.0		7SS		12
	END OF HOLE @ 26.5 FT. BGS	-26.5				
27.5						
30.0						
32.5						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-5)

PROJECT NAME: KINCARDINE LANDFILL
PROJECT NO.: 133
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

HOLE DESIGNATION: BH2-89
DATE COMPLETED: SEPTEMBER 14, 1989
DRILLING METHOD: 3 1/4" ID HSA
CRA SUPERVISOR: S. ANDERSON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
2.5	SP(SAND), some silt, fine grained, brown, dry	-2.5	7"ø BOREHOLE; CEMENT/BENTONITE GROUT	1SS		20
5.0	Moist becoming wet at 6.5 ft. BGS	-5.0		2SS		11
7.5						
10.0						
12.5						
15.0				3SS		12
17.5						
20.0	ML(SILT), little clay, some granules, moist	-20.0				
22.5				4SS		33
25.0	CL(CLAY), little silt, plastic, wet	-25.0		5SS		29
	END OF HOLE @ 26.5 FT. BGS	-26.5				
27.5						
30.0						
32.5						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-6)

PROJECT NAME: KINCARDINE LANDFILL
PROJECT NO.: 133
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

HOLE DESIGNATION: BH3-89
DATE COMPLETED: SEPTEMBER 14, 1989
DRILLING METHOD: 3 1/4" ID HSA
CRA SUPERVISOR: S. ANDERSON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
2.5			7" ϕ BACKHOLE; CEMENT/ BENTONITE GROUT			
5.0	SP(SAND), some silt, medium grained, brown, moist	-5.0		1SS	⊠	11
7.5	Fine grained, wet	-7.5		2SS	⊠	12
10.0						
12.5						
15.0	Little silt	-15.0		3SS	⊠	12
17.5	ML(SILT), sand, brown, wet	-18.0				
20.0				4SS	⊠	15
22.5	SP(SAND), some silt, some granules, medium granied, brown, wet	-21.5		5SS	⊠	13
25.0	CL(CLAY), silt, some angular granules	-25.0		6SS	⊠	31
27.5	END OF HOLE @ 27.5 FT. BGS	-27.5				
30.0						
32.5						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ◯ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-7)

PROJECT NAME: KINCARDINE LANDFILL
PROJECT NO.: 133
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

HOLE DESIGNATION: BH4-89
DATE COMPLETED: SEPTEMBER 15, 1989
DRILLING METHOD: 3 1/4" ID HSA
CRA SUPERVISOR: S. ANDERSON

DEPTH ft BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION ft AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	SP(SAND), medium to fine grained, brown, dry		7" ø BOREHOLE	1SS		8
2.5	Medium grained	-2.5	CEMENT/ BENTONITE GROUT	2SS		7
	CL(CLAY), some silt, some angular granules	-3.8				
5.0	Silt, few granules, gray, dry	-5.0		3SS		14
7.5						
10.0				4SS		28
12.5						
15.0				5SS		29
	END OF HOLE @ 16.5 FT. BGS	-16.5				
17.5						
20.0						
22.5						
25.0						
27.5						
30.0						
32.5						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-01)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW1-91
DATE COMPLETED: JULY 22, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	196.83				
	GROUND SURFACE	195.64				
	SM-SAND(TOPSOIL), fine grained sand, little silt, poorly graded, black, dry	195.34	CONCRETE SEAL	1CS		
	SM-SAND, fine grained sand, little to trace silt, poorly graded, brown, moist		BENTONITE GROUT	2		
1.0						
		194.19				
	CL-CLAY, clay and silt lense, brown, moist	194.04		3CS		
		193.91				
2.0	SM-SAND, coarse to medium grained sand, trace silt, moderately graded, gray, saturated, occasional pebble/stone	193.81	165.1mmø BOREHOLE	4		
				5		
		192.82				
3.0	SP-SAND, fine to coarse grained sand, little gravel, little silt, well graded, grey, saturated, pebbly/stoney lenses		50.8mmø PVC RISER PIPE	6CS		
4.0						
		191.30	BENTONITE PELLET SEAL			
	SM-SAND, fine grained sand, little silt, moderately graded, gray, saturated, heavy mineral laminations, stoney					
5.0			SAND PACK	7CS		
	- heaving sands	189.77	PVC WELL SCREEN			
6.0	SP-SAND, medium to coarse grained sand, little silt, moderately to well graded, saturated, occasional pebble			8CS		
		188.78		9		
7.0	CL-CLAY, some silt, stiff, low plasticity, grey, occasional pebble, competent		BENTONITE PELLET SEAL			
8.0				10CS		
9.0						
				11CS		
10.0			BENTONITE GROUT			
11.0				12CS		
12.0	END OF HOLE @ 11.96 m BGS.	183.68				
13.0						

SCREEN DETAILS:
Screened Interval:
5.18 to 6.70m BGS
Length -1.52m
Diameter -50.8mm

Slot # 10
Material -PVC
Sand pack interval:
4.57 to 7.01m BGS
Material -# 3M Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS (○) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

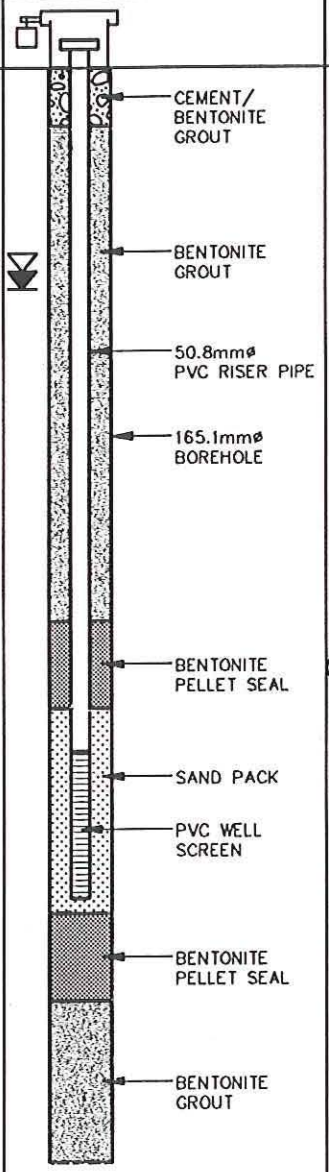
(L-02)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW2A-91
DATE COMPLETED: JULY 23, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL
	REFERENCE POINT (Top of Riser)	*197.35*
	GROUND SURFACE	*196.31*
	SP-SAND, fine grained sand, little silt, dark brown, dry	
1.0	SP-SAND, fine grained sand, little silt, medium dense, well graded, light brown, dry to damp	
2.0	- silt seam, red brown, (5cm)	*194.18*
	SP-SAND, fine to medium grained sand, little silt, medium dense, poorly graded, grey, saturated	*193.99*
3.0		
4.0	SP-SAND, fine grained sand, little silt, grey, saturated, occasionally stoney	
		191.74
5.0	SW-SAND, fine to coarse grained sand, little silt, very dense, grey, saturated	
6.0		
		189.76
7.0	SM-SAND, fine grained sand, some silt, very dense, gray, saturated	
8.0		*188.39*
	ML-SILT, some clay, stiff, medium plasticity, grey, competent, no fractures	
9.0		
10.0		
11.0		
		184.88
	END OF HOLE @ 11.43 m BGS.	
12.0		
13.0		

MONITOR INSTALLATION



SAMPLE

NUMBER	STATE	'N' VALUE
1SS		20
2SS		24
3SS		13
4SS		>50
5SS		73
6SS		71
7SS		76
8SS		73
9SS		40
10CS		
11CS		

SCREEN DETAILS:
Screened Interval: 7.16 to 8.68m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval: 6.71 to 8.84m BGS
Material -# 10 Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

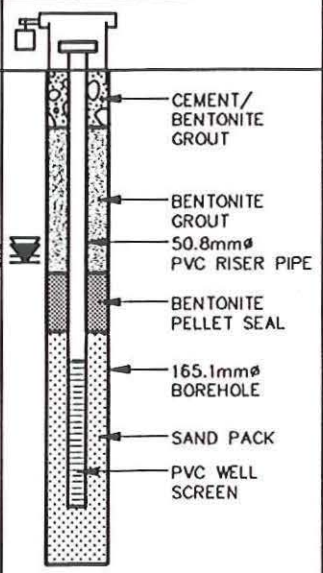
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-03)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW2B-91
DATE COMPLETED: JULY 23, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*197.25* *196.23*				
1.0	For stratigraphic details see OW2A-91					
2.0		*194.28* *194.33*				
3.0						
4.0						
5.0		*191.05*				
	END OF HOLE @ 5.18 m BGS.					
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

SCREEN DETAILS:
Screened Interval:
3.05 to 4.57m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
2.74 to 5.18m BGS
Material -# 3M Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-04)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW3-91
DATE COMPLETED: JULY 24, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	203.04				
	GROUND SURFACE	202.06				
	SM-SAND, fine grained sand, little to trace silt, loose, well graded, light brown, dry		CONCRETE SEAL	1CS		
1.0			BENTONITE GROUT			
2.0		199.84 ▽	BENTONITE PELLET SEAL	2CS		
	– damp – some silt, gray, saturated		50.8mmø PVC RISER PIPE			
3.0			SAND PACK	3CS		
		198.56 ▽	PVC WELL SCREEN			
4.0		198.10	165.1mmø BOREHOLE	4CS		
	ML-SILT, little clay, stiff, low plasticity, grey, moist, competent, occasional pebble, occasional stone					
5.0			BENTONITE PELLET SEAL			
6.0				5CS		
7.0	– occasional stone to stoney		BENTONITE GROUT			
				6CS		
8.0		193.75				
	END OF HOLE @ 8.31 m BGS.					
9.0			SCREEN DETAILS: Screened Interval: 2.74 to 4.26m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 2.13 to 4.57m BGS Material -# 3M Sand			
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-05)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW4-91
DATE COMPLETED: JULY 26, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*204.24* *203.27*				
	TOPSOIL – silty, dark brown, organic, rootlets	*202.76*	CONCRETE SEAL	1CS		
1.0	ML–SILT, trace clay, brittle, light brown, dry, highly fractured, grey on fracture planes, occasional pebble		BENTONITE PELLET SEAL			
2.0				2CS		
	– grey brown		165.1mmø BOREHOLE			
3.0						
	– grey, increased competence, slightly plastic, damp		50.8mmø PVC RISER PIPE	3CS		
4.0	– grey, competent, plastic, moist					
			SAND PACK	4CS		
5.0						
	– grey, competent, plastic, moist		PVC WELL SCREEN			
6.0						
				5CS		
7.0						
	END OF HOLE @ 7.29 m BGS.	*195.98*				
8.0			SCREEN DETAILS: Screened Interval: 3.96 to 7.01m BGS Length –3.05m Diameter –50.8mm Slot # 10 Material –PVC Sand pack interval: 3.35 to 7.29m BGS Material –# 3M Sand			
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

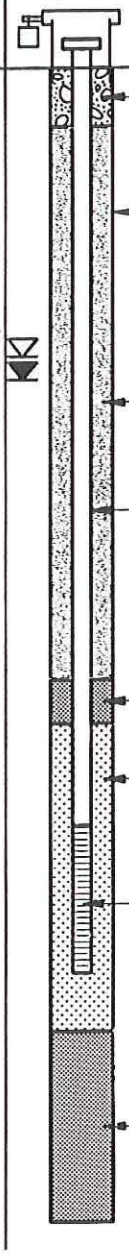
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-06)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW5A-91
DATE COMPLETED: JULY 29, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL
	REFERENCE POINT (Top of Riser)	198.83
	GROUND SURFACE	197.91
	TOPSOIL – fine grained sand, trace silt, pebbly, occasional stone, dry	197.66
1.0	SW-SAND(FILL), fine to medium grained sand, trace to little silt, loose, red brown, slightly damp	196.69
2.0	SP-SAND, fine grained sand, trace to little silt, loose, black, dry to damp, organic lenses	
	SP-SAND, fine grained sand, trace to little silt, loose, red brown, damp	
3.0		194.86 / 194.61
	SW-SAND, medium to coarse grained sand, little to some gravel, trace to little silt, moderately hard, grey, wet	194.35
4.0	SW-SAND, fine to coarse grained sand, little to some gravel, trace silt, moderately hard, grey, saturated, occasional stone or cobble	
5.0		
6.0	– little silt	
7.0		
	SP-SAND, fine grained sand, little to trace silt, grey, saturated	190.59
8.0		
9.0		
	ML-SILT, little clay, stiff, plastic, grey, moist, occasional pebble, competent	188.77
10.0		
	– brown to grey, competent, damp to moist	
11.0		
12.0	END OF HOLE @ 12.04 m BGS.	185.87
13.0		



SAMPLE NUMBER	STATE	'N' VALUE
1CS		
2		
3CS		
4		
5CS		
6CS		
7CS		
8SS		>50
9SS		49
10SS		73
11SS		27
12SS		64
13SS		27
14CS		
15CS		

SCREEN DETAILS:
Screened Interval:
7.93 to 9.45m BGS
Length –1.52m
Diameter –50.8mm

Slot # 10
Material –PVC
Sand pack interval:
6.86 to 10.06m BGS
Material –# 2M Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-07)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW5B-91
DATE COMPLETED: JULY 29, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	198.77 197.89				
0	For stratigraphy see OW5A-91		CONCRETE SEAL			
1.0			BENTONITE GROUT			
2.0			165.1mmø BOREHOLE			
			BENTONITE PELLET SEAL			
3.0		194.80 194.61				
			50.8mmø PVC RISER PIPE			
4.0			SAND PACK			
			PVC WELL SCREEN			
5.0		192.71				
	END OF HOLE @ 5.18 m BGS.					
6.0			SCREEN DETAILS: Screened Interval: 3.66 to 5.18m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 2.74 to 5.18m BGS Material -# 2M Sand			
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-08)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW6A-91
DATE COMPLETED: JULY 29, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	198.87				
	GROUND SURFACE	198.01				
	SW-SAND(FILL), fine to coarse grained sand, little gravel, loose, black, dry, occasional pebble or stone		CONCRETE SEAL	1CS		
1.0	SW-SAND(FILL), fine to medium grained sand, trace silt, loose, stratified, red brown, dry, rootlets, occasional pebble or stone	196.79		2		
		196.49 ▽ 196.49	50.8mmø PVC RISER PIPE	3CS		
2.0	SP-SAND, fine grained sand, little to trace silt, slightly dense, red brown, damp to moist, organic zones					
	SW-SAND, fine to medium grained sand, trace to little silt, moderately dense, grey, saturated, occasional stone			4		
3.0	– very saturated	194.66 ▽	BENTONITE GROUT	5CS		
4.0						
	SW-SAND, fine to coarse grained sand, little silt, dense, grey, saturated		165.1mmø BOREHOLE			
5.0	– silt/clay lense (7.5cm)			6CS		
	– fine grained sands, wood chips		BENTONITE PELLET SEAL			
6.0	– little gravel, extremely saturated					
			SAND PACK	7CS		
7.0	– wood		PVC WELL SCREEN			
		190.16				
8.0	ML-SILT, little clay, plastic, grey, competent, damp, occasional pebble			8CS		
9.0						
			BENTONITE PELLET SEAL	9CS		
10.0						
		187.42				
	END OF HOLE @ 10.59 m BGS.					
11.0						
12.0						
13.0						

SCREEN DETAILS:
Screened Interval:
6.40 to 7.92m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
6.10 to 8.53m BGS
Material -# 2M Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

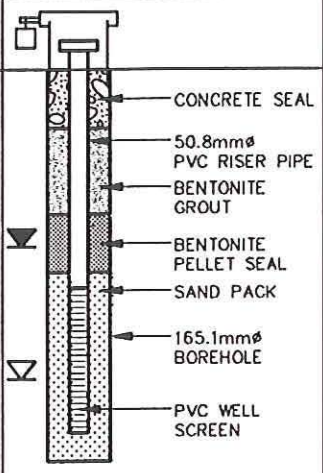
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-09)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW6B-91
DATE COMPLETED: JULY 30, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser)	198.86				
	GROUND SURFACE	197.95				
	For stratigraphy see OW6A-91					
1.0						
2.0						
3.0						
4.0		193.81				
	END OF HOLE @ 4.14 m BGS.					
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

SCREEN DETAILS:
Screened Interval:
2.29 to 3.81m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
2.13 to 4.11m BGS
Material -# 2M Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

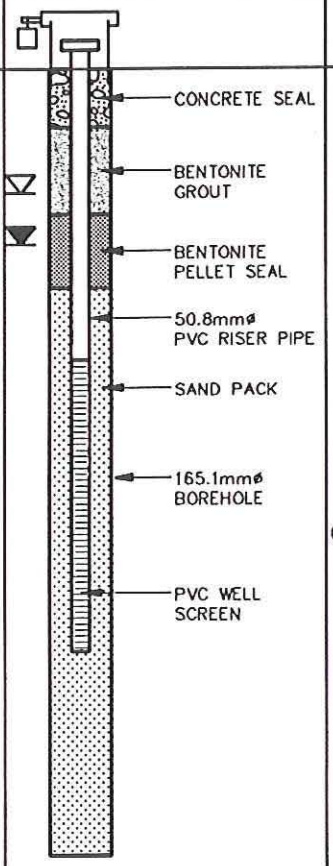
(L-10)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW7-91
DATE COMPLETED: JULY 30, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL
	REFERENCE POINT (Top of Riser)	199.26
	GROUND SURFACE	198.39
	SW-SAND(FILL), fine to coarse grained sand, little gravel, trace to little silt, loose, well graded, black, dry, organics	198.24
1.0	SP-SAND(FILL), fine grained sand, trace to little silt, loose, poorly graded, red brown, dry, stratified	197.09 / 197.02
2.0	SP-SAND, fine grained sand, trace to little silt, loose, poorly graded, red brown, dry, organic lenses - wet to saturated - very fine grained sand, some silt	196.55
3.0		
4.0		
	- saturated	
5.0		
6.0	CL-CLAY, little silt, soft, very plastic, grey, wet, occasional pebble	192.45
7.0	- some silt, gray brown	
8.0		
	END OF HOLE @ 8.23 m BGS.	190.16
9.0		
10.0		
11.0		
12.0		
13.0		

MONITOR INSTALLATION



SCREEN DETAILS:
Screened Interval:
3.05 to 6.10m BGS
Length -3.05m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
2.29 to 8.23m BGS
Material -# 2M Sand

SAMPLE NUMBER	STATE	'N' VALUE
1CS		
2CS		
3		
4CS		
5SS		27
6SS		42
7SS		12
8CS		
9CS		

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS (oval) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

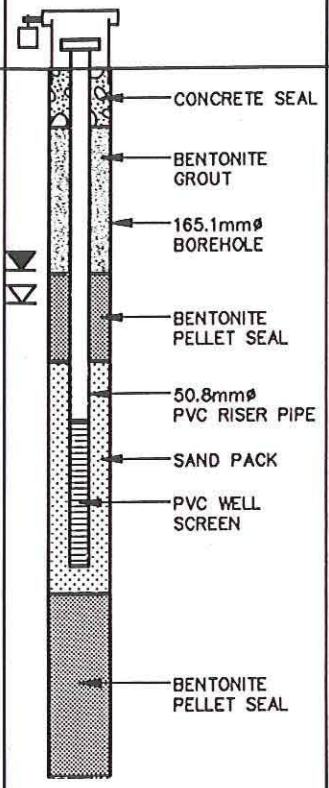
(L-11)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW8-91
DATE COMPLETED: JULY 30, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL
	REFERENCE POINT (Top of Riser)	*199.96*
	GROUND SURFACE	*199.06*
	SW-SAND(FILL), fine to coarse grained sand, little gravel, loose, well graded, black, dry	*198.80*
1.0	SP-SAND(FILL), fine to medium grained sand, trace silt, loose, moderately graded, red brown, dry, occasional organic lense	
		197.23
2.0	PEAT - organic lense	*196.97*
	SP-SAND, fine grained sand, little to trace silt, slightly dense, poorly graded, grey, damp	*196.93*
		196.62
3.0	- saturated	
4.0		
5.0		*193.98*
	ML-SILT, trace to little clay, firm to stiff, low plasticity, grey, damp, occasional pebble	
6.0	- moist	
7.0		*191.69*
	END OF HOLE @ 7.37 m BGS.	
8.0		
9.0		
10.0		
11.0		
12.0		
13.0		

MONITOR INSTALLATION



SCREEN DETAILS:
Screened Interval:
3.66 to 5.18m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
3.05 to 5.47m BGS
Material -# 2M Sand

SAMPLE NUMBER	STATE	'N' VALUE
1SS		
2		
3SS		
4		
5		
6SS		
7SS		
8		
9SS		

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

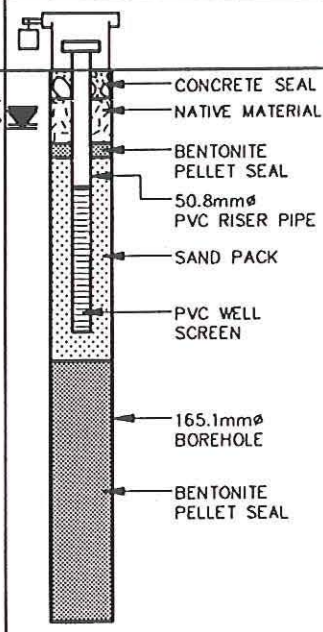
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-12)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW9-91
DATE COMPLETED: JULY 31, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*198.48* *197.53*				
	TOPSOIL – fine grained sand and silt, black organic, rootlets	*197.33*		1CS		
		196.96 *196.92* ▽				
1.0	SP–SAND, fine to medium grained sand, trace to little silt, loose to slightly dense, brown, moist – wet – saturated			2		
2.0				3CS		
		194.79				
3.0	ML–SILT, little clay, stiff to firm, slightly plastic, grey, damp to moist, competent, occasional pebble or stone					
4.0				4CS		
5.0				5CS		
		191.76				
6.0	END OF HOLE @ 5.77 m BGS.					
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						



SCREEN DETAILS:
Screened Interval:
1.22 to 2.74m BGS
Length –1.52m
Diameter –50.8mm
Slot # 10
Material –PVC
Sand pack interval:
0.91 to 3.05m BGS
Material –# 3M Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-13)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH1-91
DATE COMPLETED: JULY 24, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	201.98				
0	SW-SAND, fine grained sand, trace silt, well graded, dark brown, dry		CONCRETE SEAL	1CS		
1.0	- tan to light brown, damp					
2.0				2CS		
3.0	- fine to medium grained sand - wet	198.73 ▽	165.1mmø BOREHOLE	3CS		
4.0						
5.0			BENTONITE GROUT	4SS		13
	ML-SILT, some clay, stiff, plastic, grey, damp, competent, occasional pebble	196.65		5SS		26
6.0	- occasional stone					
7.0	- increased clay content			6CS		
8.0				7CS		
9.0	END OF HOLE @ 8.81 m BGS.	193.17				
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-14)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH2-91
DATE COMPLETED: JULY 24, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	*202.15*				
	SP-SAND, fine grained sand, little to trace silt, poorly graded, red brown to dark brown, dry, organic zones with rootlets		CONCRETE SEAL	1CS		
1.0	ML-SILT, little clay, red brown to grey mottled, dry, brittle, oxidized, fractured, weathered, occasional pebble	*201.34*				
2.0				2CS		
3.0	- gradational color change from red brown to brown to grey at 3.96m BGS		165.1mmø BOREHOLE			
	- increased clay content, more competent			3CS		
4.0			BENTONITE GROUT			
5.0	- grey, competent, moist - competent, moist			4CS		
6.0						
	- increased clay content, very moist			5CS		
7.0						
8.0				6CS		
	END OF HOLE @ 8.13 m BGS.	*194.02*				
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

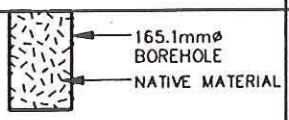
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-15)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH3A-91
DATE COMPLETED: JULY 25, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	*201.88*				
	TOPSIL - silty, organic, black	*201.52*		1CS	X	
1.0	SP-SAND, fine grained sand, trace to little silt, loose, well graded, red brown, damp, occasional organic lense, rootlets	*201.22*				
	ML-SILT, little clay, brittle, red brown to brown, dry, weathered, highly fractured horizontallly and vertically, oxidized along fracture zones, occasional pebble	*200.84*				
2.0	END OF HOLE @ 1.04 m BGS.					
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

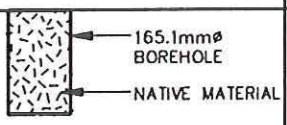
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-16)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH3B-91
DATE COMPLETED: JULY 25, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	201.72				
	TOPSOIL – silty, organic, black	201.11		1CS		
1.0	SP–SAND, fine grained sand, little silt, loose, well graded, red brown, damp	200.91				
	ML–SILT, little clay, brittle, red brown to brown, dry, weathered, highly fractured horizontally and vertically, oxidized, occasional pebble	200.65				
2.0	END OF HOLE @ 1.07 m BGS.					
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

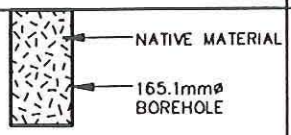
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-17)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH3C-91
DATE COMPLETED: JULY 25, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	*202.65*				
	TOPSOIL – silty, organic, black	*202.45*		1CS	X	
1.0	SP–SAND, fine to medium grained sand, trace to little silt, loose to compact, moderately graded, red brown, dry to damp	*202.14*				
	ML–SILT, trace clay, brittle, red brown to grey to light brown, dry, weathered, fractured horizontally and vertically, oxidized along fractures, occasional pebble	*201.43*				
2.0	END OF HOLE @ 1.22 m BGS.					
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-18)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH3D-91
DATE COMPLETED: JULY 25, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	203.25				
	TOPSOIL – silty, organic, black	203.05				
1.0	ML–SILT, little to trace clay, brittle, hard, red brown to brown or tan, dry, fractured horizontally and vertically, weathered, occasional pebble – very hard			1CS		
2.0			165.1mmø BOREHOLE			
3.0	– transition to grey colour, slightly damp, less fracturing – vertical fracture at 70°					
4.0	– grey, more competent, damp to moist, occasional pebble or stone, increased clay content		BENTONITE GROUT			
5.0						
6.0	– grey, plastic, competent, moist, occasional stone			6CS		
7.0						
	END OF HOLE @ 7.26 m BGS.	195.99				
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-19)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH4A-91
DATE COMPLETED: JULY 25, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	203.15				
1.0	TOPSOIL – silty, organic, black	202.87	165.1mmø BOREHOLE; NATIVE MATERIAL	1CS	X	
	ML–SILT, trace to little clay, red brown to grey, dry, brittle, weathered, fractured horizontally and vertically, oxidized, damp on fractures, occasional pebble	201.96				
	END OF HOLE @ 1.19 m BGS.					
2.0						
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-20)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH4B-91
DATE COMPLETED: JULY 25, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	203.06				
	TOPSOIL – silty, organic, black	202.81	 165.1mmø BOREHOLE; NATIVE MATERIAL	1CS		
	SM–SAND, fine to medium grained sand, trace to little silt, loose, moderately graded, dark brown, dry to damp	202.78				
1.0	ML–SILT, trace clay, red brown to grey, dry, brittle, weathered, fractured horizontally and vertically, oxidized, damp, grey at fractures, occasional pebble	201.84				
2.0	END OF HOLE @ 1.22 m BGS.					
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-21)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH4C-91
DATE COMPLETED: JULY 25, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	202.86				
1.0	TOPSOIL – silty, organic, black	202.56	165.1mmø BOREHOLE	1CS		
	ML–SILT, little clay, red brown to grey, dry, brittle, weathered, fractured horizontal and vertically, oxidized, damp and grey on fractures, occasional pebble, occasional stone	201.69	NATIVE MATERIAL			
	END OF HOLE @ 1.17 m BGS.					
2.0						
3.0						
4.0						
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-22)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH4D-91
DATE COMPLETED: JULY 26, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	202.61				
	TOPSOIL – silty, organic, red brown	202.33				
1.0	ML–SILT, trace clay, brittle, red brown, dry, highly fractured, grey on fracture planes, occasional pebble – brown, less fracturing			1CS		
2.0			165.1mmø BOREHOLE	2CS		
3.0						
4.0	– gradational colour change to grey, slightly plastic, increasing competence, slightly damp – increasing clay content, plastic, grey, competent, damp to moist at base, occasional stone		BENTONITE GROUT	3CS		
5.0				4CS		
6.0	– grey, competent					
7.0				5CS		
	END OF HOLE @ 7.26 m BGS.	195.35				
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-23)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH5-91
DATE COMPLETED: JULY 26, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	202.05				
	TOPSOIL – silty, organic, dark brown	201.75				
1.0	ML–SILT, trace to little clay, brittle, light brown, dry, weathered, fractured horizontally and vertically, grey colour on fracture planes, rootlets at top, occasional pebble			1CS		
2.0	– less fracturing, red oxidation on fracture planes – grey brown, increased competence		165.1mmø BOREHOLE	2CS		
3.0						
4.0	– gradational colour change to grey, increased competence, very slightly plastic – increased clay content, plastic, grey, damp to moist, occasional pebble or stone		BENTONITE GROUT	3CS		
5.0				4CS		
6.0						
7.0	– more competent, plastic, moist	194.81		5CS		
	END OF HOLE @ 7.24 m BGS.					
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-28)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW10-92
DATE COMPLETED: JANUARY 13, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	*203.11* *202.30*				
1.0	For stratigraphy from 0.0 to 3.0m see log OW3-91		CONCRETE SEAL BENTONITE PELLET SEAL 50.8mmø PVC PIPE 203.2mmø BOREHOLE			
2.0						
3.0	SM-SAND, little silt, loose, medium to fine grained, poorly graded, brown, moist to very moist, slightly oxidized	*199.25*	SAND PACK WELL SCREEN	1SS		4
4.0	- same, except very loose	*198.03*		2SS		2
5.0	ML-SILT, little clay, trace sand, soft, low plasticity, grey, moist - same, except some clay, trace gravel, firm	*197.12*	BENTONITE PELLET SEAL 50.8mmø SPLIT SPOON	3SS		8
6.0	END OF HOLE @ 5.18 m BGS.					
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

SCREEN DETAILS:
Screened Interval:
2.75 to 4.27m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
2.13 to 4.27m BGS
Material -#3 Silica

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-29)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW11-92
DATE COMPLETED: JANUARY 14, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	202.77 201.92				
1.0	SM-SAND(TOPSOIL), little silt, trace clay, medium to fine grained, poorly graded, brown, moist, organics, rootlets	201.46	CONCRETE SEAL BENTONITE PELLET SEAL 50.8mmø PVC PIPE SAND PACK WELL SCREEN	1CS		
2.0	SP-SAND, trace silt, medium to fine grained, poorly graded, rust brown, moist, oxidized - light brown, no oxidization			2CS		
3.0	ML-SILT, some clay, trace sand, trace gravel, low plasticity, massive, brown, mottled	199.18	203.2mmø BOREHOLE			
4.0	- same, except grey, no mottling		BENTONITE PELLET SEAL	3CS		
	END OF HOLE @ 4.27 m BGS.	197.65				
5.0			SCREEN DETAILS: Screened Interval: 1.22 to 2.74m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 0.91 to 2.74m BGS Material -#3 Silica			
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-30)

PROJECT NAME: VALENTINE AVENUE LANDFILL
HOLE DESIGNATION: OW12-92

PROJECT NO.: 4074
DATE COMPLETED: JANUARY 14, 1992

CLIENT: TOWN OF KINCARDINE
DRILLING METHOD: 108mm ID HSA

LOCATION: AS PER PLAN
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	201.02 200.10				
0	ML-SILT(FILL), some fine sand, little to trace clay, black, moist, organics, rootlets	199.80	CONCRETE SEAL	1CS		
1.0	SM-SAND, little silt, medium to fine grained, poorly graded, black, moist - same, except grey	199.03	BENTONITE PELLET SEAL			
2.0	SP-SAND, trace to little silt, fine to medium grained, poorly graded, rust brown, moist, slightly oxidized - same, except brown, no oxidization - same, except wet, dilatent - same, except trace silt	198.12	50.8mmø PVC PIPE	2CS		
3.0			SAND PACK WELL SCREEN	3CS		
4.0			203.2mmø BOREHOLE			
5.0	ML-SILT, some clay, trace sand, trace gravel, low plasticity, massive, brown, moist	195.83	BENTONITE PELLET SEAL	4CS		
6.0	END OF HOLE @ 5.79 m BGS.	194.31				
7.0			SCREEN DETAILS: Screened Interval: 2.75 to 4.27m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 2.13 to 4.27m BGS Material -#3 Silica			
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

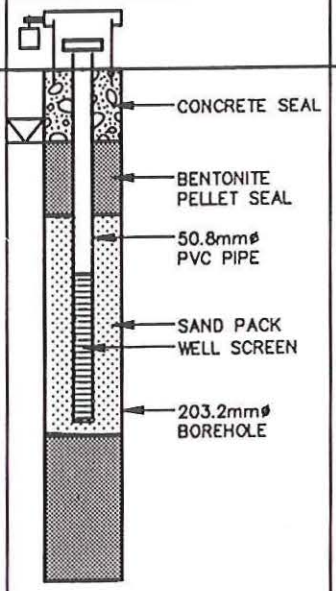
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-31)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW13-92
DATE COMPLETED: JANUARY 15, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	200.28 199.43				
	SP-SAND(TOPSOIL), some silt, trace clay, fine grained, poorly graded, black, moist, some oxidization	199.28				
1.0	SP-SAND, trace silt, medium to fine grained, poorly graded, brown, moist, oxidized - same, except wet, dilatent - same, except heaving sands, saturated, very dilatent	198.67		1CS 2CS		
2.0						
3.0				3CS		
4.0	ML-SILT, some clay, trace sand, trace gravel, low plasticity, massive, grey, moist, slightly oxidized	195.62		4CS		
5.0						
	END OF HOLE @ 5.33 m BGS.	194.10				
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						



SCREEN DETAILS:
Screened Interval:
2.14 to 3.66m BGS
Length -1.52m
Diameter -50.8mm
Slot # 10
Material -PVC
Sand pack interval:
1.52 to 3.81m BGS
Material -#3 Silica

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-32)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW14-92
DATE COMPLETED: JANUARY 15, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	201.40 200.50				
1.0	SP-SAND, trace silt, medium to fine grained, poorly graded, brown, moist, oxidized		CONCRETE SEAL BENTONITE PELLET SEAL	1CS		
2.0	- same, except grey, wet, leachate odour	198.37	50.8mmø PVC PIPE	2CS		
3.0			SAND PACK WELL SCREEN	3CS		
4.0	ML-SILT, some clay, trace fine sand, trace gravel, low plasticity, massive, brown, moist	196.54	203.2mmø BOREHOLE			
5.0			BENTONITE PELLET SEAL	4CS		
6.0	END OF HOLE @ 5.64 m BGS.	194.86				
7.0			SCREEN DETAILS: Screened Interval: 2.44 to 3.96m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 1.83 to 3.96m BGS Material -#3 Silica			
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-33)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW15-92
DATE COMPLETED: JANUARY 15, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	201.33 200.34				
1.0	SM-SAND, little silt, fine grained, poorly graded, brown, moist, organics, rootlets SP-SAND, trace silt, medium to fine grained, poorly graded, rust brown, moist, oxidized	200.19	CONCRETE SEAL	1CS		
	- same, except brown, no oxidization			2CS		
2.0	- same, except wet, dilatent	198.21	BENTONITE PELLET SEAL			
	- same, except grey, leachate odour		50.8mmø PVC PIPE			
3.0			203.2mmø BOREHOLE	3CS		
4.0	- same, except saturated, very dilatent		SAND PACK WELL SCREEN	(4CS)		
5.0	ML/CL-SILT and CLAY, trace fine sand, trace gravel, low plasticity, grey, moist	195.46				
6.0			BENTONITE PELLET SEAL	5CS		
	END OF HOLE @ 6.40 m BGS.	193.94				
7.0			SCREEN DETAILS: Screened Interval: 3.36 to 4.88m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 2.74 to 4.88m BGS Material -#3 Silica			
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS (○) WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-34)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW16A-92
DATE COMPLETED: JANUARY 16, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY/J. DUDA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	200.90 200.17				
1.0	SM-SAND, little silt, fine grained, poorly graded, brown, moist, organics, rootlets SP-SAND, trace silt, fine grained, poorly graded, rust brown, moist, oxidized	200.02	CONCRETE SEAL	1CS		
2.0	- same, except wet, no oxidization	198.34		2CS		
3.0				3CS		
4.0	ML/CL-SILT and CLAY, trace fine sand, trace gravel, low plasticity, massive, brown, oxidized, moist	196.21	203.2mmø BOREHOLE	4CS		
5.0			BENTONITE GROUT			
6.0	- same, except light grey, no oxidization		50.8mmø PVC PIPE	5CS		
7.0				6CS		
8.0						
9.0				7CS		
10.0	SCREEN DETAILS: Screened Interval: 11.58 to 13.10m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 10.97 to 13.10m BGS Material -#3 Silica		BENTONITE PELLET SEAL	8CS		
11.0						
12.0			SAND PACK WELL SCREEN	9CS		
13.0			BENTONITE PELLET SEAL 50.8mmø SPLIT SPOON	10SS		
	END OF HOLE @ 13.72 m BGS.	186.45				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

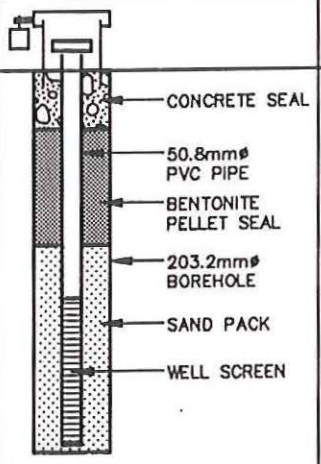
GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-35)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW16B-92
DATE COMPLETED: JANUARY 17, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY/J. DUDA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	*200.99* *200.14*				
1.0	For stratigraphy from 0.0 to 3.99m see log OW16A-92					
2.0						
3.0				1SS	X	42
4.0	END OF HOLE @ 3.99 m BGS.	*196.15*	SCREEN DETAILS: Screened Interval: 2.39 to 3.91m BGS Length -1.52m Diameter -50.8mm Slot # 10 Material -PVC Sand pack interval: 1.83 to 3.99m BGS Material -#3 Silica			
5.0						
6.0						
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-36)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: LW1-92
DATE COMPLETED: JANUARY 21, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	208.28 207.29				
1.0	ML-SILT(COVER), some to little clay, little sand, trace gravel, brown, moist REFUSE, wood fragments, plastics, textiles, bags, steel fragments, pop cans, tin cans, packaging, etc., moist	206.99	BENTONITE PELLET SEAL			
2.0						
3.0						
4.0			50.8mmø PVC PIPE GRAVEL PACK			
5.0			203.2mmø BOREHOLE			
6.0						
7.0		200.53	WELL SCREEN	1SS		27
8.0						
9.0	ML-SILT, some clay, trace fine sand, trace gravel, massive, low plasticity, brown, moist, mottled, oxidizing	198.91		2SS		41
10.0	- same, except grey		BENTONITE PELLET SEAL	3CS		
11.0	END OF HOLE @ 10.36 m BGS.	196.93				
12.0						
13.0						

SCREEN DETAILS:
Screened Interval:
5.18 to 8.23m BGS
Length -3.05m
Diameter -50.8mm
Slot # 10
Material -PVC
Gravel pack interval:
0.91 to 8.23m BGS
Material -3/4" washed gravel

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-37)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: LW2-92
DATE COMPLETED: JANUARY 22, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE ELEVATION (Top of Riser) GROUND SURFACE	208.74 207.72				
1.0	ML-SILT(COVER), little clay, trace sand, trace gravel, REFUSE, plastics, rubber, wood	207.42	BENTONITE PELLET SEAL			
2.0						
3.0						
4.0						
5.0			50.8mmø PVC PIPE			
6.0		201.93	GRAVEL PACK 203.2mmø BOREHOLE	1SS		32
7.0	SCREEN DETAILS: Screened Interval: 6.10 to 10.67m BGS Length -4.57m Diameter -50.8mm Slot # 10 Material -PVC Gravel pack interval: 1.22 to 10.67m BGS Material -3/4" washed gravel					
8.0			WELL SCREEN	2SS		15
9.0				3SS		36
10.0	SP-SAND, trace silt, medium dense, fine grained, poorly graded, black, wet, strong leachate odour	197.97		4SS		15
11.0	ML-SILT, some clay, trace fine sand, trace gravel, very stiff, low plasticity, massive, brown, moist	197.05		5SS		27
12.0	- same, except grey		BENTONITE PELLET SEAL	6CS		
13.0	END OF HOLE @ 12.80 m BGS.	194.92				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-24)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH6-92
DATE COMPLETED: JANUARY 13, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	*202.21*				
1.0	SM-SAND, little silt, loose, medium to fine grained, poorly graded, brown, moist, oxidized, rootlets and organics from 0.0 to 0.15m			1SS		5
		200.69				
2.0	ML/CL-SILT and CLAY, trace sand, trace gravel, firm, low plasticity, massive, brown, moist, oxidized, mottled		203.2mmø BOREHOLE	3CS		5
3.0			BENTONITE GROUT			
				4CS		-
4.0	- same, except gray, moist					
5.0				5CS		-
		196.42				
6.0	END OF HOLE @ 5.79 m BGS.					
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-25)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH7-92
DATE COMPLETED: JANUARY 13, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	201.55				
1.0	SP-SAND, trace silt, loose, medium to fine grained, poorly graded, brown, moist, oxidized, rootlets and organics from 0 to 0.15m			1SS		
2.0		199.26	203.2mmø BOREHOLE	2SS		
	SM-SAND, some silt, medium to fine grained, poorly graded, brown, wet	199.26 199.11				
3.0	ML/CL-SILT and CLAY, trace sand, low plasticity, massive, brown, moist, mottled - same, except some clay, trace gravel, grey		BENTONITE GROUT	3SS		
4.0						
5.0				4SS		
6.0	END OF HOLE @ 5.79 m BGS.	195.76				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-26)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH8-92
DATE COMPLETED: JANUARY 20, 1991
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	203.58				
	ML-SILT(TOPSOIL), little clay, trace sand, black, moist, organics, rootlets	203.28				
1.0	ML-SILT, some clay, trace fine sand, trace gravel, massive, very low plasticity, brown, moist, oxidized, mottled			1CS		
2.0	- SM-SAND seam (7.6cm thick at 2.18m BGS), some silt, fine grained, poorly graded, brown, moist			2CS		
3.0	- SM-SAND seam (12.7cm thick at 2.31m BGS), some silt, fine grained, poorly graded, brown, moist - same, except grey, moist		203.2mmø BOREHOLE	3CS		
4.0	- same, except medium plasticity					
5.0			BENTONITE GROUT	4CS		
6.0				5CS		
7.0						
8.0				6CS		
9.0				7CS		
10.0				8ST		
11.0	END OF HOLE @ 10.82 m BGS.	192.76	50.8mmø SHELBY TUBE			
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-27)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NO.: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: BH9-92
DATE COMPLETED: JANUARY 21, 1992
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: D. GRAY

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	GROUND SURFACE	202.55				
0	ML-SILT(TOPSOIL), little clay, trace sand, black, moist, organics, rootlets	202.40				
	SM-SAND, some silt, fine grained, poorly graded, brown, moist	202.25		1CS		
1.0	ML-SILT, some clay, trace fine sand, trace gravel, low plasticity, massive, brown, moist, mottled, oxidized					
2.0			203.2mmø BOREHOLE	2CS		
3.0			BENTONITE GROUT			
	- same, except grey, no mottling or oxidization			3CS		
4.0						
5.0	- same, except medium plasticity			4CS		
6.0	END OF HOLE @ 5.79 m BGS.	196.76				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

GRAIN SIZE ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

TABLE C.1

TEST PIT STRATIGRAPHIC LOGS
HYDROGEOLOGIC INVESTIGATION
VALENTINE AVENUE LANDFILL SITE
KINCARDINE, ONTARIO

TP1-91

Depth (m bgs) (1)	*Elevation (m AMSL)* (2)	*Stratigraphic Description*
0.00 - 0.46	201.16 - 200.70	SM (Topsoil) fine grained sand, silty, black, loose, dry, mixed with organics
0.46 - 2.00	200.70 - 199.16	SM (Sand) fine grained sand, little silt, well graded, red-brown, loose, dry
2.00 - 2.74	199.16 - 198.42	SP (Sand) fine to medium grained sand, trace silt, poorly graded, loose, grey, damp to wet at base
2.74 - 3.00	198.42 - 198.16	ML (Silt) silt, trace clay, firm, slightly plastic, grey, damp, competent

- test pit terminated at 3.00 metres bgs (198.16 m AMSL)
- 50.8 mm diameter standpipe installed to 2.82 metres bgs (198.34 m AMSL)
- water table encountered at 2.44 metres bgs (198.72 m AMSL)

TP2-91

Depth (m bgs) (1)	*Elevation (m AMSL)* (2)	*Stratigraphic Description*
0.00 - 0.15	202.74 - 202.59	SM (Topsoil) fine grained sand, silty, black, loose, dry, mixed with organics
0.15 - 2.74	202.59 - 200.00	SM (Sand) fine to medium grained sand, trace to little silt, poorly graded, grey, loose, damp to moist
2.74 - 3.10	200.00 - 199.64	ML (Silt) silt, little clay, red-brown, dry, brittle, oxidized, fractured, weathered

- test pit terminated at 3.10 metres bgs (199.64 m AMSL)
- 50.8 mm diameter standpipe installed to 2.54 metres bgs (200.20 m AMSL)
- water table not encountered.

TABLE C.1

TEST PIT STRATIGRAPHIC LOGS
HYDROGEOLOGIC INVESTIGATION
VALENTINE AVENUE LANDFILL SITE
KINCARDINE, ONTARIO

TP3-91

Depth (m bgs) (1)	*Elevation (m AMSL)* (2)	*Stratigraphic Description*
0.00 - 0.91	201.58 - 200.67	SM (Topsoil) fine grained sand, silty, black, loose, dry, organic material present
0.91 - 1.52	200.67 - 200.06	SM (Sand) fine grained sand, little to some silt, poorly graded, brown, loose, damp
1.52 - 2.13	200.06 - 199.45	ML (Silt) silt, trace clay, red-brown, damp, brittle, oxidized, fractured, weathered

- test pit terminated at 2.13 metres bgs (199.45 m AMSL)
- 50.8 mm diameter standpipe installed to 1.76 metres bgs (198.82 m AMSL)
- water table not encountered.

TP4-91

Depth (m bgs) (1)	*Elevation (m AMSL)* (2)	*Stratigraphic Description*
0.00 - 0.46	202.08 - 201.62	SM (Topsoil) fine grained sand, silty, black, loose, dry, organic material present
0.46 - 0.69	201.62 - 201.39	SM (Sand) fine grained sand, little silt, well graded, brown, loose, slightly damp
0.69 - 1.12	201.39 - 200.96	ML (Silt) silt, trace clay, red-brown, dry, brittle, oxidized, fractured, weathered

- test pit terminated at 1.12 metres bgs (200.96 m AMSL)
- water table not encountered

TABLE C.1

TEST PIT STRATIGRAPHIC LOGS
HYDROGEOLOGIC INVESTIGATION
VALENTINE AVENUE LANDFILL SITE
KINCARDINE, ONTARIO

TP5-91

Depth (m bgs) (1)	*Elevation (m AMSL)* (2)	*Stratigraphic Description*
0.00 - 0.30	202.13 - 201.83	SM (Topsoil) fine grained sand, silty, black, loose, dry, organic material present
0.30 - 1.07	201.83 - 201.06	ML (Silt) silt, trace clay, red-brown, dry, brittle, oxidized, fractured, weathered

- test pit terminated at 1.07 metres bgs (201.06 m AMSL)
- water table not encountered.

TP6-91

Depth (m bgs) (1)	*Elevation (m AMSL)* (2)	*Stratigraphic Description*
0.00 - 0.15	201.78 - 201.63	SM (Topsoil) fine grained sand, silty, black, loose, dry, organic material present
0.15 - 0.56	201.63 - 201.22	SM (Sand) fine grained sand, some silt, poorly graded, red-brown, loose, damp
0.56 - 1.22	201.22 - 200.56	ML (Silt) silt, trace clay, red-brown, damp, brittle, oxidized, fractured, weathered

- test pit terminated at 1.22 metres bgs (200.56 m AMSL)
- 50.8 mm diameter standpipe installed to 1.10 metres bgs (200.68 m AMSL)
- water table not encountered

TABLE C.1

TEST PIT STRATIGRAPHIC LOGS
HYDROGEOLOGIC INVESTIGATION
VALENTINE AVENUE LANDFILL SITE
KINCARDINE, ONTARIO

TP7-91

Depth (m bgs) (1)	*Elevation (m AMSL)* (2)	*Stratigraphic Description*
0.00 - 0.30	201.55 - 201.25	SM (Topsoil) fine grained sand, silty, black, loose, dry, organic material present
0.30 - 0.81	201.25 - 200.74	SM (Sand) fine grained sand, some silt, poorly graded, red-brown, loose, damp
0.81 - 1.12	200.74 - 200.43	ML (Silt) silt, little clay, red-brown, damp, brittle, oxidized, fractured, weathered

- test pit terminated at 1.12 metres bgs (200.43 m AMSL)
- water table not encountered

Notes:

1. mbgs - metres below ground surface
2. m AMSL - metres Above Mean Sea Level.

TEST PIT STRATIGRAPHY LOG

(L-38)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 201m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP8-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: – BASE OF WEST SIDE SLOPE AT NORTH END OF LANDFILL AREA (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.6	SP–SAND(FILL), some organics, some silt, fine grained, dark brown, dry			
0.6		1.5	SP–SAND(NATIVE), fine to medium grained, uniform gradation, rust coloured (leachate stained), dry			
1.5		3.0	SM–SAND, fine to medium grained, uniform gradation, light brown, dry			

C.2 - 1

TEST PIT STRATIGRAPHY LOG

(L-39)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 202m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP9-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: – BASE OF WEST SIDE SLOPE AT MIDPOINT OF LANDFILL AREA (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.3	SM–SAND(FILL), some silt, fine to medium grained, uniform gradation, brown, some domestic refuse (plastic)			
0.3		1.0	SP–SAND(NATIVE), trace silt, fine to medium grained, uniform gradation, brown, septic odour			
1.0		3.0	SP–SAND, trace silt, fine to medium grained, uniform gradation, light brown, dry, (water table @ 2.7 to 3.0m BGS)			
3.0	3.4	4.9	SP–SAND, trace silt, fine to medium grained, uniform gradation, grey, wet	#1		

TEST PIT STRATIGRAPHY LOG

(L-40)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 200.5m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP10-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: - WEST OF EXISTING GRAVEL ROAD OPPOSITE TP9-92 (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.5	PT-TOPSOIL(NATIVE), some rootlets			
0.5		4.6	SP-SAND, trace silt, fine to medium grained, uniform gradation, rust stained, dry			
	1.0		- light brown (1.0 to 2.0m BGS)			
	3.0		- grey, wet (3.0 to 4.5m BGS)			
4.6		5.0	CL-CLAY, little silt, firm, low to medium plasticity, grey, moist			

TEST PIT STRATIGRAPHY LOG

(L-41)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 203.5m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP11-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: - BASE OF WEST SIDE SLOPE AT SOUTH 1/3 OF LANDFILL AREA (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.3	SP-SAND(FILL), trace silt, fine to medium grained, uniform gradation, light brown, moist			
	0.15		- organics (0.15 to 0.25m BGS)			
0.3		4.9	Domestic refuse, timber, mild leachate inflow, strong odour			
4.9		5.2	SP-SAND(NATIVE), trace silt, fine to medium grained, uniform gradation, grey to light brown, wet			

TEST PIT STRATIGRAPHY LOG

(L-42)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 203.3m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP12-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: – WEST OF EXISTING GRAVEL ROAD OPPOSITE TP11-92 (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.5	SW/GW–SAND and GRAVEL(FILL), medium to coarse grained, moist			
0.5		1.2	Domestic refuse, little leachate			
1.2		1.8	SW/GW–SAND and GRAVEL(FILL), medium to coarse grained, some asphalt, moist			
1.8		3.7	Domestic refuse, little leachate			
3.7		4.0	SP–SAND(NATIVE), trace silt, fine to medium grained, uniform gradation, light brown, moist			

TEST PIT STRATIGRAPHY LOG

(L-43)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 204.5m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP13-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD
0.0		0.5	SW/GW-SAND and GRAVEL(FILL), coarse grained, some concrete, moist		
0.5		1.1	Domestic refuse, little leachate		
1.1		2.4	SW/GW-SAND and GRAVEL(FILL), medium to coarse grained, moist		
2.4		4.0	Domestic refuse, little leachate		
4.0		4.3	SP-SAND(NATIVE), trace silt, fine to medium grained, uniform gradation, light brown, moist		

LOCATION: - WEST OF EXISTING GRAVEL ROAD AT SOUTH END OF LANDFILL (AS PER PLAN)

GEOLOGIC PROFILE

TEST PIT STRATIGRAPHY LOG

(L-44)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 208m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP14-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: - ON TOP OF LANDFILL; SOUTH END, WEST SIDE (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.3	Cl-CLAY(FILL), little to some silt, medium plasticity, stiff, grey, dry "FINAL COVER"			
0.3		0.4	Domestic refuse			

TEST PIT STRATIGRAPHY LOG

(L-45)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 208.3m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP15-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: - ON TOP OF LANDFILL; SOUTH END, EAST SIDE (AS PER PLAN)
0.0		0.5	CI-CLAY(FILL), little to some silt, medium plasticity, stiff, grey, dry "FINAL COVER"			GEOLOGIC PROFILE
0.5		0.6	Domestic refuse			

TEST PIT STRATIGRAPHY LOG

(L-46)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 208.2m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP16-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: – ON TOP OF LANDFILL; SOUTH OF CENTRE, EAST SIDE (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.8	Cl–CLAY(FILL), little to some silt, medium plasticity, stiff, grey, dry "FINAL COVER"			
0.8		0.9	Domestic refuse			

TEST PIT STRATIGRAPHY LOG

(L-47)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074
CLIENT: TOWN OF KINCARDINE
LOCATION: KINCARDINE, ONTARIO

CONTRACTOR: SYRIEL VERHEYE
SURFACE ELEVATION: ~ 207.5m
TEST PIT METHOD: HYDRAULIC EXCAVATOR

TEST PIT DESIGNATION: TP17-92
DATE STARTED: MARCH 19, 1992
DATE COMPLETED: MARCH 19, 1992
CRA SUPERVISOR: W. COOLEY

DEPTH (m) FROM	DEPTH (m) AT	DEPTH (m) TO	ORDER OF DESCRIPTORS: SOIL SYMBOL, (PRIMARY COMPONENT) SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS	SAMPLE #	SAMPLE METHOD	LOCATION: - ON TOP OF LANDFILL; CENTRE, EAST SIDE (AS PER PLAN) / GEOLOGIC PROFILE
0.0		0.6	CI-CLAY(FILL), little to some silt, medium plasticity, very stiff (frost), grey, dry "FINAL COVER"			

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

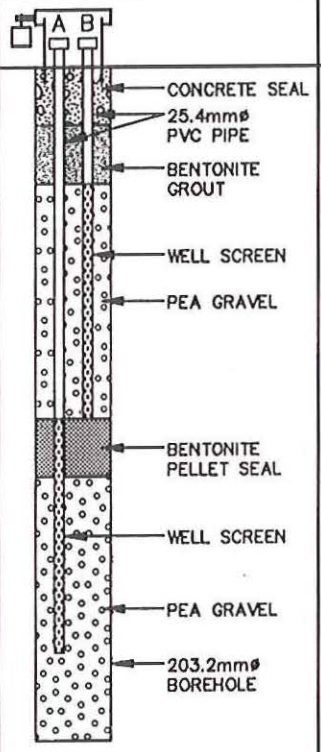
(L-48)

PROJECT NAME: VALENTINE AVENUE LANDFILL
HOLE DESIGNATION: GP1-92

PROJECT NO.: 4074-30
DATE COMPLETED: SEPTEMBER 3, 1992

CLIENT: TOWN OF KINCARDINE
DRILLING METHOD: 108mm ID HSA

LOCATION: AS PER PLAN
CRA SUPERVISOR: R. WALLER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser A) GROUND SURFACE	*202.28* *201.75*				
0.5 1.0 1.5 2.0 2.5 3.0 3.5	SP-SAND, trace silt, fine to medium grained, poorly graded, rust brown, moist, oxidized					
	END OF HOLE @ 3.51 m BGS.	*198.24*	GAS PROBE (A) DETAILS: Screened Interval: 1.83 to 3.05m BGS Length -1.2m Diameter -25.4mm Slot # Hand Slotted Material -PVC GAS PROBE (B) DETAILS: Screened Interval: 0.61 to 1.83m BGS Length -1.2m Diameter -25.4mm Slot # Hand Slotted Material -PVC			
4.0 4.5 5.0 5.5 6.0 6.5						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(L-49)

PROJECT NAME: VALENTINE AVENUE LANDFILL
HOLE DESIGNATION: GP2-92

PROJECT NO.: 4074-30
DATE COMPLETED: SEPTEMBER 3, 1992

CLIENT: TOWN OF KINCARDINE
DRILLING METHOD: 108mm ID HSA

LOCATION: AS PER PLAN
CRA SUPERVISOR: R. WALLER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser A) GROUND SURFACE	201.77 200.85	A B			
0.5 1.0 1.5 2.0 2.5	SP-SAND, trace silt, fine to medium grained, poorly graded, rust brown, moist, oxidized		CONCRETE SEAL BENTONITE GROUT 25.4mmø PVC PIPE WELL SCREEN PEA GRAVEL 203.2mmø BOREHOLE BENTONITE PELLET SEAL PEA GRAVEL WELL SCREEN			
3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5	END OF HOLE @ 2.74 m BGS.	198.11	GAS PROBE (A) DETAILS: Screened Interval: 1.83 to 2.74m BGS Length -0.91m Diameter -25.4mm Slot # Hand Slotted Material -PVC GAS PROBE (B) DETAILS: Screened Interval: 0.83 to 1.73m BGS Length -0.91m Diameter -25.4mm Slot # Hand Slotted Material -PVC			

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ◯ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

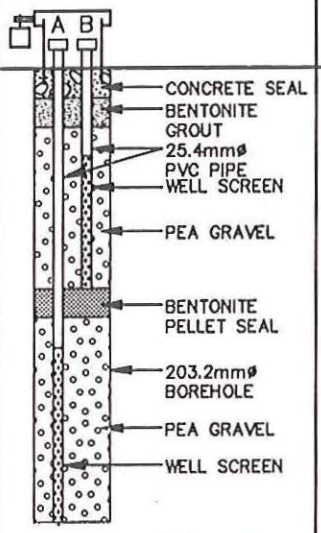
(L-50)

PROJECT NAME: VALENTINE AVENUE LANDFILL
HOLE DESIGNATION: GP3-92

PROJECT NO.: 4074-30
DATE COMPLETED: SEPTEMBER 3, 1992

CLIENT: TOWN OF KINCARDINE
DRILLING METHOD: 108mm ID HSA

LOCATION: AS PER PLAN
CRA SUPERVISOR: R. WALLER

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEVATION m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE
	REFERENCE POINT (Top of Riser A) GROUND SURFACE	*201.71* *200.82*				
0.5 1.0 1.5 2.0	SP-SAND, trace silt, fine to medium grained, poorly graded, rust brown, moist, oxidized					
2.5	END OF HOLE @ 2.36 m BGS.	*198.46*	GAS PROBE (A) DETAILS: Screened Interval: 1.45 to 2.36m BGS Length -0.91m Diameter -25.4mm Slot # Hand Slotted Material -PVC GAS PROBE (B) DETAILS: Screened Interval: 0.53 to 1.45m BGS Length -0.91m Diameter -25.4mm Slot # Hand Slotted Material -PVC			
3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

CHEMICAL ANALYSIS ⬭ WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-53)
Page 1 of 2

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW17A-96
DATE COMPLETED: OCTOBER 23, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	203.272 202.43					
0.5	TOPSOIL	202.33	CONCRETE SEAL	1CS			
	ML-SILT (FILL), some clay, trace fine sand intermixed coarse granular fill, yellow brown, moist						
1.0	SW-SAND (FILL), trace gravel, loose, medium grained, well sorted, red brown, moist	201.36					
1.5	ML-SILT (NATIVE), some clay, blocky fracture horizontal and vertical, brittle, yellow brown, dry to damp, grey to red oxidation on fracture planes, occasional rootlets at top	201.05	BENTONITE GROUT	2CS			
2.0							
2.5							
3.0			51mm Ø PVC PIPE	3CS			
	- increased competence, gradational transition to grey brown, damp						
3.5	- occasional cobble/stone						
4.0							
	- massive, plastic, competent, grey, moist						
4.5			203mm Ø BOREHOLE	4CS			
5.0							
5.5							
6.0			BENTONITE PELLETS	5CS			
6.5			SAND PACK				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW17A-96
DATE COMPLETED: OCTOBER 23, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
7.5							
8.0			SAND PACK WELL SCREEN 203mm Ø BOREHOLE	6CS			
8.5	END OF HOLE @ 8.50m BGS	*193.93*					
9.0			SCREEN DETAILS Screened interval: 7.00 to 8.50m BGS Length: 1.50m Diameter: 51mm Slot Size: #10 Material: PVC Sand Pack: 6.39 to 8.50m BGS Material: #1 Silica Sand				
9.5							
10.0							
10.5							
11.0							
11.5							
12.0							
12.5							
13.0							
13.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW17B-96
DATE COMPLETED: OCTOBER 23, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*203.285* *202.41*					
	Refer to OW17A-96 for stratigraphic details.						
-0.5			CONCRETE SEAL				
-1.0							
-1.5			BENTONITE GROUT				
-2.0			51mm Ø PVC PIPE				
-2.5							
-3.0			BENTONITE PELLETS				
-3.5			SAND PACK				
-4.0			WELL SCREEN				
-4.5			203mm Ø BOREHOLE				
-5.0	END OF HOLE @ 5.00m BGS	*197.41*					
-5.5							
-6.0							
-6.5							

SCREEN DETAILS
Screened interval:
3.50 to 5.00m BGS
Length: 1.50m
Diameter: 51mm
Slot Size: #10
Material: PVC
Sand Pack:
2.89 to 5.00m BGS
Material: #1 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-55)
Page 1 of 2

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW18A-96
DATE COMPLETED: OCTOBER 24, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*204.006* *203.29*					
	ML-SILT (FILL), some clay, mixed with coarse granular fill, yellow brown, moist to wet		CONCRETE SEAL	1CS			
0.5	ML-SILT, some to little clay, trace fine sand, weathered, blocky fracture horizontal and vertical, brittle, damp, red/grey oxidation on fracture planes, rootlets at top	*202.84*					
1.0							
1.5				2CS			
2.0			BENTONITE GROUT				
2.5							
3.0	- occasional cobble/stone - more competent, gradational change to grey/brown - massive, plastic, competent, grey, moist			3CS			
3.5							
4.0			51mm Ø PVC PIPE				
4.5				4CS			
5.0							
5.5							
6.0			203mm Ø BOREHOLE	5CS			
6.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW18A-96
DATE COMPLETED: OCTOBER 24, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
-7.5			BENTONITE GROUT	6CS			
-8.0			BENTONITE PELLETS				
-8.5			51mm Ø PVC PIPE				
-9.0			SAND PACK	7CS			
-9.5			WELL SCREEN				
-10.0			203mm Ø BOREHOLE	8CS			
-10.5	END OF HOLE @ 10.50m BGS	*192.79*					
-11.0							
-11.5							
-12.0							
-12.5							
-13.0							
-13.5							

SCREEN DETAILS
Screened interval:
9.00 to 10.50m BGS
Length: 1.50m
Diameter: 51mm
Slot Size: #10
Material: PVC
Sand Pack:
8.30 to 10.50m BGS
Material: #1 Silica Sand

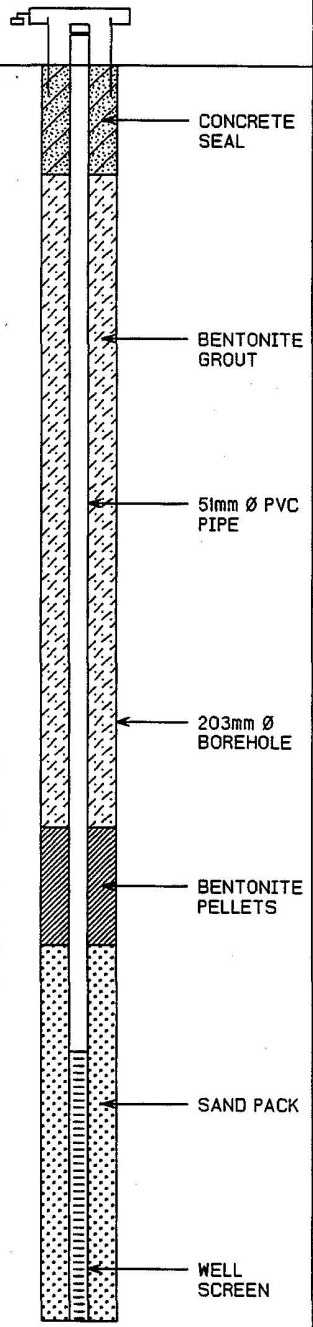
NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW18B-96
DATE COMPLETED: OCTOBER 24, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*203.907* *203.31*					
	Refer to 18A-96 for stratigraphic details.						
7.0	END OF HOLE @ 7.00m BGS	*196.31*					



NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW18B-96
DATE COMPLETED: OCTOBER 24, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE			
				NUMBER	STATE	'N' VALUE	PID (ppm)
8.0			SCREEN DETAILS Screened interval: 5.50 to 7.00m BGS Length: 1.50m Diameter: 51mm Slot Size: #10 Material: PVC Sand Pack: 4.90 to 7.00m BGS Material: #1 Silica Sand				
8.5							
9.0							
9.5							
10.0							
10.5							
11.0							
11.5							
12.0							
12.5							
13.0							
13.5							
14.0							
14.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-57)
Page 1 of 2

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW19A-96
DATE COMPLETED: OCTOBER 24, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*203.883* *203.36*					
0.5	ML-SILT, some to little clay, trace fine sand, weathered, blocky fracture, red brown, damp to dry, red oxidation on fractures, rootlets at top		CONCRETE SEAL	1CS			
1.0							
1.5				2CS			
2.0	- more competent, gradational change to grey/brown		BENTONITE GROUT				
2.5	- occasional cobble/stone						
3.0				3CS			
3.5	- increase in clay content, massive, plastic, competent, grey, moist						
4.0			51mm Ø PVC PIPE				
4.5				4CS			
5.0							
5.5							
6.0			203mm Ø BOREHOLE	5CS			
6.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW19A-96
DATE COMPLETED: OCTOBER 24, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
-7.5			BENTONITE GROUT				
-8.0			BENTONITE PELLETS	6CS			
-8.5			51mm Ø PVC PIPE				
-9.0			SAND PACK				
-9.5			WELL SCREEN	7CS			
-10.0	END OF HOLE @ 10.00m BGS	*193.36*	203mm Ø BOREHOLE				
-10.5							
-11.0							
-11.5							
-12.0							
-12.5							
-13.0							
-13.5							

SCREEN DETAILS
Screened interval:
8.50 to 10.00m BGS
Length: 1.50m
Diameter: 51mm
Slot Size: #10
Material: PVC
Sand Pack:
7.90 to 10.00m BGS
Material: #1 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

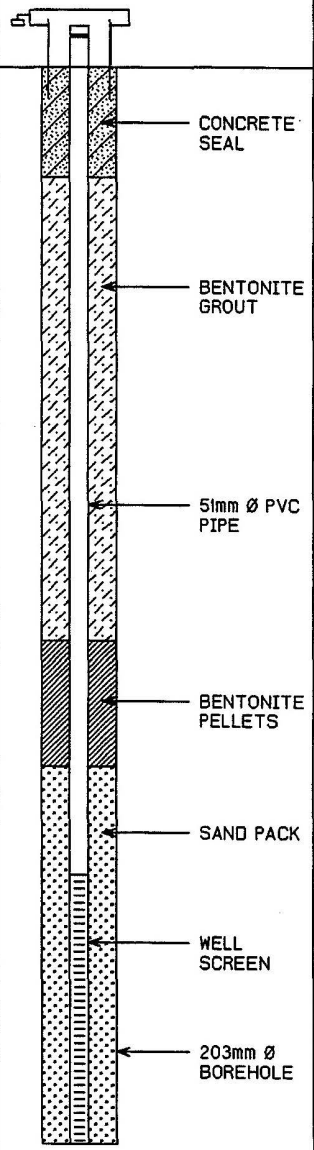
STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-58)
Page 1 of 1

PROJECT NAME: VALENTINE AVENUE LANDFILL
PROJECT NUMBER: 4074-40
CLIENT: TOWN OF KINCARDINE
LOCATION: AS PER PLAN

HOLE DESIGNATION: OW19B-96
DATE COMPLETED: OCTOBER 24, 1996
DRILLING METHOD: 108mm ID HSA
CRA SUPERVISOR: J. BOLHA

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m AMSL	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	REFERENCE POINT (Top of Riser) GROUND SURFACE	*204.059* *203.27*					
	Refer to OW19B-96 for stratigraphic details.						
6.0	END OF HOLE @ 6.00m BGS	*197.27*					



SCREEN DETAILS
Screened interval:
4.50 to 6.00m BGS
Length: 1.50m
Diameter: 51mm
Slot Size: #10
Material: PVC
Sand Pack:
3.90 to 6.00m BGS
Material: #1 Silica Sand

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW15R-13

PROJECT NUMBER: 004074-32
DATE COMPLETED: September 25, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	TOP OF CASING 201.53 TOP OF RISER 201.43 GROUND SURFACE 200.65						
0.5	FILL - sand and gravel, loose, fine to medium grained sand and gravel, brown, moist		CONCRETE	1		100	-
		200.04					
1.0	Poor recovery due to the presence of wood debris in each sample. The wood appears in various states of decay and a notable odour is present			2		8.33	>50
			50 mm dia SCH 40 PVC RISER PIPE				
1.5	- wet, saturated; strong odour present at 1.52m BGS						
			3/8 BENTONITE GRAVEL	3		8.33	7
2.0							
	- very strong odour at 2.29m BGS						
2.5				4		8.33	20

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Ward 1 Landfill Site
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW15R-13
DATE COMPLETED: September 25, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
3.5	- trace sand with silt present in sample at 3.05m BGS		50 mm dia SCH 40 PVC SCREEN	5		12.5	10
	SP - SAND, trace silt, compact, fine to medium grained sand, greyish brown, wet; odour no longer present	196.84		6		25	12
4.0							
4.5							
5.0			#1 SILICA SANDPACK	7		50	12
	ML/CL - CLAYEY SILT (TILL), with sand, trace gravel, soft, fine to very fine grained sand, fine grained gravel, some dilatancy, low plasticity, grey, saturated with little available groundwater	195.57					
5.5				8		83	9
	END OF BOREHOLE @ 5.94m BGS	194.70					

WELL DETAILS
Screened interval:
197.14 to 195.62m
3.51 to 5.03m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
200.34 to 198.05m
0.30 to 2.59m BGS
Material: BENTONITE GRAVEL
Sand Pack:
198.05 to 195.62m
2.59 to 5.03m BGS

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -WARD1.GPJ CRA_CORP.GDT 4/17/14

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW15R-13

PROJECT NUMBER: 004074-32
DATE COMPLETED: September 25, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	
			Material: NATURAL SANDPACK					
6.5								
7.0								
7.5								
8.0								
8.5								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW18A-13R

PROJECT NUMBER: 004074-32
DATE COMPLETED: September 23, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	TOP OF CASING TOP OF RISER GROUND SURFACE	204.37 204.21 203.34					
0.5	SW/GW - SANDY GRAVEL, with silt, loose, fine to coarse grained sand and gravel, grey, dry; possibly fill		CONCRETE				
1.0							
1.5							
2.0							
2.5	ML/CL - SILTY CLAY (TILL), with sand and gravel, very stiff, very fine grained sand, fine grained gravel, brown, dry; some orange mottling - becoming grey at 2.44m BGS - trace sand at 2.74m BGS	201.05	BENTONITE GROUT				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW18A-13R

PROJECT NUMBER: 004074-32
DATE COMPLETED: September 23, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
3.5	- with fine to medium grained sand, brown at 3.66m BGS - trace sand, no gravel, soft to firm, high plasticity, grey, saturated with little available water; some small pockets of saturated sand present (in trace amounts) at 3.81m BGS		50 mm dia SCH 40 PVC RISER PIPE	1			-
4.0							
4.5							
5.0							
5.5			3/8 BENTONITE GRAVEL				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW18A-13R
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 23, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
6.5							
	- brownish grey at 6.86m BGS		#1 SILICA SANDPACK				
7.0							
7.5	- very soft to soft at 7.62m BGS		50 mm dia SCH 40 PVC SCREEN				
	END OF BOREHOLE @ 7.92m BGS	195.41					
8.0							
8.5							

WELL DETAILS
Screened interval:
196.94 to 195.41m
6.40 to 7.92m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
203.03 to 197.24m
0.30 to 6.10m BGS
Material: BENTONITE GRAVEL
Sand Pack:
197.24 to 195.41m
6.10 to 7.92m BGS
Material: #1 SILICA SANDPACK

Seal:
203.34 to 202.73m
0.00 to 0.61m BGS

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW18A-13R

PROJECT NUMBER: 004074-32
DATE COMPLETED: September 23, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE				
				NUMBER	INTERVAL	REC (%)	'N' VALUE	
			Material: CONCRETE					
9.5								
10.0								
10.5								
11.0								
11.5								

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW18B-13R

PROJECT NUMBER: 004074-32
DATE COMPLETED: September 23, 2013

CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA

LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.

DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	TOP OF CASING TOP OF RISER GROUND SURFACE	204.48 204.31 203.44					
0.5	SW/GW - SANDY GRAVEL, with silt, loose, fine to coarse grained sand and gravel, grey, dry		CONCRETE	1		100	-
1.0			BENTONITE GROUT	2		0	17
1.5							
2.0				3		4.2	41
2.5	ML/CL - SILTY CLAY (TILL), with sand and gravel, very stiff, very fine grained sand, fine grained gravel, brown, dry; some orange mottling	201.15					
	- becoming grey at 2.44m BGS			4		87.5	24
	- trace sand at 2.74m BGS						

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Ward 1 Landfill Site
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW18B-13R
DATE COMPLETED: September 23, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
3.5	- with fine to medium grained sand, brown at 3.66m BGS - trace sand, no gravel, soft to firm, high plasticity, grey, saturated with little available water; some small pockets of saturated sand present (in trace amounts) at 3.81m BGS			5		87.5	18
4.0				6		70.8	6
4.5			50 mm dia SCH 40 PVC RISER PIPE BENTONITE GROUT	7		75	11
5.0							
5.5			50 mm dia SCH 40 PVC RISER PIPE	8		100	9

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Ward 1 Landfill Site
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW18B-13R
DATE COMPLETED: September 23, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
6.5				9		100	8
	- brownish grey at 6.86m BGS						
7.0				10		100	7
7.5	- very soft to soft at 7.62m BGS						
				11		100	5
8.0							
	- very soft, tacky, groundwater present at 8.38m BGS						
8.5				12		100	5

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Ward 1 Landfill Site
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW18B-13R
DATE COMPLETED: September 23, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
9.5				13		100	10
10.0			3/8 BENTONITE GRAVEL	14		100	9
10.5			#1 SILICA SANDPACK				
11.0				15		100	8
11.5				16		100	16
			50 mm dia SCH 40 PVC SCREEN				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Ward 1 Landfill Site
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW18B-13R
DATE COMPLETED: September 23, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
12.5	END OF BOREHOLE @ 12.19m BGS	190.64	WELL DETAILS Screened interval: 192.77 to 191.25m 10.67 to 12.19m BGS Length: 1.52m Diameter: 51mm Slot Size: 10 Material: SCH. 40 PVC Seal: 203.14 to 193.38m 0.30 to 10.06m BGS Material: BENTONITE GRAVEL Sand Pack: 193.38 to 191.25m 10.06 to 12.19m BGS Material: #1 SILICA SANDPACK	17		100	15
13.0							
13.5							
14.0							
14.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
HOLE DESIGNATION: OW20-13
PROJECT NUMBER: 004074-32
DATE COMPLETED: September 24, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4 HSA
LOCATION: Ward 1 Landfill Site
FIELD PERSONNEL: Allan M.
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
	TOP OF CASING 198.11 TOP OF RISER 198.01 GROUND SURFACE 197.09						
	LOAMY TOPSOIL, silty sandy topsoil, compact, fine to medium grained sand, brown, wet	196.94	CONCRETE				
	SM - SAND, silty to with silt, compact, fine to medium grained sand, dilatant, brown, wet/saturated		50 mm dia SCH 40 PVC RISER PIPE	1		100	-
0.5							
			3/8 BENTONITE GRAVEL				
1.0	- light brown at 1.07m BGS			2		83	19
			NATURAL SANDPACK				
1.5							
	- orange banding present, 1 to 2 cm thick; occassional thin silt bands present (<1 cm) at 1.83m BGS			3		62.5	8
2.0	- grey, medium grained sand predominant at 2.08m BGS						
	ML/CH - CLAY SILT (TILL), trace to with sand, trace gravel, firm, moderate plasticity, some dilatancy, fine to very fine grained sand, fine grained gravel, grey, saturated with little available groundwater	194.70		4		71	7
2.5			50 mm dia SCH 40 PVC SCREEN				

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 1
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Ward 1 Landfill Site
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: OW20-13
DATE COMPLETED: September 24, 2013
DRILLING METHOD: 4 1/4 HSA
FIELD PERSONNEL: Allan M.

DEPTH m BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. m	MONITORING WELL	SAMPLE NUMBER	SAMPLE INTERVAL	SAMPLE REC (%)	SAMPLE 'N' VALUE
3.5	- increased density; stiff at 3.05m BGS			5		42	14
4.0	- stiff to very stiff at 3.81m BGS		NATURAL CAVE MATERIAL	6		33	20
4.5	- increased clay content; CLAY AND SILT, clay appears massive at 4.57m BGS		WELL DETAILS Screened interval: 195.57 to 194.04m 1.52 to 3.05m BGS Length: 1.52m Diameter: 51mm Slot Size: 10 Material: SCH. 40 PVC Seal: 196.79 to 196.18m 0.30 to 0.91m BGS Material: BENTONITE GRAVEL Sand Pack: 196.18 to 194.65m 0.91 to 2.44m BGS Material: #1 SILICA SANDPACK	7		62.5	15
5.0	END OF BOREHOLE @ 5.18m BGS	191.91					
5.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -WARD1.GPJ CRA_CORP.GDT 4/17/14

Appendix F

Historical Water Quality Data

Appendix F.1

Historical Data Prior to 2009

APPENDIX F

GROUNDWATER AND LEACHATE LEVEL ELEVATIONS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Monitoring Well ID	*Ground Surface Elevation (m AMSL)*	*Reference Elevation (m AMSL)*	*Water Level Elevations (m AMSL)*									
			19-Jul-05	*19-Dec-05*	*16-May-06*	*27-Nov-06*	*14-Jun-07*	*11-Nov-07*	*11-Aug-08*	*Nov. 29/08*	*30-Apr-09*	*19-Nov-09*
Groundwater Observation Wells												
OW1-78	200.42	201.20	197.79	198.57	198.49	198.65	198.49	198.15	198.25	198.51	198.80	198.41
OW2-78	200.5	201.11	197.87	198.59	198.53	198.73	198.52	198.19	198.02	198.07	198.88	198.41
OW1-82	198.79	199.72	197.87	198.51	198.56	198.55	198.32	198.27	198.38	198.49	--	--
OW2-82	-	199.55	196.99	197.93	--	198.03	197.63	197.31	197.5	198.01	198.14	197.61
OW1-89	200.22	201.03	198.33	198.84	--	198.85	198.68	198.77	198.77	198.93	--	--
OW2-89	199.501	200.31	197.92	198.55	198.59	198.69	198.42	198.32	198.4	198.7	198.63	198.42
OW3-89	199.72	200.49	197.89	Frozen over	198.81	199.13	198.71	198.15	198.39	199.09	199.08	198.66
OW1-91	195.64	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned
OW2A-91	196.31	197.35	197.35	--	194.47	194.79	--	193.47	194.06	194.77	--	--
OW2B-91	196.23	197.25	197.25	--	194.37	194.79	--	193.56	194.16	194.79	194.70	194.09
OW3-91	202.06	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned	Abandoned
OW4-91	203.27	204.24	200.88	201.73	202.2	202.14	201.98	201.99	201.53	201.79	202.24	200.64
OW5A-91	197.91	198.83	194.14	--	194.91	195.38	194.62	193.92	194.46	195.31	195.16	194.61
OW5B-91	197.89	198.77	194.17	--	194.89	195.37	194.61	193.95	194.46	195.33	195.14	194.60
OW6A-91	198.01	198.87	194.01	--	194.93	195.46	194.62	193.87	194.44	195.35	195.24	194.62
OW6B-91	197.95	198.86	195.87	195.08	191.48	196.49	195.71	196.37	196.34	196.46	196.46	196.44
OW7-91	198.39	199.26	196.26	--	197.68	197.16	196.71	196.65	196.77	197.04	197.17	196.87
OW8-91	199.06	199.96	196.52	--	--	197.54	197.25	196.23	197.01	197.39	--	--
OW9-91	197.53	198.48	196.34	--	--	198.48	198.48	198.48	198.48	198.48	--	--
OW10-92	202.3	203.11	198.35	--	--	198.85	198.68	198.31	198.71	198.95	199.56	198.62
OW11-92	202.04	202.80	Dry	199.48	199.54	199.47	199.46	199.34	199.37	199.45	199.95	199.43
OW12-92	200.1	201.02	198.2	--	198.84	198.67	198.57	198.55	198.65	198.8	198.83	198.59
OW13-92	199.43	200.82	198.34	198.84	198.9	--	198.66	198.76	198.93	198.82	--	--
OW14-92	200.5	Destroyed	198.34	198.9	--	--	198.75	--	201.4	201.4	Destroyed	Destroyed
OW15-92	200.34	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
OW16A-96	200.166	200.90	198.13	198.69	198.67	198.74	198.62	198.59	198.18	198.85	198.77	198.62
OW16B-92	200.14	200.99	198.19	198.8	198.79	198.8	198.64	198.64	198.68	198.89	198.80	198.63
OW17A-96	202.43	203.27	199.81	201.09	200.87	201.23	200.76	199.9	201.43	201.35	201.08	200.98
OW17B-96	202.41	203.29	200.08	201.54	201	201.43	201.07	200.24	200.52	201.88	201.77	201.26
OW18A-96	203.29	Damaged	200.12	--	200.84	201.5	200.78	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
OW18B-96	203.31	Damaged	201.89	--	201.89	202.27	202.13	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
OW19A-96	203.36	203.88	200.52	201.21	201.34	201.51	201.41	201.01	200.72	201.12	201.58	201.17
OW19B-96	203.27	204.06	201.54	202.52	202.45	202.65	202.32	201.51	201.59	202.62	202.75	202.34
Leachate Monitoring Wells												
LW1-92	210.11	211.21	--	200.2	200.26	200.18	--	211.21	200.49	200.38	200.31	200.36
LW2-92	208.18	209.23	198.46	199.44	199.07	199.18	--	209.23	198.96	199.38	199.34	199.01
LW3-98	209.28	210.25	199.48	199.55	200.03	200.07	--	210.25	199.69	200.15	200.35	200.03

Notes:

m AMSL	Meters above mean sea level
--	No data available

APPENDIX F

LEACHATE MONITORING WELLS - GENERAL CHEMISTRY AND TOTAL METALS RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*LW2-92*	*LW2-92*	*LW2-92*	*LW2-92*	*LW2-92*	*LW2-92*	*LW2-92*	*LW2-92*	*LW2-92*
Sample Date:	*20-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)									
General Chemistry									
Chloride	276	247	240	230	260	220	240	130	220
CoNDuctivity (µmhos/cm)	--	2,540	--	3,990	4210	3930	4020	3,930	2,930
Hardness	1,370	1,400	1,280	1,200	1,300	1,100	1,300	1600	1360
Dissolved Organic Carbon (DOC)	46.6	45.5	40.3	50.8	IS	IS	54.9	--	--
Alkalinity	1,730	1,880	2,000	1,540	1,960	IS	1,940	1630	1830
Nitrate	ND	0.8	ND(0.05)	0.6	1.9	0.3	ND	ND(0.5)	7.82
Nitrite	ND	0.78	ND(0.06)	0.02	0.14	0.06	0.03	ND(0.5)	ND(0.05)
Ammonia Nitrogen	106	119	128	140	IS	IS	110	122	96
Total Kjeldahl Nitrogen (TKN)	113	120	138	120	IS	IS	110	173	117
Phenols	0.004	0.011	ND(0.002)	0.009	IS	IS	0.004	--	--
pH (std. units)	--	7.80	--	7.70	7.70	7.80	7.60	6.74	6.93
Biological Oxygen Demand (BOD)	4	--	20	ND	IS	IS	24	152	50
Chemical Oxygen Demand (COD)	140	270	148	140	IS	IS	210	890	201
Metals (mg/L)									
Aluminum	0.015	0.006	0.0168	0.03	0.019	0.013	0.023	9.08	0.87
Barium	0.38	0.28	0.431	0.44	0.37	0.36	0.61	0.42	0.42
Beryllium	ND	ND	--	ND	ND	ND	ND	ND(0.01)	ND(0.01)
Bismuth	ND	ND	--	ND	ND	ND	ND	--	--
Boron	--	--	--	--	--	--	--	1.86	2.25
Cadmium	0.0001	ND	ND(0.002)	0.0001	ND	ND	ND	0.0074	ND(0.001)
Calcium	320	280	267	300	290	290	270	386	291
Chromium	ND	ND	0.003	ND	ND	ND	ND	0.035	ND(0.01)
Cobalt	0.0059	0.0049	ND(0.003)	0.0054	0.0047	0.0055	0.0049	0.0142	ND(0.008)
Copper	ND	0.002	0.0017	0.001	0.001	0.002	0.001	0.613	0.035
Iron	13	0.3	22.1	22	20	16	38	109	22.9
Lead	ND	ND	0.00002	ND	ND	ND	ND	0.081	ND(0.01)
Magnesium	180	150	149	190	170	170	160	155	153
Manganese	0.35	0.31	0.343	0.43	0.42	0.4	0.28	1.07	0.563
Molybdenum	ND	ND	--	ND	ND	ND	ND	ND(0.01)	ND(0.01)
Nickel	0.013	0.016	0.0098	0.008	0.009	0.01	0.005	0.078	0.02
Phosphorous	--	0.7	0.18	0.33	ND	ND	1.2	--	--
Potassium	150	130	122	150	140	140	130	--	--
Silver	ND	ND	--	ND	ND	ND	ND	ND(0.01)	ND(0.001)
Sodium	260	220	197	250	250	220	200	--	--
Strontium	2.4	2	--	2.3	2.2	2.1	2.1	1.72	1.77
Titanium	ND	ND	--	ND	ND	ND	0.006	0.274	0.031
Vanadium	0.003	0.002	0.004	0.006	0.004	0.002	0.008	0.037	ND(0.01)
Zinc	ND	ND	0.0096	0.014	0.006	0.012	0.007	0.286	0.032

Notes:

ND - Parameter not detected at, or above, method detection limit
-- parameter not analyzed
IS - insufficient water for full analysis.

APPENDIX F

LEACHATE MONITORING WELLS - GENERAL CHEMISTRY AND TOTAL METALS RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*LW3-92*	*LW3-92*	*LW3-92*	*LW3-92*	*LW3-92*	*LW3-92*	*LW3-92*	*LW3-92*	*LW3-92*
Sample Date:	*21-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)									
General Chemistry									
Chloride	633	756	610	640	600	480	460	342	426
CoNDuctivity (µmhos/cm)	--	5240	--	8600	8330	7860	7370	5,850	--
Hardness	1,670	1,600	1,700	1,400	1,200	1,300	1400	1,490	1,510
Dissolved Organic Carbon (DOC)	202	233	312	198	204	112	14.7	--	--
Alkalinity	4,190	3,780	4,400	3,280	3,690	--	3470	3,300	4,060
Nitrate	ND	ND	ND(0.05)	ND	1	ND	ND	ND(0.5)	ND(0.5)
Nitrite	ND	0.04	ND(0.06)	0.01	0.1	0.05	0.01	ND(0.5)	ND(0.5)
Ammonia Nitrogen	373	398	494	495	580	430	420	326	330
Total Kjeldahl Nitrogen (TKN)	434	390	494	490	510	420	370	334	538
Phenols	0.019	0.027	0.018	0.023	0.009	0.02	0.01	--	--
pH (std. units)	--	7.8	--	7.5	7.6	7.6	7.6	6.8	--
Biological Oxygen Demand (BOD)	14	--	69	10	23	23	22	23.2	30
Chemical Oxygen Demand (COD)	640	780	666	560	88	500	430	364	450
Metals (mg/L)									
Aluminum	0.11	0.097	0.0844	0.099	0.1	0.09	0.087	0.29	0.32
Barium	0.6	0.57	0.257	0.2	0.21	0.17	0.2	0.14	0.20
Beryllium	ND	ND	--	ND	ND	ND	ND	ND(0.01)	ND(0.01)
Bismuth	ND	ND	--	ND	ND	ND	ND	--	--
Boron	--	--	--	--	--	--	--	4.12	5.0
Cadmium	0.0004	ND	ND(0.002)	ND	ND	ND	ND	ND(0.001)	ND(0.001)
Calcium	350	290	308	330	290	310	300	302	318
Chromium	0.014	ND	0.008	0.011	0.009	0.01	0.009	0.012	0.012
Cobalt	0.029	0.028	0.024	0.033	0.034	0.024	0.03	0.0168	0.024
Copper	ND	ND	0.0031	ND	ND	0.001	0.001	ND(0.01)	ND(0.01)
Iron	2.6	3.8	0.56	2.1	1.3	0.95	6.9	8.44	4.22
Lead	ND	ND	ND(0.00002)	ND	ND	ND	ND	ND(0.01)	ND(0.01)
Magnesium	320	240	226	230	180	180	170	179	175
Manganese	0.51	0.44	0.639	0.65	0.58	0.67	1.6	0.791	0.67
Molybdenum	0.003	ND	-	0.003	0.003	0.002	0.002	ND(0.01)	ND(0.01)
Nickel	0.058	0.059	0.0525	0.05	0.042	0.035	0.096	0.036	0.04
Phosphorous	--	1.5	1.3	1.3	1.5	1.2	1.1	--	--
Potassium	340	330	347	380	340	280	270	--	--
Silver	ND	ND	-	ND	ND	ND	ND	ND(0.01)	ND(0.001)
Sodium	840	740	608	650	560	440	420	--	--
Strontium	3.4	2.7	-	2	1.9	1.8	1.9	1.80	1.97
Titanium	0.031	ND	-	0.035	0.034	0.028	0.025	0.025	0.026
Vanadium	0.021	0.023	0.012	0.013	0.014	0.01	0.01	ND(0.01)	0.011
Zinc	ND	ND	0.0041	ND	0.005	0.007	ND	ND(0.03)	0.212

Notes:

ND - Parameter not detected at, or above, met
-- parameter not analyzed
IS - insufficient water for full analysis.

APPENDIX F

LEACHATE MONITORING WELLS - VOC ANALYTICAL REUSLTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*LW2-92*	*LW2-92*	*LW2-92*	*LW2-92*	*LW3-98*	*LW3-98*	*LW3-98*	*LW3-98*
Sample Date:	*12-Aug-08*	*30-Nov-08*	*29-Apr-05*	*18-Nov-05*	*12-Aug-08*	*30-Nov-08*	*29-Apr-05*	*18-Nov-05*
Parameter (mg/L)								
Volatile Organic Compounds								
Acetone	ND	10	ND(20)	ND(20)	ND	ND	28	26
Benzene	2.0	1.4	1.66	1.68	5.7	0.8	4.53	6.6
Chlorobenzene	0.5	0.3	0.83	0.59	0.4	ND	ND(0.5)	ND(0.5)
1,1-Dichloroethane	0.4	0.2	ND(0.5)	ND(0.5)	1.1	1.0	0.81	1.51
cis-1,2-Dichloroethylene	ND	0.1	ND(0.5)	ND(0.5)	ND	ND	ND(0.5)	ND(0.5)
Ethylbenzene	ND	0.7	0.87	ND(0.5)	10	ND	7.65	15.2
Methyl t-butyl ether (MTBE)	ND	0.3	ND(0.5)	ND(0.5)	6.1	5	2.54	7.17
Toluene	ND	ND	ND(0.5)	ND(0.5)	1.1	ND	1.17	1.84
M+P-Xylene	ND	0.4	ND(1.0)	ND(1.0)	11	ND	11.1	19.7
O-Xylene	ND	ND	ND(0.5)	ND(0.5)	2.9	ND	2.04	13.2
1,1,1,2-Tetrachloroethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,1,1-Trichloroethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,1,2,2-Tetrachloroethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,1-Dichloroethylene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,2-Dibromoethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,2-Dichlorobenzene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,2-Dichloroethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,2-Dichloropropane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,3-Dichlorobenzene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
1,4-Dichlorobenzene	--	--	0.55	ND(0.5)	--	--	0.95	0.56
2-Chloroethylvinylether	--	--	-	-	--	--	-	-
2-Hexanone	--	--	ND(20)	ND(20)	--	--	<20	ND(20)
Bromodichloromethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Bromoform	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Bromomethane	--	--	ND(1.0)	ND(1.0)	--	--	ND(1.0)	ND(1.0)
Carbon Disulfide	--	--	1.12	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Carbon tetrachloride	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Chloroethane	--	--	2.9	1.3	--	--	5.0	5.7
Chloroform	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Chloromethane	--	--	ND(1.0)	ND(1.0)	--	--	ND(1.0)	ND(1.0)
cis-1,3-Dichloropropene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Dibromochloromethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Dichlorodifluoromethane	--	--	ND(1.0)	ND(1.0)	--	--	ND(1.0)	ND(1.0)
Dichloromethane	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Ethylenedibromide	--	--	-	-	--	--	-	-
Methyl Ethyl Ketone	--	--	ND(20)	ND(20)	--	--	ND(20)	ND(20)
Methyl Isobutyl Ketone	--	--	ND(20)	ND(20)	--	--	ND(20)	ND(20)
Styrene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Tetrachloroethylene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
trans-1,2-Dichloroethylene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
trans-1,3-Dichloropropene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Trichloroethylene	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Trichlorofluoromethane	--	--	ND(1.0)	ND(1.0)	--	--	ND(1.0)	ND(1.0)
Trihalomethanes (total)	--	--	ND(2.0)	ND(2.0)	--	--	ND(2.0)	ND(2.0)
Vinyl chloride	--	--	ND(0.5)	ND(0.5)	--	--	ND(0.5)	ND(0.5)
Xylenes (Total)	--	--	ND(1.5)	ND(1.5)	--	--	13.1	ND(1.5)

Notes:

ND - Parameter not detected at, or above, the method detection limit
-- Parameter not anlayzed

APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*	*OW1-78*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*8-Jun-04*	*25-Nov-04*	*21-Jul-05*	*20-Dec-05*	*10-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)																
General Chemistry																
Chloride	250	85.3	87.0	66.0	110.0	112.0	129	109	103	110	130	130	130	130	142	156
Conductivity (µmhos/cm)	--	1680	1560	1590	2230	1850	2150	--	1660	--	2010	1970	2040	2110	2190	2140
Hardness	80 -100	732	642	572	942	902	883	828	780	952	840	870	750	920	980	954
Dissolved Organic Carbon (DOC)	5.0	24.7	25.5	21.5	49.5	--	33.9	26.5	28.4	29.6	46.9	30	27.4	39.1	--	--
Alkalinity	30 - 500	808	640	640	1130	906	1220	931	838	962	1040	950	986	1020	1020	1070
Nitrate	10.0	0.037U	ND(0.10)	0.51	ND	--	--	0.3	--	0.35	0.7	ND	--	--	0.36	ND(0.5)
Nitrite	1.0	ND(0.10)	ND(0.10)	0.21	ND	--	--	--	0.18	--	--	--	--	--	0.11	ND(0.5)
Ammonia Nitrogen	--	5.24	7.7	4.3	--	--	30.7	16.5	19.2	17.2	29.8	20.5	27	39	25.4	42.7
Total Kjeldahl Nitrogen (TKN)	--	11.9	20.0	11	24.7	--	38	--	16	--	--	18	--	--	30.3	56
Phenols	--	ND(0.001)	0.001	ND(0.001)	0.16	0.005	0.003	0.003	0.001	ND(0.002)	0.023	ND	0.008	ND	--	--
pH	6.5 - 8.5	7.00	6.97	7.60	7.11	7.12	6.98	--	7.9	--	8	7.7	8.1	7.7	6.87	6.9
Biological Oxygen Demand (BOD)	--	23.9	43.0	ND(2)	25.0	14.3	20.6	--	--	--	--	3	--	--	7.3	27.2
Chemical Oxygen Demand (COD)	--	64	84	98	173	--	145	--	100	--	--	480	--	--	132	387
Boron	5	--	--	--	--	--	0.462	--	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	0.3	--	--	--	0.3	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	130	201	--	--	204	204
Magnesium	--	--	--	--	--	--	--	--	--	--	130	90.3	--	--	114	108
Sodium	--	--	--	--	--	--	--	--	--	--	100	96	82.3	119	--	--
Sulphate	500	--	--	--	2.6	--	--	13.9	3	2.9	ND	--	ND	ND	--	--

Notes:

1. ODWS — Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001, where applicable.
2. 29.7/36.6 — Duplicate samples were submitted for analyses.
3. ND — The parameter was analyzed for, but was not detected at or above the detection limit. The associated value is the respective detection limit.
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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*	*OW2-82*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*9-Jun-04*	*25-Nov-04*	*21-Jul-05*	*20-Dec-05*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)															
General Chemistry															
Chloride	250	27.2	20	38.0	186.0	44.6	48.1	41.3	55	31	6	39	55	18.9	4.6
Conductivity (µmhos/cm)	--	576	829	590	1670	880	620	--	462	646	543	697	787	193	474
Hardness	80 -100	240	253	142	535	268	343	333	200	300	140	300	310	121	217
Dissolved Organic Carbon (DOC)	5.0	5.9	16.7	9.4	24.5	6.9	--	13.3	9.1	10.8	16	9.9	10.9	--	--
Alkalinity	30 - 500	265	310	220	382	295	392	355	278	299	251	305	310	214	230
Nitrate	10.0	--	--	--	8.1	--	--	ND	0.1	ND	--	--	--	--	--
Nitrite	1.0	--	--	--	0.9	--	--	--	ND	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	0.43	0.47	1.95	--	1.2	0.28	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	4.2	--	--	--	1.5	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.002	0.0600	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--
pH	6.5 - 8.5	7.10	7.18	7.50	7.61	7.24	7.35	--	8.1	7.8	8.2	7.9	8	7.6	7.38
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	15	--	--	--	28	--	--	--	--	--	--
Boron	5	--	--	--	--	--	0.057	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	ND	--	--	--	ND	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	91	--	--	--	34.2	67.5
Magnesium	--	--	--	--	--	--	--	--	--	17	--	--	--	8.67	11.9
Sodium	--	--	--	--	--	--	--	--	--	19	6.7	25.9	36.5	--	--
Sulphate	500	--	--	--	71.9	--	--	12.2	8	ND	--	9	26	--	--

Notes:

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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*	*OW2-89*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*25-Nov-04*	*21-Jul-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)														
General Chemistry														
Chloride	250	10.6	120	120	32	79.4	7	18	9	73	11	16	12.1	85
Conductivity (µmhos/cm)	--	589	940	946	640	640	--	--	400	629	604	521	379	927
Hardness	80 -100	316	357	341	259	252	242	285	210	180	330	260	231	360
Dissolved Organic Carbon (DOC)	5.0	4.6	17.0	7.8	5.4	--	4.8	4.3	3.4	5.9	5	4	--	--
Alkalinity	30 - 500	288	310	300	227	192	227	263	184	205	308	242	249	392
Nitrate	10.0	--	--	--	0.3	--	ND	ND(0.05)	ND	--	--	--	--	--
Nitrite	1.0	--	--	--	ND	--	--	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	0.32	0.4	0.26	--	0.55	0.37	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	1.68	--	--	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	ND(0.001)	ND(0.001)	ND	ND	0.001	ND(0.002)	ND	ND	ND	ND	--	--
pH	6.5 - 8.5	7.07	7.14	7.03	7.61	7.37	--	--	8	8.2	7.9	8	7.29	7.02
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	15	--	--	--	--	--	--	--	--	--
Boron	5	--	--	--	--	0.034	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	ND	--	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	69	--	--	--	76.0	113
Magnesium	--	--	--	--	--	--	--	--	8.9	--	--	--	9.99	18.8
Sodium	--	--	--	--	--	--	--	--	2.9	53	8.3	11.3	--	--
Sulphate	500	--	--	--	18.6	--	27	17	18	--	6	17	--	--

Notes:

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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	***ODWS [1]***	***OW3-89***	***OW3-89***
Sample Date:	***(mg/L)***	***30-Apr-09***	***19-Nov-09***
Parameter (mg/L)			
General Chemistry			
Chloride	250	31.6	115
Conductivity (µmhos/cm)	--	1080	1020
Hardness	80 -100	307	449
Dissolved Organic Carbon (DOC)	5.0	--	--
Alkalinity	30 - 500	428	300
Nitrate	10.0	--	--
Nitrite	1.0	--	--
Ammonia Nitrogen	--	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--
Phenols	--	--	--
pH	6.5 - 8.5	7.02	7.15
Biological Oxygen Demand (BOD)	--	--	--
Chemical Oxygen Demand (COD)	--	--	--
Boron	5	--	--
Fluoride	1.5	--	--
Calcium	--	87.6	132
Magnesium	--	21.5	28.9
Sodium	--	--	--
Sulphate	500	--	--

Notes:

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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*	*OW10-92*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*8-Jun-04*	*21-Jul-05*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)													
General Chemistry													
Chloride	250	91.4	88	140.0	14.3	20.9	56.9	30	63	46	77	57.0	60
Conductivity (µmhos/cm)	--	657	695	755	420	--	--	506	649	590	600	449	889
Hardness	80 -100	227	307	193	179	197	250	250	280	280	240	220	247
Dissolved Organic Carbon (DOC)	5.0	2.1	6.5	1.5	4.7	2.1	2.9	2.9	--	12	2.8	--	--
Alkalinity	30 - 500	190	270	140	148	163	209	204	224	216	167	166	181
Nitrate	10.0	--	ND(0.1)	--	3.5	--	0.7	2.5	--	--	--	--	--
Nitrite	1.0	--	ND(0.1)	--	ND	--	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	ND	ND	--	ND	ND	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	0.4	--	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.006	ND(0.001)	ND	ND	0.003	ND	--	ND	ND	--	--
pH	6.5 - 8.5	7.16	7.19	7.40	7.81	--	--	7.9	8.2	8	8	7.77	7
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	10	--	--	--	--	--	--	--	--
Boron	5	--	0.019	--	--	--	--	--	--	--	--	--	--
Fluoride	1.5	--	ND(0.1	--	ND	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	76	--	--	--	73.4	75.4
Magnesium	--	--	--	--	--	--	--	14	--	--	--	9.01	14.2
Sodium	--	--	--	--	--	--	--	13	--	24	22.4	--	--
Sulphate	500	--	17.5	--	9.2	--	17.3	10	--	14	10	--	--

Notes:

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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*	*OW11-92*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*8-Jun-04*	*25-Nov-04*	*20-Dec-05*	*24-Jun-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)													
General Chemistry													
Chloride	250	389	NA	280.0	355.0	253	389	229	420	460	450	647	534
Conductivity (µmhos/cm)	--	2510	NA	2040	2250	--	2010	1740	2320	2520	2410	2650	--
Hardness	80 -100	775	NA	735	832	498	777	730	1000	910	910	1000	957
Dissolved Organic Carbon (DOC)	5.0	8.9	NA	13.5	4.0	4.9	--	6.2	IS	--	6	--	--
Alkalinity	30 - 500	378	NA	540	615	458	494	617	590	608	549	525	549
Nitrate	10.0	--	--	--	ND	--	--	ND	ND	--	--	--	--
Nitrite	1.0	--	--	--	ND	--	--	0.02	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	1	IS	--	1.5	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	1.5	--	--	1.8	--	--	--	--	--
Phenols	--	ND(0.001)	NA	0.0230	0.001	0.001	ND	ND	--	--	--	--	--
pH	6.5 - 8.5	5.92	NA	6.31	6.73	--	6.91	8	7.7	7.3	7.3	6.16	--
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	16.8	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	27	--	140	22	--	--	--	--	--
Boron	5	--	NA	--	--	--	0.036	--	--	--	--	--	--
Fluoride	1.5	--	NA	--	ND	--	--	ND	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	350	--	--	348	326
Magnesium	--	--	--	--	--	--	--	--	39	--	--	32.0	34.6
Sodium	--	--	--	--	--	--	--	--	91	--	IS	--	--
Sulphate	500	--	NA	--	7.8	--	8.7	ND	1	5	2	--	--

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GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*	*OW12-92*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*8-Jun-04*	*23-Nov-04*	*21-Jul-05*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)														
General Chemistry														
Chloride	250	123	160	61	61.1	136	152	137	58	48	60	79	151	48.9
Conductivity (µmhos/cm)	--	2750	2830	2300	2260	--	2490	--	1780	2280	1710	1670	2840	1970
Hardness	80 -100	1290	1210	857	1080	763	889	1010	980	1300	930	830	1070	971
Dissolved Organic Carbon (DOC)	5.0	34.9	43.1	20.4	19.1	22.3	--	32.8	18	21.5	16.3	24.1	--	--
Alkalinity	30 - 500	1390	1400	950	875	972	1290	1290	902	538	871	724	1050	878
Nitrate	10.0	--	0.2	--	ND	--	--	ND	ND	--	--	--	--	--
Nitrite	1.0	--	ND(0.1)	--	ND	--	--	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	27.3	6.7	--	--	7.2	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	9.0	--	--	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	ND(0.001)	0.015	0.002	0.003	0.006	0.003	ND	ND	ND	ND	--	--
pH	6.5 - 8.5	6.57	6.56	6.61	6.80	--	6.75	--	7.3	7.9	7.9	7.5	6.51	6.59
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	58	--	--	--	--	--	--	--	--	--
Boron	5	--	0.81	--	--	--	0.42	--	--	--	--	--	--	--
Fluoride	1.5	--	ND(0.1)	--	ND	--	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	290	--	--	--	333	317
Magnesium	--	--	--	--	--	--	--	--	63	--	--	--	57.0	43.4
Sodium	--	--	--	--	--	--	--	--	46	56	47.4	38.8	--	--
Sulphate	500	--	24.2	--	286	--	9.4	8	97	--	27	127	--	--

Notes:

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GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	***ODWS [1]***	***OW14-92***
Sample Date:	***(mg/L)***	***24-Jun-07***
Parameter (mg/L)		
General Chemistry		
Chloride	250	44
Conductivity (µmhos/cm)	--	1600
Hardness	80 -100	1000
Dissolved Organic Carbon (DOC)	5.0	10.1
Alkalinity	30 - 500	891
Nitrate	10.0	ND
Nitrite	1.0	--
Ammonia Nitrogen	--	1.97
Total Kjeldahl Nitrogen (TKN)	--	--
Phenols	--	ND
pH	6.5 - 8.5	7.20
Biological Oxygen Demand (BOD)	--	--
Chemical Oxygen Demand (COD)	--	--
Boron	5	--
Fluoride	1.5	--
Calcium	--	330
Magnesium	--	51
Sodium	--	23
Sulphate	500	18

Notes:

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HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW15-92*	*OW15-92*	*OW15-92*	*OW15-92*	*OW15-92*	*OW15-92*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*8-Jun-04*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)							
General Chemistry							
Chloride	250	29.7/36.6	21/21	8.8	27.4	--	--
Conductivity (µmhos/cm)	--	2230	1680	423	--	--	--
Hardness	80 -100	1030/1080	785/661	777	721	--	--
Dissolved Organic Carbon (DOC)	5.0	24.9/26.9	11.7/12.1	12.3	13	--	--
Alkalinity	30 - 500	915/829	670/650	630	720	--	--
Nitrate	10.0	ND(0.04)/ND(0.04)	0.10/0.13	ND(0.1)	--	--	--
Nitrite	1.0	ND(0.10)/ND(0.10)	ND(0.10)/ND(0.10)	ND(0.3)	--	--	--
Ammonia Nitrogen	--	25.5/26.2	4.90/4.90	4.2	--	--	--
Total Kjeldahl Nitrogen (TKN)	--	28.4/30.2	11.0/12.0	10	--	--	--
Phenols	--	ND(0.001)/ND(0.001	0.003/0.004	0.0010	0.002	--	--
pH	6.5 - 8.5	6.39	6.39	8.10	--	--	--
Biological Oxygen Demand (BOD)	--	17.9/20.2	7.3/9.8	10	--	--	--
Chemical Oxygen Demand (COD)	--	72/78	34/31	56	--	--	--
Boron	5	--	--	--	--	--	--
Fluoride	1.5	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--
Sodium	--	--	--	--	--	--	--
Sulphate	500	--	--	--	--	--	--

Notes:

1.	ODWS	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001, where applicable.
2.	29.7/36.6	Duplicate samples were submitted for analyses.
3.	ND	The parameter was analyzed for, but was not detected at or above the detection limit. The associated value is the respective detection limit.
4.	--	Parameter not analyzed

Data Qualifiers:

U	The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
J	The associated value is an estimated quantity.

APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW16A-96*	*OW16A-96*
Sample Date:	*(mg/L)*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)			
General Chemistry			
Chloride	250	27.4	28.8
Conductivity (µmhos/cm)	--	432	502
Hardness	80 -100	108	90
Dissolved Organic Carbon (DOC)	5.0	--	--
Alkalinity	30 - 500	174	167
Nitrate	10.0	--	--
Nitrite	1.0	--	--
Ammonia Nitrogen	--	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--
Phenols	--	--	--
pH	6.5 - 8.5	7.97	7.82
Biological Oxygen Demand (BOD)	--	--	--
Chemical Oxygen Demand (COD)	--	--	--
Boron	5	--	--
Fluoride	1.5	--	--
Calcium	--	28.7	20
Magnesium	--	8.77	9.62
Sodium	--	--	--
Sulphate	500	--	--

Notes:

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2.	29.7/36.6	Duplicate samples were submitted for analyses.
3.	ND	The parameter was analyzed for, but was not detected at or above the detection limit. The associated value is the respective detection limit.
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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92*	*OW16B-92 (DUP*	*OW16B-92*	*OW16B-92 (DUP)*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*8-Jun-04*	*25-Nov-04*	*21-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*30-Apr-09*	*19-Nov-09*	*30-Apr-09*
Parameter (mg/L)																		
General Chemistry																		
Chloride	250	44.6J/6.5J	19.0/18.0	27.0	27.1	11.9	25.8	19.7	47	37	15	38	38	40	46.8	48	31.6	39.3
Conductivity (µmhos/cm)	--	506	628	807	1110	--	1510	--	1030	--	939	1420	1250	1440	1010	--	940	--
Hardness	80 -100	293/291	304/306	365	514	253	68	524	760	594	530	860	680	740	537	518	582	590
Dissolved Organic Carbon (DOC)	5.0	4.1/4.0	6.3/8.0	8.0	5.1	3.8	3	4.2	14.5	23.4	6.5	18.1	9.7	102	--	--	--	--
Alkalinity	30 - 500	241/249	320/310	370	471	379	168	557	880	729	495	756	628	705	540	570	540	492
Nitrate	10.0	ND(0.04)/ND(0.04)	0.39/0.39	0.69	0.3	--	--	ND	ND	ND(0.05)	1	ND	--	--	0.22	0.27	3.67	3.14
Nitrite	1.0	ND(0.10)/ND(0.10)	ND(0.10)/ND(0.10)	ND(0.1)	ND	--	--	--	0.01	--	--	--	--	--	ND(10)	ND(10)	ND(0.10)	ND(0.10)
Ammonia Nitrogen	--	1.30/1.34	2.00/ND(0.5)	3.7	--	--	0.32	2.25	13.4	8.9	3.62	6.8	6	8.7	9.85	9.69	2.12	1.96
Total Kjeldahl Nitrogen (TKN)	--	1.74/1.90	3.00/2.70	4	4.3	--	0.41	--	12	--	--	6.5	--	--	11.8	11	3.65	2.66
Phenols	--	ND(0.001)/ND(0.001	0.003/0.002	0.0020	ND	ND	ND	ND	ND	ND(0.002)	ND	ND	ND	0.01	--	--	--	--
pH	6.5 - 8.5	7.42	7.30	7.24	7.42	--	6.98	--	7.8	--	7.6	7.7	7.7	7.6	6.9	--	7.06	--
Biological Oxygen Demand (BOD)	--	8.8/6.3	ND(2.0)/2.3	ND(2)	--	--	32	--	--	--	--	ND	--	--	3.1	3.6	3.4	3.3
Chemical Oxygen Demand (COD)	--	11/13	14/20	14	14	--	15	--	53	--	--	55	--	--	33	33	37	33
Boron	5	--	--	--	--	--	2.68	--	--	--	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	ND	--	--	--	ND	--	--	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	170	285	--	--	173	167	195	198
Magnesium	--	--	--	--	--	--	--	--	--	--	25	36.6	--	--	25.2	24.9	23.1	23.5
Sodium	--	--	--	--	--	--	--	--	--	--	7.8	25.4	14.6	15.5	--	--	--	--
Sulphate	500	--	--	--	49.2	--	--	22.9	36	41	18	--	30	7	--	--	--	--

Notes:

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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*	*OW17A-96*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*9-Jun-04*	*25-Nov-04*	*21-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)																
General Chemistry																
Chloride	250	ND(3.0)	3.1	2.6	2.3	2.6	3.5	3	4	2.8	4	5	3	3	2.7	2.9
Conductivity (µmhos/cm)	--	513	516	518	560	450	516	--	586	--	553	544	535	532	518	614
Hardness	80 -100	164	130	117	154	158	152	161	180	156	180	150	170	150	155	167
Dissolved Organic Carbon (DOC)	5.0	2.3	2.3	4.8	1.1	1.1	--	1.5	1.1	ND(1)	1.5	1.2	0.9	0.9	--	--
Alkalinity	30 - 500	177	190	170	163	165	159	177	190	161	174	167	165	166	163	170
Nitrate	10.0	--	--	--	ND	--	--	1	0.2	0.07	ND	--	--	--	--	--
Nitrite	1.0	--	--	--	ND	--	--	--	ND	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	0.06	ND	0.2	ND	--	ND	0.07	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	0.18	--	--	--	0.4	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.001U	0.003	ND	ND	ND	ND	ND	ND(0.002)	ND	ND	ND	ND	--	--
pH	6.5 - 8.5	7.80	7.80	7.83	8.02	8.28	7.94	--	8.4	--	8	8.2	8.1	8.1	7.93	8.12
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	ND	--	--	--	ND	--	--	--	--	--	--	--
Boron	5	--	--	--	--	--	0.431	--	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	1.3	--	--	--	1.4	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	34	--	--	--	30.1	33.7
Magnesium	--	--	--	--	--	--	--	--	--	--	22	--	--	--	19.3	20.2
Sodium	--	--	--	--	--	--	--	--	--	--	65	55	55.9	63.1	--	--
Sulphate	500	--	--	--	98	--	--	110	119	110	109	--	102	110	--	--

Notes:

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APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*	*OW17B-96*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*9-Jun-04*	*25-Nov-04*	*21-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)																
General Chemistry																
Chloride	250	3.30	4.8	4.9	4.9	5.2	5.8	6	7	5.4	7	9	6	7	5.9	6.2
Conductivity (µmhos/cm)	--	480	477	487	540	420	460	--	341	--	512	515	--	506	4500	562
Hardness	80 -100	217	186	166	217	219	193	203	210	204	210	210	210	200	200	212
Dissolved Organic Carbon (DOC)	5.0	1.6	1.5U	2.7	0.9	1.3	--	1	0.9	ND(1)	1.2	1.1	1	0.9	--	--
Alkalinity	30 - 500	252	260	250	231	246	227	237	264	223	240	237	235	238	236	240
Nitrate	10.0	--	--	--	ND	--	--	ND	ND	ND(0.05)	ND	--	--	--	--	--
Nitrite	1.0	--	--	--	ND	--	--	--	ND	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	ND	ND	0.1	0.05	--	--	ND	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	0.1	--	--	--	0.2	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.001U	0.0140	ND	ND	ND	ND	ND	ND(0.002)	ND	ND	ND	ND	--	--
pH	6.5 - 8.5	7.51	7.62	7.64	7.96	7.95	7.85	--	8.3	--	8.1	8.2	8.1	8.2	7.84	7.93
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	ND	--	--	--	ND	--	--	--	--	--	--	--
Boron	5	--	--	--	--	--	0.221	--	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	1.4	--	--	--	1.4	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	43	--	--	--	40.8	44.1
Magnesium	--	--	--	--	--	--	--	--	--	--	26	--	--	--	23.8	24.9
Sodium	--	--	--	--	--	--	--	--	--	--	34	34	38.5	39.1	--	--
Sulphate	500	--	--	--	24.1	--	--	32.1	31	67	29	--	36	30	--	--

Notes:

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GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*	*OW18A-96*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*9-Jun-04*	*25-Nov-04*	*21-Jul-05*	*16-May-06*	*24-Jun-07*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)												
General Chemistry												
Chloride	250	ND(3.0)	3.5	3.9	2.8	3.2	4.5	4	3.4	4	--	--
Conductivity (µmhos/cm)	--	697	678	727	780	600.0	720.0	--	--	746	--	--
Hardness	80 -100	189	147	138	183	192	191.0	203	192	200	--	--
Dissolved Organic Carbon (DOC)	5.0	1.3	2.5U	3.9	1.1	1.6	--	1.5	ND(1)	1.4	--	--
Alkalinity	30 - 500	126	130	110	123	119	122.0	135	124	122	--	--
Nitrate	10.0	--	--	--	ND	--	--	ND	0.15	ND	--	--
Nitrite	1.0	--	--	--	ND	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	0.07	0.1	0.2	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	0.1	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.001U	0.0020	ND	ND	ND	ND	ND(0.002)	ND	--	--
pH	6.5 - 8.5	7.72	7.85	7.96	8.03	7.8	8.1	--	--	7.9	--	--
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	ND	--	--	--	--	--	--	--
Boron	5	--	--	--	--	--	0.5	--	--	--	--	--
Fluoride	1.5	--	--	--	1	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	41	--	--
Magnesium	--	--	--	--	--	--	--	--	--	23	--	--
Sodium	--	--	--	--	--	--	--	--	--	86	--	--
Sulphate	500	--	--	--	221	--	--	256	240	218	--	--

Notes:

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GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*	*OW18B-96*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*9-Jun-04*	*25-Nov-04*	*21-Jul-05*	*16-May-06*	*24-Jun-07*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)												
General Chemistry												
Chloride	250	3.3	4.9	4.5	5.4	5.1	6.8	6	6.1	8	--	--
Conductivity (µmhos/cm)	--	609	601	623	670	480	640	--	--	652	--	--
Hardness	80 -100	215	177	157	206	210	208	209	207	210	--	--
Dissolved Organic Carbon (DOC)	5.0	1.3	4.3U	4.9	0.8	1	--	1.5	ND(1)	1.1	--	--
Alkalinity	30 - 500	237	240	230	216	224	225	240	212	223	--	--
Nitrate	10.0	--	--	--	ND	--	--	0.9	0.09	ND	--	--
Nitrite	1.0	--	--	--	ND	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	0.07	0.2	ND	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	0.09	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.001U	ND(0.001)	ND	ND	ND	ND	ND(0.002)	ND	--	--
pH	6.5 - 8.5	7.65	7.95	7.83	8.03	7.63	7.84	--	--	8.1	--	--
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	ND	--	--	--	--	--	--	--
Boron	5	--	--	--	--	--	0.5	--	--	--	--	--
Fluoride	1.5	--	--	--	1.3	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	34	--	--
Magnesium	--	--	--	--	--	--	--	--	--	29	--	--
Sodium	--	--	--	--	--	--	--	--	--	62	--	--
Sulphate	500	--	--	--	102	--	--	109	110	107	--	--

Notes:

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GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*	*OW19A-96*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*9-Jun-04*	*25-Nov-04*	*21-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)																
General Chemistry																
Chloride	250	ND(3.0)	3.7	7.9	4.4	3.3	4.9	4	4	3.8	5	6	4	4	10.8	3.4
Conductivity (µmhos/cm)	--	689	637	631	680	--	680	--	449	--	673	681	662	663	632	686
Hardness	80 -100	188	152	127	179	175	175	201	180	180	190	180	170	170	169	178
Dissolved Organic Carbon (DOC)	5.0	2.5	1.7U	4.5	1.2	1.4	--	1.7	1.1	ND(1)	1.2	1.2	0.9	1	--	--
Alkalinity	30 - 500	173	220	150	155	151	200	165	168	160	158	154	147	149	142	156
Nitrate	10.0	--	--	--	ND	--	--	ND	ND	0.11	ND	--	--	--	--	--
Nitrite	1.0	--	--	--	ND	--	--	--	0.05	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	0.06	ND	ND(0.1)	ND	--	ND	ND	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	0.1	--	--	--	1	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.002U	ND(0.001)	ND	ND	ND	ND	ND	ND(0.002)	ND	ND	ND	ND	--	--
pH	6.5 - 8.5	7.56	7.85	7.83	8.06	--	8.08	--	8.1	--	8.2	8.3	8.3	8.1	7.74	7.6
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	ND	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	ND	--	--	--	7	--	--	--	--	--	--	--
Boron	5	--	--	--	--	--	0.461	--	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	1.2	--	--	--	1.2	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	36	--	--	--	33.9	35.9
Magnesium	--	--	--	--	--	--	--	--	--	--	24	--	--	--	20.5	21.5
Sodium	--	--	--	--	--	--	--	--	--	--	80	74	83.1	81.2	--	--
Sulphate	500	--	--	--	164	--	--	195	200	190	191	--	185	195	--	--

Notes:

1. ODWS — Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001, where applicable.
2. 29.7/36.6 — Duplicate samples were submitted for analyses.
3. ND — The parameter was analyzed for, but was not detected at or above the detection limit. The associated value is the respective detection limit.
4. -- — Parameter not analyzed

Data Qualifiers:

- U — The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- J — The associated value is an estimated quantity.

APPENDIX F

GROUNDWATER MONITORING WELLS - GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:	*ODWS [1]*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*	*OW19B-96*
Sample Date:	*(mg/L)*	*18-Apr-02*	*30-Oct-02*	*28-Apr-03*	*27-Nov-03*	*9-Jun-04*	*25-Nov-04*	*21-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (mg/L)																
General Chemistry																
Chloride	250	23.3	26.0	24.0	23.9	26.1	26.7	25	25	24	28	29	26	26	25.1	28.9
Conductivity (µmhos/cm)	--	686	667	662	710	590	696	--	455	--	703	696	683	685	629	710
Hardness	80 -100	269	216	242	249	250	233	251	220	244	250	240	220	230	236	243
Dissolved Organic Carbon (DOC)	5.0	1.5	1.9U	4.1	1.0	1.0	--	1.7	1.2	ND(1)	3.7	1.2	1.2	0.9	--	--
Alkalinity	30 - 500	279	280	270	249	273	265	290	281	255	269	262	255	260	264	258
Nitrate	10.0	--	--	--	ND	--	--	ND	ND	ND(0.05)	ND	--	--	--	--	--
Nitrite	1.0	--	--	--	ND	--	--	--	0.03	--	--	--	--	--	--	--
Ammonia Nitrogen	--	--	--	--	--	--	--	ND	0.06	0.3	0.06	--	ND	ND	--	--
Total Kjeldahl Nitrogen (TKN)	--	--	--	--	0.1	--	--	--	0.6	--	--	--	--	--	--	--
Phenols	--	ND(0.001)	0.002U	ND(0.001)	ND	ND	ND	0.002	ND	ND(0.002)	ND	ND	ND	ND	--	--
pH	6.5 - 8.5	7.42	7.71	7.75	8.04	7.65	7.47	--	8.2	--	8.1	8.3	8.2	8.1	7.45	7.57
Biological Oxygen Demand (BOD)	--	--	--	--	--	--	--	--	ND	--	--	--	--	--	--	--
Chemical Oxygen Demand (COD)	--	--	--	--	ND	--	--	--	12	--	--	--	--	--	--	--
Boron	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoride	1.5	--	--	--	1.4	--	--	--	1.5	--	--	--	--	--	--	--
Calcium	--	--	--	--	--	--	--	--	--	--	43	--	--	--	41.6	43.8
Magnesium	--	--	--	--	--	--	--	--	--	--	35	--	--	--	32.2	32.4
Sodium	--	--	--	--	--	--	--	--	--	--	64	59	74.9	67.1	--	--
Sulphate	500	--	--	--	67.9	--	--	71.8	74	74	73	--	70	72	--	--

Notes:

1. ODWS — Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001, where applicable.
2. 29.7/36.6 — Duplicate samples were submitted for analyses.
3. ND — The parameter was analyzed for, but was not detected at or above the detection limit. The associated value is the respective detection limit.
4. -- — Parameter not analyzed

Data Qualifiers:

- U — The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.
- J — The associated value is an estimated quantity.

APPENDIX F

STORM WATER MANAGEMENT PONDS -
GENERAL CHEMISTRY AND TOTAL METALS ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location:			*SWP-1*	*SWP-1*	*SWP-1*	*SWP-1*	*SWP-1*	*SWP-1*
Sample Date:	*PWQO [1]*	*ODWS [2]*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
PARAMETERS								
General Chemistry			dry	dry	dry			
Alkalinity	--	30-500	NS	NS	NS	149	215	--
Chloride	--	250	NS	NS	NS	9	15.5	--
Dissolved Organic Carbon (DOC)	--	5	NS	NS	NS	4.5	--	--
Hardness	--	80-100	NS	NS	NS	180	232	--
Laboratory Conductivity (µmhos/cm)	--		NS	NS	NS	356	--	--
Laboratory pH (Std. Units)	6.5 - 8.5	6.5 - 8.5	NS	NS	NS	7.7	--	--
Phenolics	0.001	--	NS	NS	NS	ND	--	--
Total Metals								
Aluminum	(a)	0.1	NS	NS	NS	0.34	0.194	--
Barium	--	1.0	NS	NS	NS	0.019	0.026	--
Beryllium	(g)	--	NS	NS	NS	ND	ND(0.0010)	--
Bismuth	--	--	NS	NS	NS	ND	--	--
Boron	0.2	--	NS	NS	NS	--	ND(0.050)	--
Cadmium	0.0002	0.005	NS	NS	NS	ND	ND(0.00010)	--
Calcium	--	--	NS	NS	NS	60	73.4	--
Chromium	0.0089 (b)	0.05	NS	NS	NS	ND	0.0016	--
Cobalt	0.0009	--	NS	NS	NS	ND	ND(0.00050)	--
Copper	0.005	1	NS	NS	NS	0.002	0.0019	--
Iron	0.3	0.3	NS	NS	NS	0.36	0.257	--
Lead	(c)	0.01	NS	NS	NS	ND	ND(0.0010)	--
Magnesium	--	--	NS	NS	NS	9.9	11.8	--
Manganese	--	0.05	NS	NS	NS	0.022	0.0085	--
Molybdenum	0.04	--	NS	NS	NS	ND	ND(0.0010)	--
Nickel	0.025	--	NS	NS	NS	ND	0.0038	--
Potassium	--	--	NS	NS	NS	2.7	--	--
Silver	0.0001	--	NS	NS	NS	--	ND(0.00010)	--
Sodium	--	200	NS	NS	NS	ND	--	--
Strontium	--	--	NS	NS	NS	0.21	0.294	--
Titanium	--	--	NS	NS	NS	0.016	0.0056	--
Tungsten	0.03	--	NS	NS	NS	ND	--	--
Vanadium	0.006	--	NS	NS	NS	ND	ND(0.0010)	--
Zinc	0.03	5	NS	NS	NS	0.013	0.160	--
Field								
pH (Std. Units)	6.5 - 8.5	6.5 - 8.5	--	--	--	--	7.73	--
Conductivity (µmhos/cm)	--	--	--	--	--	--	406	--
Temperature (°C)	--	--	--	--	--	--	12	--
Dissolved Oxygen	(e)	--	--	--	--	--	6.49	--

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment and Energy (MOEE), Provincial Water Quality Objectives (PWQO), July 1994, reprinted February 1999.

(2) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III); PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

ND - Parameter not detected at, or above, method detection limit

APPENDIX F

GROUNDWATER COLLECTION SYSTEM - GENERAL CHEMISTRY AND TOTAL METALS RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Date:	*9-Jun-04*	*19-Jul-04*	*29-Dec-04*	*21-Jul-05*	*20-Dec-05*	*16-May-06*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*	*Modelled Groundwater Concentrations (1) (Short Term)*	*Modelled Groundwater Concentrations (1) (Long Term)*	*Sewer Use By-Law Criteria(2) (mg/L)*
Parameter (mg/L)															
General Chemistry															
pH (std. units)	7.08	6.63	7.02	--	--	--	7.5	--	7.7	7.8	--	--	6.9	7	6.0-10.5
Alkalinity	862	880	1100	1100	946	849	1120	1040	1120	1060	970	1090	1722	540	--
Ammonia	--	33	34	35.8	37.9	31.1	42	49	43	50	33.7	40.3	51.9	31.6	--
Biochemical Oxygen Demand (BOD)	5.8	2	2	13	24	--	5	6	4	ND	7.7	3.8	98	115	300
Chemical Oxygen Demand (COD)	--	70	70	58	62	--	66	55	62	71	71	85	1208	1341	--
Chloride	519	74	93	65.9	73	54	76	57	66	100	56.5	98.9	256	163	500
Dissolved Organic Carbon (DOC)	16.7	22	33	20.3	21.1	18.4	23.4	18.7	17.4	25.6	--	--	110.6	59.3	--
Hardness	837	810	840	854	850	774	780	760	810	910	782	999	1242	428	--
Nitrate	--	0.1	0.1	ND	ND	ND(0.05)	ND	ND	ND	ND	ND(0.1)	ND(0.5)	--	--	--
Nitrite	--	0.1	0.1	ND	0.02	--	ND	0.05	ND	ND	ND(0.1)	ND(0.5)	0.1	0.1	--
Phenols	0.008	0.001	0.001	0.003	ND	0.006	0.005	ND	ND	ND	--	--	0.02	0.02	1
Total Suspended Solids (TSS)	102	--	--	--	--	--	160	43	45	63	67	65	--	--	300
Total Kjeldahl Nitrogen (TKN)	--	46	--	40.2	34	--	41	41	49	44	36.1	49.6	79.49	40.42	--

Notes:

All units expressed in mg/L.

ND The parameter was analyzed for, but was not detected at or above the method detection limit. The associated value is the respective method detection limit.

-- Parameter not analyzed

All units expressed in mg/L (ppm) unless otherwise noted.

(1) Modelled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).

(2) Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.

APPENDIX F

GROUNDWATER COLLECTION SYSTEM - GENERAL CHEMISTRY AND TOTAL METALS RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

	Monitoring Date										Modelled Groundwater Concentrations (1)	Modelled Groundwater Concentrations (1)	Sewer Use By-Law Criteria (2)
Parameter (mg/L)	*19-Jul-04*	*29-Dec-04*	*21-Jul-05*	*19-Dec-05*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*	*(Short Term)*	*(Long Term)*	*(mg/L)*
Metals													
Aluminum	0.03	0.05	0.042	0.031	0.053	0.017	0.091	0.033	ND(0.1)	ND(0.1)	55.53	56.15	50
Barium	0.2	0.21	0.26	0.22	0.23	0.19	0.19	0.22	0.17	0.28	0.87	0.57	--
Beryllium	0.001	0.001	ND	ND	ND	ND	ND	ND	ND(0.01)	ND(0.10)	0.01	0.01	--
Boron	--	--	--	--	--	--	--	--	ND(0.5)	0.55	--	--	--
Bismuth	ND	0.001	ND	ND	ND	ND	ND	ND	--	--	0.04	0.04	5
Cadmium	0.0001	0.0001	ND	0.0005	0.0003	0.0001	0.0002	ND	ND(0.001)	ND(0.001)	0.01	0.01	1
Calcium	224	227	250	240	270	250	290	250	214	275	746	637	--
Chromium	0.016	0.017	ND	ND	ND	ND	ND	ND	ND(0.001)	ND(0.01)	0.12	0.12	5
Cobalt	0.0014	0.0015	0.0013	0.0016	0.0017	0.0013	0.002	0.0022	ND(0.005)	ND(0.008)	0.05	0.05	5
Copper	0.001	0.003	ND	ND	0.001	0.002	ND	ND	ND(0.01)	ND(0.01)	0.16	0.16	2
Iron	26.1	25.9	34	26	36	12	16	27	27.9	30.5	117.1	106.1	50
Lead	0.001	0.001	ND	ND	ND	ND	ND	ND	ND(0.01)	ND(0.01)	0.4	0.39	5
Magnesium	59.8	62.2	82	65	74	66	69	70	60.2	75.9	310	202	--
Manganese	1.47	1.46	1.3	1.4	1.5	1.4	1.5	1.2	1.35	1.17	2.96	2.7	5
Molybdenum	0.001	0.001	ND	ND	ND	ND	ND	ND	ND(0.01)	ND(0.01)	0.01	0.01	5
Nickel	0.003	0.004	ND	0.002	0.003	ND	ND	ND	ND(0.02)	ND(0.02)	0.11	0.11	2
Phosphorus	--	0.05	--	--	ND	--	--	--	ND(0.03)	ND(0.03)	3.3	3.7	10
Potassium	39.4	44.5	43	39	44	42	46	43	--	--	123	45	--
Silver	0.0001	0.0001	ND	0.0007	ND	ND	ND	ND	ND(0.001)	ND(0.001)	0.01	0.01	5
Sodium	48.4	61.7	70	58	66	48	58	67	--	--	212	133	--
Strontium	1.04	1.03	1.3	1	1.3	1.1	1.4	1.3	1.18	1.42	2.32	1.36	--
Tungsten	--	0.01	ND	ND	-	ND	ND	ND	--	--	0.03	0.03	--
Zinc	0.009	0.013	0.052	0.02	0.3	0.16	0.083	0.025	0.047	0.032	1.06	1.06	2

Notes:

All units expressed in mg/L.

ND The parameter was analyzed for, but was not detected at or above the method detection limit. The associated value is the respective method detection limit.

-- Parameter not analyzed

All units expressed in mg/L (ppm) unless otherwise noted.

(1) Modelled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).

(2) Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.

APPENDIX F

GROUNDWATER COLLECTION SYSTEM - VOC ANALYTICAL RESULTS
HISTORIC WATER QUALITY RESULTS
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Date:	*21-Jul-05*	*19-Dec-05*	*24-Jun-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*	*Modelled Groundwater Concentrations (1) (Short Term)*	*Modelled Groundwater Concentrations (1) (Long Term)*
Parameter (µg/L (ppb))										
Volatile Organic Compounds										
1,1,1-Trichloroethane	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
1,1,1-Trichloroethane	--	--	--	--	--	--	ND(0.5)	ND(0.5)	--	--
1,1,2,2-Tetrachloroethane	ND(0.1)	ND(0.4)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
1,1,2-Trichloroethane	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
1,1-Dichloroethane	0.10	ND(0.4)	0.1	ND(0.1)	0.1	0.1	ND(0.5)	ND(0.5)	16.2	14.80
1,1-Dichloroethylene	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
1,2-Dibromoethane	--	--	--	--	--	--	ND(0.5)	ND(0.5)	--	--
1,2-Dichlorobenzene	0.1	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
1,2-Dichloroethane	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
1,2-Dichloropropane	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
1,3-Dichlorobenzene	ND(0.1)	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
trans-1,3-Dichloropropene	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
cis-1,3-Dichloropropene	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
1,4-Dichlorobenzene	2	ND(0.8)	1.9	1.4	1.9	1.5	1.95	2.72	1.500	1
2-Chloroethylvinyl Ether	--	--	--	--	--	--	ND(0.5)	ND(0.5)	--	--
2-Hexanone	--	--	--	--	--	--	ND(20)	ND(20)	--	--
Acetone	--	--	--	--	--	--	ND(20)	ND(20)	--	--
Benzene	1.300	0.900	1.4	1	0.9	1.1	0.88	1.30	1.9	1.000
Bromodichloromethane	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
Bromoform	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
Bromomethane	ND(0.5)	ND(2)	ND(0.5)	ND(0.5)	ND(2)	ND(0.5)	ND(1.0)	ND(1.0)	--	--
Carbon Tetrachloride	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
Carbon Disulfide	--	--	--	--	--	--	ND(0.5)	ND(0.5)	--	--
Chlorobenzene	5	ND(0.4)	5.4	4	3.1	3.8	4.61	5.10	3.600	3
Chloroethane	--	ND(0.8)	--	--	--	--	ND(1.0)	ND(1.0)	8.000	1.40
Chloroform	ND	1.000	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
Chloromethane	--	ND(2)	--	--	--	--	ND(1.0)	ND(1.0)	--	--
Dibromochloromethane	--	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
Dichloromethane (Methylene Chloride)	ND(0.5)	ND(2)	ND(0.5)	ND(0.5)	ND(2)	ND(0.5)	ND(0.5)	ND(0.5)	0.7	0.700
Ethylbenzene	ND(0.1)	0.5	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	7.5	7.4
m/p-Xylenes	1.3	1.2	0.3	0.3	0.1	0.1	ND(1.0)	ND(1.0)	11.8	11.7
o-Xylene	ND(0.1)	0.6	ND(0.1)	ND(0.1)	ND	ND	ND(0.5)	ND(0.5)	3.6	3.6
trans-1,2-Dichloroethylene	--	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
cis-1,2-Dichloroethylene	--	ND(0.4)	0.1	0.1	0.1	ND(0.1)	ND(0.5)	ND(0.5)	--	--
Tetrachloroethylene	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
Toluene	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	54.1	54.1
Trichloroethylene	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.1)	ND(0.5)	ND(0.5)	--	--
Trichlorofluoromethane	--	ND(0.8)	--	--	--	--	ND(1.0)	ND(1.0)	--	--
Vinyl Chloride	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.2)	ND(0.8)	ND(0.2)	ND(0.5)	ND(0.5)	--	--
Xylenes (total)	--	--	--	--	--	--	ND(1.5)	ND(1.5)	--	--

Notes:

All units expressed in µg/L (ppb).

(1) Modelled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine Ontario" (CRA, April 1993).

< The parameter was analzed for, but was not detected at or above the method detection limit. The associated value is the respective method detection limit.

ND The parameter was analyzed for, but was not detected at or above the method detection limit. The value in brackets is the EQL - Estimated Quantitation Limit.

-- Parameter not analyzed

APPENDIX F

LEACHATE COLLECTION SYSTEM - GENERAL CHEMISTRY AND TOTAL METALS RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Date	*19-Jun-05*	*21-Jul-05*	*17-Nov-05*	*19-Dec-05*	*15-May-06*	*16-May-06*	*9-Nov-06*	*11-May-07*	*24-Jun-07*	*9-Nov-07*	*11-Nov-07*	*12-Aug-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*	*Modelled Leachate Concentrations (1)*	*Sewer Use By-Law Criteria(2)*
Parameter (mg/L)																	
General Chemistry																	
pH (std. units)	--	--	--	--	--	--	--	--	7.6	--	--	7.2	7.3	--	--	7.1	6.0-10.5
Alkalinity	2,610	774	1020.0	--	2190	2	2910	2600	1000	1860	1920	1570	1340	3150	1980	2620	--
Ammonia	162	32.4	81	28.7	--	51.4	--	--	28.7	--	130	140	83	130	153	220	--
Biochemical Oxygen Demand (BOD)	43	12	420.0	ND	1530	372	2990	1720 UAL	80	68	56	95	1100	2300	46	3000	300
Chemical Oxygen Demand (COD)	470	110	700	67	2290	1040	1470	7800	200	390	520	550	2300	4470	368	4500	--
Chloride	70.4	119	293	44	400	140	650	560	200	560	530	510	480	490	438	1000	500
Dissolved Organic Carbon (DOC)	148	31.6	238	18.9	816	454	1470	3110	62.8	113	144	113	800	--	--	2000	--
Hardness	1,350	601	940.0	540	1830	1440	2590	3020	900	1120	980	1300	1600	2310	1190	1393	--
Nitrate	ND(0.3)	ND	ND(0.1)	ND	--	ND(0.05)	--	--	ND	--	ND	ND	ND	ND(1.0)	1	20	--
Nitrite	ND(0.2)	ND	ND(0.01)	ND	--	ND(0.06)	--	--	ND	--	ND	ND	0.03	ND(1.0)	ND(0.5)	0.072	--
Phenols	0.014	0.001	0.07	0.002	0.39	0.17	1.6	0.059	0.066	0.026	0.059	0.089	0.235	--	--	2	1
Total Suspended Solids	--	--	--	--	--	--	--	--	56	--	32	110	92	258	62	--	300
Total Kjeldahl Nitrogen (TKN)	106	33.3	76	28	--	50.6	--	--	26	--	180	150	110	171	169	201	--

Notes:

All units expressed in mg/L.

ND The parameter was analzed for, but was not detected at or above the method detection limit. The associated value is the respective method detection limit.

-- Parameter not analyzed

(1) Modelled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine Ontario" (CRA, April 1993).

(2) Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.

Data Qualifiers:

UAL The result for BOD is unreliable as the sample was a'--lyzed after the maximum holding time due to lab error.

APPENDIX F

LEACHATE COLLECTION SYSTEM - GENERAL CHEMISTRY AND TOTAL METALS RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Date:	*19-Jun-05*	*21-Jul-05*	*17-Nov-05*	*19-Dec-05*	*15-May-06*	*16-May-06*	*9-Nov-06*	*11-May-07*	*24-Jun-07*	*9-Nov-07*	*11-Nov-07*	*6-May-08*	*12-Aug-08*	*6-Nov-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*	*Modelled Leachate Concentrations (1)*	*Sewer Use By-Law Criteria(2)*
Parameter (mg/L)																			
Metals																			
Aluminum	0.500	2.600	--	2.9	0.54	11.6	0.94	0.46	0.2	0.62	0.41	1.65	0.73	2.96	1.1	1.660	0.17	107.00	50
Barium	0.220	0.160	--	0.09	0.178	0.124	0.328	0.198	0.19	0.211	0.21	0.179	0.26	0.227	0.16	0.20	0.23	1.14	--
Beryllium	ND(0.005)	ND	--	ND	ND(0.0001)	--	ND(0.0001)	ND(0.0001)	ND	ND(0.0001)	ND	ND	ND	ND	ND	1.77	1.97	0.01	--
Boron	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND(0.01)	ND(0.01)	--	--
Bismuth	ND(0.2)	ND	--	ND	ND(0.03)	--	ND(0.03)	ND(0.03)	ND	ND(0.03)	ND	ND	ND	ND	ND	--	--	ND(0.04)	5
Cadmium	ND(0.005)	0.0007	--	0.005	ND(0.002)	0.002	ND(0.002)	0.004	0.0001	ND(0.002)	0.0002	0.003	0.0002	ND	0.001	ND(0.001)	ND(0.001)	0.010	1
Calcium	183	160	--	160	445	428	708	877	290	219	240	--	300	--	440	675	243	1249	--
Chromium	0.020	0.009	--	0.015	0.042	0.047	0.033	0.046	ND	0.031	0.023	0.036	0.022	0.031	0.033	0.170	0.022	0.228	5
Cobalt	ND(0.02)	0.0031	--	0.004	0.004	ND(0.003)	ND(0.003)	0.012	0.0028	0.003	0.0079	ND	0.0081	0.004	0.0098	0.020	0.009	0.089	5
Copper	ND(0.02)	0.015	--	0.012	0.001	0.0258	0.02	0.069	0.004	0.009	0.006	0.095	0.036	0.021	0.034	0.093	ND(0.01)	0.300	2
Iron	2.87	3.8	--	28	8.81	26.9	23.5	41.5	15	8.25	3.9	18	18	8.84	6.4	53.4	2.9	213.0	50
Lead	ND(0.05)	0.0079	0.0067	0.011	ND(0.005)	0.00884	0.011	0.013	0.0009	ND(0.005)	0.0025	0.02	0.0072	0.022	0.018	0.022	ND(0.01)	1.000	5
Magnesium	200	96	--	52	176	90	200	201	110	138	170	143	180	168	120	152.0	142	432.00	--
Manganese	0.32	0.21	--	0.7	2.73	2.03	3.48	6.22	0.98	0.455	0.42	2.83	0.77	1.02	2.1	4.82	0.66	7.32	5
Molybdenum	ND(0.02)	0.002	--	ND	ND(0.005)	--	ND(0.005)	ND(0.005)	ND	ND(0.005)	0.002	ND	0.002	ND	0.003	ND(0.01)	ND(0.01)	0.010	5
Nickel	ND(0.05)	0.012	--	0.012	0.05	0.0464	0.05	0.1	0.013	0.04	0.037	0.03	0.032	0.04	0.033	0.16	0.04	0.20	2
Phosphorus	1.7	--	--	--	3.64	0.94	2.98	3.11	0.53	1.77	--	--	--	--	--	5.3	1.7	6.0	10
Potassium	243	41	--	17	169	70.7	286	334	35	--	220	--	220	--	190	--	--	152	--
Silver	ND(0.01)	ND	--	0.00006	ND(0.01)	--	ND(0.005)	ND(0.005)	ND	ND(0.005)	ND	--	ND	--	ND	ND(0.001)	ND(0.001)	0.020	5
Sodium	555	120	--	39	348	123	533	594	150	402	430	--	440	--	350	--	--	301	--
Strontium	3.03	1.7	--	0.99	2.37	--	2.75	3.08	2.1	2.28	2.5	1.99	2.7	2.01	2	2.94	2.33	2.88	--
Titanium	0.04	0.1	--	0.034	0.034	--	0.054	0.022	0.008	0.042	0.045	0.059	0.05	0.041	0.052	0.028	0.027	2.050	5
Tungsten	--	ND	--	ND	ND(0.01)	--	ND(0.01)	ND(0.01)	-	ND(0.01)	0.001	0.02	0.003	0.03	0.005	--	--	0.045	--
Vanadium	0.01	0.008	--	0.009	0.011	0.029	0.015	0.004	0.002	0.01	0.01	0.008	0.01	0.012	0.01	0.012	ND(0.01)	0.239	5
Zinc	0.45	0.78	--	2.3	1.19	1.44	0.9	1.69	0.39	0.72	0.1	1.56	0.62	4.04	0.58	0.925	0.084	1.910	2

Notes:

All units expressed in mg/L.

ND The parameter was analzyed for, but was not detected at or above the method detection limit.
The associated value is the respective method detection limit.

-- Parameter not analyzed

Data Qualifiers:

U - The material was analyzed for, but was not detected above the level of the associated value.

APPENDIX F

LEACHATE COLLECTION SYSTEM - VOC ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Date:	*19-Jun-05*	*21-Jul-05*	*17-Nov-05*	*19-Dec-05*	*15-May-06*	*16-May-06*	*9-Nov-06*	*11-May-07*	*24-Jun-07*	*9-Nov-07*	*11-Nov-07*	*8-May-08*	*12-Aug-08*	*6-Nov-08*	*30-Nov-08*	*30-Apr-09*	*19-Nov-09*
Parameter (µg/L (ppb))																	
Volatile Organic Compound																	
1,1,1-Trichloroethane	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.1)	ND(50)	ND(0.1)	ND(50)	ND(0.4)	ND(50)	5	ND(0.5)	ND(0.5)
1,1,2,2-Tetrachloroethane	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	--	ND(50)	ND(50)	ND(0.2)	ND(10)	ND(0.2)	ND(10)	ND(0.8)	ND(10)	ND(2)	ND(0.5)	ND(0.5)
1,1,2-Trichloroethane	--	ND(0.1)	ND(0.4)	ND(0.8)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.2)	ND(50)	ND(0.2)	ND(50)	ND(0.8)	ND(50)	ND(2)	ND(0.5)	ND(0.5)
1,1-Dichloroethane	0.3	0.1	ND(0.2)	ND(0.4)	ND(50)	ND(200)	ND(50)	ND(10)	ND(0.1)	ND(50)	ND(0.2)	ND(50)	ND(0.4)	ND(50)	1	ND(0.5)	ND(0.5)
1,1-Dichloroethylene	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.1)	ND(50)	ND(0.2)	ND(6.6)	ND(0.4)	ND(6.6)	ND(1)	ND(0.5)	ND(0.5)
1,2-Dibromoethane	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND(0.5)	ND(0.5)
1,2-Dichlorobenzene	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.8)	ND(10)	ND(40)	ND(10)	ND(10)	ND(0.2)	ND(10)	ND(0.4)	ND(10)	ND(0.8)	ND(10)	ND(2)	ND(0.5)	ND(0.5)
1,2-Dichloroethane	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	ND(200)	ND(50)	ND(10)	ND(0.1)	ND(50)	ND(0.2)	ND(50)	ND(0.8)	ND(50)	ND(2)	1.2	ND(0.5)
1,2-Dichloropropane	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.1)	ND(50)	ND(0.2)	--	ND(0.4)	--	ND(1)	ND(0.5)	ND(0.5)
1,3-Dichlorobenzene	ND(0.1)	ND(0.1)	ND(0.4)	ND(0.8)	ND(10)	ND(40)	ND(10)	ND(10)	ND(0.2)	ND(10)	ND(0.4)	ND(10)	ND(0.8)	ND(10)	ND(2)	ND(0.5)	ND(0.5)
trans-1,3-Dichloropropene	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.8)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.2)	ND(10)	ND(0.4)	ND(10)	ND(0.8)	ND(10)	ND(2)	ND(0.5)	ND(0.5)
cis-1,3-Dichloropropene	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.8)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.2)	ND(10)	ND(0.4)	ND(10)	ND(0.8)	ND(10)	ND(2)	ND(0.5)	ND(0.5)
1,4-Dichlorobenzene	0.6	0.3	ND(0.4)	ND(0.8)	ND(10)	ND(40)	ND(10)	ND(10)	ND(0.2)	ND(10)	0.5	ND(10)	ND(0.8)	ND(10)	ND(2)	ND(0.5)	ND(0.5)
2-Chloroethylvinyl Ether	--	--	--	--	ND(50)	--	ND(50)	ND(50)	--	ND(20)	--	ND(50)	--	ND(50)	--	ND(0.5)	ND(0.5)
Benzene	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(10)	ND(40)	ND(10)	ND(10)	0.2	ND(10)	ND(0.2)	ND(10)	ND(0.4)	ND(10)	ND(1)	0.69	ND(0.5)
Bromodichloromethane	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(10)	ND(40)	ND(10)	ND(10)	ND(0.1)	ND(10)	ND(0.2)	ND(10)	ND(0.4)	ND(10)	ND(1)	ND(0.5)	ND(0.5)
Bromoform	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.8)	ND(10)	ND(40)	ND(10)	ND(10)	ND(0.2)	ND(10)	ND(0.4)	ND(10)	ND(0.8)	ND(10)	ND(2)	ND(0.5)	ND(0.5)
Bromomethane	ND(0.5)	ND(0.5)	ND(1)	ND(2)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.5)	ND(10)	ND(1)	ND(9)	ND(2)	ND(36)	ND(5)	ND(1.0)	ND(1.0)
Carbon Tetrachloride	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.1)	ND(50)	ND(0.2)	ND(5)	ND(0.4)	ND(5)	ND(1)	ND(0.5)	ND(0.5)
Chlorobenzene	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	--	ND(50)	ND(50)	ND(0.1)	ND(50)	ND(0.2)	ND(50)	ND(0.4)	ND(50)	ND(1)	ND(0.5)	ND(0.5)
Chloroethane	ND(0.2)	--	--	ND(0.8)	ND(50)	ND(200)	ND(50)	ND(50)	--	ND(50)	--	ND(50)	--	ND(50)	--	ND(1.0)	ND(1.0)
Chloroform	ND(0.1)	ND(0.1)	0.800	1.0	ND(10)	ND(40)	ND(10)	ND(10)	ND(0.1)	ND(10)	ND(0.2)	ND(5)	ND(0.4)	ND(5)	ND(1)	ND(0.5)	ND(0.5)
Chloromethane	ND(0.5)	--	--	ND(2)	ND(50)	ND(200)	ND(50)	ND(50)	--	ND(50)	--	ND(50)	--	ND(50)	--	ND(1.0)	ND(1.0)
Dibromochloromethane	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.8)	ND(10)	ND(40)	ND(10)	ND(10)	ND(0.2)	ND(10)	ND(0.4)	ND(5)	ND(0.8)	ND(5)	ND(2)	ND(0.5)	ND(0.5)
Dichloromethane (Methylene Chloride)	ND(0.5)	--	ND(1)	ND(2)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.5)	ND(50)	ND(1)	ND(50)	ND(2)	ND(50)	ND(2)	3.91	ND(0.5)
Ethylbenzene	0.5	ND(0.1)	0.2	0.5	ND(10)	ND(40)	ND(10)	ND(10)	0.2	ND(10)	0.3	ND(10)	0.500	ND(10)	3	2.81	ND(0.5)
m/p-Xylenes	2.0	0.2	0.6	1.2	ND(10)	ND(40)	ND(10)	12.0	0.4	ND(10)	0.9	ND(10)	1.500	ND(10)	4	3.50	ND(1.0)
o-Xylene	0.9	0.1	0.3	0.6	ND(10)	ND(40)	ND(10)	ND(10)	0.1	ND(10)	0.4	ND(10)	0.500	ND(10)	1	1.0	ND(0.5)
trans-1,2-Dichloroethylene	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	--	--	--	ND(50)	ND(0.1)	--	ND(0.2)	--	ND(0.4)	--	ND(1)	ND(0.5)	ND(0.5)
cis-1,2-Dichloroethylene	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	--	--	--	ND(50)	ND(0.1)	--	ND(0.2)	--	ND(0.4)	--	ND(1)	0.81	ND(0.5)
Tetrachloroethylene	ND(0.1)	ND(0.1)	0.4	ND(0.4)	--	ND(200)	--	ND(50)	ND(0.1)	--	ND(0.2)	--	ND(0.4)	--	ND(1)	ND(0.5)	ND(0.5)
Toluene	0.2	ND(0.2)	ND(0.4)	ND(0.8)	ND(10)	ND(40)	14	31.0	2.7	ND(10)	0.7	ND(8)	1.4	ND(8)	7	8.73	ND(0.5)
Trichloroethylene	ND(0.1)	ND(0.1)	ND(0.2)	ND(0.4)	ND(50)	ND(200)	ND(50)	ND(50)	ND(0.1)	ND(50)	ND(0.2)	ND(50)	ND(0.4)	ND(50)	ND(1)	ND(0.5)	ND(0.5)
Trichlorofluoromethane	ND(0.2)	--	--	ND(0.8)	--	ND(200)	--	ND(50	-	ND(50)	-	ND(50)	--	ND(50)	--	ND(1.0)	ND(1.0)
Vinyl Chloride	ND(0.2)	ND(0.2)	ND(0.4)	ND(0.8)	ND(20)	ND(80)	ND(20)	ND(50)	ND(0.2)	ND(20)	ND(0.4)	ND(5)	ND(0.8)	ND(5)	ND(2)	ND(0.5)	ND(0.5)
2-Hexanone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND(20)	ND(20)
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	910	ND(20)
Carbon Disulfide	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	21.900	ND(0.5)
Methyl Ethyl Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1820	ND(20)
Methyl Isobutyl Ketone	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND(20)	ND(20)
Styrene	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND(0.5)	ND(0.5)
Trihalomethanes	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND(2.0)	ND(2.0)
Xylenes (total)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND(1.5)	ND(1.5)

Notes:

All units expressed in µg/L (ppb).

ND The parameter was analyzed for, but was not detected at or above the method detection limit. The associated value is the respective method detection limit.

2. Modelled leachate concentrations obtained from the report "Leachate Treatability Assessment Report, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA, November 1993).

3. Leachate VOC trigger level concentrations obtained from the report "Leachate Treatability Assessment Report, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA, November 1993).

4. -- Parameter not analzyed.

APPENDIX F

SEWAGE STABILIZATION LAGOON
GENERAL CHEMISTRY ANALYTICAL RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

Sample Location: / *Sample Date:*	*ODWS* [1]	*SG1-91* *28-Apr-03*	*SG1-91* *27-Nov-03*	*SG1-91* *8-Jun-04*	*SG1-91* *25-Nov-04*	*SG1-91* *21-Jul-05*	*SG1-91* *24-Jun-07*	*SG1-91* *11-Nov-07*	*SG1-91* *12-Aug-08*	*SG1-91* *30-Nov-08*	*SG1-91* *30-Apr-09*	*SG1-91* *19-Nov-09*
Parameter (mg/L)												
General Chemistry												
Alkalinity	30 - 500 (d)	140	168	200	163	101	174	74	109	139	161	91
Biological Oxygen Demand (BOD)	--	23	7.5	6.6	33	16	43	16	12	6	11.9	19.4
Calcium	--	--	--	--	--	--	--	--	--	--	50.0	50.8
Chemical Oxygen Demand (COD)	--	73	50	--	73	130	150	64	70	30	71	117
Chloride	250 (c)	120	118	108	83.4	98.2	79	67	79	61	91.2	72.4
Dissolved Organic Carbon (DOC)	5	8.2	5.4	8	8.4	12.9	15.5	10.2	10.9	7.9	--	--
Hardness	80 - 100	198	243	253	177	129	190	140	150	170	191	181
Laboratory Conductivity (µmhos/cm)	--	688	870	730	670	--	763	609	650	651	--	--
Magnesium	--	--	--	--	--	--	--	--	--	--	16.0	13.2
Nitrate	10 (a)	0.78	ND	--	NA	ND	0.3	3.4	1.8	0.7	1.09	2.28
Nitrite	1 (a)	0.27	1	--	NA	4.5	'--	2.2	1.8	0.28	0.22	1.09
Total Ammonia	--	12	NA	--	9.5	0.2	13.8	1.04	3.9	12	7.18	2.82
Total Kjeldahl Nitrogen (TKN)	--	13	8.62	--	17.3	8.2	20	5.2	7.9	11	8.94	6.26
Total Phenolics		0.001	ND	ND	0.002	0.002	0.002	ND	ND	ND	--	--
Field												
Field pH (Std. Units)	6.5 - 8.5	8.09	7.71	8.03	7.92	--	7.9	NA	8.12	8.03	8.4	8.42
Field Conductivity (µmhos/cm)	--	--	--	--	--	--	--	--	--	--	640	678
Field Temperature (°C)	--	--	--	--	--	--	--	--	--	--	13.6	7.8
Field Dissolved Oxygen	--	--	--	--	--	--	--	--	--	--	17.64	9.3

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
-- Parameter was not analyzed.
[a] - Criteria value from Maximum Acceptable Concentration.
[b] - Criteria value from Interim Maximum Acceptable
[c] - Criteria value from Aesthetic Objective.
[d] - Criteria value from Operational Guideline.
to 4 mg/L (25 °C) for warm water biota.
ND - parameter non-detect at value shown in parenthesis.
-- - parameter not analyzed.

APPENDIX F

LANDFILL GAS PROBES - METHANE GAS MONITORING RESULTS
HISTORIC WATER QUALITY DATA
KINCARDINE WARD 1 LANDFILL SITE
KINCARDINE, ONTARIO

	January 19, 2009		*February 4, 2009*		*March 18, 2009*		*July 15, 2009*		*December 10., 2009*	
Monitoring Location	*Methane Gas (%)* [1]	*Pressure* [2]	*Methane Gas (%)*	*Pressure*	*Methane Gas (%)*	*Pressure*	*Methane Gas (%)*	*Pressure*	*Methane Gas (%)*	*Pressure*
GP1A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP1B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

1. Methane gas is expressed in percent by volume in air.
2. Pressure is measured in inches of water.

Appendix F.2

Historical Data 2010 to 2022

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92
Sample ID:				CRA-4074-02-WARD1-19	LW-WARD1-1210-001	LW-WARD1-0511-002	LW-WARD1-1011-002	LW-WARD1-0512-002	LW-WARD1-1112-002	LW-WARD1-0513-002	LW-WARD1-1013-002	LW-WARD1-DD-061414-002	LW-WARD1-103114-001	LW-WARD1-9/6/15-001	LW-WARD1-11/13/15-002	LW-WARD1-042516-002	LW-WARD1-110416-002	LW-WARD1-041117-002	LW-WARD1-112317-002	LW-WARD1-052018-002	LW-WARD1-110418-002
Sample Date:				5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																		
Metals																					
Aluminum	mg/L	0.10	OG	1.97	0.62	0.65	0.74	0.24	0.55	0.6	0.25	0.35	0.25	0.19	0.35	0.18	<0.1	<0.1	0.082	0.112	0.155
Barium	mg/L	1.0	MAC	0.49	0.4	0.42	0.47	0.48	0.52	0.386	0.533	0.496	0.158	0.125	0.526	0.467	0.468	0.498	0.415	0.5	0.472
Beryllium	mg/L	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	5.0	IMAC	2.81	2.64	2.64	3.09	2.19	3	2.64	2.08	2.17	2.3	1.88	1.98	1.47	1.94	1.54	1.12	1.64	1.63
Cadmium	mg/L	0.005	MAC	0.001	<0.001	0.0017	0.0025	<0.0009	<0.0009	0.00115	<0.0009	<0.0009	<0.0009	<0.0009	0.00136	0.00086	0.00044	0.00036	0.000349	0.000682	0.000452
Calcium	mg/L	-	-	284	272	273	288	267	279	311	268	313	333	340	281	277	282	269	237	276	262
Chromium	mg/L	0.05	MAC	0.011	<0.01	<0.01	<0.01	<0.005	0.0053	<0.005	<0.005	<0.005	0.0105	0.0083	0.0059	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	-	-	<0.008	<0.008	<0.008	0.0064	0.0055	0.0062	0.0059	<0.005	0.0058	0.016	0.0124	0.0056	0.0064	0.0053	0.0062	0.0042	0.0063	0.0059
Copper	mg/L	1.0	AO	0.105	0.033	0.058	0.066	0.019	0.063	0.051	0.011	0.011	0.01	0.01	0.036	0.022	0.011	0.017	0.012	0.018	0.014
Iron	mg/L	0.30	AO	**36**	**14.7**	**48.1**	**47.6**	**21.5**	**25.8**	**11.8**	**21.2**	**26.5**	**74.6**	**66.7**	**31.1**	**67.3**	**17.7**	**19.1**	**4.79**	**26.3**	**22**
Lead	mg/L	0.010	MAC	**0.015**	<0.01	<0.01	**0.019**	<0.01	<0.01	0.006	<0.005	<0.005	<0.005	<0.005	0.0081	0.004	0.0018	0.0024	0.00071	0.00246	0.00277
Magnesium	mg/L	-	-	180	177	157	169	186	201	218	187	183	136	135	170	142	179	158	114	152	134
Manganese	mg/L	0.05	AO	**0.503**	**0.395**	**0.508**	**0.462**	**0.351**	**0.358**	**0.324**	**0.322**	**0.398**	**1.11**	**1.16**	**0.353**	**0.424**	**0.318**	**0.308**	**0.368**	**0.356**	**0.29**
Molybdenum	mg/L	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.00111	0.00079	0.00067	0.00071	0.00096	0.00073	0.00067
Nickel	mg/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.013	<0.01	<0.01	0.015	0.015	0.0141	0.013	0.0101	0.0111	0.0086	0.0132	0.0107
Silver	mg/L	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Strontium	mg/L	-	-	2.09	2.13	1.81	2.19	2.33	2.41	2.56	2.58	2.33	1.93	1.84	2.53	2.04	2.57	2.41	1.7	2.28	2.33
Titanium	mg/L	-	-	0.069	0.025	0.028	0.025	<0.02	0.028	0.022	<0.02	<0.02	0.026	0.02	0.0148	0.0086	0.0065	0.0071	<0.003	0.0083	0.0084
Vanadium	mg/L	-	-	0.013	<0.01	<0.01	0.012	<0.01	<0.01	<0.005	0.0068	0.0064	0.0068	0.0056	0.0085	0.0056	0.0058	0.0067	<0.005	0.0068	0.0051
Zinc	mg/L	5.0	AO	0.062	0.048	0.073	0.094	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.038	0.033	<0.03	<0.03	<0.03	<0.03	<0.03
General Chemistry																					
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	2190	2130	2170	2380	2340	2240	2680	2310	2130	2780	2340	2070	2080	2170	2140	2140	2120	2030
Ammonia-N	mg/L	-	-	120	125	114	106	110	152	115	176	128	233	285	152	134	193	1.55	149	166	173
Biochemical oxygen demand (BOD)	mg/L	-	-	99.5	155	54.9	68	2.3	18	57	31	19.1	125	14.3	44.7	21.5	10.7	24	14	27.5	18.2
Chemical oxygen demand (COD)	mg/L	-	-	342	337	360	610	210	217	70	460	219	453	366	491	460	293	311	167	294	303
Chloride	mg/L	250	AO	**319**	**253**	**262**	**314**	**347**	**326**	**261**	25.6	229	241	201	**286**	**306**	**360**	**328**	**363**	**282**	**348**
Hardness	mg/L	80-100	OG	1450	1410	1330	1410	1430	1530	1670	1440	1530	1390	1410	1400	1280	1440	1320	1060	1320	1210
Nitrate (as N)	mg/L	10.0	MAC	<2	<0.5	<2	2.81	<2	<1	6.8	<0.1	<2	<2	<0.2	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Nitrite (as N)	mg/L	1.0	MAC	<2	<0.5	<2	<2	<2	<1	<1	<0.1	<2	<2	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Total kjeldahl nitrogen (TKN)	mg/L	-	-	130	142	116	129	141	159	119	158	162	275	260	225	243	272	216	138	197	193
Field Parameters																					
Conductivity, field	µS/cm	-	-	4310	4040	-	3580	4660	4470	4640	4170	6370	4200	4230	3910	4370	4380	4480	4290	4680	4290
pH, field	s.u.	6.5-8.5	OG	6.95	6.16	-	7	6.46	6.07	6.74	6.8	7.03	6.88	5.98	7.09	6.73	6.98	6.93	6.39	6.66	6.39
Temperature, field	°C	15	AO	10	10	-	12.5	10.1	9.5	9.8	10.6	12.5	11.3	10	9.8	9.4	11.1	9.8	7.9	10.59	7.9

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98
Sample ID:				LW-WARD1-19-002	LW-WARD1-19-002	LW-WARD 1-19-001	LW2-92	LW-WARD 1-002	LW-WARD 1-001	LW-WARD 1-002	LW-WARD1-122022-001	CRA-4074-02-WARD1-20	LW-WARD1-1210-002	LW-WARD1-0511-001	LW-WARD1-1011-001	LW-WARD1-0512-001	LW-WARD1-1112-001	LW-WARD1-0513-001	LW-WARD1-1013-001	LW-WARD1-DD-061414-001	LW-WARD1-103114-002
Sample Date:				5/23/2019	12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																		
Metals																					
Aluminum	mg/L	0.10	OG	0.119	0.046	0.07	0.642	1.87	0.627	4.37	0.345	0.21	0.22	0.28	0.16	0.17	0.21	0.44	0.18	0.15	0.21
Barium	mg/L	1.0	MAC	0.555	0.574	0.515	0.456	0.507	0.398	0.746	0.406	0.15	0.17	0.15	0.15	0.12	0.15	0.147	0.166	0.121	0.584
Beryllium	mg/L	-	-	0.00001	0.000011	<0.00007	0.000043	0.000095	0.00005	0.00025	0.000025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005
Boron	mg/L	5.0	IMAC	1.26	1.08	1.75	1.54	1.62	1.52	2.01	1.71	4	3.38	3.17	2.83	2.03	3.04	2.34	2.55	2.22	2.15
Cadmium	mg/L	0.005	MAC	0.000481	0.000208	0.00035	0.001311	0.00451	0.00463	**0.00991**	0.000558	<0.001	<0.001	<0.001	<0.001	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009	<0.0009
Calcium	mg/L	-	-	-	-	297	277	295	262	288	198	313	336	328	305	294	298	347	326	334	290
Chromium	mg/L	0.05	MAC	0.00337	0.00302	0.0045	0.00664	0.013	0.00503	0.0169	0.00456	<0.01	<0.01	<0.01	<0.01	<0.005	0.009	0.0147	0.0108	0.0067	<0.005
Cobalt	mg/L	-	-	0.00627	0.00549	0.0083	0.0101	0.0161	0.0102	0.014	0.00915	0.0115	0.0169	0.0112	0.015	0.0095	0.017	0.0147	0.0195	0.0105	0.005
Copper	mg/L	1.0	AO	0.0098	0.0022	0.01	0.0161	0.0817	0.0144	0.105	0.0111	<0.01	0.013	<0.01	<0.01	<0.01	<0.01	0.027	<0.01	<0.01	<0.01
Iron	mg/L	0.30	AO	**26.4**	**22.6**	**17.5**	**84.3**	**72.9**	**29.4**	**83.4**	**13.4**	**15.4**	**24**	**66.7**	**46**	**37**	**82.4**	**215**	**41.1**	**36.4**	**14.8**
Lead	mg/L	0.010	MAC	0.00357	0.00127	0.0025	0.00272	0.0293	0.0026	0.0179	0.00207	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005
Magnesium	mg/L	-	-	119	109	165	141	138	149	137	142	175	168	155	119	137	139	150	154	133	181
Manganese	mg/L	0.05	AO	**0.29**	**0.307**	**0.341**	**1.17**	**0.64**	**0.741**	**0.837**	**0.279**	**0.862**	**0.893**	**1.09**	**0.863**	**0.902**	**1.05**	**1.2**	**0.877**	**1.07**	**0.337**
Molybdenum	mg/L	-	-	0.00063	0.00044	0.0008	0.00158	0.00446	0.00114	0.00297	0.001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005
Nickel	mg/L	-	-	0.0105	0.0095	0.014	0.0283	0.0553	0.0191	0.0377	0.0128	<0.02	0.025	<0.02	0.023	<0.02	<0.02	0.026	0.019	0.013	<0.01
Silver	mg/L	-	-	<0.00005	<0.00005	<0.0005	0.00006	0.00014	0.0001	0.00038	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	mg/L	-	-	2.44	2.44	2.58	2.51	2.41	2.2	2.14	1.93	1.84	2.09	1.94	2.05	1.71	1.75	1.93	2.04	1.74	2.54
Titanium	mg/L	-	-	0.00685	0.00459	0.0077	0.0189	0.064	0.0169	0.128	0.0144	<0.02	0.026	0.025	0.028	<0.02	0.028	0.043	0.027	<0.02	<0.02
Vanadium	mg/L	-	-	0.00573	0.00642	0.0082	0.00743	0.0143	0.0116	0.0232	0.00882	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0076	0.0075	<0.005	0.0061
Zinc	mg/L	5.0	AO	0.013	0.008	<0.02	0.039	0.108	0.039	0.141	0.011	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
General Chemistry																					
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	1860	2010	1900	2000	2080	2070	2150	2270	3190	4440	2670	2890	2410	2800	2690	3130	2380	3410
Ammonia-N	mg/L	-	-	183	156	156	193	192	179	169	212	338	312	234	285	166	292	183	378	179	144
Biochemical oxygen demand (BOD)	mg/L	-	-	27	29	16	53	67	134	261	52	21.8	36.8	45.9	56	15.8	62	147	49	40.7	21
Chemical oxygen demand (COD)	mg/L	-	-	202	156	226	206	228	242	1320	206	337	443	310	490	380	570	601	760	271	238
Chloride	mg/L	250	AO	**330**	**320**	**290**	**310**	**320**	**300**	**320**	**360**	**299**	**368**	242	**372**	190	**296**	182	32.1	216	**279**
Hardness	mg/L	80-100	OG	1100	1100	1420	1270	1300	1270	1280	1080	1500	1530	1460	1250	1300	1310	1480	1450	1380	1470
Nitrate (as N)	mg/L	10.0	MAC	<0.06	<0.06	3.59	<0.06	<0.06	6.47	**12.1**	0.07	<0.5	<0.5	<2	<2	<2	<1	<1	<0.1	<2	<2
Nitrite (as N)	mg/L	1.0	MAC	<0.03	<0.03	<0.03	<0.03	<0.3	<0.3	<0.3	<0.3	<0.5	<0.5	<2	<2	<2	<1	<1	<0.1	<2	<2
Total kjeldahl nitrogen (TKN)	mg/L	-	-	189	170	162	191	193	164	174	164	340	356	248	286	201	287	203	322	241	217
Field Parameters																					
Conductivity, field	µS/cm	-	-	4930	3970	-	4910	4830	3890	-	-	5650	5740	5360	2790	4700	5050	4550	585	6040	577
pH, field	s.u.	6.5-8.5	OG	7.16	7.06	-	6.31	-	-	-	-	7.06	6.26	6.64	6.98	6.42	6.06	6.6	6.89	6.91	6.86
Temperature, field	°C	15	AO	10.37	8.45	-	6.18	6.26	6.72	-	-	10.1	10	10.5	10	10.2	9.7	10.3	10.4	12.6	10.7

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98
Sample ID:				**LW-WARD1-9/6/15-002**	**LW-WARD1-11/13/15-001**	**LW-WARD1-042516-001**	**LW-WARD1-110416-001**	**LW-WARD1-041117-001**	**LW-WARD1-112317-001**	**LW-WARD1-052018-001**	**LW-WARD1-110418-001**	**LW-WARD1-19-001**	**LW-WARD1-19-001**	**LW-WARD 1-19-002**	**LW-WARD 1-001**	**LW-WARD 1-002**	**LW-WARD 1-001**	**LW-WARD1-122022-002**
Sample Date:				**6/9/2015**	**11/13/2015**	**4/25/2016**	**11/4/2016**	**4/11/2017**	**11/23/2017**	**5/20/2018**	**11/4/2018**	**5/23/2019**	**12/8/2019**	**5/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																
Metals																			
Aluminum	mg/L	0.10	OG	0.77	0.25	0.36	0.35	0.62	0.262	0.216	0.227	0.256	0.267	1.03	0.2	0.377	0.376	0.31	0.389
Barium	mg/L	1.0	MAC	0.58	0.161	0.175	0.521	0.344	0.118	0.116	0.188	0.138	0.258	0.538	0.144	0.167	0.279	0.208	0.273
Beryllium	mg/L	-	-	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000024	0.000029	0.00014	0.000025	0.000046	0.000043	0.000038	0.000051
Boron	mg/L	5.0	IMAC	2.02	2.51	1.97	2.45	1.61	1.37	1.5	1.8	1.06	0.844	1.29	1.23	1.04	1.09	1.08	1.3
Cadmium	mg/L	0.005	MAC	0.00158	0.0005	0.00069	0.00057	0.00101	0.000743	0.000517	0.000976	0.00058	0.000452	0.00094	0.000284	0.00045	0.000338	0.000322	0.000311
Calcium	mg/L	-	-	299	344	330	348	276	264	283	308	-	-	355	315	305	315	326	287
Chromium	mg/L	0.05	MAC	0.0133	0.0123	0.011	0.0118	0.0122	0.0083	0.0062	0.0075	0.00712	0.0071	0.0186	0.00624	0.0089	0.00891	0.00598	0.00906
Cobalt	mg/L	-	-	0.0066	0.0218	0.012	0.0178	0.0079	0.0093	0.0061	0.0147	0.00708	0.00601	0.00905	0.00908	0.00805	0.0105	0.00957	0.00987
Copper	mg/L	1.0	AO	0.073	0.02	0.018	<0.01	0.012	0.011	<0.01	<0.01	0.0074	0.0056	0.019	0.0081	0.0086	0.004	0.0052	0.0065
Iron	mg/L	0.30	AO	**41.3**	**80.8**	**75.2**	**88.3**	**45.3**	**24**	**25.1**	**17.8**	**29**	**43.7**	**128**	**23.8**	**29.2**	**44**	**35.9**	**42.2**
Lead	mg/L	0.010	MAC	**0.0102**	0.005	0.0047	0.002	0.00409	0.00376	0.00307	0.00294	0.00225	0.00164	0.0045	0.00139	0.0023	0.00131	0.00142	0.00162
Magnesium	mg/L	-	-	179	145	135	150	115	102	110	120	94.2	92	118	106	95.8	120	110	106
Manganese	mg/L	0.05	AO	**0.399**	**1.1**	**1.34**	**1.15**	**1.19**	**1.05**	**1.2**	**0.937**	**1.38**	**1.35**	**1.72**	**1.25**	**1.35**	**1.38**	**1.39**	**1.27**
Molybdenum	mg/L	-	-	<0.005	0.00306	0.00256	0.00172	0.00147	0.00147	0.00131	0.00198	0.00094	0.00081	0.0017	0.00103	0.00079	0.00087	0.00079	0.00108
Nickel	mg/L	-	-	0.016	0.0253	0.02	0.0161	0.0134	0.0159	0.0112	0.0163	0.0096	0.0075	0.013	0.0077	0.0091	0.0086	0.0078	0.0096
Silver	mg/L	-	-	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/L	-	-	2.56	1.97	1.85	2.21	1.6	1.52	1.55	1.76	1.74	2.02	2.14	1.9	1.63	2.34	1.9	1.84
Titanium	mg/L	-	-	0.031	0.0295	0.0383	0.0484	0.0487	<0.02	0.0192	0.024	0.0205	0.0273	0.081	0.0193	0.0322	0.033	0.0272	0.0344
Vanadium	mg/L	-	-	0.0143	0.0076	0.0072	0.0155	0.0087	<0.005	<0.005	0.0063	0.00495	0.00557	0.0144	0.00465	0.00558	0.00775	0.00577	0.00695
Zinc	mg/L	5.0	AO	0.173	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.007	0.005	<0.02	0.022	0.004	0.012	0.008	0.005
General Chemistry																			
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	2350	2860	2280	2740	1860	2190	1800	2190	1820	1680	1440	1810	1740	2150	1980	1940
Ammonia-N	mg/L	-	-	200	304	193	311	1.44	287	120	229	140	127	99.5	158	141	179	173	155
Biochemical oxygen demand (BOD)	mg/L	-	-	38.9	94.9	16	16.3	25.8	13.6	4.9	15.6	13	20	11	17	19	34	16	20
Chemical oxygen demand (COD)	mg/L	-	-	643	500	480	530	229	277	173	298	103	117	137	142	113	194	128	190
Chloride	mg/L	250	AO	**293**	**288**	223	**313**	102	182	103	**284**	130	120	87	170	150	210	240	200
Hardness	mg/L	80-100	OG	1480	1460	1380	1480	1160	1080	1160	1260	1120	1120	1370	1220	1160	1280	1270	1150
Nitrate (as N)	mg/L	10.0	MAC	<0.4	<0.4	<0.4	<0.4	<0.4	<0.2	<0.4	<0.4	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1.0	MAC	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.2	<0.2	<0.03	<0.03	<0.03	<0.03	<0.3	<0.3	<0.3	<0.3
Total kjeldahl nitrogen (TKN)	mg/L	-	-	194	261	316	366	200	438	150	258	144	136	93.8	160	139	175	177	152
Field Parameters																			
Conductivity, field	µS/cm	-	-	3770	5040	3370	4420	3620	4330	3210	4330	3720	3610	-	3930	3520	3960	3640	3870
pH, field	s.u.	6.5-8.5	OG	6.02	7.13	6.64	6.97	6.77	6.39	6.48	6.39	6.89	6.8	-	6.3	-	-	-	-
Temperature, field	°C	15	AO	10.7	10.1	9.6	10.5	9.6	9.5	10.19	9.5	11.06	8.71	-	7.59	6.14	6.54	6.75	6.52

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW2-92	LW3-98
Sample ID:				**CRA-4074-02-WARD1-19**	**LW-WARD1-1210-001**	**LW-WARD1-0511-002**	**LW-WARD1-1011-002**	**LW-WARD1-0512-002**	**LW-WARD1-1112-002**	**LW-WARD1-0513-002**	**LW-WARD1-1013-002**	**LW-WARD1-DD-061414-002**	**LW-WARD1-103114-001**	**LW-WARD1-9/6/15-001**	**LW-WARD1-11/13/15-002**	**LW-WARD1-042516-002**	**LW-WARD1-110416-002**	**LW-WARD1-041117-002**	**LW-WARD1-112317-002**	**LW-WARD1-052018-002**	**LW-WARD1-110418-002**	**LW-WARD 1-19-001**	**LW-WARD 1-002**	**LW-WARD 1-001**	**LW-WARD 1-002**	**CRA-4074-02-WARD1-20**
Sample Date:				**5/13/2010**	**12/1/2010**	**5/24/2011**	**11/23/2011**	**4/22/2012**	**11/27/2012**	**5/13/2013**	**10/23/2013**	**6/14/2014**	**10/31/2014**	**6/9/2015**	**11/13/2015**	**4/25/2016**	**11/4/2016**	**4/11/2017**	**11/23/2017**	**5/20/2018**	**11/4/2018**	**5/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**5/13/2010**
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																							
Volatiles																										
1,1,1,2-Tetrachloroethane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	**2.85**	**0.78**	**0.69**	**0.95**	<0.5	<0.5	**0.56**	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	**1.23**
1,1-Dichloroethene	µg/L	14	MAC	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (Ethylene dibromide)	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<2	<0.2	<0.2	<0.2	<0.2	<0.5
1,2-Dichlorobenzene	µg/L	200/3	MAC/AO	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	**0.5**	<0.5
1,2-Dichloroethane	µg/L	5	IMAC	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	5/1	MAC/AO	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.69**	**1.6**	<0.5	**0.54**	<0.5	<0.5	<0.5	**0.55**	<5	<0.5	<0.5	<0.5	**0.8**	<0.5	<0.5
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	-	-	<20	<100	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	**49**	<20	<20	<20	<20	<200	<20	<20	<20	<20	<20	<20
2-Hexanone	µg/L	-	-	<20	<100	<20	<20	<20	<20	<20	<30	<20	<20	<20	<20	<20	<20	<20	<20	<20	<200	<20	<20	<20	<20	<20	<20
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	-	-	<20	<100	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<200	<20	<20	<20	<20	<20	<20
Acetone	µg/L	-	-	<20	<100	<20	<20	<20	<20	<20	<30	<20	<20	<20	**32**	**53**	<20	<20	<20	<20	<200	**42**	<30	<30	<30	<30	**38**
Benzene	µg/L	1	MAC	**2.27**	<2.5	**1.52**	**1.1**	**2.64**	**2.45**	<0.5	**3.48**	**2.85**	**7.93**	**6.76**	**3.1**	**2.22**	**2.33**	**3.23**	**1.26**	**2.94**	<5	**2.9**	**2.4**	**2.8**	**2.6**	**2**	**5.6**
Bromodichloromethane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane (Methyl bromide)	µg/L	-	-	<1	<5	<1	<1	<1	<1	<1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<1
Carbon disulfide	µg/L	-	-	**0.72**	<2.5	<0.5	**0.53**	<0.5	<0.5	<0.5	**1.2**	<0.5	**9.9**	**3.3**	<1	<1	<1	<1	<1	**1.5**	<10	-	-	-	-	-	<0.5
Carbon tetrachloride	µg/L	2	MAC	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
Chlorobenzene	µg/L	80/30	MAC/AO	**0.73**	<2.5	**0.65**	**0.51**	**0.72**	**0.81**	<0.5	**0.88**	**0.91**	**0.72**	**0.82**	**0.9**	**1.06**	**0.59**	**0.72**	**2.43**	**1.07**	<5	**1**	**0.9**	**1.2**	**1.2**	0.9	<0.5
Chloroethane	µg/L	-	-	**1.5**	<5	**2.4**	<1	<1	**3**	<1	**1.2**	**2.1**	**2.5**	**2.6**	**2.4**	**3.4**	**1.4**	**1.4**	**3.5**	**1.5**	<10	<5	<5	<5	<5	<5	**5.2**
Chloroform (Trichloromethane)	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane (Methyl chloride)	µg/L	-	-	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<5	<5	<5	<5	<5	<1
cis-1,2-Dichloroethene	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane (CFC-12)	µg/L	-	-	**1.2**	<5	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<2	<2	<2	<2	<2	<1
Ethylbenzene	µg/L	140/1.6	MAC/AO	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**15**	**13.5**	<0.5	<0.5	<0.5	<0.5	**0.63**	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	**6.13**
Hexane	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	<1	<0.5	<0.5	<0.55	<0.5	<0.5	<0.5	<5	<1	<1	<1	<1	<1	-
m&p-Xylenes	µg/L	-	-	<1	<5	<1	<1	<1	<1	<1	<1	<1	**15.3**	**10.7**	<1	<1	<1	<1	**3.8**	<1	<10	<0.5	<0.5	<0.5	<0.5	<0.5	**7.4**
Methyl tert butyl ether (MTBE)	µg/L	15	AO	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	**2.17**	**1.34**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<2	<2	<2	<2	<2	**3.51**
Methylene chloride	µg/L	50	MAC	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<2	<2	<2	<2	<2	<2	<2	<2	<20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
o-Xylene	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**6.72**	**2.34**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.55**
Styrene	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/L	10	MAC	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	60/24	MAC/AO	<0.5	**272**	**3.88**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.68**	**1.23**	**8.74**	<0.5	**0.53**	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.84**
trans-1,2-Dichloroethene	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	µg/L	-	-	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	µg/L	5	MAC	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane (CFC-11)	µg/L	-	-	<1	<5	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<5	<5	<5	<5	<5	<1
Vinyl chloride	µg/L	1	MAC	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5
Xylenes (total)	µg/L	90/20	MAC/AO	<1.5	<5.6	<1.5	<1.5	<1.5	<1.5	-	<1.1	-	**22**	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	**9**

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98	LW3-98
Sample ID:				LW-WARD1-1210-002	LW-WARD1-0511-001	LW-WARD1-1011-001	LW-WARD1-0512-001	LW-WARD1-1112-001	LW-WARD1-0513-001	LW-WARD1-1013-001	LW-WARD1-DD-061414-001	LW-WARD1-103114-002	LW-WARD1-9/6/15-002	LW-WARD1-11/13/15-001	LW-WARD1-042516-001	LW-WARD1-110416-001	LW-WARD1-041117-001	LW-WARD1-112317-001	LW-WARD1-052018-001	LW-WARD1-110418-001	LW-WARD 1-19-002	LW3-98	LW-WARD 1-001	LW-WARD 1-002	LW-WARD 1-001	LW-WARD1-122022-002
Sample Date:				12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																						
Volatiles																									
1,1,1,2-Tetrachloroethane	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,1,1-Trichloroethane	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,1,2,2-Tetrachloroethane	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,1,2-Trichloroethane	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,1-Dichloroethane	µg/L	-	-	**1.4**	**0.58**	**0.67**	**0.53**	<0.5	**0.58**	**0.56**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.8**	<0.5	0.6	<20
1,1-Dichloroethene	µg/L	14	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,2-Dibromoethane (Ethylene dibromide)	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<8
1,2-Dichlorobenzene	µg/L	200/3	MAC/AO	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.57**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,2-Dichloroethane	µg/L	5	IMAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,2-Dichloropropane	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,3-Dichlorobenzene	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
1,4-Dichlorobenzene	µg/L	5/1	MAC/AO	<0.5	**1.6**	**0.92**	**1.42**	<0.5	**0.95**	<0.5	**1.7**	<0.5	<0.5	**0.5**	**1.86**	**2.68**	**2.36**	**3.28**	**2.3**	**2.52**	**1.7**	**2.4**	**2.2**	**2.3**	1	<20
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<800
2-Hexanone	µg/L	-	-	<20	<20	<20	<20	<20	<20	<30	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<800
Acetone	µg/L	-	-	<20	**39**	**23**	**24**	<20	<20	<30	<20	<20	<20	<20	<20	<20	<20	<20	<20	**25**	<30	<30	<30	<30	<30	<1200
Benzene	µg/L	1	MAC	**5.49**	**3.78**	**5.07**	**5.8**	**1.47**	**5.22**	**6.44**	**5.73**	**3.45**	**3.23**	**7**	**4.78**	**0.65**	**1.15**	**1.42**	**1.1**	<0.5	**0.6**	**1.1**	**1.5**	**0.6**	0.8	<20
Bromodichloromethane	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Bromoform	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Bromomethane (Methyl bromide)	µg/L	-	-	<1	<1	<1	<1	<1	<1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Carbon disulfide	µg/L	-	-	**1.33**	**1.64**	**0.56**	**1.36**	**1.06**	**1.08**	**5.6**	<0.5	<1	**1.1**	**3.6**	<1	<1	<1	**1.4**	<1	<1	-	-	-	-	-	-
Carbon tetrachloride	µg/L	2	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<8
Chlorobenzene	µg/L	80/30	MAC/AO	<0.5	**0.64**	**0.52**	**0.54**	<0.5	**0.63**	**0.56**	**0.83**	**0.95**	**0.88**	**0.61**	**0.83**	<0.5	<0.5	**0.74**	<0.5	<0.5	<0.5	**0.5**	**0.6**	<0.5	<0.5	<20
Chloroethane	µg/L	-	-	**4.4**	**3.6**	**3.2**	**2.3**	<1	**2.6**	**2.4**	**3.2**	**1.6**	**1.3**	**2.2**	**3.4**	**1.9**	**3.5**	**4.7**	**3.7**	<1	<5	<5	**5.7**	<5	<5	-
Chloroform (Trichloromethane)	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Chloromethane (Methyl chloride)	µg/L	-	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<5	<5	<5	<5	<20
cis-1,2-Dichloroethene	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
cis-1,3-Dichloropropene	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.71**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Dibromochloromethane	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Dichlorodifluoromethane (CFC-12)	µg/L	-	-	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	**2.1**	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<80
Ethylbenzene	µg/L	140/1.6	MAC/AO	**11**	**10.9**	**10.1**	**0.83**	**2.66**	**13.1**	**9.49**	**15.7**	<0.5	<0.5	**13.1**	**10.7**	<0.5	**1.03**	**0.59**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Hexane	µg/L	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.8	<1	<1	<1	<1	<1	<40
m&p-Xylenes	µg/L	-	-	**15.3**	**15.2**	**14.1**	**8.6**	**4.1**	**13.2**	**11.2**	**11.6**	<1	<1	**13**	**4.8**	**1.4**	<1	**14.7**	<1	**2.7**	<0.5	**1.7**	<0.5	<0.5	<0.5	<20
Methyl tert butyl ether (MTBE)	µg/L	15	AO	**5.14**	**1.15**	**1.29**	**1.03**	**0.88**	**1.99**	**4.5**	**0.89**	<0.5	<0.5	**2.56**	**0.85**	**0.97**	<0.6	**0.84**	**0.54**	<25	<2	<2	<2	<2	<2	<80
Methylene chloride	µg/L	50	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<20
o-Xylene	µg/L	-	-	**9.98**	**4.39**	**7.44**	**1.74**	**1.43**	**5.45**	**6.43**	**0.79**	<0.5	<0.5	**3.61**	**0.95**	**1.31**	<0.5	**4.69**	<0.5	**2.19**	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Styrene	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Tetrachloroethene	µg/L	10	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Toluene	µg/L	60/24	MAC/AO	**1.95**	**1.36**	**1.48**	**0.84**	<0.5	**1.77**	**1.42**	**0.93**	<0.5	<0.5	**1.39**	**0.75**	<0.5	<0.5	**0.54**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
trans-1,2-Dichloroethene	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
trans-1,3-Dichloropropene	µg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Trichloroethene	µg/L	5	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<20
Trichlorofluoromethane (CFC-11)	µg/L	-	-	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<5	<5	<5	<5	<200
Vinyl chloride	µg/L	1	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<8
Xylenes (total)	µg/L	90/20	MAC/AO	**25.2**	**19.6**	**21.5**	**10.3**	**5.5**	-	**17.7**	-	<1.1	-	-	-	-	-	-	-	-	<0.5	**2.1**	<0.5	<0.5	<0.5	<20

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78
Sample ID:				CRA-4074-02-WARD1-01	GW-WARD1-1210-016	GW-WARD1-0511-021	GW-WARD1-1011-017	GW-WARD1-0512-017	GW-WARD1-1112-017	GW-WARD1-1112-018	GW-WARD1-0513-017	GW-WARD1-0513-018	GW-WARD1-1013-017	GW-WARD1-DD-061414-023	GW-WARD1-103114-022	GW-WARD1-9/6/15-020	GW-WARD1-9/6/15-021	GW-WARD1-11/13/15-020	GW-WARD1-042516-020	GW-WARD1-110416-020	GW-WARD1-110416-021	GW-WARD1-041117-020	GW-WARD1-112317-020	GW-WARD1-052018-020	GW-WARD1-052018-024	GW-WARD1-110418-020	GW-WARD1-19-021	GW-WARD1-19-022
Sample Date:				5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	11/27/2012 Duplicate	5/13/2013	5/13/2013 Duplicate	10/23/2013	6/14/2014	10/31/2014	6/9/2015	6/9/2015 Duplicate	11/13/2015	4/25/2016	11/4/2016	11/4/2016 Duplicate	4/11/2017	11/23/2017	5/20/2018	5/20/2018 Duplicate	11/4/2018	5/23/2019	12/8/2019
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	226	198	190	215	247	198	213	246	249	231	186	201	197	195	201	167	161	154	163	157	164	167	<0.05	-	-
Magnesium (dissolved)	mg/L	-	-	115	111	116	99.8	106	92.1	94.5	117	122	98.2	97.4	105	89.6	90.8	86.1	74.7	75	77.7	75.4	67.2	69.7	71	<0.05	-	-
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	1090	983	1240	1020	1180	1050	1040	1100	1140	1060	962	1040	1060	984	890	750	785	773	792	732	723	724	<10	706	682
Ammonia-N	mg/L	-	-	20.4	22.1	27.6	17.3	21.5	18.8	18.8	27.1	27.3	21.1	27.3	16.7	21.1	22.7	19.1	20.9	14.7	15	17.5	14	13.5	13.4	0.16	12.6	11.4
Biochemical oxygen demand (BOD)	mg/L	-	-	45.5	33	18.4	54	3	27	15.5	4.6	5.4	6.6	4.3	9	25.3	5	2.8	3	2.4	3.1	<2	19	3.6	3.6	<2	13	11
Chemical oxygen demand (COD)	mg/L	-	-	255	110	340	116	124	106	141	116	116	<120	105	96	76	72	92	94	76	69	76	87	87	<76	<10	21	30
Chloride	mg/L	250	AO	144	155	165	147	169	151	149	157	157	135	144	131	126	124	103	103	92.6	94.2	81.5	90	85.2	85.6	<0.5	80	78
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	1040	952	952	947	1050	874	921	1100	1120	980	865	936	860	860	856	725	711	706	718	668	698	710	<10	678	682
Nitrate (as N)	mg/L	10.0	MAC	0.56	<0.1	0.17	<0.1	<0.1	0.19	<0.1	<0.1	0.23	0.47	0.26	0.24	0.13	<0.1	0.26	0.114	0.486	1.01	<0.02	<0.02	0.028	0.129	<0.02	0.11	<0.06
Nitrite (as N)	mg/L	1.0	MAC	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.136	0.081	<0.05	0.017	<0.01	0.039	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.03
pH	s.u.	6.5-8.5	OG																			-	-	-	-	-	-	-
Total kjeldahl nitrogen (TKN)	mg/L	-	-	33.9	23.6	29.5	19.8	27.4	23	23.1	33.4	29.9	19.2	23.6	24.5	23.2	24.2	19.9	24.8	15.5	16.6	21.6	16.6	18.3	20.2	0.22	12.8	13.3
Field Parameters																												
Conductivity, field	µS/cm	-	-	2430	1960	2530	2170	2450	1850	1850	2460	2460	2110	2870	2010	1870	1870	1600	1750	1670	1670	1580	1460	869	869	1460	1880	1610
pH, field	s.u.	6.5-8.5	OG	7.27	6.3	6.72	7.06	6.84	6.17	6.17	6.91	6.91	6.97	7.22	7.03	6.34	6.34	7.23	6.69	7.21	7.21	7.14	6.42	6.81	6.81	6.42	7.1	7.49
Temperature, field	°C	15	AO	7.7	9.9	7.7	10.1	6	10.6	10.6	7.2	7.2	11.3	8.9	11.4	8.3	8.3	11.1	5.9	12	12	6.2	10.5	6.97	6.97	10.5	7.72	8.73

Notes:

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IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-78	OW1-89	OW1-89	OW1-89	OW1-89	OW1-89	OW1-89	OW1-89	OW1-89	OW1-89	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78
Sample ID:				GW-WARD1-19-022	OW1-78	GW-WARD 1-017	GW-WARD 1-022	GW-WARD 1-019	GW-WARD 1-020	CRA-4074-02-WARD1-16	GW-WARD1-1210-010	GW-WARD1-0511-001	GW-WARD1-1011-011	GW-WARD1-0412-012	GW-WARD1-1112-012	GW-WARD1-0513-012	GW-WARD1-1013-014	GW-WARD1-DD-061414-011	GW-WARD1-0511-015	GW-WARD1-1011-003	GW-WARD1-0412-003	GW-WARD1-1112-003	GW-WARD1-0513-003	GW-WARD1-1013-003	GW-WARD1-DD-061414-007	GW-WARD1-103114-001	GW-WARD1-9/6/15-003	GW-WARD1-11/13/15-008
Sample Date:				8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015
Parameters	**Units**	**ODWS [1]**	**ODWS Source**																									
Metals																												
Calcium (dissolved)	mg/L	-	-	194	158	207	162	165	164	247	322	253	271	292	230	277	212	104	62.6	-	59.6	72.6	68.2	71	66.8	61.1	61.6	60.9
Magnesium (dissolved)	mg/L	-	-	64.8	62.6	64.7	60.7	67.4	62.5	32.3	36.2	27.6	25.4	30.7	23.6	29	24.3	7.33	24	-	21.2	26.6	26	26.5	26.6	28.4	26.7	26.3
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	811	698	715	738	638	631	768	875	684	841	955	715	711	766	593	333	-	330	307	314	347	316	330	353	337
Ammonia-N	mg/L	-	-	14.6	14.9	13.8	12.2	12.3	3.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	7	<2	6	<4	10	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	32	33	29	33	55	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	62	67	56	68	230	200	33.8	43.5	98.2	61	31	61.2	63.8	55.9	14.5	11.3	-	20.5	23.2	24.9	26.2	28.3	28	27.5	25.9
Conductivity	uS/cm	-		-	-	1440	1550	1630	1600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	752	652	783	654	690	667	750	954	745	781	855	673	810	629	291	255	-	236	291	277	287	276	269	264	260
Nitrate (as N)	mg/L	10.0	MAC	0.27	0.17	<0.06	0.06	<0.06	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG	-	-	7.93	7.92	7.8	7.41																			
Total kjeldahl nitrogen (TKN)	mg/L	-	-	14.2	15.3	14.3	12.4	16.3	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	1450	1350	1580	1210	1410	2160	1440	1420	1610	1570	1730	1440	1540	1300	1460	657	656	655	517	637	678	950	704	578	576
pH, field	s.u.	6.5-8.5	OG	6.6	6.28	6.37	6.7	6.07	6.73	6.84	5.97	6.39	6.73	6.19	5.91	6.42	6.65	6.85	6.65	7.37	7.07	6.46	7.13	6.9	7.35	7.17	6.49	7.2
Temperature, field	°C	15	AO	13.1	7.91	7.7	9.91	12.7	6	8.6	11	8.7	11.7	8.4	12.4	8	13.6	9	9.7	10.7	6.5	10.5	7.1	11.2	8.14	10.7	8.1	11

Notes:

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Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-78	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82
Sample ID:				**GW-WARD1-042516-011**	**GW-WARD1-110416-008**	**GW-WARD1-041117-018**	**GW-WARD1-112317-008**	**GW-WARD1-052018-002**	**GW-WARD1-110418-008**	**GW-WARD1-19-009**	**GW-WARD1-19-005**	**GW-WARD1-19-004**	**OW2-78**	**GW-WARD 1-001**	**GW-WARD 1-005**	**GW-WARD 1-007**	**GW-WARD 1-001**	**CRA-4074-02-WARD1-09**	**GW-WARD1-1210-001**	**GW-WARD1-0511-012**	**GW-WARD1-1011-001**	**GW-WARD1-1011-003**	**GW-WARD1-0412-001**	**GW-WARD1-1112-001**	**GW-WARD1-0513-001**	**GW-WARD1-1013-001**	**GW-WARD1-DD-061414-002**	**GW-WARD1-103114-008**
Sample Date:				**4/25/2016**	**11/4/2016**	**4/11/2017**	**11/23/2017**	**5/20/2018**	**11/4/2018**	**5/23/2019**	**12/8/2019**	**8/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**	**5/13/2010**	**12/1/2010**	**5/24/2011**	**11/23/2011**	**11/23/2011**	**4/22/2012**	**11/27/2012**	**5/13/2013**	**10/23/2013**	**6/14/2014**	**10/31/2014**
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	55.6	59.4	61.7	60.2	62.6	38.2	-	-	66.2	57.8	69.1	68.1	63.1	91.7	78.4	58.5	72.4	79.7	57.4	70.5	86.2	46	101	71.4	98.1
Magnesium (dissolved)	mg/L	-	-	26.1	29.6	28.7	27.3	26.4	17.3	-	-	25.7	24.9	26.6	24.8	26.5	35	13.5	9.54	10.6	12.9	21.3	11.7	11.4	13.3	16.5	12.9	16.4
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	324	336	335	333	316	97	319	313	323	304	304	332	295	313	297	238	232	276	312	252	326	226	342	263	374
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	29	30.5	23.7	26.8	25.4	3.67	27	29	27	30	30	29	33	32	14.5	31.9	10.8	16.4	17.7	10.9	21.3	34.1	72.1	23.2	17.8
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	641	655	620	590	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	246	270	272	263	265	167	252	278	271	247	282	272	266	373	251	185	225	252	231	224	262	170	319	231	313
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG			-	-	-	-	-	-	-	-	7.86	7.92	7.53	7.53											
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	646	689	656	597	402	597	770	806	734	808	811	735	728	NM	578	428	495	573	-	566	492	441	706	541	643
pH, field	s.u.	6.5-8.5	OG	7	7.31	7.16	6.01	6.87	6.01	7.24	7.47	6.88	6.38	6.47	6.67	6.02	NM	7.72	6.96	6.87	7.78	-	7.21	6.52	7.28	7.26	7.82	7.35
Temperature, field	°C	15	AO	6.4	11	7.7	10.4	7.4	10.4	7.96	8.82	10.9	9.1	7.7	8.19	11.3	NM	8	7.8	12.9	8.5	-	5.1	8.9	11.1	11.9	14.7	10.8

Notes:

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Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-82	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89
Sample ID:				GW-WARD1-9/6/15-001	GW-WARD1-11/13/15-006	GW-WARD1-042516-012	GW-WARD1-110416-006	GW-WARD1-041117-002	GW-WARD1-112317-006	GW-WARD1-052018-009	GW-WARD1-110418-006	GW-WARD1-19-005	GW-WARD1-19-011	GW-WARD1-19-007	OW2-82	GW-WARD 1-008	GW-WARD 1-015	GW-WARD 1-005	GW-WARD 1-004	CRA-4074-02-WARD1-10	GW-WARD1-1210-002	GW-WARD1-0511-011	GW-WARD1-1011-002	GW-WARD1-0412-002	GW-WARD1-1112-002	GW-WARD1-0513-002	GW-WARD1-1013-002	GW-WARD1-DD-061414-005
Sample Date:				6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	80.3	80.6	61.9	87.7	72.5	103	53.9	34.7	-	-	143	92.4	69.2	118	92.9	147	123	121	81	105	127	88.6	72.2	96.6	71.1
Magnesium (dissolved)	mg/L	-	-	12	13.3	8.32	16.1	13.1	16.4	11.9	30.1	-	-	33.8	20.3	10.2	18.5	17.8	27.5	17.5	14.4	7.68	11.9	13.1	11.5	10.8	13.2	12
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	288	278	205	298	249	338	250	245	250	351	469	316	250	351	367	402	354	371	254	270	358	311	220	365	232
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	6.42	6.34	6.44	10.5	39.9	32.4	8.19	30.1	10	15	29	15	11	30	22	31	42.9	21.1	9.4	54.7	57.3	84.5	8.9	94.6	13.2
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	499	682	715	767	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	250	256	189	286	235	324	183	211	252	345	496	315	1210	370	305	480	378	362	234	311	372	269	225	296	227
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG					-	-	-	-	-	-	-	-	7.9	8.02	7.84	7.44									
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	509	441	346	319	405	588	212	588	427	830	757	776	612	653	526	897	948	460	475	683	831	609	430	781	630
pH, field	s.u.	6.5-8.5	OG	7.1	7.65	7.66	7.85	7.79	6.04	7.91	6.04	8.13	7.88	6.87	6.69	7.59	6.91	6.09	7.02	7.67	6.57	6.92	7.36	6.93	6.46	7.17	7.29	7.71
Temperature, field	°C	15	AO	10.5	10.4	7.4	10.2	6	9	12.95	9	11.79	6.21	14.8	4.94	8.5	8.19	14.3	4.57	7.4	10.5	7.8	10.6	6.3	10.9	6.8	12.3	9.2

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW2-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89
Sample ID:				GW-WARD1-103114-002	GW-WARD1-9/6/15-002	GW-WARD1-11/13/15-007	GW-WARD1-042516-014	GW-WARD1-110416-007	GW-WARD1-041117-005	GW-WARD1-112317-007	GW-WARD1-052018-001	GW-WARD1-110418-007	GW-WARD1-19-001	GW-WARD1-19-008	GW-WARD1-19-006	OW2-89	GW-WARD 1-002	GW-WARD 1-004	GW-WARD 1-006	GW-WARD 1-005	CRA-4074-02-WARD1-11	GW-WARD1-1210-003	GW-WARD1-0511-004	GW-WARD1-1011-004	GW-WARD1-0412-004	GW-WARD1-1112-004	GW-WARD1-0513-004	GW-WARD1-1013-004
Sample Date:				10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																								
Metals																											
Calcium (dissolved)	mg/L	-	-	85.8	98.2	89.4	73.3	103	74.4	116	77.8	29	-	-	101	95.3	80.1	96.7	136	105	98	104	110	124	104	99.4	89.4	103
Magnesium (dissolved)	mg/L	-	-	12.8	13.2	11.1	9.13	14.8	11.7	17.3	11.6	20.5	-	-	16	19.9	14.3	18.7	25.2	18.5	30.9	27.2	27.1	25.9	28.5	22.4	23.1	18.8
General Chemistry																											
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	327	306	262	230	500	256	456	308	186	285	346	338	360	349	301	403	365	308	255	449	397	378	265	627	345
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	14	10.6	17	8.59	78.7	8.1	14.8	10	10.3	11	83	18	30	19	30	22	17	73.2	55.9	38.1	89.5	65.9	46.3	17.2	14.2
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	-	713	600	789	693	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	267	299	269	221	317	234	362	242	157	252	403	318	320	259	318	444	338	372	371	385	416	376	340	318	334
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG						-	-	-	-	-	-	-	-	8.03	8.04	7.7	7.39								
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-
Field Parameters																											
Conductivity, field	µS/cm	-	-	499	498	431	410	760	449	605	289	605	529	1050	772	750	695	554	614	917	956	602	1080	1080	857	510	1220	638
pH, field	s.u.	6.5-8.5	OG	7.4	6.7	7.49	6.92	7.52	7.35	6.28	7.09	6.28	7.43	7.42	6.89	6.5	6.78	7.11	6.09	6.96	7.84	6.58	6.92	6.91	6.86	6.27	6.6	7.02
Temperature, field	°C	15	AO	11.9	8.3	11.5	5.6	12.5	5.6	10.3	7.1	10.3	7.38	8.4	13.4	7.09	7.2	10.1	13.6	5.89	7.2	8.5	7.6	9.4	6.2	8.7	6.6	11.1

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW3-89	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92
Sample ID:				GW-WARD1-DD-061414-003	GW-WARD1-103114-009	GW-WARD1-9/6/15-004	GW-WARD1-11/13/15-009	GW-WARD1-042516-013	GW-WARD1-110416-009	GW-WARD1-041117-019	GW-WARD1-112317-009	GW-WARD1-052018-017	GW-WARD1-110418-009	GW-WARD1-19-006	GW-WARD1-19-007	GW-WARD1-19-009	OW3-89	GW-WARD 1-003	GW-WARD 1-008	GW-WARD 1-008	CRA-4074-02-WARD1-05	GW-WARD1-1210-006	GW-WARD1-0511-010	GW-WARD1-1011-014	GW-WARD1-0412-005	GW-WARD1-1112-005	GW-WARD1-0513-005	GW-WARD1-1013-013
Sample Date:				6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																								
Metals																											
Calcium (dissolved)	mg/L	-	-	159	119	158	178	220	208	193	143	196	30.2	-	-	517	125	351	286	275	78.5	82.8	58.1	76.6	51.6	79.3	58.2	72.3
Magnesium (dissolved)	mg/L	-	-	25.6	20.7	23.4	24.1	24.9	33.7	22.9	20	22.2	18.8	-	-	51.8	18.3	45.3	41.9	37.8	12.8	14	6.98	11.4	7.86	13.5	6.35	12.4
General Chemistry																											
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	565	425	485	616	670	777	580	427	690	182	658	317	358	347	430	554	491	210	213	172	186	168	208	181	222
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	18.6	43.6	35.7	9.6	12.8	19.4	7.34	16.7	4.59	3.19	5	12	**1800**	61	**2000**	**2100**	**2100**	52.9	49.8	19	66	21.8	53	7.9	50.8
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	6140	6650	6270	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	504	382	491	544	651	659	576	440	580	153	699	353	1500	389	1060	886	843	249	265	174	238	161	254	171	232
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG							-	-	-	-	-	-	-	-	7.65	7.86	7.43								
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Field Parameters																											
Conductivity, field	µS/cm	-	-	1290	910	169	975	1320	1520	1120	694	672	694	1710	748	609	899	4310	5330	559	634	458	584	517	359	477	408	582
pH, field	s.u.	6.5-8.5	OG	6.95	6.99	6.1	6.84	7.32	6.69	6.65	6.46	6.25	6.46	6.68	7.29	6.25	6.33	6.17	6.77	6.06	7.39	6.45	7.22	7.84	7.41	6.69	7.29	7.66
Temperature, field	°C	15	AO	8.9	10.8	8.8	10.5	5.8	11.5	6	9	7.08	9	8.68	6.67	13.1	5.4	7.7	10.3	12.4	7.9	10.7	8.5	10.4	7.5	7.6	7.6	11.9

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW10-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92
Sample ID:				GW-WARD1-DD-061414-008	GW-WARD1-103114-012	GW-WARD1-9/6/15-015	GW-WARD1-042516-002	GW-WARD1-110416-015	GW-WARD1-041117-009	GW-WARD1-112317-016	GW-WARD1-052018-014	GW-WARD1-110418-016	GW-WARD1-19-007	GW-WARD1-19-013	GW-WARD1-19-014	OW10-92	GW-WARD 1-012	GW-WARD 1-006	GW-WARD 1-015	GW-WARD 1-019	CRA-4074-02-WARD1-06	GW-WARD1-1210-009	GW-WARD1-0511-006	GW-WARD1-1011-005	GW-WARD1-0412-006	GW-WARD1-1112-006	GW-WARD1-0513-006	GW-WARD1-1013-005
Sample Date:				6/14/2014	10/31/2014	6/9/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	81.3	75.4	66.6	56.9	68.8	57.6	76.1	57.2	192	-	-	75.6	63.7	67.7	75.4	79.5	71.9	304	324	347	277	262	183	373	262
Magnesium (dissolved)	mg/L	-	-	11.8	12.9	11.2	6.99	11.5	7.95	13	7.34	11.3	-	-	12.7	12.1	10.8	9.94	11.7	12	43.9	37	33	31.7	32.4	26	37.6	31.6
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	206	244	215	178	235	175	227	148	495	197	169	230	209	195	242	201	206	607	511	610	547	612	518	665	-
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<0.1	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<4	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	13	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	73.2	43.1	39.1	7.14	30.9	4.28	25.5	12.8	15.7	3	9	24	17	7	6	9	17	**470**	**571**	**621**	**407**	**411**	**355**	**506**	-
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	-	381	449	415	417	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	252	241	213	171	219	177	244	173	526	211	200	241	209	214	229	247	229	940	962	1000	822	787	565	1090	783
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	0.25	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<0.03	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG						-	-	-	-	-	-	-	-	8	8.21	8.05	7.75								
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<0.5	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	802	540	432	377	-	371	463	262	463	411	476	-	535	488	534	409	508	2390	2190	2840	2570	2260	1760	2750	-
pH, field	s.u.	6.5-8.5	OG	7.72	7.6	6.68	7.58	-	7.37	6.36	7.46	6.36	7.66	7.59	-	6.64	6.71	7.18	7.94	7.12	6.66	5.9	6.19	6.63	6.1	5.89	6.25	-
Temperature, field	°C	15	AO	9.9	11.7	9.3	7.3	-	7.5	10.8	9.57	10.8	10.24	8.63	-	7.94	8.9	11.2	15.4	7.15	8.4	10.4	8.7	10.8	7.5	11.2	8	-

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

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Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW11-92	OW12-92	OW12-92	OW12-92	OW12-92	OW12-92	OW12-92	OW12-92	OW12-92
Sample ID:				GW-WARD1-DD-061414-001	GW-WARD1-103114-011	GW-WARD1-9/6/15-005	GW-WARD1-11/13/15-001	GW-WARD1-042516-008	GW-WARD1-110416-001	GW-WARD1-041117-014	GW-WARD1-112317-001	GW-WARD1-052018-018	GW-WARD1-110418-001	GW-WARD1-19-014	OW11-92	GW-WARD 1-010	GW-WARD 1-002	GW-WARD 1-014	GW-WARD 1-016	CRA-4074-02-WARD1-07	GW-WARD1-1210-005	GW-WARD1-0511-003	GW-WARD1-1011-013	GW-WARD1-0412-014	GW-WARD1-1112-014	GW-WARD1-0513-014	GW-WARD1-112317-015	GW-WARD1-052018-016
Sample Date:				6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	11/23/2017	5/20/2018
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	260	274	241	252	230	233	206	214	231	85	-	202	258	222	227	200	283	269	334	262	225	263	534	163	226
Magnesium (dissolved)	mg/L	-	-	27.5	31.4	30.9	36.9	24.3	26.8	27.5	28.2	25.2	14.4	-	27	27.3	25.7	26.2	27	45.6	36	97.7	98.2	148	39.9	102	61.7	66.3
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	673	690	672	-	694	692	698	620	650	274	648	574	624	654	665	749	798	805	1450	1450	1730	1020	1010	1280	1220
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	271	213	172	-	115	114	85.8	74	56.8	10.5	59	60	54	52	69	51	56.6	59.9	189	141	243	74	1340	221	127
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	1260	1240	1320	1410	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	762	813	729	781	673	693	629	651	680	272	702	615	757	659	673	609	896	819	1240	1060	1170	822	1760	662	837
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG							-	-	-	-	-	-	7.65	7.58	7.47	7.05								-	-
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	2890	1680	1520	-	1470	-	1540	1280	780	1280	1790	-	1440	1430	1280	NM	1830	1610	3000	2660	3560	1840	5260	3030	877
pH, field	s.u.	6.5-8.5	OG	6.74	7.08	5.56	-	6.92	-	6.48	6.51	6.33	6.51	6.79	-	6.37	6.25	6.48	NM	6.81	6.01	6.47	6.78	6.37	5.89	6.43	6.48	6.41
Temperature, field	°C	15	AO	10.6	12.7	10	-	7.1	-	7.2	10	8.4	10	9.78	-	9.4	9.13	16.1	NM	8.3	10.9	8.8	11.7	8.9	12.4	7.9	11.7	7.23

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW12-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92	OW13-92
Sample ID:				GW-WARD1-110418-014	CRA-4074-02-WARD1-13-92	GW-WARD1-1210-007	GW-WARD1-0511-014	GW-WARD1-1011-012	GW-WARD1-0412-013	GW-WARD1-1112-013	GW-WARD1-0513-013	GW-WARD1-1013-015	GW-WARD1-DD-061414-009	GW-WARD1-103114-006	GW-WARD1-9/6/15-013	GW-WARD1-11/13/15-013	GW-WARD1-042516-017	GW-WARD1-110416-013	GW-WARD1-041117-007	GW-WARD1-112317-013	GW-WARD1-052018-012	GW-WARD1-110418-013	GW-WARD1-19-012	GW-WARD1-19-012	GW-WARD1-19-013	OW13-92	GW-WARD 1-013	GW-WARD 1-013
Sample Date:				11/4/2018	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																								
Metals																											
Calcium (dissolved)	mg/L	-	-	185	249	212	205	249	275	262	363	378	292	192	96.9	154	126	253	103	84.2	237	135	-	-	256	183	224	158
Magnesium (dissolved)	mg/L	-	-	26.4	57.9	41.3	39.5	33.5	33.8	37.9	52.6	60.9	40.5	21.9	6.07	16.9	13.5	30	9.95	9.4	21.2	12	-	-	19.6	12.8	16.3	9.45
General Chemistry																											
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	603	687	731	680	816	857	673	757	889	699	768	737	680	767	845	744	533	683	605	788	713	770	734	678	591
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--
Chloride	mg/L	250	AO	63.5	193	155	101	78.3	90.2	49.2	**556**	**368**	**352**	**531**	91.9	**490**	215	113	99	58.2	83.9	92.2	34	35	41	36	130	66
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1470	1220
Hardness	mg/L	80-100	OG	569	860	698	675	759	826	811	1120	1190	895	569	267	455	369	756	298	249	679	386	682	642	721	509	626	432
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--
pH	s.u.	6.5-8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.36	7.84
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--
Field Parameters																											
Conductivity, field	µS/cm	-	-	3030	1920	1700	1620	1620	1910	1270	2700	2520	3094	3340	1420	2360	1470	2400	852	1300	549	1300	1790	930	1500	1410	1350	1130
pH, field	s.u.	6.5-8.5	OG	6.48	6.92	6.06	6.54	6.74	6.22	5.98	6.41	6.62	6.64	6.74	5.91	6.89	6.37	6.7	6.92	6.51	6.41	6.51	6.72	6.88	6.29	5.84	6.07	6.6
Temperature, field	°C	15	AO	11.7	7.9	9.7	8.3	10.4	8.3	10.7	7.9	13	9.4	12.3	8.7	12	6.3	13.2	6.9	10.4	7.23	10.4	8.49	7.55	**15.1**	7.98	8.2	11.1

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW13-92	OW13-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW14-92	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13
Sample ID:				GW-WARD 1-012	GW-WARD 1-010	GW-WARD1-103114-007	GW-WARD1-9/6/15-014	GW-WARD1-11/13/15-014	GW-WARD1-042516-018	GW-WARD1-110416-014	GW-WARD1-041117-008	GW-WARD1-112317-014	GW-WARD1-052018-015	GW-WARD1-110418-017	GW-WARD1-19-011	GW-WARD1-19-009	GW-WARD1-19-012	OW14-92	GW-WARD 1-011	GW-WARD 1-016	GW-WARD 1-013	GW-WARD 1-022	GW-WARD1-103114-020	GW-WARD1-103114-021	GW-WARD1-9/6/15-023	GW-WARD1-11/13/15-022	GW-WARD1-11/13/15-023	GW-WARD1-042516-023
Sample Date:				6/29/2022	12/20/2022	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	10/31/2014	10/31/2014 Duplicate	6/9/2015	11/13/2015	11/13/2015 Duplicate	4/25/2016
Parameters	**Units**	**ODWS [1]**	**ODWS Source**																									
Metals																												
Calcium (dissolved)	mg/L	-	-	220	222	239	237	279	229	242	231	189	204	267	-	-	271	223	245	218	246	225	213	211	165	221	217	235
Magnesium (dissolved)	mg/L	-	-	28.3	25.5	27.4	16.6	25.2	21.2	22.4	11.1	8.08	19.4	95.7	-	-	28	17.7	16.5	12.6	29	18	32.4	32.5	12.3	17.2	17.4	26.3
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	751	644	730	740	787	729	767	681	606	547	1340	757	664	791	667	599	602	689	604	678	700	840	702	698	1160
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	--	--	-	1.5	4.56	5.17	6.8	4.56	4.52	15
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	--	--	-	9	2	<2	8.7	7.3	5.5	<2
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	--	--	-	12	61	56	41	65	58	149
Chloride	mg/L	250	AO	27	39	25.7	48.2	32	27.4	25	9.61	14.7	59.6	161	16	21	24	23	20	20	32	44	32.7	31.7	13.2	20.7	20.2	35.8
Conductivity	uS/cm	-		1370	1190	-	-	-	-	-	-	-	-	-	-	-	-	-	1100	1050	1270	1110	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	666	660	710	659	799	659	697	622	506	588	1060	726	678	792	629	681	597	734	635	665	661	463	624	613	695
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	--	--	-	<0.06	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	--	--	-	<0.03	<0.1	<0.1	<0.05	<0.05	<0.05	<0.01
pH	s.u.	6.5-8.5	OG	7	7.08						-	-	-	-	-	-	-	-	7.25	7.6	6.95	6.89						
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	--	--	-	2.2	6.94	6.48	8.63	5.93	5.99	27
Field Parameters																												
Conductivity, field	µS/cm	-	-	1200	1140	1430	1350	1350	1310	1170	1180	1090	680	1090	1750	1290	1350	980	1150	965	1210	1430	1440	1440	1200	947	947	1540
pH, field	s.u.	6.5-8.5	OG	6.48	6.68	6.69	5.66	6.77	6.54	6.64	6.44	6.48	6.24	6.48	6.63	6.69	6.25	5.89	6.01	6.38	6.39	6.43	6.6	6.6	5.71	6.86	6.86	6.47
Temperature, field	°C	15	AO	13.7	8.6	12.5	9.3	12.5	7.2	14.4	7.5	11.3	8.07	11.3	9.09	9.38	16.2	8.51	9.1	11.3	13.7	9.32	12.6	12.6	9	12.1	12.1	7.8

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW15R-13	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92
Sample ID:				GW-WARD1-110416-023	GW-WARD1-041117-023	GW-WARD1-112317-023	GW-WARD1-052018-022	GW-WARD1-110418-023	GW-WARD1-19-020	GW-WARD1-19-020	GW-WARD1-19-020	OW15R-13	GW-WARD 1-022	GW-WARD 1-020	GW-WARD 1-020	GW-WARD 1-021	GW-WARD 1-023	GW-WARD1-1011-010	GW-WARD1-0412-011	GW-WARD1-1112-011	GW-WARD1-0513-011	GW-WARD1-1013-012	GW-WARD1-DD-061414-016	GW-WARD1-103114-003	GW-WARD1-9/6/15-012	GW-WARD1-11/13/15-012	GW-WARD1-042516-010	GW-WARD1-110416-012
Sample Date:				11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	6/29/2022 Duplicate	12/20/2022	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	194	231	201	254	154	-	-	260	191	195	234	194	193	205	23.4	21.3	24.1	23.7	22.3	22.6	17.5	17.6	18.9	17.6	17.8
Magnesium (dissolved)	mg/L	-	-	27.6	24.1	19.3	21.6	67	-	-	23.6	15.3	15.9	19.1	20.1	20.3	26.7	8.07	7.43	8.55	8.93	8.07	8.67	9	8.4	8.6	8.38	8.42
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	779	844	657	706	640	740	1140	831	512	878	637	573	646	827	157	169	166	164	171	160	176	172	166	169	173
Ammonia-N	mg/L	-	-	13.8	9.4	6.25	0.947	12.6	4.8	2.3	2.1	1.6	2.5	1.1	6.3	6	6.4	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	5.9	8.4	4.2	8.4	8.9	8	14	<2	14	8	<4	<4	<4	12	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	310	240	170	<69	83	15	19	25	20	29	29	40	42	32	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	13.6	22.7	9.3	12	80.8	18	8	11	10	24	14	13	13	9	27.3	29.2	28.7	29.2	28.5	29.5	28.1	29.3	27.5	28.5	27.9
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	1560	1070	1050	1150	1100	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	599	675	581	724	661	637	608	746	540	551	663	568	566	622	92	84	95	96	89	92	81	78	83	79	79
Nitrate (as N)	mg/L	10.0	MAC	<0.02	<0.02	<0.02	<0.02	0.585	<0.06	<0.06	0.28	0.07	<0.06	0.08	0.14	0.14	<0.06	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	<0.01	<0.01	<0.01	<0.01	0.013	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG		-	-	-	-	-	-	-	-	7.38	7.75	7.45	7.4	6.99											
Total kjeldahl nitrogen (TKN)	mg/L	-	-	21	19.2	8.6	2.31	14.6	4.8	2.7	2.3	2	4.3	1.4	6.8	10.3	10	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	1360	1340	1150	807	1150	1570	1170	1236	1080	1740	1150	966	966	1230	444	470	346	418	450	605	466	438	426	402	438
pH, field	s.u.	6.5-8.5	OG	6.78	6.54	6.47	6.21	6.47	6.76	6.97	6.28	5.96	5.93	7.38	6.7	6.7	6.57	8.04	7.61	6.91	7.64	7.8	7.82	7.55	7.16	7.87	7.21	8.1
Temperature, field	°C	15	AO	13.3	8.2	11.7	7.93	11.7	8.69	9.47	**16.5**	9.51	8.9	10.9	15	15	8.87	10.7	8.3	11.4	8.6	11.5	10.3	11.6	9.5	11.7	8.7	12.2

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16A-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92
Sample ID:				GW-WARD1-041117-006	GW-WARD1-112317-012	GW-WARD1-052018-011	GW-WARD1-110418-012	GW-WARD1-19-013	GW-WARD1-19-015	GW-WARD1-19-011	OW16A-92	GW-WARD 1-015	GW-WARD 1-001	GW-WARD 1-011	GW-WARD 1-015	GW-WARD1-1210-017	GW-WARD1-1210-018	GW-WARD1-0511-017	GW-WARD1-0511-018	GW-WARD1-1011-018	GW-WARD1-1011-019	GW-WARD1-0512-018	GW-WARD1-0512-019	GW-WARD1-1112-020	GW-WARD1-0513-020	GW-WARD1-1013-018	GW-WARD1-1013-019	GW-WARD1-DD-061414-021
Sample Date:				4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	12/1/2010	12/1/2010 Duplicate	5/24/2011	5/24/2011 Duplicate	11/23/2011	11/23/2011 Duplicate	4/22/2012	4/22/2012 Duplicate	11/27/2012	5/13/2013	10/23/2013	10/23/2013 Duplicate	6/14/2014
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																								
Metals																											
Calcium (dissolved)	mg/L	-	-	18.2	18.5	17.8	69.4	-	-	21.1	20	23	21.7	21.5	22.2	235	247	199	203	205	198	165	164	189	159	228	218	183
Magnesium (dissolved)	mg/L	-	-	8.76	8.89	8.77	12.7	-	-	9.1	9.08	8.85	8.85	9.05	9.16	29.8	35.8	22.5	23.1	25.2	24.4	24.6	23.8	24.7	18.3	31.3	29.7	27.5
General Chemistry																											
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	168	161	158	199	170	175	190	182	161	178	166	160	669	663	238	238	571	541	473	474	631	383	689	609	615
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	--	--	-	-	3.72	3.47	1.79	1.77	1.83	1.94	4.85	4.87	6.61	4.39	4.11	2.06	13.8
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	--	--	-	-	7.7	10.5	<2	<2	11.4	9.9	<2	<2	2.3	<2	4.3	5.2	<2
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	--	--	-	-	40	38	<10	<10	23	34	30	25	32	19	<63	<59	36
Chloride	mg/L	250	AO	28	28.9	28.3	34.9	30	31	32	31	31	32	36	36	48.3	48.1	249	245	48.2	48.2	55	55.4	42.8	37.1	55.9	53.5	85.2
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	425	424	419	349	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	82	83	81	225	83.4	86.4	90.3	87.4	93.8	90.6	90.9	93.2	711	763	591	603	615	596	513	507	575	473	699	666	571
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	--	--	-	-	0.25	0.25	<0.1	<0.1	8.93	9.08	<0.1	4.31	<0.1	0.28	4.65	4.63	1.35
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	--	--	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
pH	s.u.	6.5-8.5	OG	-	-	-	-	-	-	-	-	8	8.14	8.02	8.08													
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	--	--	-	-	8.42	8.08	2.64	2.74	5.15	5.24	9.48	9.68	9.04	5.35	4.72	2.73	14.1
Field Parameters																											
Conductivity, field	µS/cm	-	-	425	413	286	413	477	540	545	554	554	504	598	445	1290	1290	1310	-	1250	-	948	948	963	845	1290	572	1770
pH, field	s.u.	6.5-8.5	OG	7.77	6.6	7.11	6.6	7.42	7.77	7.39	6.82	7.47	7.7	6.34	8.06	6.16	6.16	6.84	-	7.19	-	6.79	6.79	6.08	7.02	6.83	6.83	7.71
Temperature, field	°C	15	AO	9.3	10.8	9.4	10.8	10.23	10.01	12.3	9.62	9.7	10.4	13.3	6.61	10.8	10.8	8.3	-	11.5	-	7.8	7.8	11.7	7.9	13.4	13.4	10.4

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92	OW16B-92
Sample ID:				GW-WARD1-DD-061414-022	GW-WARD1-103114-023	GW-WARD1-9/6/15-022	GW-WARD1-11/13/15-021	GW-WARD1-042516-021	GW-WARD1-042516-022	GW-WARD1-110416-022	GW-WARD1-041117-021	GW-WARD1-041117-022	GW-WARD1-112317-021	GW-WARD1-112317-022	GW-WARD1-052018-021	GW-WARD1-110418-021	GW-WARD1-110418-022	GW-WARD1-19-023	GW-WARD1-19-024	GW-WARD1-19-023	GW-WARD1-19-024	GW-WARD1-19-021	GW-WARD1-19-023	OW16B-92	OW20-13	GW-WARD 1-018	GW-WARD 1-021	GW-WARD 1-017
Sample Date:				6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	4/25/2016	11/4/2016	4/11/2017	4/11/2017	11/23/2017	11/23/2017	5/20/2018	11/4/2018	11/4/2018	5/23/2019	5/23/2019	12/8/2019	12/8/2019	8/13/2020	8/13/2020	12/27/2020	12/27/2020	5/11/2021	5/11/2021	11/15/2021
Parameters	**Units**	**ODWS [1]**	**ODWS Source**	**Duplicate**					**Duplicate**			**Duplicate**		**Duplicate**					**Duplicate**		**Duplicate**		**Duplicate**				
Metals																												
Calcium (dissolved)	mg/L	-	-	182	222	198	259	253	244	253	313	301	190	213	225	174	155	-	-	-	-	216	220	179	182	249	224	249
Magnesium (dissolved)	mg/L	-	-	27.5	28.4	44	103	96.8	96.2	107	96.8	97	93.8	94.4	35.7	35.3	66.5	-	-	-	-	63.2	66.3	45.6	45.4	38.2	37.1	58.5
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	635	744	814	970	861	908	1010	837	833	780	846	791	751	649	969	924	798	685	638	698	845	802	958	930	900
Ammonia-N	mg/L	-	-	13.9	11.2	23.5	41.5	50.3	50.3	38.4	32.6	32.4	39.5	37.2	30	30.6	12.2	35.9	35.9	34.8	27.6	26.6	26.5	42.5	27.9	28.7	30.4	25.1
Biochemical oxygen demand (BOD)	mg/L	-	-	3.9	3.1	8.8	2.3	5	3.9	3.6	2.8	4.1	4.9	4.4	5.5	<3	7.1	7	11	12	11	<2	6	14	<2	4	7	<4
Chemical oxygen demand (COD)	mg/L	-	-	36	54	38	74	58	59	66	48	51	46	46	<56	52	90	39	35	32	30	30	26	42	44	39	40	36
Chloride	mg/L	250	AO	87.5	75.4	56.3	83.9	48.9	42.5	62.1	39.5	39.3	48.1	53.4	29.9	41.8	82	52	52	37	40	22	23	26	48	40	40	27
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1880	1800	1600
Hardness	mg/L	80-100	OG	569	670	675	1070	1030	1010	1070	1180	1150	860	921	708	580	660	1110	1160	830	841	799	823	634	642	780	713	863
Nitrate (as N)	mg/L	10.0	MAC	1.25	0.54	0.94	0.35	0.208	0.181	0.031	0.026	0.027	0.051	<0.02	0.048	0.022	0.254	0.11	0.08	<0.06	0.08	0.14	0.12	<0.06	<0.06	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1.0	MAC	<0.1	<0.1	<0.05	<0.05	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5	OG																							7.66	7.54	7.79
Total kjeldahl nitrogen (TKN)	mg/L	-	-	14.3	13.5	27.3	39.7	53.2	54.4	38.7	34.5	35.3	34.4	38.3	38.6	34.2	14.1	48.3	49.9	37.1	37.2	24.6	24.4	42.5	28.2	30.2	39	23.4
Field Parameters																												
Conductivity, field	µS/cm	-	-	1770	1210	905	2120	1390	1390	1700	1410	1410	1240	1240	714	1240	1240	1820	1820	1290	1290	1080	1080	1020	1020	1270	1270	889
pH, field	s.u.	6.5-8.5	OG	7.71	6.88	6.06	7.04	6.65	6.65	6.87	6.92	6.92	6.53	6.53	6.6	6.53	6.53	6.94	6.94	7	7	6.57	6.57	6.2	6.2	6.47	6.47	6.64
Temperature, field	°C	15	AO	10.4	13.3	9.8	12.5	7.2	7.2	13.8	7.5	7.5	11.2	11.2	8.94	11.2	11.2	9.34	9.34	8.57	8.57	**16.5**	**16.5**	7.09	7.09	8.9	8.9	11.2

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW16B-92	OW16B-92	OW16B-92	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96	OW17A-96
Sample ID:				GW-WARD 1-018	GW-WARD 1-018	GW-WARD 1-021	GW-WARD1-0511-002	GW-WARD1-1011-008	GW-WARD1-0412-009	GW-WARD1-1112-009	GW-WARD1-0513-009	GW-WARD1-1013-010	GW-WARD1-DD-061414-014	GW-WARD1-103114-010	GW-WARD1-9/6/15-010	GW-WARD1-11/13/15-010	GW-WARD1-042516-001	GW-WARD1-110416-010	GW-WARD1-041117-010	GW-WARD1-112317-010	GW-WARD1-052018-003	GW-WARD1-110418-010	GW-WARD1-19-003	GW-WARD1-19-006	GW-WARD1-19-002	OW17A-96	GW-WARD 1-005	GW-WARD 1-009
Sample Date:				11/15/2021	6/29/2022	12/20/2022	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																								
Metals																											
Calcium (dissolved)	mg/L	-	-	255	174	198	38.7	44.6	41.5	48.9	44.1	41.8	41.9	31.5	30.3	31.8	29.1	29.6	30.9	29.9	32.4	44.5	-	-	31.9	30.1	37.2	32.2
Magnesium (dissolved)	mg/L	-	-	60.6	26.3	47.8	19	17.3	16.4	19.3	19.9	18.2	18.5	20.4	18.5	18.8	18.1	19.3	19.2	18.4	17.4	24.4	-	-	18.7	19.1	18.5	16.8
General Chemistry																											
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	851	832	799	176	172	177	171	175	200	174	190	186	291	250	214	200	193	176	258	180	190	183	179	168	185
Ammonia-N	mg/L	-	-	25.4	31.8	4.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	8	<4	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	35	46	47	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	27	42	53	2.2	3	3.2	3.2	2.9	2.8	3.2	3.2	3.09	3.72	3.08	2.92	3.14	2.93	2.86	6.87	3	4	2	4	3	4
Conductivity	uS/cm	-		1530	1740	1470	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	519	523
Hardness	mg/L	80-100	OG	887	543	691	175	183	171	202	192	179	181	163	152	157	147	153	156	150	153	211	154	162	157	154	169	150
Nitrate (as N)	mg/L	10.0	MAC	<0.06	0.09	<0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	<0.03	<0.03	<0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG	7.85	7.41	7.14													-	-	-	-	-	-	-	-	8.23	8.18
Total kjeldahl nitrogen (TKN)	mg/L	-	-	23.5	32.7	29.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																											
Conductivity, field	µS/cm	-	-	889	866	1360	615	547	629	472	520	478	671	530	461	534	525	633	542	491	338	491	1050	665	644	722	7.44	902
pH, field	s.u.	6.5-8.5	OG	6.64	5.79	6.68	7.48	8.32	7.96	6.68	8.07	7.98	8.98	7.85	7.31	7.88	7.12	8.15	7.43	6.79	7.67	6.79	7.64	8.16	7.85	7.26	7.36	7.36
Temperature, field	°C	15	AO	11.2	14.3	8.67	8.8	11.1	8.4	10.3	8.8	10.5	10.6	10.2	9.4	10.5	8	11.1	8.8	10.7	9.55	10.7	8.52	9.73	11.9	8.8	9.2	10.7

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW17A-96	OW17A-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96	OW17B-96
Sample ID:				GW-WARD 1-009	GW-WARD 1-009	GW-WARD1-0511-007	GW-WARD1-1011-009	GW-WARD1-0412-010	GW-WARD1-1112-010	GW-WARD1-0513-010	GW-WARD1-1013-011	GW-WARD1-DD-061414-019	GW-WARD1-103114-017	GW-WARD1-9/6/15-011	GW-WARD1-11/13/15-011	GW-WARD1-042516-007	GW-WARD1-110416-011	GW-WARD1-041117-016	GW-WARD1-112317-011	GW-WARD1-052018-008	GW-WARD1-110418-011	GW-WARD1-19-004	GW-WARD1-19-010	GW-WARD1-19-005	OW17B-96	GW-WARD 1-016	GW-WARD 1-012	GW-WARD 1-010
Sample Date:				6/29/2022	12/20/2022	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	35.6	38.5	45.6	48.1	45.9	46.6	50.7	48.4	45	42.7	41.9	45.4	41.2	41.9	45.4	44.9	44.5	18.6	-	-	44	43.7	50.6	48.9	45.4
Magnesium (dissolved)	mg/L	-	-	19.2	19.2	23.8	21.4	20.9	21.5	24.2	22.5	22.7	25.7	23.1	23.4	22.1	24.3	24	24.9	24.1	9.04	-	-	23.1	22.9	23.1	23.3	24.6
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	158	176	238	245	247	295	241	246	240	248	255	249	242	267	218	289	265	177	257	277	234	240	232	256	240
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-
Chloride	mg/L	250	AO	4	4	5.2	6.5	6.6	7.4	6.4	6.4	6.6	7	6.72	6.81	6.13	6.55	6.49	6.72	6.21	30.2	6	6	6	7	6	7	9
Conductivity	uS/cm	-		524	502	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	507	517	524
Hardness	mg/L	80-100	OG	168	175	212	208	201	205	226	214	206	213	200	210	194	204	212	215	210	84	203	210	205	203	221	218	215
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-
pH	s.u.	6.5-8.5	OG	8.2	8.12													-	-	-	-	-	-	-	-	7.96	8.31	8.03
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	978	1500	523	613	529	443	484	674	635	506	419	444	484	561	517	487	316	487	1000	633	628	617	663	615	682
pH, field	s.u.	6.5-8.5	OG	6.86	7.68	7.39	7.9	7.77	6.62	7.95	7.74	8.58	7.81	7.18	7.92	7.41	7.84	7.61	6.7	7.46	6.7	7.53	7.89	7.86	7.08	7.26	7.54	6.67
Temperature, field	°C	15	AO	14.2	7.54	8.8	11.11	7.6	10.3	7.9	12	10.1	11.3	8.8	11	6.9	12.7	7.2	10.4	8.02	10.4	8.18	8.63	12.3	8.59	8.3	11.1	12.6

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW17B-96	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18AR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13
Sample ID:				GW-WARD 1-011	GW-WARD1-103114-004	GW-WARD1-9/6/15-008	GW-WARD1-11/13/15-004	GW-WARD1-042516-003	GW-WARD1-110416-004	GW-WARD1-041117-011	GW-WARD1-112317-004	GW-WARD1-052018-006	GW-WARD1-110418-004	GW-WARD1-19-016	GW-WARD1-19-003	GW-WARD1-19-001	OW18AR-13	GW-WARD 1-006	GW-WARD 1-010	GW-WARD 1-003	GW-WARD 1-003	GW-WARD 1-008	GW-WARD1-9/6/15-009	GW-WARD1-11/13/15-005	GW-WARD1-042516-004	GW-WARD1-110416-005	GW-WARD1-041117-012	GW-WARD1-112317-005
Sample Date:				12/20/2022	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	12/20/2022 Duplicate	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	47.3	33.1	31.7	31.6	29.4	29.1	29.1	29.2	30	110	-	-	31.3	28.5	37.7	35.5	35	37.1	35.7	43	42.9	38.2	37.8	40	38.2
Magnesium (dissolved)	mg/L	-	-	23	25	20.7	21.2	19.7	21	20.6	22.3	20	17	-	-	20.5	20.2	21.2	20.6	21.7	20.5	20.7	19.1	18.2	17.7	18	17.8	17.4
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	237	162	173	171	169	178	208	188	177	495	194	189	197	183	185	197	179	230	247	103	100	104	108	108	102
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	9	37.3	23	16.1	13	10.1	20.8	13	10	20.6	10	8	6	8	10	9	9	7	8	3.93	3.75	3.5	3.36	3.66	3.49
Conductivity	uS/cm	-		496	-	-	-	-	-	-	-	-	-	-	-	-	-	589	582	563	546	538	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	213	185	164	166	155	159	158	165	157	345	161	170	162	154	181	173	177	177	174	186	182	168	169	173	167
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG	8.06						-	-	-	-	-	-	-	-	8.28	8.22	8.25	8.18	8.28					-	-
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	516	640	502	483	542	549	621	516	342	516	562	673	635	650	688	593	566	711	711	601	582	645	666	666	591
pH, field	s.u.	6.5-8.5	OG	7.63	7.88	7.19	8.32	6.9	8.24	7.79	6.22	7.4	6.22	7.93	7.88	7.98	7.68	7.65	7.64	6.81	7.93	7.93	7.18	8.38	6.85	8.32	7.76	6.1
Temperature, field	°C	15	AO	8.16	11.3	9.3	11.5	8.5	12.2	9	11.2	8.94	11.2	9.5	9.85	12.6	9.98	8.9	10.7	12.9	7.68	7.68	9.9	10.3	9.3	10.8	9.8	11.2

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW18BR-13	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96
Sample ID:				GW-WARD1-052018-007	GW-WARD1-110418-005	GW-WARD1-19-018	GW-WARD1-19-004	GW-WARD1-19-008	OW18BR-13	GW-WARD 1-007	GW-WARD 1-011	GW-WARD 1-004	GW-WARD 1-002	GW-WARD1-1210-014	GW-WARD1-0511-005	GW-WARD1-1011-007	GW-WARD1-0412-007	GW-WARD1-1112-007	GW-WARD1-0513-007	GW-WARD1-1013-006	GW-WARD1-DD-061414-004	GW-WARD1-103114-013	GW-WARD1-9/6/15-006	GW-WARD1-11/13/15-002	GW-WARD1-042516-005	GW-WARD1-110416-002	GW-WARD1-041117-004	GW-WARD1-112317-002
Sample Date:				5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	40.1	34.3	-	-	39.8	35.5	45.5	41.9	40.4	42	33.7	39.4	51.5	44.5	46.1	49.6	45.7	47.5	33.3	32.7	35.8	31.5	34.1	36.5	33.8
Magnesium (dissolved)	mg/L	-	-	16.8	21.3	-	-	17	16.3	16.6	16.3	17.2	16	21.1	20.4	27.2	17.9	19.3	21.5	19.4	19.4	21.1	19.6	19.4	18.9	20.2	20.3	18.8
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	95	142	92	97	103	96	93	102	96	99	158	151	250	154	149	145	149	144	151	148	148	150	154	156	152
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	3.14	3.56	4	3	2	4	3	4	7	5	3.5	2.8	27.5	3.8	3.7	3.6	3.3	3.6	3.6	3.6	3.39	3.26	3.23	3.46	3.31
Conductivity	uS/cm	-		-	-	-	-	-	-	679	683	673	642	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	169	173	165	171	170	156	182	172	172	171	171	182	241	185	195	212	194	199	170	162	169	157	168	175	162
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG	-	-	-	-	-	-	7.97	7.99	8.01	8.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	394	591	672	797	730	762	777	663	618	664	491	745	675	664	525	699	648	960	686	545	520	595	583	619	571
pH, field	s.u.	6.5-8.5	OG	7.42	6.1	7.95	7.85	7.87	7.65	7.6	7.65	6.75	8.02	6.81	7.03	7.36	7.28	6.64	7.1	7.45	7.5	8.09	6.49	8.23	7.36	8.06	7.35	6.48
Temperature, field	°C	15	AO	9.6	11.2	10.16	9.72	12.2	9.75	9.7	10.2	13.1	9.53	10.1	8.8	11.4	8.3	11.3	8.9	10.6	9.9	10.3	9.4	9.7	8.7	10.3	9.2	9.7

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19A-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96
Sample ID:				GW-WARD1-052018-010	GW-WARD1-110418-002	GW-WARD1-19-017	GW-WARD1-19-001	GW-WARD1-19-003	OW19A-96	GW-WARD 1-004	GW-WARD 1-003	GW-WARD 1-001	GW-WARD 1-007	GW-WARD1-0511-016	GW-WARD1-1011-006	GW-WARD1-0412-008	GW-WARD1-1112-008	GW-WARD1-0513-008	GW-WARD1-1013-007	GW-WARD1-DD-061414-010	GW-WARD1-103114-014	GW-WARD1-9/6/15-007	GW-WARD1-11/13/15-003	GW-WARD1-042516-009	GW-WARD1-110416-003	GW-WARD1-041117-015	GW-WARD1-112317-003	GW-WARD1-052018-019
Sample Date:				5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									
Metals																												
Calcium (dissolved)	mg/L	-	-	35.1	155	-	-	37.3	33.9	40.9	38.5	37.9	39.7	45.6	48.4	49.7	57.5	55.1	49.2	50.6	38.6	39.2	42.6	38.5	37.7	38.4	36.7	35.3
Magnesium (dissolved)	mg/L	-	-	19.9	23.1	-	-	20.8	19.3	19.5	19.3	20.4	19.1	31.3	18.4	26.9	30.7	31.4	27.7	29	30.8	30.4	30.7	29.5	31.5	32.2	30.8	32.4
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	137	457	140	140	159	166	137	154	137	152	265	152	273	248	257	263	261	263	272	259	265	253	265	258	247
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	250	AO	2.99	11.2	4	4	2	5	3	4	5	4	26.7	4.3	29.4	28.8	30.2	28.8	31.3	29.4	30.5	28.9	29.5	28.8	25.7	29.3	30.7
Conductivity	uS/cm	-		-	-	-	-	-	-	623	636	619	607	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	80-100	OG	169	482	166	179	179	164	182	175	179	178	243	197	235	270	267	237	246	223	223	233	218	224	229	219	221
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	s.u.	6.5-8.5	OG	-	-	-	-	-	-	7.89	8.05	8.25	8.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Parameters																												
Conductivity, field	µS/cm	-	-	382	571	609	700	676	744	781	718	570	620	788	677	681	543	660	648	879	658	562	545	630	630	694	585	407
pH, field	s.u.	6.5-8.5	OG	6.88	6.48	8.03	7.66	7.4	7.61	6.64	6.8	7.04	7.86	6.95	7.35	7.19	6.67	7.13	7.65	7.57	8.01	6.71	8.08	7.54	8.02	7.08	6.44	7.03
Temperature, field	°C	15	AO	9.32	9.7	11.01	8.6	12.8	10.51	10.2	10.01	14.2	9.15	8.9	11.5	8	11.1	8	12.5	9.1	11.8	8.6	11.3	7.9	12.5	7.9	11	8.57

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW19B-96	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	OW20-13	Field Blank
Sample ID:				GW-WARD1-110418-003	GW-WARD1-19-019	GW-WARD1-19-002	GW-WARD1-19-010	OW19B-96	GW-WARD 1-014	GW-WARD 1-007	GW-WARD 1-002	GW-WARD 1-006	GW-WARD1-9/6/15-016	GW-WARD1-11/13/15-015	GW-WARD1-042516-006	GW-WARD1-110416-016	GW-WARD1-041117-001	GW-WARD1-112317-017	GW-WARD1-052018-013	GW-WARD1-110418-018	GW-WARD1-19-008	GW-WARD1-19-016	14R	GW-WARD 1-009	GW-WARD 1-014	GW-WARD 1-016	GW-WARD 1-018	CRA-4074-02-WARD1-04
Sample Date:				11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***																									**Field Blank**
Metals																												
Calcium (dissolved)	mg/L	-	-	59.2	-	-	40.1	41.5	46	41.3	41.8	44.8	146	181	181	191	108	94.3	103	105	-	-	176	195	122	101	125	<0.5
Magnesium (dissolved)	mg/L	-	-	27.2	-	-	30.3	28.2	28.1	27	29.9	29.4	34.5	37.1	39.8	42.1	24.4	23	22.3	24.8	-	-	34.6	34.2	19.5	19.8	17.7	<0.5
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	312	256	249	258	242	242	265	246	249	284	278	276	317	351	347	327	344	323	388	286	296	358	284	376	<10
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<0.1	0.051
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	5	<2
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<8	<10
Chloride	mg/L	250	AO	26.5	31	30	31	31	30	30	35	35	**505**	**701**	**895**	**840**	**534**	**430**	**354**	**461**	**350**	**370**	**620**	**390**	**260**	240	**370**	<2
Conductivity	uS/cm	-		-	-	-	-	-	664	673	680	658	-	-	-	-	-	-	-	-	-	-	-	1840	1380	1130	1520	-
Hardness	mg/L	80-100	OG	260	217	222	225	220	230	214	228	233	506	606	616	649	371	330	350	365	321	425	583	628	384	333	385	<10
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<0.06	<0.1
Nitrite (as N)	mg/L	1.0	MAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<0.03	<0.1
pH	s.u.	6.5-8.5	OG	-	-	-	-	-	7.96	8.27	8.13	8.22	-	-	-	-	-	-	-	-	-	-	-	8.01	7.99	7.93	7.83	-
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	--	--	-	<0.5	<0.15
Field Parameters																												
Conductivity, field	µS/cm	-	-	585	635	760	728	764	789	701	630	659	1780	2140	2800	3220	2090	1920	982	1920	1840	266	2360	1930	1280	1040	1810	-
pH, field	s.u.	6.5-8.5	OG	6.44	7.94	7.68	7.45	8.08	6.82	7.14	6.74	7.78	5.71	7.54	6.99	7.59	7.54	6.49	7.18	6.49	7.53	7.34	6.78	6.71	7.16	7.32	6.46	-
Temperature, field	°C	15	AO	11	9.12	9.52	12.2	10.43	9.6	10.85	12.9	9.23	9	11.3	6.7	12.7	6.5	8.7	9.1	8.7	9.15	6.57	5.7	8.16	10.1	15.3	4.7	-

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:				Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sample ID:				GW-WARD1-1210-019	GW-WARD1-0511-020	GW-WARD1-1011-020	GW-WARD1-0512-020	GW-WARD1-1112-019	GW-WARD1-0513-019	GW-WARD1-1013-020	GW-WARD1-DD-061414-024	GW-WARD1-103114-024	GW-WARD1-9/6/15-024	GW-WARD1-11/13/15-024	GW-WARD1-042516-024	GW-WARD1-110416-024	GW-WARD1-041117-024	GW-WARD1-112317-024	GW-WARD1-052018-023	GW-WARD1-110418-024	GW-WARD1-19-022	GW-WARD1-19-021	GW-WARD1-19-024	B-1	GW-WARD 1-019	GW-WARD 1-019	GW-WARD 1-022	GW-WARD 1-017
Sample Date:				12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	8/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**
Metals																												
Calcium (dissolved)	mg/L	-	-	2.93	9.93	<0.5	1.15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.072	<0.05	<0.05	<0.05	0.073	<0.05	214	-	-	0.08	0.03	0.09	0.18	0.06	<0.01
Magnesium (dissolved)	mg/L	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	19.1	-	-	0.019	0.003	0.009	0.01	0.004	<0.001
General Chemistry																												
Alkalinity, total (as $CaCO_3$)	mg/L	30-500	OG	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	583	6	<2	<2	2	5	2	<2	<2
Ammonia-N	mg/L	-	-	0.069	0.057	<0.05	<0.05	<0.05	<0.05	<0.05	0.065	<0.05	<0.05	<0.05	0.024	0.087	<0.02	0.129	0.137	3.56	<0.1	<0.1	<0.1	-	<0.1	<0.1	<0.1	<0.1
Biochemical oxygen demand (BOD)	mg/L	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<4	<2	-	<4	8	<4	<4
Chemical oxygen demand (COD)	mg/L	-	-	<10	<10	<10	13	<10	<10	36	<10	<10	<10	<10	<10	<10	<10	<10	16	71	<8	<8	<8	-	<8	<8	<8	<8
Chloride	mg/L	250	AO	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	14	<1	<1	<1	<1	<1	<1	<1	<1
Conductivity	uS/cm	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	3	3	3
Hardness	mg/L	80-100	OG	<10	25	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	613	0.18	0.49	0.28	0.08	0.27	0.48	0.15	<0.05
Nitrate (as N)	mg/L	10.0	MAC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.06	<0.06	<0.06	-	<0.06	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1.0	MAC	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	-	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.02	7.31	5.92	6.32
Total kjeldahl nitrogen (TKN)	mg/L	-	-	0.54	<0.15	<0.15	<0.15	0.18	<0.15	0.25	<0.15	<0.15	0.76	0.23	<0.15	0.29	<0.15	<0.15	<0.15	6	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5
Field Parameters																												
Conductivity, field	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Temperature, field	°C	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP1	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2
Sample ID:			SW-WARD1-1210-002	SW-WARD1-0511-002	SW-WARD1-0513-002	SW-WARD1-042516-001	SW-WARD1-041117-003	SW-WARD1-112317-003	SW-WARD1-052018-002	SW-WARD1-19-002	SW-WARD 1-19-002	POND NO 1	SW-WARD 1-001	SW-WARD 1-001	SW-WARD 1-001	CRA-4074-02-WARD1-18	SW-WARD1-1210-003	SW-WARD1-0511-003	SW-WARD1-1011-002	SW-WARD1-0512-002	SW-WARD1-1112-002	SW-WARD1-0513-001
Sample Date:			12/1/2010	5/24/2011	5/13/2013	4/25/2016	4/11/2017	11/23/2017	5/20/2018	5/23/2019	12/8/2019	12/27/2020	5/11/2021	11/15/2021	6/29/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013
Parameters	**Units**	***PWQO*** [1]																				
Metals																						
Aluminum	mg/L	0.075 (a)	**0.87**	**1.64**	**0.095**	-	0.064	**0.086**	0.024	0.01	-	**0.94**	**0.163**	**0.092**	0.06	0.06	**1.45**	**1.94**	**0.188**	**0.25**	**1.34**	**0.285**
Barium	mg/L	-	0.029	0.035	0.026	-	0.0318	0.024	0.0467	0.0915	-	0.0304	0.0651	0.0212	0.0211	0.018	0.052	0.087	0.045	0.034	0.039	0.012
Beryllium	mg/L	1.1 (h)	<0.001	<0.001	<0.001	-	<0.0001	<0.0001	<0.0001	<0.000007	-	0.00004	0.000008	0.00001	0.000009	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.2	<0.05	<0.05	<0.05	-	0.037	0.041	0.08	0.172	-	0.055	0.093	0.034	0.043	0.127	**0.339**	**0.583**	0.198	0.125	0.058	<0.05
Cadmium	mg/L	0.0002	0.00019	**0.00038**	<0.0001	-	0.000135	**0.000362**	**0.000538**	0.000025	-	0.000028	0.000168	0.000064	0.00003	**0.00215**	0.0001	0.00019	<0.0001	<0.0001	**0.00023**	0.00012
Calcium	mg/L	-	70	63.2	94.7	100	79.8	84.9	81.5	-	-	95.5	140	121	33.9	20.3	88.6	129	77.9	38.6	66.9	28.4
Chromium	mg/L	0.0089 (b)	0.0015	0.0029	<0.0005	-	<0.0005	0.00068	<0.0005	0.00038	-	0.0018	0.0007	0.00035	0.00027	<0.001	0.0038	**0.0108**	0.0014	<0.001	0.00197	<0.0005
Cobalt	mg/L	0.0009	<0.0008	0.00089	<0.0005	-	0.00024	0.00025	0.00045	**0.0019**	-	0.000408	**0.000978**	**0.00162**	0.000278	<0.0005	**0.00127**	**0.00629**	**0.00117**	<0.0005	0.00064	<0.0005
Copper	mg/L	0.005	0.0039	**0.0066**	<0.001	-	0.0026	0.0033	0.0017	0.0005	-	0.0027	0.0037	0.0015	0.0004	0.0018	**0.0056**	**0.0056**	0.001	<0.001	0.0026	0.0015
Iron	mg/L	0.3	**0.77**	**1.62**	0.102	-	0.218	0.083	**0.574**	**0.813**	-	**0.797**	0.18	**1.92**	**1.55**	0.197	**1.61**	**2.54**	**0.413**	0.241	**1.09**	0.246
Lead	mg/L	0.025 (c)	<0.001	<0.001	<0.001	-	0.00021	-	0.000212	0.00005	-	0.00096	0.0003	0.00031	0.00015	<0.001	0.002	0.0023	<0.001	<0.001	<0.001	<0.001
Magnesium	mg/L	-	10.4	9.07	15.3	14.9	13.2	14.9	16.3	26.8	-	27.1	27.6	17.9	28.3	18.2	19.4	31.4	23.9	27.2	22.5	15.3
Manganese	mg/L	-	0.0383	0.0298	0.0056	-	0.0226	0.0388	0.0298	0.26	-	0.0386	0.0095	0.56	0.0485	0.0166	0.271	0.715	0.039	0.03	0.0504	0.0343
Molybdenum	mg/L	0.04	<0.001	0.0013	<0.001	-	0.000718	0.000471	0.000607	0.0003	-	0.00035	0.00037	0.00018	0.00006	<0.001	0.0015	0.0025	0.0012	0.0012	0.0012	0.001
Nickel	mg/L	0.025	<0.002	0.0033	<0.002	-	0.00082	0.00112	0.0014	0.0025	-	0.0015	0.002	0.0011	0.0005	<0.002	0.0048	0.0145	0.0058	0.0036	0.0034	<0.002
Silver	mg/L	0.0001	<0.0001	<0.0001	<0.0001	-	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium	mg/L	-	0.297	0.258	0.274	-	0.261	0.264	0.309	0.521	-	0.588	0.483	0.302	0.254	0.3	0.492	0.809	0.542	0.417	0.363	0.167
Titanium	mg/L	-	0.0272	0.0413	0.0037	-	0.00214	<0.0025	0.00119	0.00067	-	0.0273	0.00431	0.00255	0.00196	0.0029	0.0389	0.0721	0.0066	0.0077	0.0492	0.007
Vanadium	mg/L	0.006	0.0018	0.0033	<0.001	-	<0.0005	<0.0005	<0.0005	0.00022	-	0.00167	0.00046	0.00097	0.00051	0.0012	0.003	0.0045	0.0014	<0.001	0.0027	0.0015
Zinc	mg/L	0.02-0.03 (g)	0.014	0.0208	0.0044	-	0.0128	0.0114	0.0056	0.005	-	0.013	0.011	0.009	0.004	0.0093	**0.0392**	**0.125**	0.0104	0.0053	0.0058	<0.003
General Chemistry																						
Alkalinity, total (as $CaCO_3$)	mg/L	-	148	147	241	361	247	273	279	509	486	282	447	366	190	64	196	355	278	180	193	97
Ammonia-N	mg/L	-	-	-	-	0.936	-	-	-	-	-	<0.1	2.9	0.5	<0.1	-	-	-	-	-	-	-
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	8.2	-	-	-	-	-	6	14	<4	5	-	-	-	-	-	-	-
Chemical oxygen demand (COD)	mg/L	-	-	-	-	<10	-	-	-	-	-	15	40	12	51	-	-	-	-	-	-	-
Chloride	mg/L	-	22.4	11.4	17.6	12.3	7.93	12.9	13.3	27	8	11	43	12	28	50	54.8	106	69.4	90.7	39.2	8.2
Hardness	mg/L	-	218	195	299	311	254	273	270	422	-	350	462	377	201	126	301	453	293	209	260	134
Nitrate (as N)	mg/L	-	-	-	-	0.026	-	-	-	-	-	<0.06	0.34	0.36		-	-	-	-	-	-	-
Nitrite (as N)	mg/L	-	-	-	-	<0.01	-	-	-	-	-	<0.03	0.04	<0.03	,0.06	-	-	-	-	-	-	-
Nitrite/Nitrate	mg/L	-	-	-	-	-	-	-	-	-	-	<0.06	0.38	0.36	<0.03	-	-	-	-	-	-	-
Phenolics (total)	mg/L	0.001	-	-	-	**0.0044**	**0.0023**	**0.0078**	**0.0068**	**0.011**	<0.005	<0.001	<0.001	<0.001	**0.006**	-	-	-	-	-	-	-
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	2.43	-	-	-	-	-	0.7	3.8	<0.5	1.5	-	-	-	-	-	-	-
Total suspended solids (TSS)	mg/L	-											--	9	-							
Un-ionized ammonia	mg/L	0.02 (d)	-	-	-	0.00191	-	-	-	-	-	<0.00019	0.00971	0.00078	<0.00087	-	-	-	-	-	-	-
Field Parameters																						
Conductivity, field	µS/cm	-	315	350	523	666	544	560	367	1400	1240	708	1080	729		372	507	1210	803	686	450	247
Dissolved oxygen (DO), field	mg/L	>4 (f)	8.71	**2.17**	4.23	-	6.29	-	**2.97**	-	**3.29**	**3.26**	6.29	8.01		7.98	8.19	**0.81**	5.7	7.1	5.63	7.06
pH, field	s.u.	6.5-8.5	6.94	7.17	7.21	7.07	7.66	**6.42**	7.06	7.59	7.54	7.13	7.19	6.88		**10.23**	6.69	6.85	8.02	7.61	7.06	8.41
Temperature, field	°C	-	4.3	13.8	9.4	6.6	9.3	4	10.79	12.94	8.23	4.02	9.4	8.71		10.7	5.5	14.8	3.5	7.46	2.7	11.6
Turbidity, field	NTU	-	-	-	-	-	-	-	-	-	-	17	--	--		-	-	-	-	-	-	-

Notes:

(1) Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.
(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.
(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.
(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.
(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.
(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

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Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2	SWP2
Sample ID:			SW-WARD1-1013-002	SW-WARD1-DD-061414-002	SW-WARD1-103114-002	SW-WARD1-9/6/15-002	SW-WARD1-11/13/15-002	SW-WARD1-042516-002	SW-WARD1-110416-002	SW-WARD1-041117-002	SW-WARD1-112317-002	SW-WARD1-052018-001	SW-WARD1-110418-002	SW-WARD1-19-001	SW-WARD 1-19-003	SW-WARD 1-19-002	POND NO 2	SW-WARD 1-002	SW-WARD 1-002	SW-WARD 1-002	SW-WARD1-122022-001
Sample Date:			10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022
Parameters	**Units**	***PWQO*** [1]																			
Metals																					
Aluminum	mg/L	0.075 (a)	**0.329**	**0.112**	**0.241**	**0.111**	**1.06**	**0.205**	**0.406**	**2.47**	**0.261**	**0.216**	**0.514**	-	**0.214**	0.044	**0.122**	0.045	**0.339**	**0.383**	**0.174**
Barium	mg/L	-	0.023	<0.01	0.028	0.0113	0.0357	0.00979	0.0285	0.0281	0.0291	0.00973	0.0192	-	0.0161	0.0261	0.0834	0.126	0.0167	0.196	0.0332
Beryllium	mg/L	1.1 (h)	<0.001	<0.001	<0.001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	0.000008	<0.000007	0.00001	<0.000007	0.000009	0.000014	0.000013
Boron	mg/L	0.2	<0.05	<0.05	0.052	0.026	0.032	0.032	0.048	0.034	0.045	0.045	0.037	-	0.033	0.055	0.047	0.036	0.027	**0.468**	0.044
Cadmium	mg/L	0.0002	<0.0001	<0.0001	0.00019	<0.00009	0.000051	0.000026	0.000062	0.000095	<0.00001	0.000022	0.000015	-	0.000023	<0.000003	**0.0005**	0.00001	0.000017	0.000012	0.000019
Calcium	mg/L	-	37.2	18.2	68.6	19.6	43.6	31	37.8	49.8	81.8	22.4	43.1	-	-	22.7	174	26.1	62.4	78.3	95.8
Chromium	mg/L	0.0089 (b)	0.0007	<0.0005	0.00066	0.00066	0.00218	<0.0005	0.0007	0.00394	0.00067	0.00051	0.00086	-	0.00047	0.00036	0.00107	0.00022	0.00076	0.00126	0.00031
Cobalt	mg/L	0.0009	<0.0005	<0.0005	<0.0005	<0.0005	0.00058	0.00029	0.00037	**0.00101**	0.00023	0.00028	0.00032	-	0.000162	0.00015	**0.00175**	0.000328	0.000205	0.00191	0.000244
Copper	mg/L	0.005	0.0013	<0.001	0.0012	<0.001	0.0017	0.0012	0.0022	0.0031	0.0021	0.0015	0.0015	-	0.0019	0.0007	0.0008	0.001	0.0011	0.0008	0.001
Iron	mg/L	0.3	**0.441**	0.192	**0.818**	0.286	**1.2**	**0.388**	**0.767**	**2.56**	0.249	0.28	**0.737**	-	0.215	0.204	**11**	**0.31**	**0.335**	4.89	0.292
Lead	mg/L	0.025 (c)	<0.001	<0.001	<0.001	<0.0005	0.0008	0.00065	0.00056	0.00141	-	0.000186	0.000405	-	0.00021	0.00005	0.00024	0.00028	0.00023	0.00028	0.00023
Magnesium	mg/L	-	11.9	11.5	19.3	17.1	16.2	16.8	14.9	16.6	23.3	16.8	13.4	-	20.5	26.5	21.2	19.9	17.6	25.1	27.9
Manganese	mg/L	-	0.0308	0.0146	0.0682	0.0465	0.0487	0.0547	0.0749	0.0746	0.0143	0.0312	0.0215	-	0.01213	0.0179	1.07	0.0388	0.03227	0.116	0.0724
Molybdenum	mg/L	0.04	<0.001	<0.001	<0.001	<0.0005	0.00069	0.00052	0.000733	0.000459	0.000787	0.00075	0.000834	-	0.00056	0.00037	0.00017	0.00013	0.00036	0.00061	0.00036
Nickel	mg/L	0.025	<0.002	<0.002	<0.002	<0.001	0.002	0.00087	0.00143	0.00348	0.00108	0.00102	0.00126	-	0.0011	0.0006	0.0016	0.0005	0.0009	0.0042	0.0011
Silver	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	-	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/L	-	0.216	0.136	0.345	0.168	0.267	0.217	0.22	0.265	0.511	0.21	0.271	-	0.458	0.276	0.476	0.271	0.294	0.413	0.55
Titanium	mg/L	-	0.0092	0.0045	0.0063	0.0024	0.0321	0.00544	0.0097	0.0575	0.00696	0.00592	0.0138	-	0.00739	0.00087	0.00454	0.00126	0.00788	0.0109	0.00449
Vanadium	mg/L	0.006	<0.001	0.0019	<0.001	0.00137	0.00217	0.00108	0.00148	0.00446	0.00093	0.00096	0.00124	-	0.00063	0.00025	0.00039	0.00032	0.00096	0.00086	0.00057
Zinc	mg/L	0.02-0.03 (g)	0.0074	<0.003	0.0106	0.0033	0.0084	<0.003	0.0072	0.0139	<0.003	<0.003	0.0049	-	0.004	0.004	0.005	0.006	0.007	0.004	0.007
General Chemistry																					
Alkalinity, total (as $CaCO_3$)	mg/L	-	137	79	254	98	154	361	151	199	271	106	141	165	261	138	422	132	216	38	346
Ammonia-N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	0.4	<0.1	<0.1	24.4	<0.1
Biochemical oxygen demand (BOD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<4	-	-	4	5	<4	5	<4
Chemical oxygen demand (COD)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	10	-	-	14	40	22	75	14
Chloride	mg/L	-	10.4	33	30.3	153	114	11.5	18.1	8.5	14.9	7.07	9.55	5	11	14	6	7	9	59	23
Hardness	mg/L	-	142	93	251	119	176	147	156	193	300	125	163	171	274	166	521	147	228	299	354
Nitrate (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.06	-	-	0.09	0.15	0.12	0.36	<0.06
Nitrite (as N)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.03	-	-	<0.03	<0.03	<0.03	0.09	<0.03
Nitrite/Nitrate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09	0.15	0.12	0.45	<0.06
Phenolics (total)	mg/L	0.001	-	-	-	**0.0048**	**0.0015**	**0.0015**	**0.0046**	**0.0014**	**0.0083**	**0.0098**	**0.0021**	-	<0.003	**0.005**	<0.001	<0.001	<0.001	0.012	<0.001
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	0.5	0.5	<0.5	27.3	<0.5
Total suspended solids (TSS)	mg/L	-																--	20	-	-
Un-ionized ammonia	mg/L	0.02 (d)	-	-	-	-	-	-	-	-	-	-	-	<0.00182	-	-	0.00024	<0.00198	<0.00047	0.04711	<0.0002
Field Parameters																					
Conductivity, field	µS/cm	-	307	357	608	546	567	299	334	383	513	166	513	338	691	-	1000	360	478	1080	727
Dissolved oxygen (DO), field	mg/L	>4 (f)	7.74	6.84	5.7	5.77	-	-	-	7.68	-	4.61	-	-	**3.83**	-	**3.26**	9.74	8.18	**3.05**	-
pH, field	s.u.	6.5-8.5	8.38	**10.01**	7.48	8.33	8.4	7.61	7.59	8.01	**6.08**	7.8	**6.08**	7.79	7.82	-	6.56	7.93	7.41	6.72	7.3
Temperature, field	°C	-	7.4	19.5	8.8	17.2	8.2	10.4	10.2	10.6	2.3	12.4	2.3	13.54	2.09	-	5.86	10.5	7.4	16.3	-
Turbidity, field	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	--	--		

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

\- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

36.0 Parameter exceeds the PWQO.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:							GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS
Sample ID:				*Modelled Groundwater Concentrations [2] (Short-term)*	*Modelled Groundwater Concentrations [2] (Long-term)*	*Sewer Use By-Law Criteria [3]*	**CRA-4074-02-WARD1-21**	**GCS-WARD1-1210-001**	**GCS-WARD1-0511-001**	**GCS-WARD1-1011-001**	**GCS-WARD1-0512-001**	**GCS-WARD1-1112-001**	**GCS-WARD1-0513-001**	**GCS-WARD1-1013-001**	**LCS-WARD1-DD-061414-001**	**GCS-WARD1-103114-001**	**GCS-WARD1-9/6/15-001**	**GCS-WARD1-11/13/15-001**	**GCS-WARD1-042516-001**	**GCS-WARD1-110416-001**
Sample Date:							**5/13/2010**	**12/1/2010**	**5/24/2011**	**11/23/2011**	**4/22/2012**	**11/27/2012**	**5/13/2013**	**10/23/2013**	**6/14/2014**	**10/31/2014**	**6/9/2015**	**11/13/2015**	**4/25/2016**	**11/4/2016**
Parameters	**Units**	*ODWS [1]*	*ODWS Source*																	
Metals																				
Aluminum	mg/L	0.10	OG	55.53	56.15	50	<0.1	0.24	0.042	<0.1	0.14	<0.1	0.024	0.02	0.024	0.019	<0.1	0.038	0.014	0.033
Barium	mg/L	1.0	MAC	0.87	0.57	-	0.22	0.15	0.188	0.17	0.24	0.13	0.146	0.204	0.149	0.255	0.146	0.155	0.108	0.232
Beryllium	mg/L	-	-	0.01	0.01	-	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	<0.005	<0.0001	<0.0001	<0.0001
Boron	mg/L	5.0	IMAC	-	-	-	<0.5	<0.5	0.408	<0.5	<0.5	0.61	0.394	0.396	0.415	0.82	0.45	0.69	0.316	0.746
Cadmium	mg/L	0.005	MAC	0.01	0.01	1	<0.001	<0.001	0.00047	<0.001	<0.0009	<0.0009	0.00021	<0.0001	<0.0001	<0.0001	<0.0009	0.0002	0.000026	0.000195
Calcium	mg/L	-	-	746	637	-	236	227	241	245	243	208	262	246	236	228	256	212	227	251
Chromium	mg/L	0.05	MAC	0.12	0.12	5	<0.01	<0.01	0.0019	<0.01	<0.005	<0.005	0.00135	0.00147	0.00147	0.00195	<0.005	0.00183	0.00081	0.00133
Cobalt	mg/L	-	-	0.05	0.05	5	<0.008	<0.008	0.00139	<0.005	<0.005	<0.005	0.00141	0.00156	0.00158	0.00349	<0.005	0.00267	0.00145	0.00253
Copper	mg/L	1.0	AO	0.16	0.16	2	<0.01	<0.01	0.0012	<0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	<0.01	0.0012	<0.001	<0.001
Iron	mg/L	0.30	AO	117.1	106.1	50	**27.5**	**16.7**	**28.8**	**20.2**	**29.6**	<0.5	**20.1**	**16.1**	**15.7**	**6.27**	**3.78**	**0.507**	**3.8**	**3.97**
Lead	mg/L	0.010	MAC	0.4	0.39	5	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	<0.005	0.00033	0.00021	0.00021
Magnesium	mg/L	-	-	310	202	-	72.2	58.6	59.2	53.4	73.9	53.6	66.5	72.4	55.6	85.9	63.5	78.3	49.2	82.3
Manganese	mg/L	0.05	AO	2.96	2.7	5	**1.12**	**0.981**	**1.3**	**1.17**	**1.13**	**0.659**	**1.12**	**0.956**	**1.07**	**0.495**	**0.931**	**0.427**	**0.957**	**0.656**
Molybdenum	mg/L	-	-	0.01	0.01	5	<0.01	<0.01	<0.001	<0.01	<0.01	<0.01	<0.001	<0.001	<0.001	<0.001	<0.005	<0.0005	0.000143	0.000203
Nickel	mg/L	-	-	0.11	0.11	2	<0.02	<0.02	<0.002	<0.02	<0.02	<0.02	0.0022	<0.002	<0.002	0.0042	<0.01	0.004	0.00203	0.00343
Silver	mg/L	-	-	0.01	0.01	5	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.00005	<0.00005	<0.00005
Strontium	mg/L	-	-	212	133	-	1.24	1.1	1.17	1.27	1.22	1.04	1.31	1.33	1.1	1.28	1.05	1.12	0.936	1.27
Titanium	mg/L	-	-	0.98	0.99	5	<0.02	<0.02	0.0021	<0.02	<0.02	<0.02	<0.002	<0.002	<0.002	<0.002	<0.02	0.00132	0.00062	0.00148
Vanadium	mg/L	-	-	0.13	0.12	5	<0.01	<0.01	0.0028	<0.01	<0.01	<0.01	0.002	0.0019	0.0019	0.0017	<0.005	0.00089	0.00082	0.00137
Zinc	mg/L	5.0	AO	1.06	1.06	2	<0.03	<0.03	0.0133	0.035	<0.03	0.779	0.0045	0.004	0.0036	0.0134	<0.03	0.0247	0.0123	0.0077
General Chemistry																				
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	1722	540	-	986	958	961	945	1100	859	982	1030	983	1350	1050	1040	918	1140
Ammonia-N	mg/L	-	-	51.9	31.6	-	36.6	28.9	28.2	26.8	33.8	29.9	34.6	36.5	44.4	56.4	45.9	56.6	39	57.4
Biochemical oxygen demand (BOD)	mg/L	-	-	98	115	300	9.2	3	4.7	5.3	5.2	<2	3.2	3.3	2.7	4.9	2.1	<2	2.2	2.9
Chemical oxygen demand (COD)	mg/L	-	-	1208	1341	-	76	51	49	61	84	61	570	<61	72	100	58	90	51	105
Chloride	mg/L	250	AO	256	163	500	95.4	71.9	57.8	73.2	99.1	69.5	62.2	5	62.9	132	70.8	90.3	48.3	86.3
Hardness	mg/L	80-100	OG	1242	428	-	886	807	845	831	910	741	927	911	819	922	900	852	770	965
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	<0.5	0.13	<0.1	<0.5	<0.1	0.75	<0.1	<0.1	<0.1	<2	0.31	2.54	0.654	0.433
Nitrite (as N)	mg/L	1.0	MAC	0.1	0.1	-	<0.5	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<2	<0.05	0.171	<0.01	<0.01
Phosphorus	mg/L	-	-	3.3	3.7	10	0.037	0.045	<0.03	<0.03	0.048	<0.03	0.036	<0.03	0.036	0.034	0.065	0.052	0.0113	0.083
Total kjeldahl nitrogen (TKN)	mg/L	-	-	79.49	40.42	-	47.4	30.7	28.8	29.8	44.9	32.9	34.7	32.2	355	59.1	48.6	49.4	32.4	75.9
Total suspended solids (TSS)	mg/L	-	-	-	-	300	56	57	72.8	50	100	6.4	52.5	39	40	16.9	11	10.9	1830	53.8
Field Parameters																				
Conductivity, field	µS/cm	-	-	-	-	-	2150	1830	1370	1980	2080	1610	684	1930	6030	2550	1860	1950	1730	2250
pH, field	s.u.	6.5-8.5	OG	6.9	7	6.0-10.5	7.05	6.47	6.97	7.21	6.61	6.45	6.84	6.98	7.16	7.17	6.39	7.91	6.87	7.4
Temperature, field	°C	15	AO	-	-	-	8.1	10.2	8.5	11.2	7.5	8.2	7.4	12.4	13.1	11.1	8.5	10.6	6.5	12.3
Turbidity, field	NTU	5.0/5.0	MAC/AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).
(3) Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.
OG Operation Guideline (water treatment and distribution).
IMAC Interim Maximum Acceptable Concentration (health related).
MAC MAC - Maximum Acceptable Concentration (health related).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
< Parameter detected below the laboratory method detection limit.
36.0 Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:							GCS	GCS	GCS	GCS	GCS	GCS	GCS	GCS-PUMP	GCS	GCS	GCS	GCS
Sample ID:							GCS-WARD1-041117-001	GCS-WARD1-112317-001	GCS-WARD1-052018-001	GCS-WARD1-110418-001	GCS-WARD1-19-001	GCS-WARD1-19-001	GCS-WARD1-19-001	STATION NO. 1 (PS1)	GCS-WARD 1-001	GCS-WARD 1-001	GCS-WARD 1-001	GCS-PUMP STN NO. 1 PS1
Sample Date:							4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022
Parameters	**Units**	*ODWS [1]*	*ODWS Source*	*Modelled Groundwater Concentrations [2] (Short-term)*	*Modelled Groundwater Concentrations [2] (Long-term)*	*Sewer Use By-Law Criteria [3]*												
Metals																		
Aluminum	mg/L	0.10	OG	55.53	56.15	50	0.033	0.027	0.104	0.026	0.038	0.007	0.011	0.024	0.027	0.015	0.056	0.036
Barium	mg/L	1.0	MAC	0.87	0.57	-	0.157	0.208	0.112	0.206	0.0992	0.133	0.0996	0.124	0.105	0.131	0.0966	0.12
Beryllium	mg/L	-	-	0.01	0.01	-	<0.0001	<0.0001	<0.001	<0.0001	<0.000007	<0.000007	<0.000007	0.00001	<0.000007	0.00001	0.00001	0.000016
Boron	mg/L	5.0	IMAC	-	-	-	0.331	0.469	0.33	0.431	0.235	0.508	0.24	0.285	0.263	0.198	0.197	0.304
Cadmium	mg/L	0.005	MAC	0.01	0.01	1	0.000134	0.000026	0.000052	0.000012	0.000078	0.000328	0.00008	0.00216	0.000051	0.000018	0.000026	0.000067
Calcium	mg/L	-	-	746	637	-	220	261	227	261	-	-	259	241	273	267	233	-
Chromium	mg/L	0.05	MAC	0.12	0.12	5	0.00122	0.00131	<0.005	0.0012	0.00086	0.00068	0.00112	0.00082	0.00083	0.00079	0.00095	0.00118
Cobalt	mg/L	-	-	0.05	0.05	5	0.00149	0.00184	0.0014	0.00185	0.00135	0.00145	0.0013	0.00122	0.00125	0.000872	0.000769	0.000843
Copper	mg/L	1.0	AO	0.16	0.16	2	<0.001	<0.001	<0.01	<0.001	0.0004	0.0012	0.0005	0.0017	0.0004	0.0003	0.0004	0.0007
Iron	mg/L	0.30	AO	117.1	106.1	50	**9.2**	**11.6**	**7.05**	**19.5**	**6.6**	**1.07**	**5.47**	**2.62**	**3.53**	**10.5**	**4.61**	**20.6**
Lead	mg/L	0.010	MAC	0.4	0.39	5	0.00016	0.00011	<0.0005	0.00015	0.00017	0.00015	0.00084	0.00097	0.00282	0.00017	0.00146	0.00071
Magnesium	mg/L	-	-	310	202	-	46.3	59.1	45.4	53.7	36.1	51.1	40.5	42.5	40.4	38.3	37.4	35.4
Manganese	mg/L	0.05	AO	2.96	2.7	5	**0.973**	**0.914**	**0.898**	**0.854**	**0.958**	**0.818**	**0.894**	**0.779**	**1.01**	**0.759**	**0.957**	**0.914**
Molybdenum	mg/L	-	-	0.01	0.01	5	0.000204	0.000186	<0.0005	0.000181	0.00007	0.00017	0.00018	0.00015	0.0001	0.00006	0.00042	0.00014
Nickel	mg/L	-	-	0.11	0.11	2	0.00191	0.00207	<0.005	0.00191	0.0014	0.002	0.0015	0.0023	0.0014	0.0011	0.0013	0.001
Silver	mg/L	-	-	0.01	0.01	5	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium	mg/L	-	-	212	133	-	0.956	1.13	0.916	1.06	0.931	1.11	1.1	0.995	1.09	0.942	0.925	0.852
Titanium	mg/L	-	-	0.98	0.99	5	0.00094	<0.0015	0.004	<0.0012	0.00151	0.0003	0.00054	0.00095	0.00105	0.00095	0.00225	0.00214
Vanadium	mg/L	-	-	0.13	0.12	5	0.00142	0.0014	<0.005	0.00117	0.00099	0.00044	0.001	0.00077	0.00077	0.00095	0.00068	0.00141
Zinc	mg/L	5.0	AO	1.06	1.06	2	0.005	0.0102	<0.03	0.0137	0.007	0.011	0.006	0.013	0.005	0.006	0.007	0.024
General Chemistry																		
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	1722	540	-	866	982	836	980	811	878	804	563	818	712	735	767
Ammonia-N	mg/L	-	-	51.9	31.6	-	34	36.6	29.6	28.6	25.4	27.2	27.3	21.7	21.7	13.9	14.1	12.2
Biochemical oxygen demand (BOD)	mg/L	-	-	98	115	300	2.2	<3	3.1	<3	<4	5	<2	7	<4	4	<4	<12
Chemical oxygen demand (COD)	mg/L	-	-	1208	1341	-	52	71	54	83	40	19	43	38	37	31	20	30
Chloride	mg/L	250	AO	256	163	500	40.6	77.9	38.4	53	31	55	40	140	200	180	97	53
Hardness	mg/L	80-100	OG	1242	428	-	739	895	754	872	682	844	813	776	849	824	736	717
Nitrate (as N)	mg/L	10.0	MAC	-	-	-	0.31	<0.1	0.1	<0.1	0.19	0.17	0.51	0.22	0.29	<0.06	0.07	0.08
Nitrite (as N)	mg/L	1.0	MAC	0.1	0.1	-	<0.01	<0.05	<0.05	<0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Phosphorus	mg/L	-	-	3.3	3.7	10	0.0194	0.0213	0.0235	0.0636	0.04	0.03	-	0.1	0.01	0.012	<0.03	<0.03
Total kjeldahl nitrogen (TKN)	mg/L	-	-	79.49	40.42	-	39.6	38.6	39.4	33.8	24.9	29.6	-	22	23.8	13.3	15.8	12.6
Total suspended solids (TSS)	mg/L	-	-	-	-	300	29.2	51	27	52	25	100	16	13	15	32	13	49
Field Parameters																		
Conductivity, field	µS/cm	-	-	-	-	-	1640	1970	879	1970	1770	2099	-	1760	2100	1590	1290	1500
pH, field	s.u.	6.5-8.5	OG	6.9	7	6.0-10.5	7.23	6.64	6.9	6.64	7.55	7.22	-	6.61	6.89	6.77	21	-
Temperature, field	°C	15	AO	-	-	-	7	10.4	7.9	10.4	8.9	8.04	-	7.48	8.4	10.8	5.92	6.75
Turbidity, field	NTU	5.0/5.0	MAC/AO	-	-	-	-	-	-	-	-	-	-	18	--	--	12.8	7.54

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).
[3]	Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:						GCS CRA-4074-02-WARD1-21	GCS GCS-WARD1-1210-001	GCS GCS-WARD1-0511-001	GCS GCS-WARD1-1011-001	GCS GCS-WARD1-0512-001	GCS GCS-WARD1-1112-001	GCS GCS-WARD1-0513-001	GCS GCS-WARD1-1013-001	GCS LCS-WARD1-DD-061414-001	GCS GCS-WARD1-103114-001	GCS GCS-WARD1-9/6/15-001	GCS GCS-WARD1-11/13/15-001	GCS GCS-WARD1-042516-001	GCS GCS-WARD1-110416-001	GCS GCS-WARD1-041117-001
Sample ID:																				
Sample Date:						5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017
Parameters	Units	*ODWS* [1]	*ODWS Source*	*Modelled Groundwater Concentrations* [2] *(Short-term)*	*Modelled Groundwater Concentrations* [2] *(Long-term)*															
Volatiles																				
1,1,1,2-Tetrachloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	-		16.2	14.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	µg/L	14	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (Ethylene dibromide)	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	200/3	MAC/AO	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	µg/L	5	IMAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	5/1	MAC/AO	1.5	1	**2.2**	**1.55**	**2.04**	**1.83**	**1.82**	**0.93**	**1.62**	**1.41**	**1.9**	**1.38**	**0.93**	<0.5	**0.74**	**1.16**	**0.91**
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	-		-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Hexanone	µg/L	-		-	-	<20	<20	<20	<20	<20	<20	<20	<30	<20	<20	<20	<20	<20	<20	<20
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	-		-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Acetone	µg/L	-		-	-	<20	<20	<20	<20	<20	<20	<20	<30	<20	<20	<20	<20	<20	<20	<20
Benzene	µg/L	1	MAC	1.9	1	**0.99**	**0.65**	**0.8**	**0.55**	**1.23**	<0.5	**0.7**	**0.87**	**0.69**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1
Bromoform	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1
Bromomethane (Methyl bromide)	µg/L	-		-	-	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon disulfide	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1
Carbon tetrachloride	µg/L	2	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	µg/L	80/30	MAC/AO	3.6	3.2	**4.43**	**2.61**	**4.25**	**2.84**	**3.83**	**0.77**	**4.26**	**3.57**	**5.52**	**0.78**	**0.97**	<0.5	**1.4**	**1.32**	**2.72**
Chloroethane	µg/L	-		8	1.4	<1	<1	<1	**1.2**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chloroform (Trichloromethane)	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1
Chloromethane (Methyl chloride)	µg/L	-		0.7	0.7	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1
Dichlorodifluoromethane (CFC-12)	µg/L	-		-	-	<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1
Ethylbenzene	µg/L	140/1.6	MAC/AO	7.5	7.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexane	µg/L	-		-	-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5
m&p-Xylenes	µg/L	-		11.8	11.7	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Methyl tert butyl ether (MTBE)	µg/L	15	AO	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methylene chloride	µg/L	50	MAC	0.7	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.5	<2	<2	<2	<2	<2	<2
N-Hexane (C6 and isomers)	µg/L	-		-	-	-	-	-	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-
o-Xylene	µg/L	-		3.6	3.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/L	10	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	60/24	MAC/AO	54.1	54.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	µg/L	5	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane (CFC-11)	µg/L	-		-	-	<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes	µg/L	100	MAC	-	-	<2	<2	<2	<2	<2	<2	-	<3.2	-	<2	-	-	-	-	-
Vinyl chloride	µg/L	1	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes (total)	µg/L	90/20	MAC/AO	-	-	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	-	<1.1	-	<1.1	-	-	-	-	-

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.

(2) Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).

OG Operation Guideline (water treatment and distribution).

IMAC Interim Maximum Acceptable Concentration (health related).

MAC MAC - Maximum Acceptable Concentration (health related).

AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).

\- Parameter not analyzed / no information available

< Parameter detected below the laboratory method detection limit.

36.0 Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:						**GCS**	**GCS**	**GCS**	**GCS**	**GCS**	**GCS**	**GCS**	**GCS**	**GCS**
Sample ID:						**GCS-WARD1-112317-001**	**GCS-WARD1-052018-001**	**GCS-WARD1-110418-001**	**GCS-WARD1-19-001**	**GCS-PUMP STATION NO. 1 (PS1)**	**GCS-WARD 1-001**	**GCS-WARD 1-001**	**GCS-WARD 1-001**	**GCS-PUMP STN NO. 1 PS1**
Sample Date:						**11/23/2017**	**5/20/2018**	**11/4/2018**	**5/13/2020**	**12/27/2020**	**5/11/2021**	**11/15/2021**	**6/29/2022**	**12/20/2022**
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***	***Modelled Groundwater Concentrations (Short-term)*** [2]	***Modelled Groundwater Concentrations (Long-term)*** [2]									
Volatiles														
1,1,1,2-Tetrachloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	µg/L	-		16.2	14.8	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	µg/L	14	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (Ethylene dibromide)	µg/L	-		-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	µg/L	200/3	MAC/AO	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	µg/L	5	IMAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	µg/L	5/1	MAC/AO	1.5	1	**1.11**	**0.83**	**0.99**	**0.5**	**0.6**	**0.6**	<0.5	0.7	0.6
2-Butanone (Methyl ethyl ketone) (MEK)	µg/L	-		-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Hexanone	µg/L	-		-	-	<20	<20	<20	<20	<20	<20	<20	<20	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	µg/L	-		-	-	<20	<20	<20	<20	<20	<20	<20	<20	<20
Acetone	µg/L	-		-	-	<20	<20	**39**	<30	<30	<30	<30	<30	<30
Benzene	µg/L	1	MAC	1.9	1	**0.77**	<0.5	**0.82**	<0.5	<0.5	<0.5	<0.5	<0.5	0.6
Bromodichloromethane	µg/L	-		-	-	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	µg/L	-		-	-	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane (Methyl bromide)	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon disulfide	µg/L	-		-	-	<1	<1	<1	-	-	--	--	-	-
Carbon tetrachloride	µg/L	2	MAC	-	-	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	µg/L	80/30	MAC/AO	3.6	3.2	**1.88**	**1.74**	**2.07**	**1.1**	**0.8**	**1.2**	**0.6**	**1.2**	**2.1**
Chloroethane	µg/L	-		8	1.4	<1	<1	<1	<5	<5	<5	<5	<5	-
Chloroform (Trichloromethane)	µg/L	-		-	-	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane (Methyl chloride)	µg/L	-		0.7	0.7	<1	<1	<1	<5	<5	<5	<5	<5	-
cis-1,2-Dichloroethene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	µg/L	-		-	-	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	-	<0.5
Dichlorodifluoromethane (CFC-12)	µg/L	-		-	-	<1	<1	<1	<2	<2	<2	<2	<0.5	<0.5
Ethylbenzene	µg/L	140/1.6	MAC/AO	7.5	7.4	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2
Hexane	µg/L	-		-	-	<0.5	<0.5	<0.5	<1	<1	<1	<1	<0.5	<0.5
m&p-Xylenes	µg/L	-		11.8	11.7	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<1	<1
Methyl tert butyl ether (MTBE)	µg/L	15	AO	-	-	<0.5	<0.5	<0.5	<2	<2	<2	<2	<0.5	<0.5
Methylene chloride	µg/L	50	MAC	0.7	0.7	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<2	<2
N-Hexane (C6 and isomers)	µg/L	-		-	-	-	-	-	-	-	-	-	<0.5	<0.5
o-Xylene	µg/L	-		3.6	3.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Styrene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/L	10	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	µg/L	60/24	MAC/AO	54.1	54.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,2-Dichloroethene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	µg/L	-		-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	µg/L	5	MAC	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane (CFC-11)	µg/L	-		-	-	<1	<1	<1	<5	<5	<5	<5	<5	<5
Trihalomethanes	µg/L	100	MAC	-	-	-	-	-	-	-			<0.2	<0.2
Vinyl chloride	µg/L	1	MAC	-	-	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.5	<0.5
Xylenes (total)	µg/L	90/20	MAC/AO	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5		

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:					LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS
Sample ID:					CRA-4074-02-WARD1-22	LCS-WARD1-1210-001	LCS-WARD1-0511-001	LCS-WARD1-1011-001	LCS-WARD1-0512-001	LCS-WARD1-1112-001	LCS-WARD1-0513-001	LCS-WARD1-1013-001	GCS-WARD1-DD-061414-001	LCS-WARD1-103114-001	LCS-WARD1-9/6/15-001	LCS-WARD1-11/13/15-001	LCS-WARD1-042516-001	LCS-WARD1-110416-001	LCS-WARD1-041117-001	LCS-WARD1-112317-001	LCS-WARD1-052018-001	LCS-WARD1-110418-001	LCS-WARD1-19-001	LCS-WARD1-19-001	LCS-WARD1-19-001	LCS-PUMP STATION NO 2 (PS2)	LCS-WARD 1-001	LCS-WARD 1-001	LCS-WARD1-001	LCS-PUMPSTATION NO.2 (PS2)
Sample Date:					5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/22/2019	12/8/2019	5/13/2020	12/27/2020	5/12/2021	11/15/2021	6/29/2022	12/20/2022
Parameters	**Units**	**ODWS [1]**	**ODWS Source**	**Modelled Leachate Concentrations [2]**	**Sewer Use By-Law Criteria [3]**																								
Metals																													
Aluminum		0.10	OG	107	50	0.26	0.93	2.6	0.65	0.432	0.69	1.84	14.7	0.37	2.58	<0.1	0.077	0.092	0.24	0.139	0.146	0.102	0.095	0.111	0.22	0.366	4.96	0.081	0.102	0.156	0.245
Barium		1.0	MAC	1.14		0.22	0.16	0.134	0.19	0.13	0.2	0.198	0.238	0.161	0.16	0.151	0.128	0.104	0.15	0.116	0.148	0.108	0.125	0.107	0.156	0.118	0.121	0.113	0.106	0.217	0.491
Beryllium		-		0.01		<0.01	<0.01	<0.001	<0.01	<0.001	<0.01	<0.005	<0.005	<0.005	<0.001	<0.005	<0.0001	<0.0001	<0.001	<0.0001	<0.0001	<0.001	<0.0001	0.000007	0.000013	<0.000007	0.000017	<0.000007	0.000011	0.000009	0.000015
Boron		5.0	IMAC	-		1.19	1.19	0.46	1.11	0.561	0.88	1.58	0.91	1.26	0.673	0.81	0.572	0.47	0.8	0.327	0.546	0.55	0.492	0.315	0.403	0.353	0.459	0.403	0.247	0.915	1.71
Cadmium		0.005	MAC	0.01	1	<0.001	<0.001	0.00012	<0.001	<0.0001	<0.0009	<0.0009	<0.0009	<0.0009	0.00011	<0.0009	0.000051	0.000096	<0.0001	0.000319	0.000076	0.00271	0.00005	0.00158	0.0005	0.000944	0.000628	0.000031	0.000069	0.000042	0.000037
Calcium		-		1249		223	235	170	214	199	236	426	348	563	228	233	226	195	228	191	220	202	186	-	-	228	221	210	178	134	277
Chromium		0.05	MAC	0.228	5	0.01	0.012	0.0078	<0.01	0.0046	0.0116	0.0283	0.0451	0.0258	0.00735	0.0062	0.00554	0.00278	<0.005	0.0019	0.00263	<0.005	0.00182	0.00173	0.0029	0.00221	0.00356	0.00156	0.00212	0.00526	0.0102
Cobalt		-		0.089	5	<0.008	<0.008	0.00445	0.0068	0.00474	0.0071	0.0069	0.0117	<0.005	0.00402	<0.005	0.00278	0.00227	0.0037	0.002	0.00271	0.0023	0.00404	0.00224	0.00267	0.0025	0.00263	0.00246	0.0019	0.00501	0.00898
Copper		1.0	AO	0.30	2	<0.01	0.012	0.007	<0.01	0.0028	0.017	0.013	0.027	<0.01	0.0048	<0.01	0.0036	0.0011	<0.01	0.0017	0.0014	<0.01	<0.001	0.0017	0.0017	0.0069	0.0153	0.0013	0.001	0.001	0.0027
Iron		0.30	AO	213	50	**3.35**	**3.51**	**6.13**	**4.84**	**2.66**	**3.8**	**11.4**	**20.8**	**3.38**	**11.4**	**7.31**	**8.44**	**5.29**	**3.34**	**12.8**	**5.77**	**5.62**	**2.58**	**7.67**	**5.71**	**4.82**	**5.67**	**5.05**	**11**	**4.14**	**18.8**
Lead		0.010	MAC	1	5	<0.01	<0.01	0.0053	<0.01	<0.001	**0.013**	0.0072	**0.0144**	<0.005	0.0027	<0.005	0.00052	0.00073	<0.001	0.00093	0.00045	0.0007	0.00051	0.00089	0.00575	0.00189	0.00392	0.00023	0.00342	0.00047	0.00176
Magnesium		-		432		122	102	72.6	103	94.4	130	112	92.8	99.3	90.3	99.4	64.4	75.6	103	69.7	84.2	78.9	67.9	63.2	71.6	68.6	80.8	71.3	58.3	87.5	123
Manganese		0.05	AO	7.32	5	**0.617**	**0.797**	**0.691**	**0.568**	**0.646**	**0.485**	**2.81**	**1.83**	**2.84**	**1.05**	**0.859**	**0.574**	**0.887**	**0.641**	**1.09**	**0.896**	**0.92**	**0.792**	**1.02**	**0.975**	**0.777**	**0.869**	**0.775**	**0.951**	**0.183**	**0.365**
Molybdenum		-		0.01	5	<0.01	<0.01	0.0012	<0.01	<0.001	<0.01	<0.005	<0.005	<0.005	<0.001	<0.005	0.00058	0.000294	0.00053	0.000431	0.000347	<0.0005	0.000755	0.00033	0.00079	0.00041	0.00051	0.00033	0.00034	0.00159	0.00078
Nickel		-		0.20	2	<0.02	<0.02	0.0129	0.021	0.0138	0.022	0.028	0.035	0.015	0.0097	0.013	0.0085	0.00575	0.0095	0.00413	0.00504	0.0075	0.008	0.0055	0.0049	0.0056	0.006	0.0053	0.0028	0.0119	0.0149
Phosphorus		-		6.0	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.259	0.255	0.319	0.267	0.13	0.379	0.462	-
Silver		-		0.02	5	<0.001	<0.001	<0.0001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.0005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Strontium		-		2.88		2.05	1.75	1.3	2.27	1.79	1.89	1.76	1.12	2.05	1.51	1.72	1.2	1.3	1.85	1.14	1.53	1.32	1.53	1.41	1.79	1.7	1.6	1.49	1.25	1.58	3.18
Titanium		-		2.05	5	0.022	0.043	0.0923	0.035	0.0183	0.033	0.072	0.419	0.023	0.0832	<0.02	0.00722	0.00496	0.0111	0.00612	0.00427	0.0036	0.00346	0.00428	0.00824	0.00627	0.00912	0.00239	0.00403	0.0117	0.0184
Vanadium		-		0.239	5	<0.01	<0.01	0.0061	<0.01	0.003	<0.01	0.0115	0.0328	0.0057	0.007	0.0105	0.0261	0.0033	<0.005	0.00188	0.00215	<0.005	0.00215	0.00137	0.00191	0.00162	0.00215	0.00114	0.00187	0.00671	0.0142
Zinc		5.0	AO	1.91	2	0.162	0.108	0.2	0.039	0.0377	0.207	1.01	0.404	0.359	0.399	0.036	0.0576	0.0253	<0.03	0.0167	0.0197	<0.03	0.279	0.023	0.082	0.05	0.118	0.016	0.017	1.03	0.555
General Chemistry																															
Alkalinity, total (as CaCO3)		30-500	OG	2620		1610	2000	963	1570	1190	1280	2320	1320	2300	1120	1320	988	1040	1160	880	1120	955	824	908	990	916	762	878	817	1120	2040
Ammonia-N		-		220		104	85.2	38.7	97.1	55.9	67.8	94	72.1	102	44	101	46.2	57.3	70.3	26.5	46.2	35.3	35.4	30.9	36.8	32.8	33.9	28.1	21.5	96.6	169
Biochemical oxygen demand (BOD)		-		3000	300	85.8	25.5	25.5	49	8.9	8.6	1380	387	1200	9.8	13.7	23.3	8	11.4	5.3	6	3.9	5.1	<4	30	19	18	8	<4	14	43
Chemical oxygen demand (COD)		-		4500		350	268	112	270	146	143	2890	1180	2080	151	170	150	96	140	76	95	90	97	53	60	68	63	54	48	153	244
Chloride		250	AO	1000	500	**358**	**320**	155	**369**	**258**	**255**	**251**	15.6	230	143	221	150	103	190	50.5	103	91.7	146	83	89	99	87	84	42	290	410
Dissolved organic carbon (DOC)		5.0	AO	-	-																							--	**14.3**	-	-
Hardness		80-100	OG	1393		1060	1010	724	957	886	1120	1520	1250	1820	942	991	828	799	994	764	895	829	743	735	854	851	885	--	685	695	1200
Nitrate (as N)		10.0	MAC	20		<0.5	3	2.23	1.11	1.89	<1	<1	<0.1	<2	0.21	0.15	0.22	0.26	0.36	<0.1	0.21	0.4	0.66	0.17	0.45	1.62	1.23	0.94	0.23	0.14	<0.06
Nitrite (as N)		1.0	MAC	0.072		<0.5	<0.5	<0.1	<0.5	<0.1	<1	<1	<0.1	<2	<0.1	<0.05	0.074	<0.05	0.103	<0.05	<0.05	<0.05	0.067	<0.03	0.04	0.11	0.05	0.08	<0.03	0.37	<0.3
Phenolics (total)		-		-	-																							<0.002	0.002	-	0.021
Phosphorus		-		6.0	10	1.39	1.04	0.49	0.418	0.263	0.348	6.1	2.92	11.4	0.783	0.465	2.31	0.385	0.548	0.396	0.447	0.327	0.185	0.03	-	0.24	0.2	--	-	0.15	2.87
Total kjeldahl nitrogen (TKN)		-		201		120	90.3	40.3	119	69.6	76.9	105	72	144	53.3	83.2	48.4	47.1	61	33	50.2	52.8	39.3	31.9	40.4	31.7	34.2	29.6	21	95.9	154
Total suspended solids (TSS)		-		-	300	68.7	75.3	167	55.2	34	188	560	2270	54	418	18.7	41.5	855	31	41.1	25.8	15.7	15.7	34	54	77	40	21	69	17	93
Field Parameters																															
Conductivity, field		-				3810	3170	2200	3900	2910	2700	677	2700	2710	2630	2710	1960	2050	2590	1690	2220	1910	2220	2260	2240	-	1710	2120	2320	3310	4810
pH, field		6.5-8.5	OG	7.1	6.0-10.5	8.13	6.92	7.09	7.67	7.46	6.34	6.77	7.27	7.09	7.33	6.58	7.06	6.72	7.57	6.98	5.28	7.06	5.28	7.09	7.61	-	6.82	6.87	7	6.96	6.8
Temperature, field		15	AO			11	12.7	11.8	12.1	11	11.2	9.9	13.3	10.3	12.5	12	11.3	10.1	12.4	10.9	12.5	10.63	12.5	11.58	10.47	-	8.27	8.8	11.9	16.2	7.26
Turbidity, field		5.0/5.0	MAC/AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27	--	-	-	-

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Modeled groundwater concentrations obtained from the report "Design Brief, Groundwater Collection System, Valentine Avenue Landfill Site, Kincardine, Ontario" (CRA , April 1993).
(3) Municipality of Kincardine sewer use By-Law (No. 1987-107) criteria, where applicable.
OG Operation Guideline (water treatment and distribution).
IMAC Interim Maximum Acceptable Concentration (health related).
MAC MAC - Maximum Acceptable Concentration (health related).
AO Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
< Parameter detected below the laboratory method detection limit.
NM Not Measured.
36.0 Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS	LCS
Sample ID:			CRA-4074-02-WARD1-22	LCS-WARD1-1210-001	LCS-WARD1-0511-001	LCS-WARD1-1011-001	LCS-WARD1-0512-001	LCS-WARD1-1112-001	LCS-WARD1-0513-001	LCS-WARD1-1013-001	GCS-WARD1-DD-061414-001	LCS-WARD1-103114-001	LCS-WARD1-9/6/15-001	LCS-WARD1-11/13/15-001	LCS-WARD1-042516-001	LCS-WARD1-110416-001	LCS-WARD1-041117-001	LCS-WARD1-112317-001	LCS-WARD1-052018-001	LCS-WARD1-110418-001	LCS-WARD1-19-001	LCS-PUMP STATION NO 2 (PS2)	LCS-WARD 1-001	LCS-WARD 1-001	LCS-WARD1-001	LCS-PUMPSTATION NO.2 (PS2)
Sample Date:		*ODWS Source*	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015	4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/13/2020	12/27/2020	5/12/2021	11/15/2021	6/29/2022	12/20/2022
Parameters	**Units** *ODWS* [1]																								
Volatiles																									
1,1,1,2-Tetrachloroethane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-Trichloroethane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2,2-Tetrachloroethane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-Trichloroethane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.28**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1-Dichloroethene	14	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dibromoethane (Ethylene dibromide)	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
1,2-Dichlorobenzene	200/3	MAC/AO	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloroethane	5	IMAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2.56**	<0.5	**3.61**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,2-Dichloropropane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,3-Dichlorobenzene	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,4-Dichlorobenzene	5/1	MAC/AO	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.33**	<0.5	**0.73**	**0.64**	**0.52**	<0.5	<0.5	<0.5	**0.53**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7
2-Butanone (Methyl ethyl ketone) (MEK)	-		**65**	<20	<20	<20	<20	<20	**2500**	**1680**	**1380**	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
2-Hexanone	-		<20	<20	<20	<20	<20	<20	<20	<30	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	-		<20	<20	<20	<20	<20	<20	**25**	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Acetone	-		**78**	<20	<20	<20	<20	<20	**1400**	<750	**720**	<20	<20	<20	<20	<20	<20	<20	<20	<20	<30	<30	<30	<30	<30	<30
Benzene	1	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.19**	**1.05**	**1.89**	<0.5	<0.5	<0.5	<0.5	<0.5	**0.7**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.4**
Bromodichloromethane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromoform	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromomethane (Methyl bromide)	-		<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbon disulfide	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**3.34**	**5.6**	**2.73**	<1	<1	<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-
Carbon tetrachloride	2	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chlorobenzene	80/30	MAC/AO	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.1
Chloroethane	-		<1	<1	<1	<1	<1	<1	**1.7**	<1	**3.1**	<1	<1	<1	**1.6**	<1	<1	<1	<1	<1	<5	<5	<5	<5	<5	-
Chloroform (Trichloromethane)	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane (Methyl chloride)	-		<1	<1	<1	<1	<1	<1	<1	<1	**2.1**	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<5	<5	<5	<5	-
cis-1,2-Dichloroethene	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2.37**	**0.74**	**3.46**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cis-1,3-Dichloropropene	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibromochloromethane	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorodifluoromethane (CFC-12)	-		<1	<1	<1	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<2
Ethylbenzene	140/1.6	MAC/AO	<0.5	**1.79**	<0.5	<0.5	<0.5	<0.5	**4.76**	**5.02**	**7.05**	<0.5	<0.5	**1.13**	<0.5	<0.5	**0.55**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hexane	-		-	-	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<1
m&p-Xylenes	-		<1	**5.2**	**1.1**	<1	<1	<1	**13.2**	**11.2**	**18**	**1.3**	<1	**4.1**	<1	<1	**1.1**	<1	<1	<1	<0.5	<0.5	<0.5	<0.5	0.6	2
Methyl tert butyl ether (MTBE)	15	AO	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<2	<2	<2	<2	<2
Methylene chloride	50	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**19.5**	<5	**29.4**	<2	<2	<2	<2	<2	<2	<2	<2	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
N-Hexane (C6 and isomers)	-		-	-	-	-	-	-	-	<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
o-Xylene	-		<0.5	**1.68**	<0.5	<0.5	<0.5	<0.5	**5.21**	**3.86**	**6.09**	**0.51**	<0.5	**1.25**	<0.5	<0.5	**0.5**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8
Styrene	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.54**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	10	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	60/24	MAC/AO	**0.5**	**1.06**	<0.5	<0.5	<0.5	<0.5	**112**	**588**	**284**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3.6
trans-1,2-Dichloroethene	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.18**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene	5	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.77**	<0.5	**0.86**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlorofluoromethane (CFC-11)	-		<1	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<5	<5	<5	<5	<5	<5
Trihalomethanes	100	MAC	<2	<2	<2	<2	<2	<2	-	<3.2	-	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	1	MAC	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**1.3**	<0.5	<1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Xylenes (total)	90/20	MAC/AO	<1.5	**6.8**	<1.5	<1.5	<1.5	<1.5	-	**15.1**	-	**1.8**	-	-	-	-	-	-	-	-	<0.5	<0.5	<0.5	<0.5	0.8	2.8

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim Maximum Acceptable Concentration (health related).
MAC	MAC - Maximum Acceptable Concentration (health related).
AO	Aesthetic Objective (non-health related, i.e. colour, taste, smell).
-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory method detection limit.
36.0	Parameter exceeds the ODWS.

Appendix F

General Chemistry and Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 1 Landfill Site
Kincardine, Ontario

Sample Location:			SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1R-91	SG1	SG1	SG1	SG1	SG1	SG1	SG1	SG1	SG1	SG1	SG1
Sample ID:			SSL-WARD1-042516-001	SSL-WARD1-110416-001	SW-WARD1-041117-001	SSL-WARD1-112317-001	SSL-WARD1-052018-001	SSL-WARD1-110418-001	SSL-WARD1-19-001	SSL-WARD1-19-001	SSL-WARD1-19-001	SG1R-91	SSL-WARD 1-001	SSL-WARD 1-001	SSL-WARD 1-001	SSL-WARD1-122022-001	CRA-4074-02-WARD1-17	SW-WARD1-1210-001	SW-WARD1-0511-001	SW-WARD1-1011-001	SW-WARD1-0512-001	SW-WARD1-1112-001	SW-WARD1-0513-003	SW-WARD1-1013-001	SW-WARD1-DD-061414-001	SW-WARD1-103114-001	SSL-WARD1-9/6/15-001	SSL-WARD1-11/13/15-001
Sample Date:			4/25/2016	11/4/2016	4/11/2017	11/23/2017	5/20/2018	11/4/2018	5/23/2019	12/8/2019	5/13/2020	12/27/2020	5/11/2021	11/15/2021	6/29/2022	12/20/2022	5/13/2010	12/1/2010	5/24/2011	11/23/2011	4/22/2012	11/27/2012	5/13/2013	10/23/2013	6/14/2014	10/31/2014	6/9/2015	11/13/2015
Parameters	**Units**	**PWQO[1]**																									
Metals																											
Aluminum	mg/L	0.075 (a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.11	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.016	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	1.1 (h)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.129	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.0002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00024	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	-	71.5	62.9	65.3	56.9	60.2	55.3	-	-	66.9	62.2	48.7	62.5	70.3	73.5	48.3	58.8	75.1	56.2	56.7	60.3	67	64	68.3	51.7	66.2	53.8
Chromium	mg/L	0.0089 (b)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	0.0009	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0008	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0061	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.51	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	0.025 (c)	-	-	0.000259	-	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	15.6	10.4	16	13.7	16.3	13.1	-	-	18	15.2	15.2	16.6	18.5	16.9	14.6	12.3	18.4	12.4	15.3	14.1	18.5	17.2	16	14	16.9	13.2
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0358	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	mg/L	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0022	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.384	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.006	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0015	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	0.02-0.03 (g	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.015	-	-	-	-	-	-	-	-	-	-	-
General Chemistry																											
Alkalinity, total (as CaCO3)	mg/L	-	255	150	228	163	229	185	249	195	218	206	173	211	211	211	153	157	216	167	211	177	190	133	233	156	233	180
Ammonia-N	mg/L	-	11.9	12.7	11.3	9.62	12.9	21.1	16.3	18.6	18.8	19.2	14.8	14	21.3	17.7	10.8	8.25	14	11.5	14	11.6	9.17	8.54	16.2	11.4	27.4	17.9
Biochemical oxygen demand (BOI	mg/L	-	6.8	14.3	16.4	29	2.8	9.9	10	-	11	15	38	14	33	18	6.4	29.5	<2	8.7	25	20	2.7	19.6	6.9	26.6		
Chemical oxygen demand (COD)	mg/L	-	52	208	69	619	51	89	47	41	52	37	55	48	98	56	30	97	51	42	72	<99	45	72	61	90		
Chloride	mg/L	-	92.2	74.1	95.8	70.4	112	85.1	91	90	110	89	110	69	170	130	92.4	70.4	89.7	75.5	98.4	75.9	111	79.1	108	77.6		
Dissolved organic carbon (DOC)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	7.7	-	-												
Hardness	mg/L	-	243	200	229	199	217	192	254	217	241	218	184	225	252	253	263	191	205	209	243	231	236	187	235	189		
Nitrate (as N)	mg/L	-	0.568	0.841	0.691	1.42	0.132	0.176	0.33	0.48	0.25	0.32	0.44	0.55	<0.06	0.5	0.15	<0.3	<0.1	0.62	0.65	0.64	<0.1	0.38	0.03	0.186		
Nitrite (as N)	mg/L	-	0.093	1.39	0.066	2.04	0.052	0.045	0.1	0.1	0.06	0.06	0.14	0.06	<0.03	0.04	<0.1	<0.3	<0.1	0.23	0.14	0.11	<0.1	<0.1	0.022	0.196		
Nitrite/Nitrate	mg/L	-	-	2.231	-	-	0.184	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Phenolics (total)	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	<0.002	0.002	-	-												
Total kjeldahl nitrogen (TKN)	mg/L	-	13.9	23.5	16.9	47.3	18.9	27.3	17.2	21.1	20.2	22.6	16.9	15	35.2	19.5	14.5	15	19	15.5	12.4	9.54	15.1	14.9	23.5	22.7		
Un-ionized ammonia	mg/L	0.02 (d)	0.02523	0.2019	0.25825	0.00224	0.04154	0.00491	0.11198	0.08296	-	0.0121	0.00808	0.01374	0.11095	0.06371	0.08507	0.3163	0.0335	0.0053	0.0247761	0.0791997	0.30921	0.06134	0.04098	0.48041		
Field Parameters																											
Conductivity, field	µS/cm	-	791	708	774	700	537	700	1260	1070	-	900	970	877	1080	1010	839	757	984	659	924	791	1320	806	769	645		
Dissolved oxygen (DO), field	mg/L	>4 (f)	-	-	9.42	-	-	-	-	5.47	-	2.39	7.41	6.03	1.03	-	2.15	7	3.63	3.27	5.73	9.39	6.87	8.01	5.6	-		
pH, field	s.u.	6.5-8.5	6.95	7.83	7.98	6.24	7.03	6.24	7.33	7.54	-	6.61	6.32	6.67	7.03	7.51	7.18	8.29	7.04	6.48	7.13	7.74	7.58	7.4	6.57	8.14		
Temperature, field	°C	-	10.6	10.6	10.9	3.4	13.64	3.4	14.56	2.96	-	5.18	11.8	8.99	20.1	1.2	17.6	4.4	9.6	4.9	11	8.9	20.7	9.3	17.5	8.3		
Turbidity, field	NTU	-	-	-	-	-	-	-	-	-	-	23	--	--			-	-	-	-	-	-	-	-	-	-		

Notes:

[1] Ministry of the Environment and Climate Change (MOECC), Ontario Drinking Water Standards Quality Objectives (PWQO), July 1994, reprinted February 1999.

(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(b) PWQO for Cr (III) is 0.0089 mg/L; PWQO for Cr (VI) is 0.001 mg/L.

(c) Lead objective is alkalinity dependent. For alkalinity <20 mg/L the PWQO is 5 µg/L, for alkalinity between 40 and 80 mg/L, the PWQO is 20 µg/L, and for alkalinity > 80 mg/L the PWQO is 25 µg/L.

(d) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(f) Dissolved oxygen is temperature dependent. Value should not be less than the range of 7 mg/L (0 °C) to 4 mg/L (25 °C) for warm water biota.

(g) An interim PWQO of 0.02 mg/L has been set while the established limits is 0.03 mg/L for zinc.

(h) Beryllium objective is hardness dependent. At hardness <75 mg/L, the PWQO is 0.011 mg/L; >75 mg/L the PWQO is 1.1 mg/L

\- Parameter not analyzed / no information

< Parameter detected below the laboratory method detection limit

36.0 Parameter exceeds the PWQO.

Appendix F.3

LFG Historical Data 2009 to 2022

Monitoring Location	January 19, 2009		February 4, 2009		March 18, 2009		July 15, 2009		December 10, 2009	
	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP1B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

(1) Methane gas is expressed in percent by volume in air.
(2) Pressure is measured in inches of water

Landfill gas monitoring was not completed in 2010 as the Municipalities landfill gas monitoring probe was damaged.

Monitoring Location	January 2011		February 2011		March 2011		April 2011		July 2011		November 2011	
	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP1B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

(1) Methane gas is expressed in percent by volume in air.
(2) Pressure is measured in inches of water

Monitoring Location	January 2012		February 2012		March 2012		April 2012		July 2012		November 2012	
	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP1B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

(1) Methane gas is expressed in percent by volume in air.
(2) Pressure is measured in inches of water

Monitoring Location	January 2013		February 2013		March 2013		May 2013		July 2013		October 2013	
	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	nm	nm	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP1B-92	nm	nm	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP2A-92	nm	nm	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP2B-92	nm	nm	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP3A-92	nm	nm	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP3B-92	nm	nm	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0

Notes:

(1) Methane gas is expressed in percent by volume in air.
(2) Pressure is measured in inches of water

Monitoring Location	January 2014		February 2014		March 2014		May 2014		July 2014		October 2014		December 2014		December 2014	
	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	nm	nm	nm	nm	nm	nm	nm	nm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP1B-92	nm	nm	nm	nm	nm	nm	nm	nm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2A-92	nm	nm	nm	nm	nm	nm	nm	nm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2B-92	nm	nm	nm	nm	nm	nm	nm	nm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3A-92	nm	nm	nm	nm	nm	nm	nm	nm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3B-92	nm	nm	nm	nm	nm	nm	nm	nm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

Methane gas is expressed in percent by volume in air
Pressure is measured in inches of water

Monitoring Location	January 2015		March 2015		May 2015		June 2015		November 2015	
	Methane Gas (%)	Pressure	Methane Gas (%LEL)	Pressure	Methane Gas (%LEL)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	nm	0.0	20.9	0.0	20.3	0.0	0.0	0.0	0.0	0.0
GP1B-92	nm	0.0	20.4	0.0	20.6	0.0	0.0	0.0	0.0	0.0
GP2A-92	nm	0.0	19.7	0.0	19.0	0.0	0.0	0.0	0.0	0.0
GP2B-92	nm	0.0	20.9	0.0	19.0	0.0	0.0	0.0	0.0	0.0
GP3A-92	nm	0.0	20.9	0.0	19.0	0.0	0.0	0.0	0.0	0.0
GP3B-92	nm	0.0	20.9	0.0	19.0	0.0	0.0	0.0	0.0	0.0

Notes:

Methane gas is expressed in percent by volume in air
Pressure is measured in inches of water

Monitoring Location	January 2016		March 2016		April 2016		June 2016		November 2016	
	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP1B-92	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP2A-92	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP2B-92	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP3A-92	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0
GP3B-92	nm	nm	nm	nm	0.0	0.0	nm	nm	0.0	0.0

Notes:

Methane gas is expressed in percent by volume in air
Pressure is measured in inches of water

Monitoring Location	January 2017		February 2017		March 2017		April 2017		June 2017		July 2017		November 2017		December 2017	
	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure	Methane Gas (%)	Pressure
GP1A-92	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP1B-92	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP2B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3A-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GP3B-92	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

Methane gas is expressed in percent by volume in air
Pressure is measured in inches of water
GHD field staff use a Landtec® GEM2000 portable gas monitoring instrument that is calibrated daily (prior to use)

Monitoring Location	January 2018				February 2018				March 2018				April 2018			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	4.4	0.0	9.4	4.5	0.1	0.0	7.8	9.2	0.1	0.0	5.4	15.3	0.5	nm	0.7	22.2
GP1B-92	0.0	0.0	0.1	21.1	0.0	0.0	0.1	21	0.0	0.0	0.3	20.2	0.0	nm	0.0	21.1
GP2A-92	0.0	0.0	0.8	19.3	0.0	0.0	0.7	19.5	0.0	0.0	0.9	18.8	0.0	nm	0.0	20.5
GP2B-92	0.0	0.0	1	18.8	0.0	0.0	0.8	19.3	0.0	0.0	0.8	19.5	0.0	nm	0.0	20.2
GP3A-92	0.0	0.0	0.8	19.8	0.0	0.0	0.1	19.4	0.0	0.0	0.8	19.6	0.0	nm	0.0	20.1
GP3B-92	0.0	0.0	0.3	20.2	0.0	0.0	0.4	20.6	0.0	0.0	0.3	20.3	0.0	nm	0.0	20.4

Monitoring Location	May 2018				July 2018				November 2018			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	nm	nm	0.0	0.0	nm	nm	0.0	0.0	nm	nm
GP1B-92	0.0	0.0	nm	nm	0.0	0.0	nm	nm	0.0	0.0	nm	nm
GP2A-92	0.0	0.0	nm	nm	0.0	0.0	nm	nm	0.0	0.0	nm	nm
GP2B-92	0.0	0.0	nm	nm	0.0	0.0	nm	nm	0.0	0.0	nm	nm
GP3A-92	0.0	0.0	nm	nm	0.0	0.0	nm	nm	0.0	0.0	nm	nm
GP3B-92	0.0	0.0	nm	nm	0.0	0.0	nm	nm	0.0	0.0	nm	nm

Notes:

Methane gas is expressed in percent by volume in air
Pressure is measured in inches of water
GHD field staff use a Landtec® GEM2000 portable gas monitoring instrument that is calibrated daily (prior to use)

Monitoring Location	January 2019 Methane Gas (%)	Pressure	CO_2	O_2	February 2019 Methane Gas (%)	Pressure	CO_2	O_2	March 2019 Methane Gas (%)	Pressure	CO_2	O_2	April 2019 Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	2.1	16	0.0	0.0	5.7	9.2	3.0	0.0	6.3	9.3	0.7	0.0	8.1	5.5
GP1B-92	0.0	0.0	1.0	17.2	0.0	0.0	6	9.3	0.0	0.0	0.1	19.2	0.8	0.0	8.2	4.4
GP2A-92	0.0	0.0	0.9	18.1	0.0	0.0	1.6	17.9	0.0	0.0	1.7	16.4	0.0	0.0	1.5	18.8
GP2B-92	0.0	0.0	0.8	17.8	0.0	0.0	1.3	18.7	0.0	0.0	1.8	16.3	0.0	0.0	1.3	18.9
GP3A-92	0.0	0.0	0.5	18.8	0.0	0.0	0.9	19.6	0.0	0.0	0.0	19.8	0.0	0.0	0.8	20.0
GP3B-92	0.0	0.0	0.1	19.3	0.0	0.0	0.9	19.6	0.0	0.0	0.0	19.4	0.0	0.0	1.1	19.8

Monitoring Location	May 2019 Methane Gas (%)	Pressure	CO_2	O_2	July 2019 Methane Gas (%)	Pressure	CO_2	O_2	December 2019 Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.2	0.0	0.0	20.4	0.0	0.0	5.6	15.8	0.0	0.0	1.5	17.8
GP1B-92	0.3	0.0	1.0	19.7	0.0	0.0	2.4	18.5	0.0	0.0	0.1	19.1
GP2A-92	0.0	0.0	1.0	18.9	0.0	0.0	2.0	18.1	0.0	0.0	0.8	18
GP2B-92	0.0	0.0	1.2	18.6	0.0	0.0	2.5	17.6	0.0	0.0	0.9	17.8
GP3A-92	0.0	0.0	1.5	18.9	0.0	0.0	3.5	16.6	0.0	0.0	1.0	18.6
GP3B-92	0.0	0.0	0.5	19.8	0.0	0.0	1.0	19.1	0.0	0.0	0.2	19.4

Notes:

Methane gas is expressed in percent by volume in air
Pressure is measured in inches of water
GHD field staff use a Landtec® GEM2000 portable gas monitoring instrument that is calibrated daily (prior to use)

Monitoring Location	January 2020 Methane Gas (%)	Pressure	CO_2	O_2	February 2020 Methane Gas (%)	Pressure	CO_2	O_2	March 2020 Methane Gas (%)	Pressure	CO_2	O_2	April 2020 Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	0.3	19.1	0.0	0.0	3.7	15.6	NA	NA	NA	NA	NA	NA	NA	NA
GP1B-92	0.0	0.0	0.0	19.3	0.0	0.0	0.4	18.9	NA	NA	NA	NA	NA	NA	NA	NA
GP2A-92	0.0	0.0	0.6	18	0.0	0.0	0.5	18.0	NA	NA	NA	NA	NA	NA	NA	NA
GP2B-92	0.0	0.0	0.7	17.9	0.0	0.0	0.6	17.9	NA	NA	NA	NA	NA	NA	NA	NA
GP3A-92	0.0	0.0	4.7	19.1	0.0	0.0	0.7	17.8	NA	NA	NA	NA	NA	NA	NA	NA
GP3B-92	0.0	0.0	0.1	11.7	0.0	0.0	0.4	17.0	NA	NA	NA	NA	NA	NA	NA	NA

Monitoring Location	May 2020 Methane Gas (%)	Pressure	CO_2	O_2	August 2020 Methane Gas (%)	Pressure	CO_2	O_2	December 2020 Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	NA	NA	NA	NA	0.0	0.0	0.0	19.1	0.0	0.0	4.8	13.8
GP1B-92	NA	NA	NA	NA	0.0	0.0	0.0	18.9	0.0	0.0	0.1	19.5
GP2A-92	NA	NA	NA	NA	0.0	0.0	0.0	20.1	0.0	0.0	0.8	18
GP2B-92	NA	NA	NA	NA	0.0	0.0	0.0	20.2	0.0	0.0	1.0	17.8
GP3A-92	NA	NA	NA	NA	0.0	0.0	0.0	19.7	0.0	0.0	0.5	19
GP3B-92	NA	NA	NA	NA	0.0	0.0	0.0	19.1	0.0	0.0	0.2	19.3

Notes:

Methane gas is expressed in percent by volume in air
Pressure is measured in inches of water
GHD field staff use a Landtec® GEM2000 portable gas monitoring instrument that is calibrated daily (prior to use)
NA - gas measurements not available (the March, April, May 2020 field notes were stolen).

Monitoring Location	January 2021				February 2021				March 2021				April 2021			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	5.4	12.4	0.0	0.0	5.8	12.2	7.8	0.0	8.6	5.6	0.0	0.0	0.3	15.9
GP1B-92	0.0	0.0	1.8	17.2	0.0	0.0	4.8	13.2	0.6	0.0	0.9	16.7	0.0	0.0	7.3	9.2
GP2A-92	0.0	0.0	0.7	18.5	0.0	0.0	1.2	15.9	0.0	0.0	1.2	16	0.0	0.0	10.9	16.0
GP2B-92	0.0	0.0	0.8	18.2	0.0	0.0	1.3	16.2	0.0	0.0	1.2	16.2	0.0	0.0	10.7	16.2
GP3A-92	0.0	0.0	0.8	18.9	0.0	0.0	1.9	17.1	nm	nm	nm	nm	nm	nm	nm	nm
GP3B-92	0.0	0.0	0.6	19.3	0.0	0.0	1.1	16.9	nm	nm	nm	nm	nm	nm	nm	nm

Monitoring Location	May 2021				July 2021				October 2017				November 2017			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	3.3	16.0	0.0	0.0	4.5	15.1	0.0	0.0	nm	nm	0.0	0.0	0.0	19.1
GP1B-92	0.0	0.0	5.9	14.0	0.0	0.0	5.8	14.8	0.0	0.0	nm	nm	30.0	0.0	4.9	1.9
GP2A-92	0.0	0.0	1.5	16.8	0.0	0.0	2.5	16.4	0.0	0.0	nm	nm	0.0	0.0	0.0	0.0
GP2B-92	0.0	0.0	1.3	16.7	0.0	0.0	2.5	16.2	0.0	0.0	nm	nm	0.0	0.0	0.0	0.0
GP3A-92	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm
GP3B-92	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm

Monitoring Location	December 2017				January 2018				February 2018				March 2018			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	8.8	8.8	0.0	0.0	7.9	10.5	16.0	0.0	12.7	3.0	0.0	0.0	5.3	12.6
GP1B-92	0.0	0.0	0.3	18.0	0.0	0.0	0.6	19.7	0.7	0.0	0.5	17.6	0.0	0.0	0.4	20.1
GP2A-92	0.0	0.0	0.6	17.8	0.0	0.0	0.1	20.4	0.0	0.0	1.3	16.2	0.0	0.0	0	20.5
GP2B-92	0.0	0.0	0.7	17.6	0.0	0.0	0.4	20.0	0.0	0.0	1.3	16.2	0.0	0.0	0.1	20.1
GP3A-92	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm
GP3B-92	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm

Monitoring Location	May 2018				June 2018				November 2018			
	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2	Methane Gas (%)	Pressure	CO_2	O_2
GP1A-92	0.0	0.0	0.0	19.1	0.0	0.0	6.9	13.8	0.1	0.0	0.5	21.7
GP1B-92	0.0	0.0	0.0	18.9	0.0	0.0	5.1	14.8	0.1	0.0	5.4	16.6
GP2A-92	0.0	0.0	0.0	20.1	0.0	0.0	1.8	16.3	0.1	0.0	0.7	21.5
GP2B-92	0.0	0.0	0.0	20.1	0.0	0.0	1.8	16.4	0.1	0.0	0.7	21.3
GP3A-92	nm	nm	nm	nm	nm	nm	nm	nm	0.1	0.0	0.3	21.3
GP3B-92	nm	nm	nm	nm	nm	nm	nm	nm	0.1	0.0	1.3	21.1

Notes:

Methane gas is expressed in percent by volume in air.
Pressure is measured in inches of water.
GHD field staff use a Landtec® GEM2000 portable gas monitoring instrument that is calibrated daily (prior to use).
nm - Not measured (GP3A & B were compromised/damaged in March 2021).

Appendix G

Groundwater and Leachate Collection Systems

Appendix G.1

Groundwater Collection System and Leachate Collection System Maintenance Programs

GCS ANNUAL MAINTENANCE PROGRAM
2003 ANNUAL MONITORING REPORT
GROUNDWATER AND LEACHATE COLLECTION SYSTEMS
WARD 1 LANDFILL SITE

Item	*Frequency*	*Maintenance Activity*
A. COLLECTION SYSTEM		
1. 200 mm Ø Perforated DR26 HDPE Collector Pipe (MH1-MH4)	Semi-Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
2. 200 mm Ø DR26 HDPE Collector Pipe (Wet Well -MH1)	Semi-Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
3. 1200 mm Ø Manholes	Semi-Annual	• Remove sediment/precipitate from manhole sumps/ benching with vacuum truck. • Inspect condition of benching, rungs, parging and frame and cover and clean/repair as required.
B. PUMP STATION No 1		
1. 1500 mm Ø Wet Well	Semi-Annual	• Remove sediment/ precipitate from wet well sump with vacuum truck. • Inspect condition of rungs, access hatch, exit pole and lifting davit and clean/repair as required.
2. 75 mm Ø Flanged PVC Gate Valves (Series CGA)	Semi-Annual	• Close and open gate valves to ensure proper operation of valve disc and stem extension and clean/repair as required.
3. 75 mm Ø Threaded PVC Elastomeric Check Valve (Series 2633)	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate buildup, and clean/repair as required.
4. 75 mm Ø Sch. 80 PVC Discharge Pipe	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove precipitate buildup on interior wall of pipe using a combination of swabbing and pigging, as required, with rodding.
5. 3HP Submersible Pump (Model No. 3RHX 30M2-21-25)	Daily	• Inspect seal leak warning light.
	Semi-Annual (1st year of operation only)	• Remove pump and inspect condition of volute case/impeller and clean/repair as required. • Clean volute air hole vent as required. • Ensure pump is securely seated in discharge base to provide leak proof seal.
	Not Applicable	• Subsequent to first year of operation maintain pump only as required by activation of seal leak warning light.
	Not Applicable	• Maintain on hand one (1) spare tungsten-carbide lower mechanical seal with stainless steel spring and viton o-rings/elastomers.

GCS ANNUAL MAINTENANCE PROGRAM
2003 ANNUAL MONITORING REPORT
GROUNDWATER AND LEACHATE COLLECTION SYSTEMS
WARD 1 LANDFILL SITE

Item	*Frequency*	*Maintenance Activity*
C. FORCEMAIN		
1. 75 mm Ø DR17 HDPE Forcemain	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove precipitate buildup on interior walls of forcemain using a combination of swabbing and pigging, as required, with high pressure flushing.
D. VALVE CHAMBER		
1. 1500 mm Ø Chamber	Semi-Annual	• Inspect condition of rungs, parging and frame and cover and clean/repair as required.
2. 75 mm Ø Flanged Cast Iron Gate Valve (Series 421A)	Semi-Annual	• Close and open gate valve to ensure proper operation of valve disc and stem and clean/repair as required.
3. 75 mm Ø Flanged PVC Cast Iron Elastomeric Check Valve (Series 33)	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate building, and clean/repair as required.

Note:

Annual maintenance program will be reviewed and updated, from time to time, based on observations of the Groundwater Collection System's performance under continued operation.

LCS ANNUAL MAINTENANCE PROGRAM
2003 ANNUAL MONITORING REPORT
GROUNDWATER AND LEACHATE COLLECTION SYSTEMS
WARD 1 LANDFILL SITE

Item	*Frequency*	*Maintenance Activity*
A. COLLECTION SYSTEM		
1. 200 mm Ø Perforated DR26 HDPE Header Pipe (Wet Well - MH6)	Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
2. 150 mm Ø Perforated DR26 HDPE Collector Pipe (Wet Well - MH5 and MH6-CO1)	Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
3. 1200 mm Ø Manholes	Annual	• Remove sediment/precipitate from manhole sumps/ benching with vacuum truck. • Inspect condition of benching, rungs, parging and frame and cover and clean/repair as required.
B. PUMP STATION No.2		
1. 1500 mm Ø Wet Well	Annual	• Remove sediment/ precipitate from wet well sump with vacuum truck. • Inspect condition of rungs, access hatch, exit pole and lifting davit and clean/repair as required.
2. 75 mm Ø Flanged PVC Gate Valves (Series CGA)	Annual	• Close and open gate valves to ensure proper operation of valve disc and stem extension and clean/repair as required.
3. 75 mm Ø Threaded PVC Elastomeric Check Valve (Series 2633)	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate buildup, and clean/repair as required.
4. 75 mm Ø Sch. 80 PVC Discharge Pipe	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove precipitate buildup on interior wall of pipe using a combination of swabbing and pigging, as required, with rodding.
5. 3HP Submersible Pump (Model No. 3RHX 30M2-21-25)	Daily	• Inspect seal leak warning light.
	Annual (1st year of operation only)	• Remove pump and inspect condition of volute case/impeller and clean/repair as required. • Clean volute air hole vent as required. • Ensure pump is securely seated in discharge base to provide leak proof seal.
	Not Applicable	• Subsequent to first year of operation maintain pump only as required by activation of seal leak warning light.
	Not Applicable	• Maintain on hand one (1) spare tungsten-carbide lower mechanical seal with stainless steel spring and viton o-rings/elastomers.

LCS ANNUAL MAINTENANCE PROGRAM
2003 ANNUAL MONITORING REPORT
GROUNDWATER AND LEACHATE COLLECTION SYSTEMS
WARD 1 LANDFILL SITE

Item	*Frequency*	*Maintenance Activity*
C. FORCEMAIN		
1. 75 mm Ø DR17 HDPE Forcemain	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove precipitate buildup on interior walls of forcemain using a combination of swabbing and pigging, as required, with high pressure flushing.
D. VALVE CHAMBER		
1. 1500 mm Ø Chamber	Annual	• Inspect condition of rungs, parging and frame and cover and clean/repair as required.
2. 75 mm Ø Flanged Cast Iron Gate Valve (Series 421A)	Annual	• Close and open gate valve to ensure proper operation of valve disc and stem and clean/repair as required.
3. 75 mm Ø Flanged PVC Cast Iron Elastomeric Check Valve (Series 33)	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate building, and clean/repair as required.

Note:

Annual maintenance program will be reviewed and updated, from time to time, based on observations of the Leachate Collection System's performance under continued operation.

Appendix G.2

Groundwater Collection System and Leachate Collection System Operations Review

November 17, 2017 Reference No. 004074

Mr. Adam Weishar
Municipality of Kincardine
1475 Concession 5
RR #5
Kincardine, Ontario
N2Z 2X6

Dear Mr. Weishar:

Re: Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site, Kincardine, Ontario

1. Introduction

GHD has prepared this letter report to present a review of the groundwater and leachate collection systems (GCS – groundwater collection system, LCS – leachate collection systems) operating at the Ward 1 Landfill Site located at 140 Valentine Avenue, Kincardine, Ontario.

The GCS and LCS are located on the downgradient and upgradient sides of the landfill footprint respectively. Together, the systems operate on a continual basis to provide hydraulic control within and surrounding the waste mound. The operation of the GCS is governed by Environmental Compliance Approval (ECA) No. 3-0408-93-006 which was issued on September 27, 1995. Similarly, the LCS is governed by ECA No. 3-0354-94-006 which was issued on June 29, 1994 (amended on March 13, 1997).

In response to decreased flow rates within the GCS, increases in leachate indicator parameters concentrations within the GCS and LCS, and increases in leachate indicator parameter concentrations at compliance monitoring well OW1-78, GHD recommended that a review of the GCS and LCS operation be undertaken. This recommendation was originally made in the 2010 Annual Monitoring Report (CRA, 2011).

The locations of both collection systems and surrounding monitoring wells are illustrated on the attached Figure 1. A zoom in on the landfill footprint which more clearly shows the GCS and LCS is provided on Figure 2.

This letter provides a review of the operation as well as recommendations concerning the long-term operation of the GCS and LCS to ensure Site compliance with respect to the Reasonable Use Guideline.

2. System Configuration and Maintenance

The GCS consists of an "L" shaped interceptor drain located on the downgradient side(s) of the landfill footprint. The interceptor drain, consisting of a perforated pipe with filter sock, was installed along the

north and west corners of the waste footprint within the surficial sand close to the sand/till interface. The GCS was designed to induce an inward gradient in the vicinity of the collector to discourage the lateral migration of shallow groundwater from the landfill area beyond the collector. The interceptor drain conveys collected groundwater to sump MH1 and ultimately to Pump Station No. 1 located in southwest corner of the ELA. From there it is pumped to the Municipality's WWTP.

The LCS consists of a series of french drains and collector pipes which collect leachate from the base of the ELA. The LCS reduces leachate mounding on the landfill base of the ELA, thereby minimizing leachate seepage through the landfill base. The LCS also reduces the potential occurrence of leachate seeps through the final cover soils, which can occur as a result of leachate mounding. Leachate collected by the LCS is routed to Pump Station No. 2, where it is pumped by a forcemain for treatment at the Municipality's WWTP. Between late 2012 and mid-2016, leachate hauled from the Kincardine Waste Management Centre was also pumped to Pump Station No. 2 where it was added to the total flow.

Full descriptions of the GCS and LCS are provided in the reports entitled:

- Design Brief Leachate Collection System, Conestoga-Rovers & Associates, April 1994
- Design Brief Groundwater Collection System, Conestoga-Rovers & Associate, April 1993

The as-built elevation of the GCS varies from approximately 196.5 to 197.5 metres above mean sea level (mAMSL) and the elevation of the LCS shows that the bottom elevation of the French drains varies from approximately 198.8 to 199.9 mAMSL. Both systems flow into separate pumphouses where pumping is controlled by high/low water elevations. High/low water levels for the GCS and LCS are 196.5/196.1 mAMSL and 196.7/195.7 mAMSL respectively. As indicated in the design brief reports, flow through the GCS was calculated to be between 3,150 to 5,970 m^3/month (19.3 USGPM to 36.5 USGPM) and flow through the LCS was calculated to be between 183 to 363 m^3/month (after Site closure/installation of final cap).

Detailed monitoring of the leachate and water levels in the immediate vicinity of the GCS and LCS is possible through measurement of static levels at LW1-93, LW2-93, LW3-93, OW1-78, OW2-78, OW4-91, OW11-93, OW13-92, OW14-92, OW15, OW16A/B-96, and upgradient/cross-gradient wells OW18A/B, OW19A/B-96.

Municipality of Kincardine staff follow a detailed inspection and maintenance program to ensure that both the GCS and LCS continue to operate normally. Activities include regular inspections of gate valves, pumping equipment and collection chamber, as well as cleaning any sediment buildup via vac-trucks.

The full maintenance programs are included in Attachment A.

3. Flow Rate

The following section provides a review of the flow rates measured in the GCS and the LCS as well as a review of the leachate indicator concentrations trends in the GCS, LCS, and downgradient compliance monitoring well OW1-78.

The total annual recorded volumes of groundwater and leachate extracted and discharged to the Municipality's WWTP during 2009 through 2016 were:

	Total Annual Flow (m^3)							
	2009	2010	2011	2012	2013	2014	2015	2016
GCS	12,523	9,745	12,422	16,915	5,974	2,920	290	477
LCS	6,692	3,552	4,639	2,382	4,304	2,549	5,209	12,754
LCS*	-	-	-	2,815	9,298	7,530	9,411	15,168

Note: *Total Annual Flow measure for the leachate collection system. This volume is a combination of leachate from Ward 1 and the KWMC.

Figure 3 provides an illustration of the monthly flow rates from the two collection systems as well as the combined LCS flow from Ward 1 and the leachate hauled from the Kincardine Waste Management Centre. Figure 3 illustrates key operational milestones at the Site. A summary of the monthly flow rates are included in the attached Tables 1.1 and 1.2.

As illustrated on Figure 3, monthly flow volumes in the GCS follow a declining trend with increases in the summer/fall months in 2009, 2011, 2012. Pumping volumes declined significantly in 2015 and 2016. The LCS is typically off during hot summer months. The increased flow volumes observed during the summer and late fall months in the GCS may be related to the decreased LCS flow in the summer.

As shown above, the total annual flow in the LCS has not followed a general increasing or decreasing trend over the past eight years. Figure 3 shows that on a monthly basis, flow volumes between mid-2009 and 2013 were relatively consistent and were typically below 500 m^3/month. In 2014, flow through the LCS from May to October was 0.0 m^3 (discounting leachate originating from the KWMC). This resulted in an annual flow that was much lower than previous years. Flow volume in 2016 was well above historic values. The cause for the sudden increase in LCS flow in 2016 is unknown. Flow rates in the LCS were expected to decrease with the installation of the final cap. In late 2016, average flow rates in the LCS are reported to have decreased to levels similar to 2012 and thus the calculated flow volumes from 2014 to 2016 may be erroneous in some way. The period of increased flow in the LCS corresponds to the time period leachate was being hauled from the Kincardine Waste Management Centre to Pumphouse No. 2. Continued monitoring of flow rates should provide evidence for possible recording errors in the amounts of leachate coming from either source.

4. Concentration Trends

Figures 4 and 5 provide illustrations of key leachate indicator parameter concentrations versus time for the GCS, LCS (Figure 4), and OW1-78 (Figure 5) respectively. The following observations are drawn from Figure 4:

- GCS concentrations of alkalinity, chloride, and boron have been generally consistent, and within historical ranges.
    - Concentrations of ammonia and hardness have followed a slight increasing trend.
    - Recent concentrations of iron in the GCS have shown a decreasing trend.
- Concentrations in the LCS have been much more variable over time. The current concentrations are within historical ranges.
- Concentrations of chloride, hardness, and iron have, in general, followed a slight decreasing trend during recent monitoring years.
- In general, indicator parameter concentrations are less elevated in the GCS than the LCS.

The following observations are drawn from Figure 5:

- Concentrations of alkalinity, chloride, hardness, and conductivity followed an increasing trend until approximately 2012. Between 2012 and 2016 concentrations decreased.
- Concentrations of chloride in OW1-78 were above the Site Specific Reasonable Use Criteria (137 mg/L) between 2009 and 2014. However, concentrations have shown decreasing trends since 2014 and are now well below the Reasonable Use Criteria.

The concentrations of chloride reported at the GCS, LCS, and OW1-78 between 2009 and 2016 were (spring/fall):

	Chloride Concentration (mg/L)							
	2009	2010	2011	2012	2013	2014	2015	2016
GCS	56.5 | 98.9	95.4 | 71.9	57.8 | 73.2	99.1 | 69.5	62 | 5	216 | 132	70.8 | 90.3	48.3 | 86.3
LCS	490 | 438	358 | 320	155 | 369	258 | 255	251 | 16	230 | 279	221 | 150	103 | 190
OW1-78	142 | 156	144 | 155	165 | 147	169 | 150*	157* | 135	144 | 131	125* | 103	103 | 92.6

Note: * duplicate analytical result have been averaged

It is likely that capping of the landfill (largely completed in mid-2012) decreased the volumes of precipitation infiltrating the waste, creating leachate, flowing into the GCS. Decreasing rates of leachate generation are anticipated to lower the concentrations of leachate indicator parameters in groundwater

downgradient of the landfill footprint. Declining chloride concentrations reported within the GCS and at OW1-78 are evidence of this.

5. Environmental Factors and Groundwater Elevations

The purpose of reviewing environmental factors is to determine if there is a correlation between reductions in flow rates within the GCS and the LCS and changing environmental conditions (i.e., precipitation, static water levels).

Figure 6 provides hydrographs, water elevations versus time, in relation to the as-built elevations of the GCS and LCS. Water elevations for leachate wells, LW2-92 and LW3-98, as well as select groundwater monitoring wells located upgradient, cross-gradient, and downgradient of the landfill footprint are presented.

The following observations are drawn from Figure 6:

- Overall, Figure 6 shows that groundwater and leachate elevations are relatively consistent between 2009 and 2016 with some minor decreasing trends
- Water elevations at LW3-98 and OW18BR-13 indicate a recent increasing trend.
- Leachate elevations at LW1-98 were consistent between 2008 and 2010. The well was dry between 2010 and 2016 when the fall 2016 elevation was measured at 201.9 mAMSL. This may be indicative of increasing leachate mounding.
- Elevations of leachate and groundwater in proximity to the GCS and LCS remain above their respective collection systems.

Figure 7 provides an illustration of monthly total precipitation volumes and mean monthly temperatures recorded between 2009 and 2017 recorded at the Kincardine weather station (station ID: 6124127 Canadian Climate Data, 2017). Between 2009 and 2017, the monthly total precipitation ranged between 4.8 mm and 193.4 mm with an average of 71.4 mm. Figure 7 shows that there has been an overall decreasing trend in the monthly total precipitation volumes with an overall increasing trend in temperatures; however, these trends are minor.

Figure 7 shows that volumes of precipitation are variable throughout the year with increasing volumes during November through January and decreases during the summer months (July, August, and September).

Combining the trends presented in Figures 6 and 7 there is some correlation in overall decreasing trends between 2009 and 2017. Both the overall groundwater elevations and precipitation volumes have shown minor decreasing trends.

Ultimately, groundwater elevations remain above the GCS thus, groundwater is available to flow into the GCS. This should keep flow rates consistent through time. Therefore, the decreased flow volumes in the GCS are not related environmental factors.

Based on recent water level data downgradient of the GCS, it appears as though limited hydraulic capture of shallow groundwater continues occurring from the operation of the GCS. Analyzing the fall 2016 groundwater elevation data in the immediate vicinity of the GCS, shows a flattening of the groundwater flow patterns just downgradient from the GCS and some reversal of gradients in the vicinity of OW13-92 and OW14-92. Thus, some hydraulic capture is occurring and the GCS continues to function despite decreased flow volumes. In comparison to previous years, the hydraulic capture is much less pronounced. Figure 8 shows the groundwater contours from October 2001 and the fall 2016 monitoring event. As shown in the figure, the 2001 groundwater contours show a defined groundwater contour sump, which results from inward gradients created by the GCS. The change in groundwater flow patterns is a reflection of the large decline in flow into and through the GCS.

6. Conclusions and Recommendations

The following conclusions are provided based on the review of the GCS and LCS:

System and Maintenance Review

1. Both the GCS and LCS are designed to optimize the collection of groundwater and leachate respectively. The invert elevations of the GCS and LCS continue to be well below the respective water elevations and thus, operations should continue normally, provided maintenance is sufficient.
2. Regular, semi-annual maintenance appears sufficient in clearing precipitation, clogging, and buildup within the GCS and LCS; however, additional remediation maybe required.

Flow Rate Review

1. Decreased leachate production is expected following capping of the landfill. Final capping results in decreased precipitation infiltrating the landfill which in turn causes decreased leachate production. This should result in less flow through the LCS; however, this did not occur. Flow in 2016 increased dramatically.
2. The installation of the final cap should not significantly influence the flow into/through the GCS; however, flow rates have steadily declined since 2012.

Concentration Trend Review

1. Current leachate indicator parameter concentrations in the GCS and LCS are generally stable with some slight decreasing trends. Concentrations are expected to follow gradual decreasing trends following capping and subsequent aging of the waste.

2. Decreasing chloride concentrations at OW1-78, reported since 2014, are likely related to decreased leachate production and subsequent decreased contaminants entering the underlying aquifer. Concentrations are currently below the Reasonable Use Criteria.

Environmental and Water Elevation Review

1. There is some correlation between the amount of precipitation and overall groundwater elevations in the vicinity of the landfill footprint. Both demonstrate minor decreasing trends over the past nine years; however, decreases are insufficient to explain decreased GCS flow.
2. Groundwater elevations in the vicinity of the GCS remain well above the invert elevations as well as the high water level in the pump station thus, groundwater is available to flow into the GCS and declining flow rates are not related to groundwater elevations.
3. Groundwater contour maps show that the GCS continues to create a sump about the GCS. The sump is less pronounced during recent monitoring events in comparison to historic (1991).
4. Leachate elevations show recent increasing trends at two of the leachate monitoring locations. This increase may indicate increased leachate mounding within the landfill footprint. This is contrary to the completion of final capping and expected declines in leachate production.
5. The increasing trends in leachate at LW1 and LW2 correspond with increasing flow rates in the LCS.

In summary, environmental factors are not impacting flow into the GCS. Current geochemical trends show improvements in water quality; however, this is more likely related to installing the final cap as the effectiveness of the GCS is less pronounced. It is most likely that the progressive decline in flow through the GCS is related to fouling of the filter sock/perforated pipe.

Increased leachate mounding maybe the cause of increased flows in the LCS; however, leachate production is expected to stabilize with the placement of the final cap over the landfill footprint. Increased flow in the LCS also corresponds to the time-period when leachate was being hauled to the Site from the KWMC and thus, there may be some error in reporting the sources of flow through the LCS. There does not appear to be any flow issues within the LCS.

The 2016 analytical data (2016 Annual Monitoring Report - GHD, 2017) demonstrates that groundwater quality at the Site is in compliance with MOECC Reasonable Use Concentrations and thus, declining operations of the GCS is acceptable.

Based on the conclusions presented above, the following recommendations are provided:

- It is recommended that operation of the GCS continue as is. If improved operations are required in the future (due to future compliance issues), it is recommended that a downhole camera be used to visually inspect the underground portions of the GCS (i.e. the perforated collector pipe).
- Visual diagnostic information will allow for a focused remediation of the GCS. Additional recommendations for remediation will be made based on the results of the visual inspection. These

may include additional high-powered water scouring, scrubbing, bleaching and/or acid treatments, or replacing sections of the collector piping.

- It is recommended to continue operation of the LCS as is. If future monitoring shows significantly increased flow into the LCS from the ELA and/or increased leachate mounding, additional action may be required to prevent leachate seepage/leachate control. This may include decreasing the high water level in Pumphouse No. 2 that would increase flow through the system.

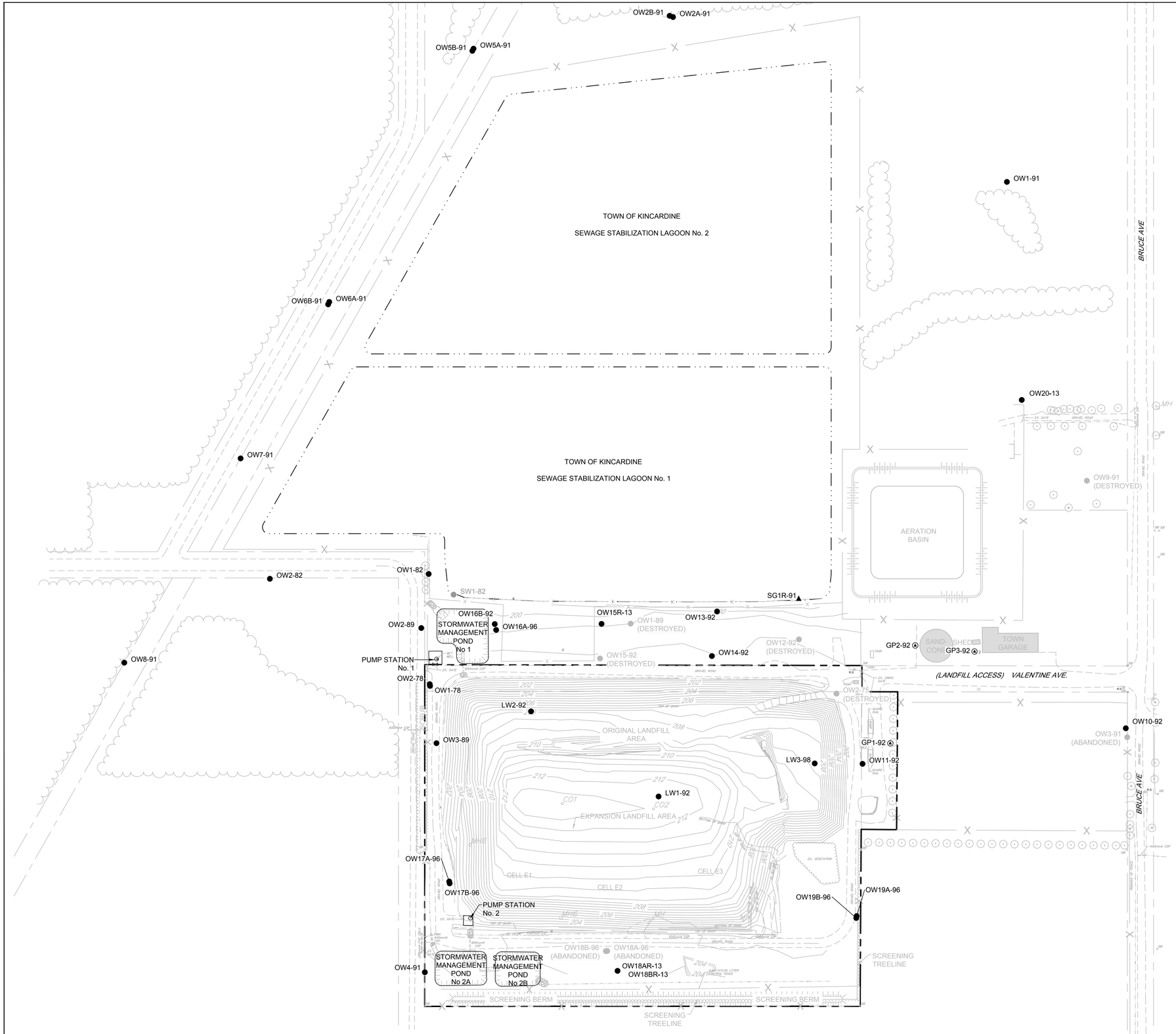
Sincerely,

GHD

James R. Yardley, P.Eng.

AM/mg/7

Encl.



LEGEND

- PROPERTY BOUNDARY (GENERAL)
- SITE PROPERTY BOUNDARY
- 200 — SEPTEMBER 2014 EXISTING GROUND CONTOUR
- EDGE OF GRAVEL
- EXISTING FENCE LINE
- EXISTING DITCH AND DIRECTION OF FLOW
- BOTTOM OF SLOPE / TOP OF SLOPE
- EXISTING TREELINE
- EXISTING TREE
- RIP RAP EROSION PROTECTION
- EXISTING BUILDING
- OW12-92 — OBSERVATION WELL
- OW15-92 (DESTROYED) — FORMER MONITORING LOCATION
- LW2-92 — LEACHATE WELL
- GP1-92 — GAS PROBE NEST
- SG1R-91 — STAFF GAUGE

GHD

0 15 30 45m

Client

MUNICIPALITY OF KINCARDINE

KINCARDINE WARD 1 LANDFILL SITE

Project

GROUNDWATER AND LEACHATE COLLECTION SYSTEMS REVIEW

No.	Issue	Drawn	Approved	Date
-	-	-	-	-

Drawn	K. DHALIWAL	Designer	NA
Drafting Check	A. MOLENHUIS	Design Check	NA
Project Manager	J. YARDLEY	Date	Sept. 15, 2017
This document shall not be used for construction unless signed and sealed for construction.		Scale	1:1500
Original Size	ANSI D	Bar is 20mm on original size drawing	0 — 20mm

Project No. **04074-15**

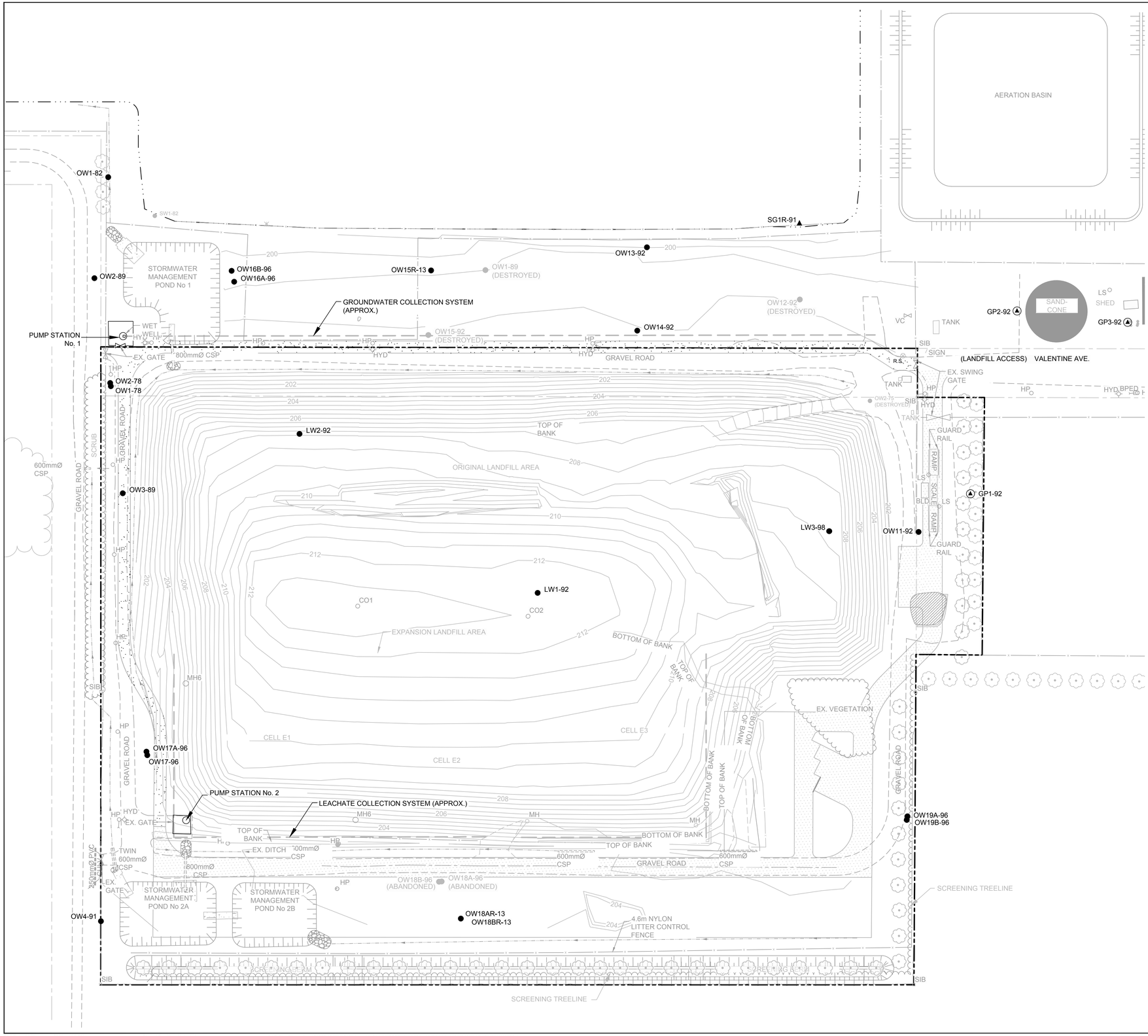
Title

MONITORING LOCATIONS

Sheet No.

FIGURE 1

Sheet 1 of 3



LEGEND

- PROPERTY BOUNDARY (GENERAL)
- SITE PROPERTY BOUNDARY
- 200 SEPTEMBER 2014 EXISTING GROUND CONTOUR
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- EXISTING TREE
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- OW12-92 OBSERVATION WELL
- OW15-92 (DESTROYED) FORMER MONITORING LOCATION
- LW2-92 LEACHATE WELL
- GP1-92 GAS PROBE NEST
- SG1R-91 STAFF GAUGE
- MH7 / CO2 EXISTING MANHOLE / EXISTING CLEANOUT
- SIB EXISTING BUILDING
- HP STANDARD IRON BAR
- HYD HYDRO POLE / HYDRANT

GHD

GHD

0 8 16 24m

Client
MUNICIPALITY OF KINCARDINE
KINCARDINE WARD 1 LANDFILL SITE

Project
GROUNDWATER AND LEACHATE COLLECTION SYSTEMS REVIEW

No.	Issue	Drawn	Approved	Date
-	-	-	-	-

Drawn	K. DHALIWAL	Designer	NA
Drafting Check	A. MOLENHUIS	Design Check	NA
Project Manager	J. YARDLEY	Date	SEPT. 15, 2017
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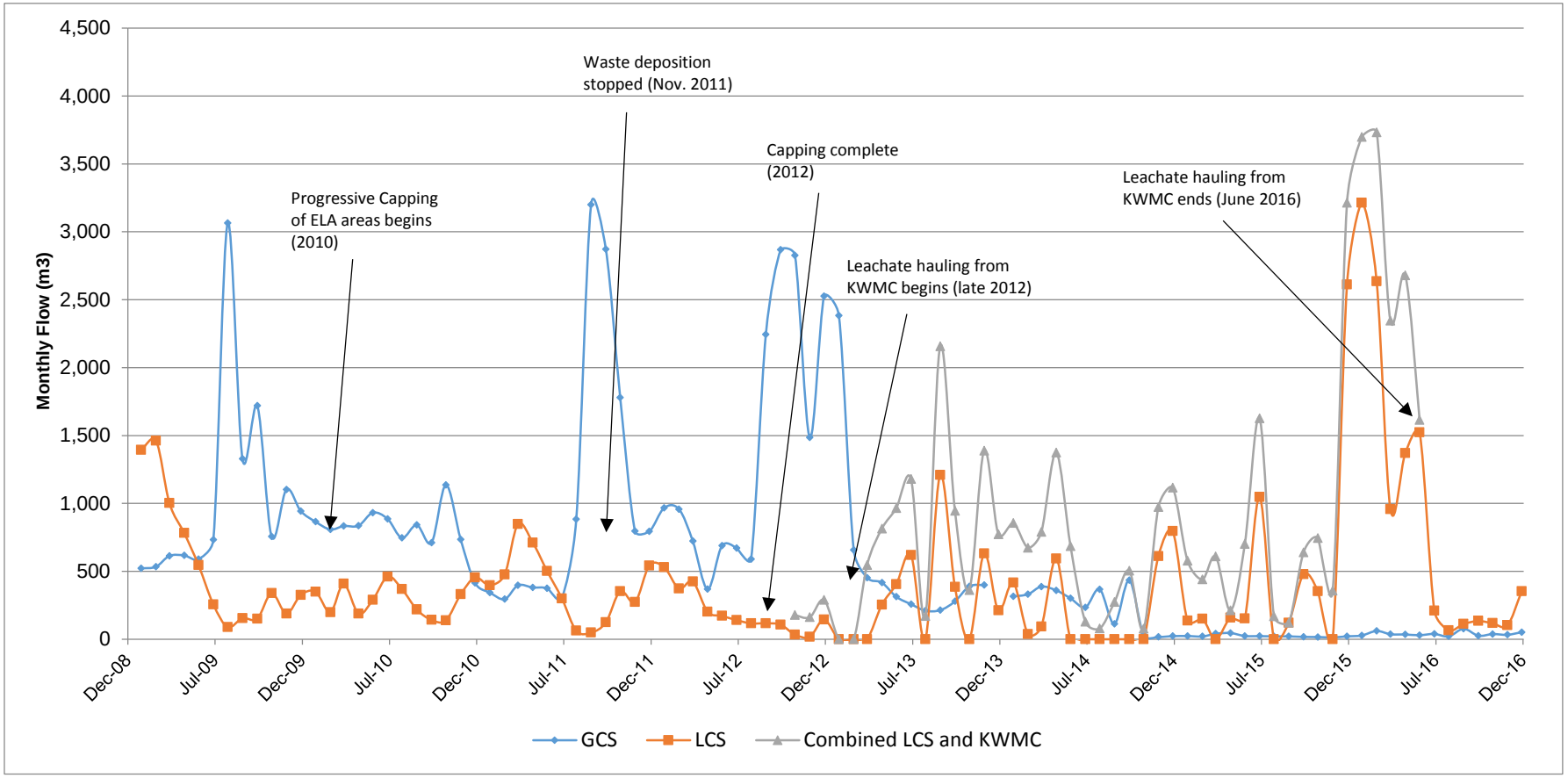
Original Size	ANSI D	Bar is 20mm on original size drawing	0 20mm

Project No. **04074-15**

Title
LANDFILL AREA

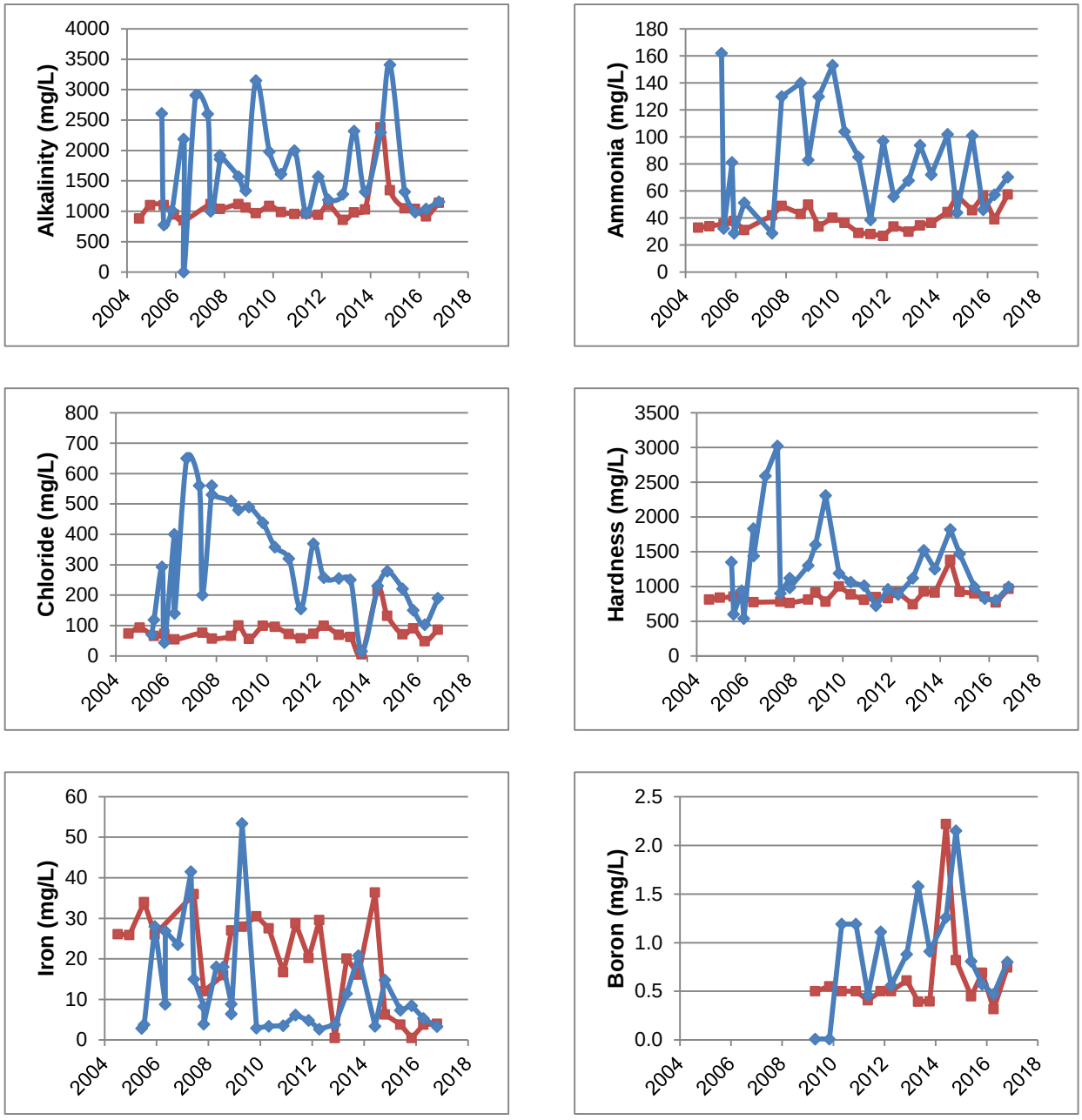
Sheet No.
FIGURE 2

Sheet **2** of **3**



Note:
The LCS is off during the hot summer periods
*monthly 2012 and 2013 flow from KWMC have been averaged using the annual total

figure 3
GCS & LCS Monthly Flow
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Municipality of Kincardine, Ontario

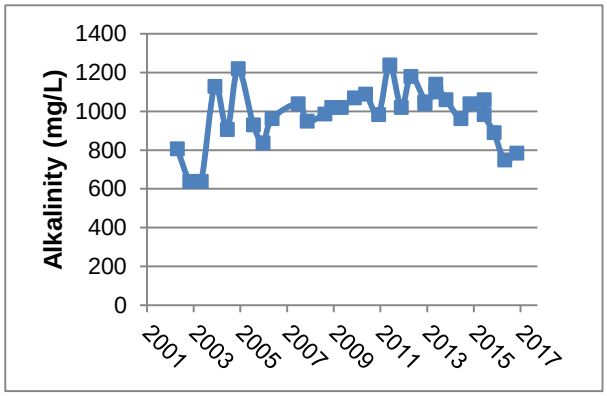


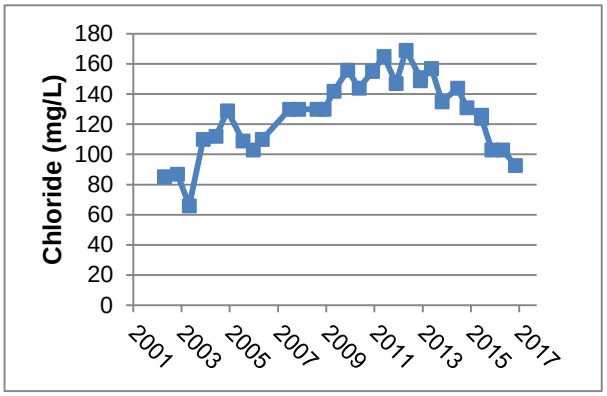
Notes:
Non-detects are shown as the full laboratory detection limit

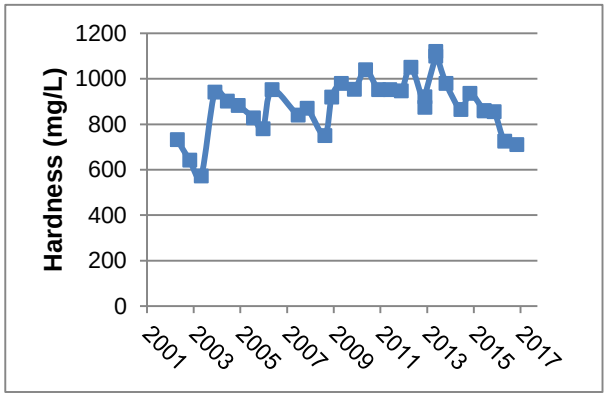
LCS

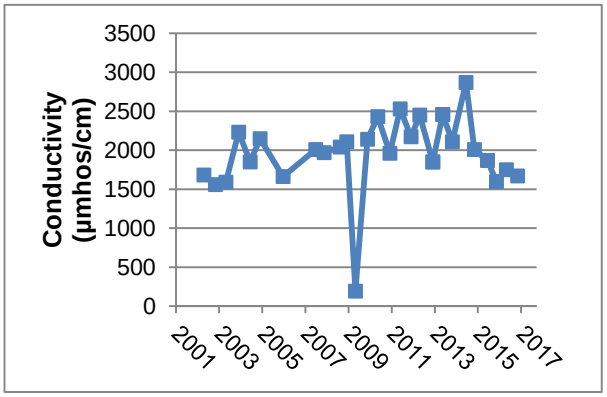
GCS

figure 4
Concentrations versus Time - GCS & LCS
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Municipality of Kincardine, Ontario



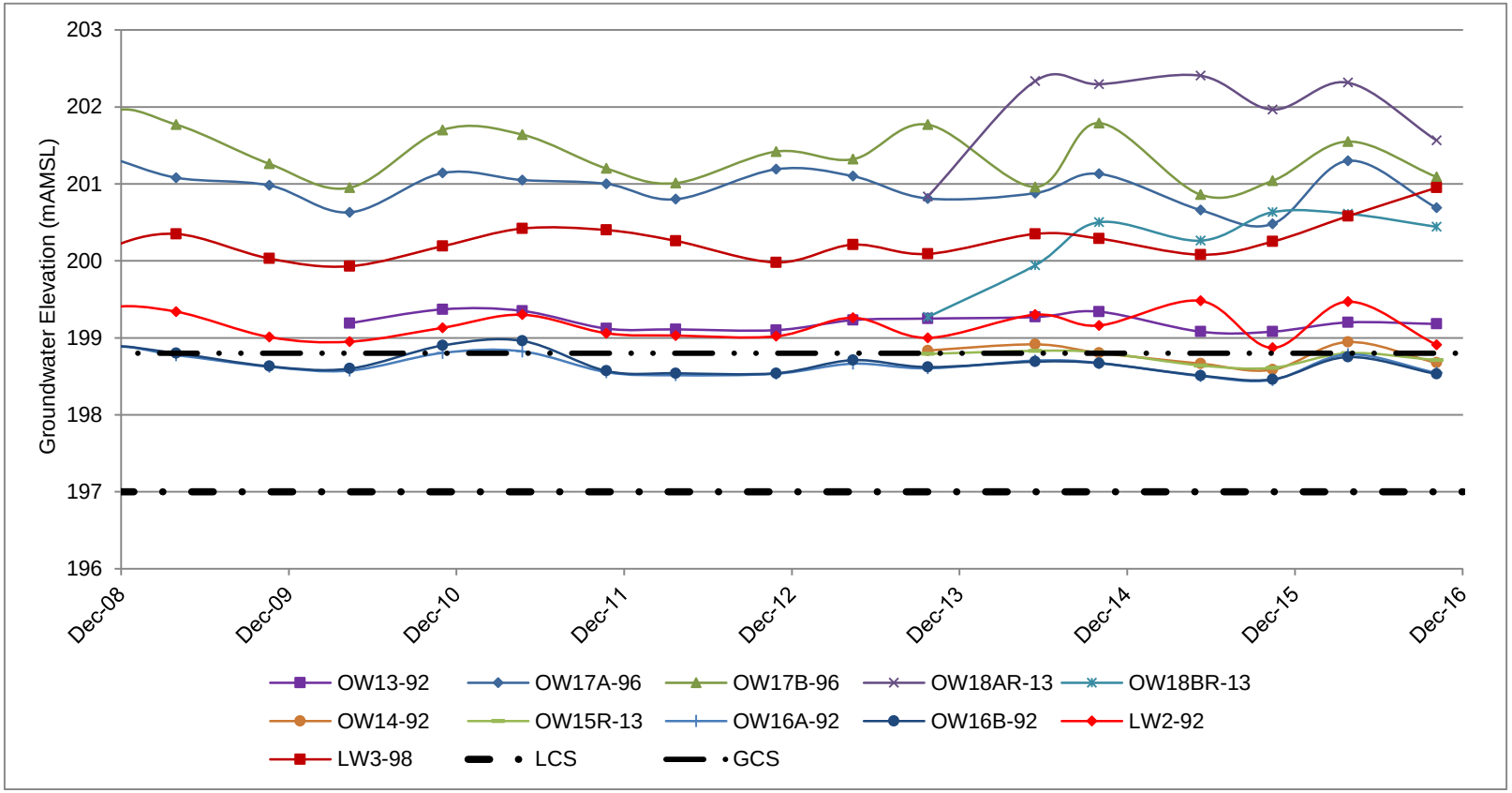






Notes:
Non-detects are shown as the full laboratory detection limit

figure 5
Concentrations versus Time - OW1-78
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Municipality of Kincardine, Ontario



Note:
LCS bottom (french drains 199.9 - 198.8 (mAMSL)
GCS bottom 196.5 - 197.5 (mAMSL)

figure 6
Hydrographs
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Municipality of Kincardine, Ontario

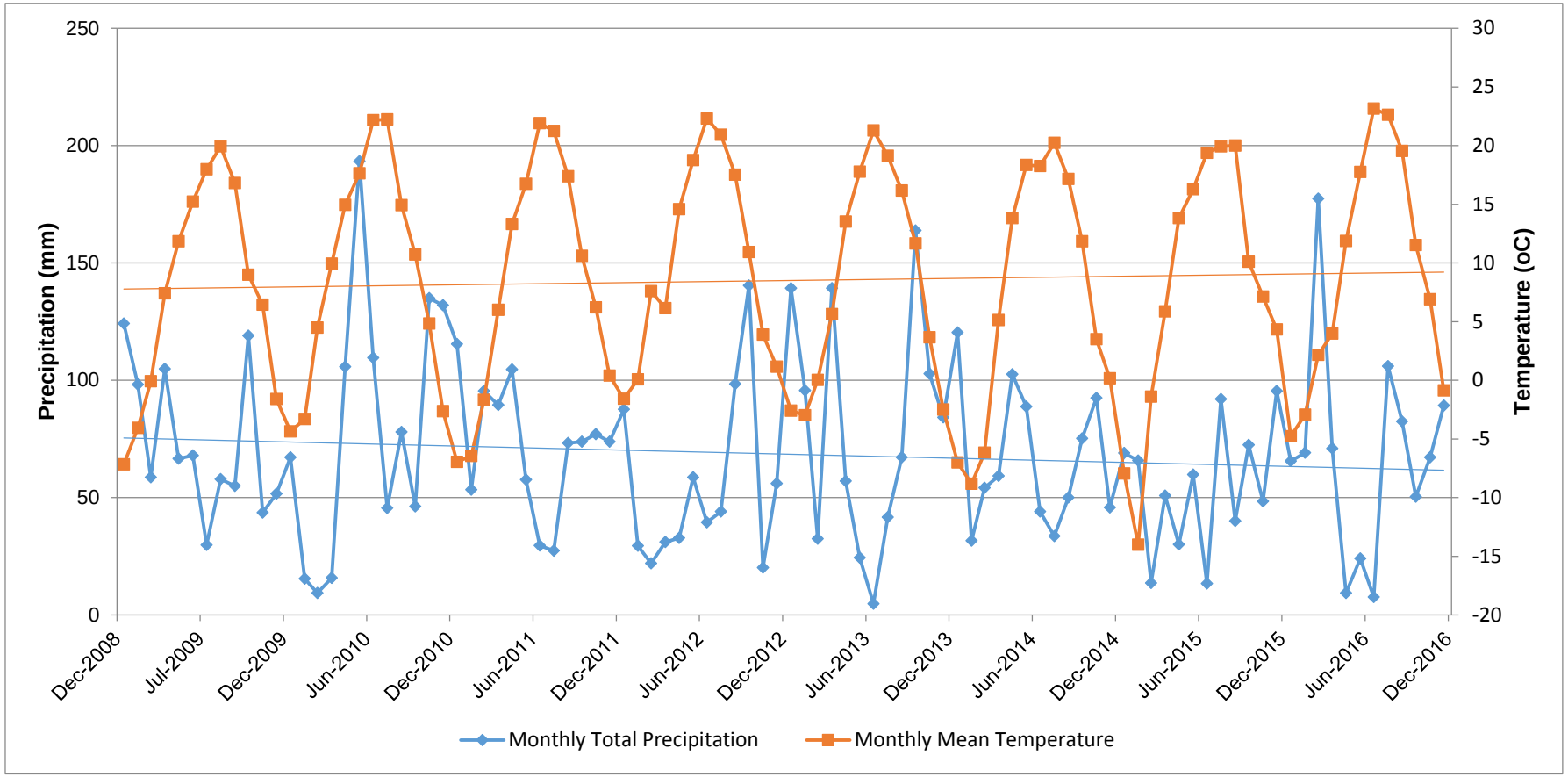
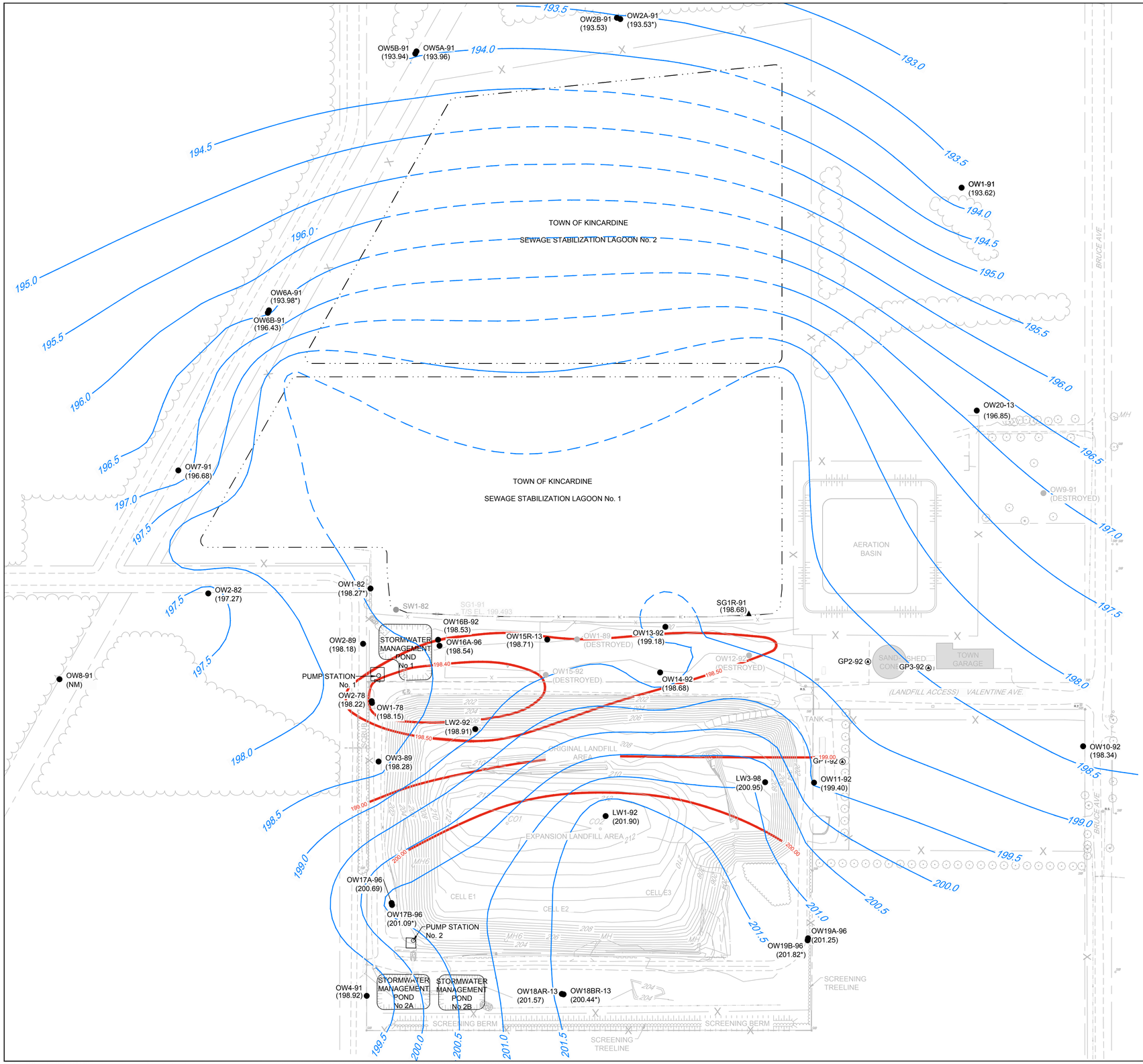


figure 7
Climate Data
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Municipality of Kincardine, Ontario



LEGEND

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- LW2-92 — LEACHATE WELL
- GP1-92 — GAS PROBE NEST
- SG1R-91 — STAFF GAUGE
- 199-01 — GROUNDWATER ELEVATION (m AMSL)
- * — NOT USED TO GENERATE CONTOURS
- NM — NOT MEASURED
- mbtbar — METRES BELOW TBAR
- 196.5 — 2016 GROUNDWATER ELEVATION CONTOUR (m AMSL)
- 196.5 — INFERRED 2016 GROUNDWATER ELEVATION CONTOUR (m AMSL)
- 198.50 — 2001 GROUNDWATER ELEVATION CONTOUR (m AMSL)

GHD
651 Colby Drive
Waterloo Ontario N2V 1C2 Canada
T 519 884 0510 F 519 884 0525 W www.ghd.com

0 15 30 45m

Client
MUNICIPALITY OF KINCARDINE
KINCARDINE WARD 1 LANDFILL SITE

Project
GROUNDWATER AND LEACHATE COLLECTION SYSTEMS REVIEW

No.	Issue	Drawn	Approved	Date

Drawn	K. DHALIWAL	Designer	NA
Drafting Check	A. MOLENHUIS	Design Check	NA
Project Manager	J. YARDLEY	Date	Nov 16, 2017
This document shall not be used for construction unless signed and sealed for construction.		Scale	1:1500
Original Size	ANSI D	Bar is 20mm on original size drawing	0 20mm

Project No. **04074-10**

Title
GROUNDWATER CONTOURS

Sheet No.
FIGURE 8

Sheet 3 of 3

Plot Date: 16 November 2017 - 11:04 AM
Plotted By: Allan Molenhuis
CAD File: P:\drawings\04000s\04074\04074-pres\04074-15(PRES001)\04074-15(PRES001)GN\04074-10(091)GN-WA003.dwg

Table 1.1

GCS Flow Rates
Ward 1 Landfill Site
Kincardine, Ontario

Year Month	Daily Average Pumping Hours (hr)	Average Daily Flow Rate (m^3/day)	Maximum Single Daily Flow Rate (m^3/day)	Total Flow (%)	Pumping Rate (L/s)	Pumping Rate (m^3/day)	Total Flow (m^3)
2009							
January	1.5	16.8	26.4	0	3.2	276.5	522
February	1.8	19.1	26.8	0	2.9	250.6	534
March	2.1	19.8	22.7	0	2.7	233.3	614
April	2.1	20.6	30.8	0	2.8	241.9	617
May	2.1	19.0	20.9	0	2.6	224.6	590
June	2.2	24.4	75.9	1	3.2	276.5	732
July	5.0	98.8	247.9	3	5.5	475.2	3,064
August	2.7	42.8	155.4	1	4.4	380.2	1,328
September	3.3	57.3	83.7	2	4.9	423.4	1,719
October	1.8	24.4	43.0	1	3.9	337.0	756
November	2.5	36.8	51.8	1	4.2	362.9	1,103
December	2.3	30.5	37.8	1	3.7	319.7	944
						2009 Total Flow (m^3)	12,523
2010							
January	2.33	27.9	31.3	1	3.3	285.1	865.1
February	2.5	28.87	31.3	1	3.2	276.5	808.3
March	2.6	26.9	45.4	1	2.9	250.6	833.8
April	2.85	27.87	31.6	1	2.7	233.3	836.1
May	2.7	30.1	79	1	3.1	267.8	932
June	2.7	29.5	37.3	1	3	259.2	885.7
July	2.38	24.07	30.85	1	2.8	241.9	746.1
August	27.2*	27.2	29.1	1	0.3*	25.9*	841.5
September	1.9	23.7	29.3	1	3.5	302.4	711.4
October	2.4	36.7	72.4	1	4.3	371.5	1136.4
November	1.6	24.5	75.3	1	4.3	371.5	733.9
December	0.98	13.39	21.2	0	3.8	328.3	415.1
						2010 Total Flow (m^3)	9,745
2011							
January	0.9	11.1	14.9	0	3.4	293.8	343.8
February	0.9	105	12.9	3	3.2	276.5	295.3
March	1.1	12.8	15.6	0	3.1	267.8	397.1
April	1.2	12.7	14.1	0	3	259.2	381.5
May	1.2	12.1	16.8	0	2.9	250.6	375.1
June	1	10.2	11.8	0	2.8	241.9	304.7
July	1.9	28.5	128.6	1	4.1	354.2	884.3
August	5.9	103.2	154.8	3	4.8	414.7	3199.6
September	5.4	95.7	113.4	3	4.9	423.4	2870.8
October	3.6	57.4	101.1	1	4.4	380.2	1779.3
November	2.3	26.6	29.4	1	3.2	276.5	797
December	2.4	25.6	30.8	0	2.9	250.6	794
						2011 Total Flow (m^3)	12,422

Table 1.1

GCS Flow Rates
Ward 1 Landfill Site
Kincardine, Ontario

Year Month	Daily Average Pumping Hours (hr)	Average Daily Flow Rate (m^3/day)	Maximum Single Daily Flow Rate (m^3/day)	Total Flow (%)	Pumping Rate (L/s)	Pumping Rate (m^3/day)	Total Flow (m^3)
2012							
January	3.01	31.18	38.4	1	2.9	250.6	966.8
February	3.43	33.02	36.5	1	2.7	233.3	957.7
March	2.7	23.31	31.9	1	2.4	207.4	722.8
April	1.72	12.28	16.3	0	2	172.8	368.4
May	2.72	22.19	33.6	1	2.3	198.7	688
June	2.27	22.39	27.93	1	2.7	233.3	671.7
July	1.88	18.99	21.25	1	2.8	241.9	588.7
August*	5	72.4	103.8	2	4	345.6	2244.6
September	6.16	95.58	107.83	3	4.3	371.5	2867.6
October	6.16	91.17	106.1	2	4.1	354.2	2826.5
November	3.11	50.91	172.45	1	4.6	397.4	1484.6
December	6.57	81.51	115.6	2	3.4	293.8	2527.1
						2012 Total Flow (m^3)	16,915
2013							
January	8.3	39.1	44.3	1.0	1.3	112.3	2382.9
February	13.3	40.4	44.4	1.0	0.8	69.1	656.8
March	15.6	28.5	38.3	1.0	0.5	43.2	453.4
April	2.2	9.1	0.0	0.0	1.1	95.0	417.1
May	2.5	50.1	76.8	1.0	5.6	483.8	313.1
June	1.7	22.4	30.2	1.0	3.7	319.7	258.0
July	1.5	16.7	24.1	0.0	3.1	267.8	210.8
August	1.3	14.6	16.2	0.0	3.1	267.8	213.9
September	1.5	16.7	21.1	1.0	3.1	267.8	279.0
October	1.6	12.6	18.4	0.0	2.2	190.1	389.5
November	8.4	13.3	20.1	0.0	0.4	34.6	399.0
December	-	-	-	-	-	-	-
						2013 Total Flow (m^3)	5,974
2014							
January	4.6	10.2	17.8	0.0	0.6	51.8	315.7
February	1.8	11.8	12.7	0.0	1.8	155.5	331.4
March	2.0	12.5	16.4	0.0	1.7	146.9	388.0
April	2.3	11.6	16.0	0.0	1.4	121.0	359.8
May	2.0	9.7	11.5	0.0	1.3	112.3	301.3
June	1.6	7.8	9.2	0.0	1.3	112.3	235.0
July	4.4	11.9	27.4	0.0	0.7	60.5	368.1
August	-	3.7	31.7	0.0	-	-	113.2
September	-	14.5	136.8	0.0	-	-	434.5
October	0.1	1.1	2.7	0.0	2.9	250.6	32.8
November	0.2	0.6	0.8	0.0	0.9	77.8	17.4
December	0.2	0.7	1.0	0.0	1.0	86.4	22.9
						2014 Total Flow (m^3)	2,920

Table 1.1

GCS Flow Rates
Ward 1 Landfill Site
Kincardine, Ontario

Year Month	Daily Average Pumping Hours (hr)	Average Daily Flow Rate (m^3/day)	Maximum Single Daily Flow Rate (m^3/day)	Total Flow (%)	Pumping Rate (L/s)	Pumping Rate (m^3/day)	Total Flow (m^3)
2015							
January	0.21	0.76	1.1	0	1.0	86.4	23.7
February	0.21	0.71	2.2	0	0.9	77.8	20.6
March	0.25	1.35	6.9	0	1.5	129.6	40.6
April	0.28	1.51	9.4	0	1.5	129.6	45.5
May	0.22	0.78	1.1	0	1.0	86.4	24.2
June	0.21	0.76	1	0	1.0	86.4	22.9
July	0.17	0.69	0.9	0	1.1	95.0	21.4
August	0.17	0.68	0.8	0	1.1	95.0	21.1
September	0.13	0.57	1.1	0	1.2	103.7	17.3
October	0.13	0.53	0.75	0	1.1	95.0	16.5
November	0.13	0.46	0.75	0	1.0	86.4	14.0
December	0.15	0.68	1	0	1.3	112.3	21.2
						2015 Total Flow (m^3)	290
2016							
January	-	-	-	-	-	-	28.0
February	-	-	-	-	-	-	61.0
March	-	-	-	-	-	-	37.0
April	-	-	-	-	-	-	35.0
May	-	-	-	-	-	-	30.0
June	-	-	-	-	-	-	39.0
July	-	-	-	-	-	-	21.0
August	-	-	-	-	-	-	77.0
September	-	-	-	-	-	-	26.0
October	-	-	-	-	-	-	38.0
November	-	-	-	-	-	-	33.0
December	-	-	-	-	-	-	52.0
						2016 Total Flow (m^3)	477

Table 1.2

LCS Flow Rates
Ward 1 Landfill Site
Kincardine, Ontario

Year / Month	Daily Average Pumping Hours (hr)	Average Daily Flow Rate (m^3/day)	Maximum Single Daily Flow Rate (m^3/day)	Total Flow (%)	Pumping Rate (L/s)	Pumping Rate (m^3/day)	Total Combined Flow (m^3)	Leachate from KWMC (m^3)	LCS Flow (m^3)
2009									
January	4.6	45.0	114	1	2.7	233.3	1,394.6	-	1,394.6
February	8.7	52.2	69.6	1	1.7	146.9	1,462.0	-	1,462.0
March	11.2	32.4	73.8	1	0.8	69.1	1,003.0	-	1,003.0
April	9.0	26.1	54.9	0	0.8	69.1	782.0	-	782.0
May	3.2	17.6	28.3	0	1.6	138.2	545.0	-	545.0
June	1.0	8.5	9.7	0	2.4	207.4	256.0	-	256.0
July	0.5	2.9	7.2	0	1.6	138.2	90.0	-	90.0
August	0.9	5.0	7.8	0	1.6	138.2	155.0	-	155.0
September	0.6	5.0	16.8	0	2.2	190.1	151.0	-	151.0
October	2.7	10.9	24.4	0	1.1	95.0	339.0	-	339.0
November	0.7	6.3	13.6	0	2.4	207.4	189.0	-	189.0
December	0.9	10.5	20.8	0	3.2	276.5	325.0	-	325.0
					2009 Total LCS Flow (m^3)		6,691.6	-	6,691.6
2010									
January	1.01	11.28	27.7	0	3.1	267.8	349.8	-	349.8
February	0.55	7.11	8.33	0	3.6	311.0	199.1	-	199.1
March	1.1	13.2	23.65	0	3.3	285.1	407.9	-	407.9
April	0.57	6.3	7.64	0	3.1	267.8	189.0	-	189.0
May	1.2	9.4	16.23	0	2.2	190.1	290.2	-	290.2
June	2.2	15.4	29.07	0	1.9	164.2	460.9	-	460.9
July	3.37	11.92	26	0	1	86.4	369.4	-	369.4
August	7.07	7.1	10.4	0	0.3	25.9	219.1	-	219.1
September	1.2	4.8	7.05	0	1.1	95.0	142.4	-	142.4
October	0.9	4.5	5.7	0	1.4	121.0	139.1	-	139.1
November	2.3	11.0	29.5	0	1.3	112.3	330.7	-	330.7
December	1.83	14.7	113.8	0	2.2	190.1	454.1	-	454.1
					2010 Total LCS Flow (m^3)		3,551.7	-	3,551.7
2011									
January	1.3	12.8	33.5	0	2.7	233.3	397.4	-	397.4
February	2.1	17	44.4	0	2.3	198.7	475.7	-	475.7
March	4.3	27.4	61.3	0	1.8	155.5	848.3	-	848.3
April	4.7	23.7	36.3	0	1.4	121.0	710.7	-	710.7
May	3.5	16.2	26.8	0	1.3	112.3	501.3	-	501.3
June	2.1	10	14.6	0	1.4	121.0	299.6	-	299.6
July	0.8	10.5	16.4	0	3.5	302.4	62.7	-	62.7
August	6.2	5.5	7.4	0	0.2	17.3	49.3	-	49.3
September	1.1	4.1	6.8	0	1	86.4	124.4	-	124.4
October	3.4	11.4	30.6	0	0.9	77.8	353.8	-	353.8
November	2.6	9.1	33.3	0	1	86.4	273.0	-	273.0
December	4.8	17.5	29.6	0	1	86.4	542.7	-	542.7
					2011 Total LCS Flow (m^3)		4,638.9	-	4,638.9

Table 1.2

LCS Flow Rates
Ward 1 Landfill Site
Kincardine, Ontario

Year / Month	Daily Average Pumping Hours (hr)	Average Daily Flow Rate (m^3/day)	Maximum Single Daily Flow Rate (m^3/day)	Total Flow (%)	Pumping Rate (L/s)	Pumping Rate (m^3/day)	Total Combined Flow (m^3)	Leachate from KWMC (m^3)	LCS Flow (m^3)
2012									
January	6.54	17.1	28.85	0	0.7	60.5	530.4	-	530.4
February	6.1	12.85	21.45	0	0.6	51.8	372.7	-	372.7
March	5.89	13.7	20.6	0	0.6	51.8	424.8	-	424.8
April	1.99	6.75	8.1	0	0.9	77.8	202.6	-	202.6
May	1.61	5.56	6.33	0	1	86.4	172.5	-	172.5
June	1.26	4.68	5.16	0	1	86.4	140.5	-	140.5
July	1.47	3.76	4.53	0	0.7	60.5	116.6	-	116.6
August*	1.33	3.79	4.9	0	0.8	69.1	117.7	-	117.7
September	1.08	3.58	3.93	0	0.9	77.8	107.4	-	107.4
October	1.9	5.76	17.3	0	0.8	69.1	178.6	144.0	34.6
November	2.27	5.4	12.7	0	0.7	60.5	161.9	144.0	17.9
December	3.78	9.32	6.75	0	0.7	60.5	289.0	144.0	145.0
					2012 Total LCS Flow (m^3)		2,814.7	432.0	2,382.7
2013									
January	0.4	5.7	5.0	0.0	4	345.6	0.0	0.0	0.0
February	0.8	9.8	20.9	0.0	3.4	293.8	0.0	0.0	0.0
March	0.3	3.7	4.9	0.0	3.4	293.8	545.6	559.6	0.0
April	0.4	4.4	7.0	0.0	3.1	267.8	814.3	559.6	254.7
May	2.5	3	3.2	0.0	0.3	25.9	964.1	559.6	404.5
June	0.2	2.4	4.0	0.0	3.3	285.1	1,179.0	559.6	619.4
July	0.3	1.9	3.4	0.0	2.1	181.4	170.5	559.6	0.0
August	0.1	1.7	1.7	0.0	4.6	397.4	2,157.6	559.6	1,598.0
September	0.1	1.8	3.0	0.0	5.0	432.0	945.0	559.6	385.4
October	7.9	11.7	49.7	0.0	0.4	34.6	361.2	559.6	0.0
November	8.3	46.3	164.7	1.0	1.6	138.2	1,389.0	559.6	829.4
December	5.1	24.9	41.8	0.0	1.4	121.0	771.9	559.6	212.3
					2013 Total LCS Flow (m^3)		9,298.2	5,596.0	4,303.7
2014									
January	4.3	27.6	77.4	1.0	1.8	155.5	855.6	439.3	416.3
February	6.1	24.1	58.00	1.0	1.1	95.0	674.0	637.5	36.5
March	8.3	25.5	57.20	1.0	0.9	77.8	791.2	698.3	92.9
April	13.7	45.8	133.95	1.0	0.9	77.8	1,373.9	779.7	594.2
May	18.9	22.1	150.20	0.0	0.3	25.9	685.1	824.3	0.0
June	22.9	4.3	44.1	0.0	0.1	8.6	128.9	763.3	0.0
July	16.9	2.5	6.3	0.0	-	-	78.3	427.8	0.0
August	8.3	8.8	29.2	0.0	0.3	25.9	272.9	454.6	0.0
September	20.6	16.8	120.95	0.0	0.2	17.3	504.6	608.0	0.0
October	20.4	2.5	21.7	0.0	-	-	76.9	550.4	0.0
November	1.9	32.4	445.6	1.0	4.7	406.1	972.4	360.5	611.9
December	1.8	36.0	164.56	1.0	5.7	492.5	1,116.5	319.5	797.0
					2014 Total LCS Flow (m^3)		7,530.3	6,863.1	2,548.8

Table 1.2

LCS Flow Rates
Ward 1 Landfill Site
Kincardine, Ontario

Year / Month	Daily Average Pumping Hours (hr)	Average Daily Flow Rate (m^3/day)	Maximum Single Daily Flow Rate (m^3/day)	Total Flow (%)	Pumping Rate (L/s)	Pumping Rate (m^3/day)	Total Combined Flow (m^3)	Leachate from KWMC (m^3)	LCS Flow (m^3)
2015									
January	1.39	18.65	68.5	1	3.7	319.7	578.3	441.8	136.5
February	1.20	15.18	47	1	3.5	302.4	440.5	289.3	151.2
March	0.98	20.28	148.6	0	5.8	501.1	608.6	624.0	0.0
April	1.85	42.44	51.85	1	6.4	553.0	212.2	53.4	158.8
May	2.67	22.6	59.95	1	2.4	207.4	700.6	548.0	152.6
June	1.93	54.22	143.95	1	7.8	673.9	1,626.6	579.5	1,047.1
July	0.42	5.41	25.03	0	3.6	311.0	168.0	183.1	0.0
August	0.38	3.88	10.8	0	2.8	241.9	120.5	0.0	120.5
September	0.62	21.33	158.65	1	9.6	829.4	640.1	161.5	478.6
October	0.89	24.04	99.7	1	7.5	648.0	745.5	392.8	352.7
November	0.86	11.89	39.7	0	3.8	328.3	356.7	405.0	0.0
December	1.94	103.68	690.8	3	14.9	1287.4	3,214.2	602.6	2,611.6
					2015 Total LCS Flow (m^3)		9,411.8	4,281.2	5,209.5
2016									
January	-	-	-	-	-	-	3,699.0	486.5	3,212.5
February	-	-	-	-	-	-	3,732.0	638.1	3,093.9
March	-	-	-	-	-	-	2,345.0	581.6	1,763.4
April	-	-	-	-	-	-	2,680.0	615.9	2,064.1
May	-	-	-	-	-	-	1,615.0	91.8	1,523.2
June	-	-	-	-	-	-	210.0	-	210.0
July	-	-	-	-	-	-	66.0	-	66.0
August	-	-	-	-	-	-	112.0	-	112.0
September	-	-	-	-	-	-	134.0	-	134.0
October	-	-	-	-	-	-	118.0	-	118.0
November	-	-	-	-	-	-	103.0	-	103.0
December	-	-	-	-	-	-	354.0	-	354.0
					2016 Total LCS Flow (m^3)		15,168.0	2,413.9	12,754.1

Attachment A
Maintenance Programs

GCS Annual Maintenance Program
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Kincardine, Ontario

Item	Frequency	Maintenance Activity
A. COLLECTION SYSTEM		
1. 200 mm Ø Perforated DR26 HDPE Collector Pipe (MH1-MH4)	Semi-Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
2. 200 mm Ø DR26 HDPE Collector Pipe (Wet Well -MH1)	Semi-Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
3. 1200 mm Ø Manholes	Semi-Annual	• Remove sediment/precipitate from manhole sumps/ benching with vacuum truck. • Inspect condition of benching, rungs, parging and frame and cover and clean/repair as required.
B. PUMP STATION No 1		
1. 1500 mm Ø Wet Well	Semi-Annual	• Remove sediment/ precipitate from wet well sump with vacuum truck. • Inspect condition of rungs, access hatch, exit pole and lifting davit and clean/repair as required.
2. 75 mm Ø Flanged PVC Gate Valves (Series CGA)	Semi-Annual	• Close and open gate valves to ensure proper operation of valve disc and stem extension and clean/repair as required.
3. 75 mm Ø Threaded PVC Elastomeric Check Valve (Series 2633)	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate buildup, and clean/repair as required.
4. 75 mm Ø Sch. 80 PVC Discharge Pipe	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove precipitate buildup on interior wall of pipe using a combination of swabbing and pigging, as required, with rodding.
5. 3HP Submersible Pump (Model No. 3RHX 30M2-21-25)	Daily	• Inspect seal leak warning light.
	Semi-Annual (1st year of operation only)	• Remove pump and inspect condition of volute case/impeller and clean/repair as required. • Clean volute air hole vent as required. • Ensure pump is securely seated in discharge base to provide leak proof seal.
	Not Applicable	• Subsequent to first year of operation maintain pump only as required by activation of seal leak warning light.
	Not Applicable	• Maintain on hand one (1) spare tungsten-carbide lower mechanical seal with stainless steel spring and viton o-rings/elastomers.

GCS Annual Maintenance Program
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Kincardine, Ontario

Item	Frequency	Maintenance Activity
C. FORCEMAIN		
1. 75 mm Ø DR17 HDPE Forcemain	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove precipitate buildup on interior walls of forcemain using a combination of swabbing and pigging, as required, with high pressure flushing.
D. VALVE CHAMBER		
1. 1500 mm Ø Chamber	Semi-Annual	• Inspect condition of rungs, parging and frame and cover and clean/repair as required.
2. 75 mm Ø Flanged Cast Iron Gate Valve (Series 421A)	Semi-Annual	• Close and open gate valve to ensure proper operation of valve disc and stem and clean/repair as required.
3. 75 mm Ø Flanged PVC Cast Iron Elastomeric Check Valve (Series 33)	Annually or when pumping rate decreases to 33% (approximately 25 USgpm) of design flow (approximately 75 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate building, and clean/repair as required.

Note:

Annual maintenance program will be reviewed and updated, from time to time, based on observations of the Groundwater Collection System's performance under continued operation.

LCS Annual Maintenace Program
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Kincardine, Ontario

Item		Frequency	Maintenance Activity
A.	**COLLECTION SYSTEM**		
1.	200 mm Ø Perforated DR26 HDPE Header Pipe (Wet Well - MH6)	Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
2.	150 mm Ø Perforated DR26 HDPE Collector Pipe (Wet Well - MH5 and MH6-CO1)	Annual	• Remove sediment/precipitate from pipe using high pressure flushing.
3.	1200 mm Ø Manholes	Annual	• Remove sediment/precipitate from manhole sumps/ benching with vacuum truck. • Inspect condition of benching, rungs, parging and frame and cover and clean/repair as required.
B.	**PUMP STATION No.2**		
1.	1500 mm Ø Wet Well	Annual	• Remove sediment/ precipitate from wet well sump with vacuum truck. • Inspect condition of rungs, access hatch, exit pole and lifting davit and clean/repair as required.
2.	75 mm Ø Flanged PVC Gate Valves (Series CGA)	Annual	• Close and open gate valves to ensure proper operation of valve disc and stem extension and clean/repair as required.
3.	75 mm Ø Threaded PVC Elastomeric Check Valve (Series 2633)	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate buildup, and clean/repair as required.
4.	75 mm Ø Sch. 80 PVC Discharge Pipe	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove precipitate buildup on interior wall of pipe using a combination of swabbing and pigging, as required, with rodding.
5.	3HP Submersible Pump (Model No. 3RHX 30M2-21-25)	Daily	• Inspect seal leak warning light.
		Annual (1st year of operation only)	• Remove pump and inspect condition of volute case/impeller and clean/repair as required. • Clean volute air hole vent as required. • Ensure pump is securely seated in discharge base to provide leak proof seal.
		Not Applicable	• Subsequent to first year of operation maintain pump only as required by activation of seal leak warning light.
		Not Applicable	• Maintain on hand one (1) spare tungsten-carbide lower mechanical seal with stainless steel spring and viton o-rings/elastomers.

LCS Annual Maintenace Program
Groundwater and Leachate Collection Systems Review
Ward 1 Landfill Site
Kincardine, Ontario

Item	Frequency	Maintenance Activity
C. FORCEMAIN		
1. 75 mm Ø DR17 HDPE Forcemain	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove precipitate buildup on interior walls of forcemain using a combination of swabbing and pigging, as required, with high pressure flushing.
D. VALVE CHAMBER		
1. 1500 mm Ø Chamber	Annual	• Inspect condition of rungs, parging and frame and cover and clean/repair as required.
2. 75 mm Ø Flanged Cast Iron Gate Valve (Series 421A)	Annual	• Close and open gate valve to ensure proper operation of valve disc and stem and clean/repair as required.
3. 75 mm Ø Flanged PVC Cast Iron Elastomeric Check Valve (Series 33)	Annually or when pumping rate decreases to 33% (approximately 20 USgpm) of design flow (approximately 65 USgpm)	• Remove valve and inspect condition of sleeve and body, and for precipitate building, and clean/repair as required.

Note:

Annual maintenance program will be reviewed and updated, from time to time, based on observations of the Leachate Collection System's performance under continued operation.

Appendix H

Waste Water Treatment Plant 2023 Annual Performance Report

KINCARDINE WASTEWATER TREATMENT AND COLLECTION SYSTEM

Annual Performance Report 2023

Municipality of Kincardine, Environmental Services

THE MUNICIPALITY OF KINCARDINE

Table of Contents

Appendices

1.0 Introduction

The Kincardine Wastewater Treatment System has an Environmental Compliance Approval (ECA) #A-500-1121679176 that was issued on February 11, 2022. Section 11 (4) of the ECA requires that an Annual Performance Report is prepared and outlines the information that must be contained within it.

The Kincardine Wastewater Collection system falls within the Municipal Sewage Collection System ECA 088-W601 issued on November 10, 2022. Schedule E Section 4.6 of the ECA required that an Annual Performance Report is prepared and outlines the information that must be contained within it.

This report covers the requirements of both the treatment system and the collection system ECA's. A copy of both ECA's are available in Appendix A.

The Kincardine Wastewater Treatment Plant is classified as a class II Treatment facility and is located at 520 Bruce Avenue in Kincardine. The plant consists of an aerated lagoon cell with a hybrid coarse/fine bubble submerged air diffuser system, and two conventional stabilization ponds. Alum is added to the aerated cell discharge before the stabilization ponds to aid in phosphorous removal. Treated sewage leaving the lagoon ponds flows by gravity over to the Effluent station located at 169 Mahood Johnston Drive in Kincardine. The effluent is disinfected year-round by ultraviolet radiation before being discharged to Lake Huron. A schematic of the overall treatment system is available in Appendix B.

The Kincardine sewage collection system is a class II Wastewater collection system that services the town of Kincardine including the West Ridge on the Lake Development north of the Huron Ridge subdivision and the Huronville subdivision in Huron Kinloss south of Saratoga Road. The system consists of approximately 61 kilometers of gravity sewermain, 12 kilometers of pressurized sewermains, 11 pumping stations and services approximately 3939 properties. The collection system leads to the Kincardine Lagoons located at 520 Bruce Ave, Kincardine. A map of the collection system is available in Appendix B

2.0 Monitoring Data

Operations staff collected biweekly grab samples of raw sewage, final effluent sewage, as well as semi-annual samples as required by the ECA. All samples were submitted to SGS Environmental Services for analysis. The analytical results of the biweekly sampling are tracked in monthly spreadsheets and then summarized in an annual spreadsheet. All semi-annual chemical results were within the Provincial Water Quality Objectives with the exception of aluminum which exceeded the limits.

On April 12 and 27 extra TSS samples were taken to lower the monthly average results as the April 4 result was high. On September 19 the E. coli could not be processed as it was over the holding time when received at the lab so a resample was taken and shipped on September 22.

Acute Lethality testing is performed on an annual basis to ensure compliance with the federal regulations for Effluent Regulatory Reporting. These samples are sent to Nautilus Environmental Company Inc. for the analysis of fish mortality.

Monitoring results are included in Appendix C along with the full monitoring schedule for 2023 and 2024.

2.1 Influent Data

The raw flows coming into the plant are recorded with an Influent Flow meter. Influent flows from the Groundwater and Leachate pumping stations at the neighbouring decommissioned Valentine Avenue Landfill site are added manually to the total influent flow for the plant as the flows do not pass through the Influent flow meter. The influent flows are suspected to be under the influence of inflow and infiltration which is discussed further in section 2.3 Design Objectives. Charts comparing Influent flows for the past 5 years as well as the 2023 Influent Flows vs precipitation are available in Appendix D.

Table 1 summarizes the influent flows at the lagoon as well as the contributing collection system flows. There are 11 pumping station in total, but the smaller stations direct the sewage through the larger ones. Only the pump stations with direct forcemains to the lagoons are listed. The Huron Terrace pump station has a new flowmeter installed to

capture flows. The other pumping stations do not have flow meters. The flows are measured using the liquid pumped with a reference to the material level on the milltronics units. Debris floating around may cause false reading levels. The milltronics units were verified for accuracy in June 2023 but had not been verified in 2022. The Influent flow meter at the Kincardine Wastewater Treatment Plant has been calibrated by a third party on an annual basis however could still have varying accuracy ranging from 0.1% to 5%.

Table 1 KWW Lagoon and Collection System Flows

	Average Flow (m^3/d)	**Maximum Flow (m^3/d)**	**Total Flow (m^3)**
Huron Terrace Pump Station	2,496	8,014	854,559
Goderich St Pump Station	365	631	133,845
Park St Pump Station	930	3,516	339,301
Kincardine Ave Pump Station	339	1,560	123,387
Leachate 140 Valentine Ave	15	201	3,151
Groundwater 140 Valentine Ave	4	13	1,473
Total metered sewage from collection system			1,455,716
Influent Flow			1,402,103
Effluent Flow			1,073,681

2.2 Groundwater, Leachate and Imported Septage

There was no imported septage waste accepted by the municipality in 2023.

The current ECA has a Design Objective (Section 6) which outlines groundwater and leachate flow limits from the decommissioned Valentine Avenue Landfill. A flow of approximately 200 m3/d of Groundwater and 63 m3/d of combined Leachate flow (approximately 30m3/d from the valentine Avenue Landfill and approximately 33 m3/d from the Kincardine Waste Management Center) is permitted. Both the groundwater and leachate are pumped via a 75mm forcemain from the Valentine Ave site directly into the aerated cell. From January 1 to February 8, 2023, the Leachate pump was out of service. Bluewater Sanitation hauled loads of leachate from the Valentine Avenue pump station to the aerated cell on an as needed basis during this time. A new pump was installed in the Leachate PS on February 8, 2023. Since the chamber was backed up with leachate from the pump being out of service, the new pump was run in hand multiple times per week from February to mid June to attempt to pump the chamber down but keep the daily flow below the limit of 30m3/d. There were multiple instances between March and June where the pump was left in hand too long and the flows exceeded the daily limit of 30m3/d for the Valentine Ave site but did not exceed the total limit of 63m3/d. The pump was placed back in auto on June 18. There were 5 daily exceedances from June to December which correlate with heavy precipitation days. Table 2 shows a listing of the days with leachate exceedances and the amounts. Table 3 below gives a monthly summary of the groundwater and leachate flows.

Table 2 Leachate Exceedances

Date of Exceedance	Leachate Flow m3
March 13	134.1
March 14	69.6
March 22	38.6
March 27	36.2
March 28	40.3
April 6	200.6
May 8	31.2
May 14	33.3
May 28	32.3
September 15	40.9
September 16	40.9
September 17	40.9
December 27	52.5
December 28	52.5

Note: On the days when the 30m3/day was exceeded from the valentine Ave PS, there was no leachate transferred from the KWMC. The total leachate amount of 63m3/day was only exceeded on 3 dates above.

Table 3 Groundwater, Leachate and Imported Septage

Month	Groundwater Total m3	Leachate Total Valentine Ave m3	Leachate Total KWMC m3	Imported Septage m3
January	167.3	177.3	105	0
February	152.7	156.6	0	0
March	172.7	643.7	0	0
April	108.5	401.5	0	0
May	91.3	332.7	0	0
June	76.8	258.7	0	0
July	114.4	134.4	0	0
August	110.6	120.2	0	0
September	103.3	198.2	0	0
October	113.7	103.7	0	0
November	116.9	224.7	0	0
December	144.7	596.7	0	0
Totals	1472.9	3151.1	105	0

Table 4 below shows the groundwater and leachate flows for the past 5 years.

Table 4 Groundwater and Leachate Flows

		2019	**2020**	**2021**	**2022**	**2023**
Groundwater (max = 200 m^3/d)	Annual average flow (m^3/d)	2.2	2.1	2.6	3.4	4.0
	Total Annual flow (m^3)	816	783	931	1,241	1,473
Leachate (Valentine Ave max = 30 m^3/d) (KWMC max = 33 m^3/d)	Annual average flow (m^3/d)	14.6	14.2	11.9	29.7	9.2
	Total Annual flow (m^3)	5,325	5,178	4,329	1,040	3,348

Note: From January 2022 to February 2023 the Leachate pump was out of service and the chamber was only pumped out as needed.

Municipal staff in conjunction with GHD Engineering, collected leachate and groundwater samples so that leachate testing was completed four times per year and

groundwater testing twice per year. Appendix E contains the results for the leachate samples that were collected by the Municipality of Kincardine. GHD Engineering has been contracted by the municipality to monitor the Valentine landfill site and prepare a separate annual report on their findings. Please refer to the Ward 1 Valentine Avenue report for detailed information on the landfill's collection system.

2.3 Design Objectives

The design capacity for the plant is 5910 m3/day. Table 5 shows precipitation and flow data monthly for 2023. The months with design exceedances correlate with snow melt and heavy precipitation events.

Table 5 Design Capacity

Month	Influent Flow Total m3	Precipitation mm	Design Capacity 5910 m3/day	Design exceedances (# of days)	Effluent Flow Total m3
January	132,898	32	73%	4	92,746
February	119,807	32	72%	3	97,056
March	131,268	60	72%	3	109,355
April	149,103	104	84%	5	133,481
May	118,944	57	65%	1	85,894
June	97,571	38	55%	0	64,393
July	109,820	129	60%	0	90,100
August	108,906	110	59%	0	87,608
September	91,168	23	51%	0	57,463
October	104,928	75	57%	0	78,145
November	110,169	48	62%	0	89,836
December	127,519	59	70%	1	87,604
Totals	1,402,103	765	65%	17	1,073,681

Table 6 compares the precipitation and flow data over the past 5 years. The lagoon system is at approximately 65% capacity and is under the influence of inflow and infiltration.

Table 6 Flow vs Precipitation

	2019	2020	2021	2022	2023
Annual Influent Flow (m^3)	1,382,344	1,372,688	1,441,167	1,350,495	1,402,103
Overall Percentage of Influent Design Capacity	64%	63%	67%	63%	65%
Design Capacity Exceedances (days)	15	12	22	13	17
Annual Effluent Flow (m3)	1,135,261	1,108,680	1,136,733	998,846	1,073,681
Precipitation (mm)	709	444	375	582	765
Kincardine Drinking Water Produced (m^3) (*Adjusted)	1,072,574	1,130,119	1,410,221	1,205,253*	1,090,896
% Increase- KWTP water produced vs KWWTP Influent Flow	27%	23%	7%	11%	23%

In 2022 the KWTP was shut down for repairs in May and October-November, estimated flows supplied to distribution system by Huron Kinloss were included in total flows. Also removed average volumes for Routes 30, 32 (area north of Huron Ridge) and Inverhuron Park as they are not serviced by the Kincardine Wastewater System.

2.4 Effluent Data

Tables 7 and 8 compare the Final Effluent average quality to the effluent criteria limits in the ECA. The CBOD exceeded the objective in April but not the monthly average limit. The Total Suspended Solids exceeded the objective in April and September and November but there was no exceedance of the monthly average limit.

Table 7 Final Effluent Waste Loading

Monthly Averages	**CBOD5**	**Total Suspended Solids**	**Total Phosphorus**
Limits	177.0 kg/D	236.0 kg/D	5.9 kg/D
January	43	52	0.8
February	49	62	0.8
March	72	90	0.9
April	118	166	1.0
May	30	41	0.7
June	12	12	0.6
July	52	45	0.8
August	62	57	0.7
September	39	64	0.6
October	44	70	1.0
November	70	90	1.2
December	65	71	1.7

Table 8 Final Effluent Quality

	CBOD5 (mg/L)	Total Suspended Solids (mg/L)	Total Phosphor-ous (mg/L)	E. coli CFU/100 mL	pH (Single Sample Result)
ECA Objectives (mg/L) Monthly Average	**25**	**30**	**1.0**	**150**	**6.5-9.0**
ECA Limits (mg/L) Monthly Average	**30**	**40**	**1.0**	**200**	**6.0-9.5**
January	14.5	17.5	0.27	2	7.70
February	14.0	18.0	0.23	2	7.60
March	20.5	25.5	0.26	2	7.90
April	**26.5**	**37.3**	0.22	4	8.30
May	11.0	14.7	0.24	3	7.50
June	5.5	5.5	0.28	2	7.80
July	18.0	15.5	0.26	3	7.80
August	22.0	20.0	0.24	94	8.10
September	20.5	**33.5**	0.32	5	8.40
October	17.3	27.7	0.40	3	8.00
November	23.5	**30.0**	0.42	9	8.70
December	23.0	25.0	0.61	13	8.40

2.5 Effluent Quality Control Measures

The ability of the Kincardine lagoon system to treat and remove waste in 2023 was comparable to previous years. The UV system provides disinfection of the effluent year-round during normal operations. In 2023 the average UV dosage was 153.18mj/cm2 with the range spanning from 42.7 to 411.9mj/cm2. The effluent station did not have a backup power source in 2023 therefore any power outages caused the effluent to bypass UV disinfection. Bypass information can be found in Section 6.0.

Alum dosage adjustments were made to maintain final effluent Total Phosphorous levels below 1.0 mg/L. The pH of the effluent was maintained within the range of 6.0 to 9.5, was essentially free of floating and settleable solids and did not contain oil or any other substance in amounts sufficient to create a visible film, sheen, foam or discolouration on the receiving waters.

Table 9 below, summarizes and compares the alum dosages and the percent removals achieved over the last 5 years. There is no BOD percent Removal since we test for BOD on the raw influent and CBOD is tested on the final effluent.

A chart showing the influent flow vs the Alum usage is also available in Appendix D.

Table 9 Comparison of Alum Dosage and Percent Removal

		2019	2020	2021	2022	2023
Alum Dosage (Average)	mg/L	15.6	14.8	14.8	17.42	19.37
	kg/day	55.8	53.4	55.4	61.90	72.28
Percent Removal	TSS	83%	81%	73%	80%	83%
	TP	91%	92%	89%	91%	86%
	TKN	23%	35%	21%	40%	19%

3.0 Operating Issues and Corrective Actions

The new hybrid coarse/fine bubble submerged air diffuser system was commissioned in April 2023. There have been issues with the blowers and trying to keep the dissolved oxygen (D.O.) above the minimum required 2mg/L. Sludge was not removed from the aerated cell prior to the installation of the units and may have been contributing to the

lower D.O. readings. The sludge in the aerated cell was stirred up after the initial commissioning of the units but the D.O. has slowly risen from a minimum of 0.09mg/L in May to a max reading of 5.29mg/L in November. There was a slight decrease in the D.O. from November to December. The recommended quarterly blowout procedure and diffuser cleaning was not completed on the unit before the end of 2023. This maintenance will be performed in 2024.

The Leachate pump that was placed out of service in November 2021 was replaced in January 2023. The pump had been backordered and experienced shipping delays, so the leachate was trucked from the pump station to the aerated cell when needed. There have been no issues with the pump in 2023.

Problems with pumps plugging occurred at the Harbour Street, Hunter Street and Kincardine Avenue pumping stations. The Harbour Street and Hunter Street pumping stations do not have bar screens so any debris entering the wet wells can get clogged in the pumps. The Kincardine Avenue Pumping station does not have an automatic bar screen, so it requires continual manual removal of solid waste from the wet wells. Staff usually perform this on a bi-weekly basis by making a physical entry in the confined space. Even with this preventative maintenance being performed, debris can still get clogged in the pumps.

There were 16 UV alarms in 2023. Five of the alarms were due to power flickers or interruptions. Bank A and Bank B had Major UV alarms and required maintenance to be performed. During the maintenance one of the banks would be in service while the second bank was being worked on.

4.0 Maintenance and calibration summaries

The Kincardine Wastewater system follows a preventative maintenance schedule set out by the Environmental Services Staff. This schedule includes inspections and maintenance for KWWTP blowers, alum pumps, aeration system cleaning, UV system maintenance, pump station inspections, bar screen cleaning, monthly generator maintenance, as well as sewermain flushing and inspections. All maintenance and

repairs are recorded in the corresponding site logbook. A copy of the preventative maintenance schedules are available in Appendix F.

Other planned maintenance included:

-replacing the old hatches and frames on the east and west lagoon effluent chambers.

-UV equipment had the motor control card changed, ballasts and bulbs replaced.

-Wet wells were cleaned at the Durham St PS, Goderich St PS, Queen St PS, Park Street, and Kincardine Ave pump stations

-Hunter St PS chains replaced on pumps

-Goderich St and Kincardine Ave pumps greased

-The Connaught PS had the generator battery charger replaced due to an alarm

-The Goderich St. PS generator had the battery replaced

-Annual pump station inspections for all site components were completed

-Annual sewer flushing program

-1 new sanitary lateral installation

Emergency repairs and maintenance in 2023 included:

-KWWTP splitter box cleaning due to an overflow in November

-Groundwater PS capacitor and relay changed out, and fuse for milltronics replaced

-Pumps pulled and debris removed at Harbour st PS, Hunter St PS, Kincardine Ave PS

-Kincardine Ave Pump #1 impeller, wear rings, bolts and washers replaced

-Huron Terrace bar screen repair and fuse replaced for pump #1

-Leachate PS replacement of pump

-Park Street Pump #2 repair

-Sewermain Flushing on Palmateer and Wieck Blvd for backup issues

-3 Sanitary Lateral Repairs

-3 Sanitary Cleanout Repairs

-1 Manhole repair

-1 Grinder line repair

4.1 Sludge Depths

The sludge depths were measured in the Aerated Cell and Lagoon Cells 2 and 3 using a Sludge Judge. The estimated volume of sludge calculated is similar to previous years. No sludge was removed from any of the cells in 2023.

Table 10 Estimated Sludge Volumes

	2019	2020	2021	2022	2023	Cell Capacity used 2023
Aerated Cell (m^3)	5,442	4,665	6,047	6,306	6,219	72%
East Cell (#2) (m^3)	25,901	20,721	19,426	24,671	29,139	45%
West Cell (#3) (m^3)	25,145	21,277	23,211	24,501	31,593	49%

Average sludge depths are calculated by adding up all the depths (ft) in a cell and dividing it by the number of readings then converting ft to metres.

4.2 Calibrations

Routine calibration and maintenance procedures are conducted on all the monitoring equipment used on the Wastewater Treatment System. The Alum metering pumps discharge volumes are measured minimally once/day to ensure proper dosage rates. Monitoring equipment for pH, dissolved oxygen, phosphorous and conductivity measurements are calibrated according to the manufacture's instruction prior to use.

Influent and effluent flow miltronics equipment is calibrated yearly to check that accuracy is within +/- 5% of full scale. Refer to Appendix G to review the 2023 Calibration Certificates.

5.0 Complaints

There were no complaints related to the Kincardine Wastewater Treatment system in 2023.

There were 32 complaints for the Kincardine Wastewater Collection System. Most of the complaints received were for wastewater backups that ended up being a homeowner issue on private property. There was one event caused by a heavy rainstorm in April where the Park Street pumping station was bypassing, and the collection system was backed up enough to cause backups in three homes. A full listing of the complaints is available in Appendix H.

6.0 Bypasses, Overflows and Spills

The Kincardine Wastewater Treatment System had two bypasses and one spill reported in 2023. The bypasses occurred at the effluent station and were both due to power outages. The effluent station does not currently have a backup generator on site so during power outages when the UV disinfection system is down all flows going through the station are reported as bypasses. A backup generator has been purchased and will be installed in 2024.

The spill at the Wastewater Treatment Plant occurred in November 2023 and was cased by a plugged outlet at the splitter box between the aerated cell and the lagoon. The debris was removed from the outlet, the spill cleaned up and contaminated soil around the box removed. Cleaning of the splitter box is scheduled twice a year in the spring and fall. The spill occurred before the fall cleaning could be completed. Staff will need to ensure that cleaning the cleaning is scheduled earlier or more frequently in the 2024 season to prevent spills.

The wastewater collection system had one spill and two overflows. The spill was caused by a leak in a grinder line. The area was excavated, the grinder line repaired, contaminated soil removed, and the area was disinfected.

The two overflows occurred on April 5th at the Durham Street PS and the Park Street Pump stations. The overflows were due to a significant rainfall event. Both pumping stations have engineering started for required upgrades to the sites.

All bypasses, overflows and spill events were reported to the Spills Action Center for the Ministry of the Environment, Conservation and Parks, The Ministry of Health through the Grey Bruce Health Unit and Environment Canada. Downstream users identified such as

Bruce Power and the Inverhuron Provincial Park were also notified if the bypass or spill went into Lake Huron. A summary of bypasses, overflows and spills are available to the public on the municipal website.

Details including dates, volumes, durations, and sampling results are available in Appendix I.

6.1 Efforts to Reduce Bypasses, overflows and spills

Treatment System

Engineering was completed in 2022 for a diesel generator to be added at the wastewater effluent station located at 169 Mahood Johnston Drive. The diesel generator will assist with keeping a constant power supply to the UV disinfection system and will eliminate wastewater bypasses during power outages in the area. The generator was tendered 2023 the installation was delayed until 2024 because of backordered electrical components. Engineering costs for 2022 were $3,115, 2023 costs for engineering are $7,058.90. Budgeted costs for 2024 installation are $111,669.10.

Collection System

The existing Huron Terrace pumping station was replaced in 2022. The new pumping station was commissioned in January 2023 and has 2 submersible pumps, and one standby pump with variable frequency drives each rated at 150 L/s. The increased size of the pumps and the upsizing of the forcemain to the lagoons from the pump station should eliminate the possibility of an overflow as it is designed for an initial period peak flow and a 20-year period peak flow of 190 L/s and 300 L/s respectively. Expenditures for the pump station project in 2022 were $4,473,300.63. A Total cost of $443,740.44 was required to complete the project in 2023.

Engineering has commenced for upgrades to the Durham Street pumping station. The upgrades will include larger pumps to assist with eliminating the possibility of overflow during wet weather events. Total expenditures on Engineering in 2022 is $5,947 and 2023 is $115,550.45. The project is scheduled to commence in 2024 with a budget of $1,585,489.

Engineering has commenced for upgrades to the Park Street pumping station. The upgrades will include larger pumps to assist with eliminating the possibility of overflow during wet weather events. A total of $9,766.98 was spent on engineering in 2023 and another $164,697 has been budgeted for works in 2024. The upgrades are scheduled to take place in 2025.

The Queen Street reconstruction project included the replacement and upsizing of the sewer main in the downtown core from Durham Market North to Durham Street which was thought to have been installed in the 1930's. The pipe was degrading and could no longer be maintained due to blockages. Replacement of the pipes will have reduced the chance of a spill having to be reported significantly. Preliminary costs of $59,283.59 were spent on engineering for sewer in 2022. Total cost for the sewer portion of the project in 2023 was $4,556,500.

6.2 Conformance with Procedure F-5-1

All of the projects listed in section 6.1 above assist in achieving conformance with procedure F-5-1 by reducing the likelihood of a bypass, overflow or spill occurring.

Wastewater Effluent Station UV Disinfection System upgrades are planned for 2024. A total of $30,000 has been budgeted to rebuild Bank A. This project will assist the system in meeting the effluent objective criteria by ensuring the equipment is functioning at peak performance.

7.0 Modifications to Sewage Works

There were no modifications to the treatment system requiring a Notice of Modifications to Sewage Works. The Aeration upgrades had previously been added to the ECA in version 1.0 issued on February 11, 2022.

There were no alterations to the system in 2023 that posed a significant drinking water threat as noted in the report provided by B. M. Ross and Associates.

8.0 Completion of Construction Works

The Queen Street pumping station was replaced in 2023 for a total cost of $39,755.52. The upgrade included a Quadplex grinder pumping unit and the replacement of the

50mm forcemain with a 38mm forcemain. The Director notification and SS2 form were forwarded to the ministry in July 2023.

The Huron Terrace Pumping Station as mentioned in section 6.1 was completed in January 2023. The pumping station components were already included in the new CLI ECA Issue number 1 received in November 2022. The Director notification form for the completion of the project was forwarded to the Ministry in February 2023.

Aeration upgrades have been completed at the Kincardine Wastewater Treatment Plant. Hybrid coarse/fine bubble type submerged air diffusers were installed in the aerated cell with two positive displacement blowers (one duty, one standby), each with design air flow rate of 425 L/s as per the description in the ECA. A total of $1,011,416.07 was spent on the project in 2022. Due to equipment delivery delays the project was completed in 2023 with a total of $426,508.69. The aeration system was commissioned in May 2023.

APPENDIX A

ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A-500-1121679176
Version: 1.0
Issue Date: February 11, 2022

Pursuant to section 20.3 of the Environmental Protection Act, Revised Statutes of Ontario (R.S.O.) 1990, c. E. 19 and subject to all other applicable Acts or regulations this Environmental Compliance Approval is issued to:

CORPORATION OF THE MUNICIPALITY OF KINCARDINE

1475 CONCESSION 5 CONCESSION
KINCARDINE ONTARIO
N2Z 2X6

For the following site:

520 Bruce Avenue , Kincardine, KINCARDINE, ONTARIO, CANADA, N2Z 2X6

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s) 4648-8DVSSR, issued on March 12, 2021.

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

upgrade, usage and operation of existing municipal sewage works, for the treatment of sanitary sewage and disposal of effluent to Lake Huron via a Sewage Treatment Plant (Kincardine Wastewater Treatment Plant) continuous discharge Lagoon and Final Effluent disposal facilities as follows:

Classification of Collection System: Separate Sewer System

Classification of Sewage Treatment Plant: Secondary Equivalent

Design Capacity of Sewage Treatment Plant

Design Capacity with All Treatment Trains in Operation	**Existing Works**
Rated Capacity	**5,910 m^3/d**

Influent and Imported Sewage

Receiving Location	Types
In Collection System	Sanitary Sewage/Septage/Leachate

Proposed Works:

Kincardine Wastewater Treatment Plant (WWTP)

Aerated Lagoon

- installation of new hybrid coarse/fine bubble type submerged air diffusers along the floor of aerated cell, equipped with two (2) positive displacement blowers (one duty, one standby), each with design air flow rate of 425 L/s at design pressure of 60 kPa;

- decommissioning and removal the existing surface aerators from the Aerated lagoon;

Existing Works:

Kincardine WWTP

Influent Structure

- forcemains to an inlet structure with a 760 mm diameter pipe to Aerated Lagoon;
- inlet pipes to Aerated Lagoon;

Influent Flow Measurement and Sampling Point

- Parshall flume and sampling point at the inlet structure;

Aerated Lagoon

- one (1) aerated lagoon cell with a design volume of approximately 24,000 m^3 and 0.85 ha surface area, equipped with four (4) 11 kW (15 hp) aerators;
- one (1) distribution chamber to discharge from the aerated lagoon cell to two (2) conventional stabilization ponds;

Conventional Stabilization Ponds

- two (2) conventional stabilization ponds, each with a design storage volume of approximately 118,000 m^3 (a total combined volume of 236,000 m^3);

Supplementary Treatment Systems

- Phosphorus Removal
    - one (1) 27 m^3 capacity chemical storage tank equipped with two (2) chemical metering pumps (one standby), associated valves, piping and control system enclosed in a 6.2 m x 6.2 m storage building;

Disinfection System

- one (1) ultraviolet irradiation (UV) disinfection channel equipped with two banks of UV lamp modules, each with a treatment capacity of 12,000 m^3/d;
- piping, flow measurement weir, low liquid level sensor, automatic level controller, electrical system, submersible ultraviolet intensity monitoring probe;

Final Effluent Flow Measurement and Sampling Point

- flow measurement device and sampling point at outlet of disinfection channel;

Final Effluent Disposal Facilities

- effluent sewer from the UV disinfection channel discharging to Lake Huron;

including all other mechanical system, electrical system, instrumentation and control system, standby power system, piping, pumps, valves and appurtenances essential for the proper, safe and reliable operation of the Works in accordance with this Approval, in the context of process performance and general principles of wastewater engineering only;
all in accordance with the submitted supporting documents listed in Schedule A.

DEFINITIONS

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Annual Average Daily Influent Flow" means the cumulative total sewage flow of Influent to the Sewage Treatment Plant during a calendar year divided by the number of days during which sewage was flowing to the Sewage Treatment Plant that year;
2. "Approval" means this environmental compliance approval and any schedules attached to it, and the application;
3. "BOD5" (also known as TBOD5) means five day biochemical oxygen demand measured in an unfiltered sample and includes carbonaceous and nitrogenous oxygen demands;
4. "Bypass" means diversion of sewage around one or more treatment processes, excluding Preliminary Treatment System, within the Sewage Treatment Plant with the diverted sewage flows being returned to the Sewage Treatment Plant treatment train upstream of the Final Effluent sampling point(s) and discharged via the approved effluent disposal facilities;
5. "CBOD5" means five day carbonaceous (nitrification inhibited) biochemical oxygen demand measured in an unfiltered sample;
6. "Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of the EPA;
7. "District Manager" means the District Manager of the appropriate local district office of the Ministry where the Works is geographically located;
8. " *E. coli*" refers to coliform bacteria that possess the enzyme beta-glucuronidase and are capable of cleaving a fluorogenic or chromogenic substrate with the corresponding release of a fluorogen or chromogen, that produces fluorescence under long wavelength (366 nm) UV light, or color development, respectively. Enumeration methods include tube, membrane filter, or multi-well procedures. Depending on the method selected, incubation temperatures include 35.5 + 0.5 °C or 44.5 + 0.2 °C (to enumerate thermotolerant species). Depending on the procedure used, data are

reported as either colony forming units (CFU) per 100 mL (for membrane filtration methods) or as most probable number (MPN) per 100 mL (for tube or multi-well methods);

9. "EPA" means the *Environmental Protection Act,* R.S.O. 1990, c.E.19, as amended;
10. "Equivalent Equipment" means alternate piece(s) of equipment that meets the design requirements and performance specifications of the piece(s) of equipment to be substituted;
11. "Event" means an action or occurrence, at a given location within the Works that causes a Bypass or Overflow. An Event ends when there is no recurrence of Bypass or Overflow in the 12-hour period following the last Bypass or Overflow. Overflows and Bypasses are separate Events even when they occur concurrently;
12. "Existing Works" means those portions of the Works included in the Approval that have been constructed previously;
13. "Final Effluent" means effluent that is discharged to the environment through the approved effluent disposal facilities, including all Bypasses, that are required to meet the compliance limits stipulated in the Approval for the Sewage Treatment Plant at the Final Effluent sampling point(s);
14. "Imported Sewage" means sewage hauled to the Sewage Treatment Plant by licensed waste management system operators of the types and quantities approved for co-treatment in the Sewage Treatment Plant, including hauled sewage and leachate within the meaning of R.R.O. 1990, Regulation 347: General – Waste Management, as amended;
15. "Influent" means flows to the Sewage Treatment Plant from the collection system and Imported Sewage;
16. "Limited Operational Flexibility" (LOF) means the conditions that the Owner shall follow in order to undertake any modification that is pre-authorized as part of this Approval;
17. "Ministry" means the ministry of the government of Ontario responsible for the EPA and OWRA and includes all officials, employees or other persons acting on its behalf;
18. "Monthly Average Effluent Concentration" is the mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month, calculated and reported as per the methodology specified in Schedule F;
19. Monthly Average Daily Effluent Flow" means the cumulative total Final Effluent discharged during a calendar month divided by the number of days during which Final Effluent was discharged that month;
20. "Monthly Average Daily Effluent Loading" means the value obtained by multiplying the Monthly Average Effluent Concentration of a contaminant by the Monthly Average Daily Effluent Flow over the same calendar month;
21. "Monthly Geometric Mean Density" is the mean of all Single Sample Results of E. coli measurement in the samples taken during a calendar month, calculated and reported as per the methodology specified in Schedule F;
22. "Normal Operating Condition" means the condition when all unit process(es), excluding Preliminary Treatment System, in a treatment train is operating within its design capacity;
23. "Operating Agency" means the Owner or the entity that is authorized by the Owner for the management, operation, maintenance, or alteration of the Works in accordance with this Approval;
24. "Overflow" means a discharge to the environment from the Works at designed location(s) other than the approved effluent disposal facilities or via the effluent disposal facilities downstream of the Final Effluent sampling point;
25. "Owner" means The Corporation of the Municipality of Kincardine and its successors and assignees;
26. "OWRA" means the *Ontario Water Resources Act,* R.S.O. 1990, c. O.40, as amended;
27. "Professional Engineer" means a person entitled to practice as a Professional Engineer in the Province of Ontario under a license issued under the Professional Engineers Act;
28. "Proposed Works" means those portions of the Works included in the Approval that are under construction or to be constructed;
29. "Rated Capacity" means the Annual Average Daily Influent Flow for which the Sewage Treatment Plant is designed to handle;

30. "Sanitary Sewers" means pipes that collect and convey wastewater from residential, commercial, institutional and industrial buildings, and some infiltration and inflow from extraneous sources such as groundwater and surface runoff through means other than stormwater catch basins;

31. "Separate Sewer Systems" means wastewater collection systems that comprised of Sanitary Sewers while runoff from precipitation and snowmelt are separately collected in Storm Sewers;

32. "Sewage Treatment Plant" means all the facilities related to sewage treatment within the sewage treatment plant site excluding the Final Effluent disposal facilities;

33. "Single Sample Result" means the test result of a parameter in the effluent discharged on any day, as measured by a probe, analyzer or in a composite or grab sample, as required;

34. "Storm Sewers" means pipes that collect and convey runoff resulting from precipitation and snowmelt (including infiltration and inflow);

35. "Works" means the approved sewage works, and includes Proposed Works, Existing Works and modifications made under Limited Operational Flexibility.

TERMS AND CONDITIONS

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

1. **GENERAL PROVISIONS**
    1. The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Works is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
    2. Except as otherwise provided by these conditions, the Owner shall design, build, install, operate and maintain the Works in accordance with the description given in this Approval, and the application for approval of the Works.
    3. Where there is a conflict between a provision of any document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence.

2. **CHANGE OF OWNER AND OPERATING AGENCY**
    1. The Owner shall, within thirty (30) calendar days of issuance of this Approval, prepare/update and submit to the District Manager the Municipal and Local Services Board Wastewater System Profile Information Form, as amended (Schedule G) under any of the following situations:
        1. the form has not been previously submitted for the Works;
        2. this Approval is issued for extension, re-rating or process treatment upgrade of the Works;
        3. when a notification is provided to the District Manager in compliance with requirements of change of Owner or Operating Agency under this condition.
    2. The Owner shall notify the District Manager and the Director, in writing, of any of the following changes within thirty (30) days of the change occurring:
    change of address of Owner;
        1. change of Owner, including address of new owner;
        2. change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c. B.17, as amended, shall be included in the notification;
        3. change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C.39, as

amended, shall be included in the notification.

3. The Owner shall notify the District Manager, in writing, of any of the following changes within thirty (30) days of the change occurring:
    1. change of address of Operating Agency;
    2. change of Operating Agency, including address of new Operating Agency.
4. In the event of any change in ownership of the Works, the Owner shall notify the succeeding owner in writing, of the existence of this Approval, and forward a copy of the notice to the District Manager.
5. The Owner shall ensure that all communications made pursuant to this condition refer to the environmental compliance approval number.

3. **CONSTRUCTION OF PROPOSED WORKS**

1. All Proposed Works in this Approval shall be constructed and installed and must commence operation within five (5) years of issuance of this Approval, after which time the Approval ceases to apply in respect of any portions of the Works not in operation. In the event that the construction, installation and/or operation of any portion of the Proposed Works is anticipated to be delayed beyond the time period stipulated, the Owner shall submit to the Director an application to amend the Approval to extend this time period, at least six (6) months prior to the end of the period. The amendment application shall include the reason(s) for the delay and whether there is any design change(s).
2. Within thirty (30) days of commencement of construction, the Owner shall prepare and submit to the District Manager a schedule for the completion of construction and commissioning operation of the Proposed Works. The Owner shall notify the District Manager within thirty (30) days of the commissioning operation of any Proposed Works. Upon completion of construction of the Proposed Works, the Owner shall prepare and submit a statement to the District Manager, certified by a Licensed Engineering Practioner, that the Proposed Works is constructed in accordance with this Approval.
3. Within one (1) year of completion of construction of the Proposed Works, a set of record drawings of the Works shall be prepared or updated. These drawings shall be kept up to date through revisions undertaken from time to time and a copy shall be readily accessible for reference at the Works.

4. **BYPASSES**

1. Any Bypass is prohibited, except:
    a. an emergency Bypass when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of a treatment process or when an unforeseen flow condition exceeds the design capacity of a treatment process that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not bypassed;
    b. a planned Bypass that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Bypass, including an estimated quantity and duration of the Bypass, an assessment of the impact on the quality of the Final Effluent and the mitigation measures if necessary, and the District Manager has given written consent of the Bypass.
2. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) prior to bypassing.
3. At the beginning of a Bypass Event, the Owner shall immediately notify the Spills Action Centre (SAC) and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:
    a. the type of the Bypass as indicated in Paragraph 1 and the reason(s) for the Bypass;
    b. the date and time of the beginning of the Bypass;

c. the treatment process(es) gone through prior to the Bypass and the treatment process(es) bypassed;

d. the effort(s) done to maximize the flow through the downstream treatment process(es) and the reason(s) why the Bypass was not avoided.

4. Upon confirmation of the end of a Bypass Event, the Owner shall immediately notify the SAC and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

a. the date and time of the end of the Bypass;

b. the estimated or measured volume of Bypass.

5. For any Bypass Event, the Owner shall collect daily sample(s) of the Final Effluent, inclusive of the Event and analyze for all effluent parameters outlined in Compliance Limits condition that require composite samples, following the same protocol specified in the Monitoring and Recording condition for the regular samples. The sample(s) shall be in addition to the regular Final Effluent samples required under the monitoring and recording condition. If the Event occurs on a scheduled monitoring day, the regular sampling requirements prevail. If representative sample for the effluent parameter(s) that require grab sample cannot be obtained, they shall be collected after the Event at the earliest time when situation returns to normal.

6. The Owner shall submit a summary report of the Bypass Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary reports shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5) and either a statement of compliance or a summary of the non-compliance notifications submitted as required under Paragraph 1 of Condition 11. If there is no Bypass Event during a quarter, a statement of no occurrence of Bypass is deemed sufficient.

7. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Bypass Event.

5. **OVERFLOWS**

1. Any Overflow is prohibited, except:

a. an emergency Overflow in an emergency situation when a structural, mechanical or electrical failure causes a temporary reduction in the capacity of the Works or when an unforeseen flow condition exceeds the design capacity of the Works that is likely to result in personal injury, loss of life, health hazard, basement flooding, severe property damage, equipment damage or treatment process upset, if a portion of the flow is not overflowed;

b. a planned Overflow that is a direct and unavoidable result of a planned repair and maintenance procedure or other circumstance(s), the Owner having notified the District Manager in writing at least fifteen (15) days prior to the occurrence of Overflow, including an estimated quantity and duration of the Overflow, an assessment of the impact on the environment and the mitigation measures if necessary, and the District Manager has given written consent of the Overflow.

2. Notwithstanding the exceptions given in Paragraph 1, the Operating Agency shall undertake everything practicable to maximize the flow through the downstream treatment process(es) and Bypass(es) prior to overflowing.

3. At the beginning of an Overflow Event, the Owner shall immediately notify the SAC and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

a. the type of the Overflow as indicated in Paragraph 1 and the reason(s) for the Overflow;

b. the date and time of the beginning of the Overflow;

c. the point of the Overflow from the Works, the treatment process(es) gone through prior to the Overflow, the disinfection status of the Overflow and whether the Overflow is discharged through the effluent disposal facilities or an alternate location;

d. the effort(s) done to maximize the flow through the downstream treatment process(es) and Bypass(es) and the reason(s) why the Overflow was not avoided.

4. Upon confirmation of the end of an Overflow Event, the Owner shall immediately notify the SAC and the local Medical Officer of Health. This notice shall include, at a minimum, the following information:

   a. the date and time of the end of the Overflow;

   b. the estimated or measured volume of the Overflow.

5. For any Overflow Event

   a. in the Sewage Treatment Plant, the Owner shall collect grab sample(s) of the Overflow, one near the beginning of the Event and one every eight (8) hours for the duration of the Event, and have them analyzed at least for CBOD5, total suspended solids, total phosphorus, total ammonia nitrogen, nitrate as N, nitrite as N, total Kjeldahl nitrogen, *E. coli.,* except that raw sewage and primary treated effluent Overflow shall be analyzed for BOD5, total suspended solids, total phosphorus and total Kjeldahl nitrogen only.

6. The Owner shall submit a summary report of the Overflow Event(s) to the District Manager on a quarterly basis, no later than each of the following dates for each calendar year: February 15, May 15, August 15, and November 15. The summary report shall contain, at a minimum, the types of information set out in Paragraphs (3), (4) and (5). If there is no Overflow Event during a quarter, a statement of no occurrence of Overflow is deemed sufficient.

7. The Owner shall develop a notification procedure in consultation with the District Manager and SAC and notify the public and downstream water users that may be adversely impacted by any Overflow Event.

6. **DESIGN OBJECTIVES**

1. The Owner shall operate and maintain the Works such that the design monthly average landfill leachate flow of 63 m^3/d (approximately 30 m^3/d from Valentine Avenue Landfill and approximately 33 m^3/d from Kincardine Waste Management Centre) and groundwater (contaminated) flow of approximately 200 m^3/d from Valentine Avenue Landfill for co-treatment at the Works is not exceeded.

2. The Owner shall design and undertake everything practicable to operate the Sewage Treatment Plant in accordance with the following objectives:

   a. Final Effluent parameters design objectives listed in the table(s) included in Schedule B.

   b. Final Effluent is essentially free of floating and settleable solids and does not contain oil or any other substance in amounts sufficient to create a visible film or sheen or foam or discolouration on the receiving waters.

   c. Annual Average Daily Influent Flow is within the Rated Capacity of the Sewage Treatment Plant.

7. **COMPLIANCE LIMITS**

1. The Owner shall operate and maintain the Sewage Treatment Plant such that compliance limits for the Final Effluent parameters listed in the table(s) included in Schedule C are met.

2. The Owner shall operate and maintain the Sewage Treatment Plant such that the Final Effluent is disinfected continuously year-round.

8. **OPERATION AND MAINTENANCE**

1. The Owner shall ensure that, at all times, the Works and the related equipment and appurtenances used to achieve compliance with this Approval are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate staffing and training, including training in all procedures and other requirements of this Approval and the OWRA and regulations, adequate laboratory facilities, process controls and alarms and the use of process chemicals and other substances used in the Works.

2. The Owner shall prepare/update the operations manual for the Works within six (6) months of completion of

construction of the Proposed Works, that includes, but not necessarily limited to, the following information:

a. operating procedures for the Works under Normal Operating Conditions;

b. inspection programs, including frequency of inspection, for the Works and the methods or tests employed to detect when maintenance is necessary;

c. repair and maintenance programs, including the frequency of repair and maintenance for the Works;

d. procedures for the inspection and calibration of monitoring equipment;

e. operating procedures for the Works to handle situations outside Normal Operating Conditions and emergency situations such as a structural, mechanical or electrical failure, or an unforeseen flow condition, including procedures to minimize Bypasses and Overflows;

f. a spill prevention and contingency plan, consisting of procedures and contingency plans, including notification to the District Manager, to reduce the risk of spills of pollutants and prevent, eliminate or ameliorate any adverse effects that result or may result from spills of pollutants;

g. procedures for receiving, responding and recording public complaints, including recording any followup actions taken.

3. The Owner shall maintain the operations manual up-to-date and make the manual readily accessible for reference at the Works.

4. The Owner shall ensure that the Operating Agency fulfills the requirements under O. Reg. 129/04, as amended for the Works, including the classification of facilities, licensing of operators and operating standards.

9. **MONITORING AND RECORDING**

1. The Owner shall, upon commencement of operation of the Works, carry out a scheduled monitoring program of collecting samples at the required sampling points, at the frequency specified or higher, by means of the specified sample type and analyzed for each parameter listed in the tables under the monitoring program included in Schedule D and record all results, as follows:

a. all samples and measurements are to be taken at a time and in a location characteristic of the quality and quantity of the sewage stream over the time period being monitored.

b. definitions and preparation requirements for each sample type are included in document referenced in Paragraph 3.b.

c. definitions for frequency:

i. Bi-weekly means once every two weeks;

ii. Semi-annually means once every six months;

d. a schedule of the day of the week/month for the scheduled sampling shall be created. The sampling schedule shall be revised and updated every year through rotation of the day of the week/month for the scheduled sampling program, except when the actual scheduled monitoring frequency is three (3) or more times per week.

2. In addition to the scheduled monitoring program required in Paragraph 1, the Owner shall collect daily sample(s) of the Final Effluent, on any day when there is any situation outside Normal Operating Conditions, and analyze for all effluent parameters outlined in Compliance Limits condition that require composite samples, following the same protocol specified in this condition for the regular samples. If the Event occurs on a scheduled monitoring day, the regular sampling requirements prevail. If representative sample for the effluent parameter(s) that require grab sample cannot be obtained, they shall be collected after the Event at the earliest time when situation returns to normal.

3. The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following documents and all analysis shall be conducted by a laboratory accredited to the ISO/IEC:17025 standard or as directed by the District Manager :

a. the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended;

b. the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended; and

c. the publication "Standard Methods for the Examination of Water and Wastewater", as amended.

4. The Owner shall monitor and record the flow rate and daily quantity using flow measuring devices or other methods of measurement as approved below calibrated to an accuracy within plus or minus 15 per cent (+/- 15%) of the actual flowrate of the following:

   a. Influent flow to the Sewage Treatment Plant by continuous flow measuring devices and instrumentations, or in lieu of an actual installation of equipment, adopt the flow measurements of the Final Effluent for the purpose of estimating Influent flows if the Influent and Final Effluent streams are considered not significantly different in flow rates and quantities;

   b. Final Effluent discharged from the Sewage Treatment Plant by continuous flow measuring devices and instrumentations, or in lieu of an actual installation of equipment, adopt the flow measurements of the Influent for the purpose of estimating Final Effluent flows if the Influent and Final Effluent streams are considered not significantly different in flow rates and quantities;

   c. leachate and groundwater (contaminated) received for co-treatment at the Sewage Treatment by flow measuring devices/pumping rate;

   d. blended hauled sewage received for co-treatment at the Sewage Treatment Plant by flow measuring devices/pumping rates.

5. The Owner shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this Approval.

10. **LIMITED OPERATIONAL FLEXIBILITY**

1. The Owner may make pre-authorized modifications to the Sewage Treatment Plant in Works in accordance with the document "Limited Operational Flexibility - Protocol for Pre-Authorized Modifications to Municipal Sewage Works" (Schedule E), as amended, subject to the following:

   a. the modifications will not involve the addition of any new treatment process or the removal of an existing treatment process, including chemical systems, from the liquid or solids treatment trains as originally designed and approved.

   b. the scope and technical aspects of the modifications are in line with those delineated in Schedule E and conform with the Ministry’s publication “Design Guidelines for Sewage Works 2008”, as amended, Ministry’s regulations, policies, guidelines, and industry engineering standards;

   c. the modifications shall not negatively impact on the performance of any process or equipment in the Works or result in deterioration in the Final Effluent quality;

   d. where the pre-authorized modification requires notification, a "Notice of Modifications to Sewage Works" (Schedule E), as amended shall be completed with declarations from a Licensed Engineering Practitioner and the Owner and retained on-site prior to the scheduled implementation date. All supporting information including technical memorandum, engineering plans and specifications, as applicable and appropriate to support the declarations that the modifications conform with LOF shall remain on-site for future inspection.

2. The following modifications are not pre-authorized under Limited Operational Flexibility:

   a. Modifications that involve addition or extension of process structures, tankages or channels;

   b. Modifications that involve relocation of the Final Effluent outfall or any other discharge location or that may require reassessment of the impact to the receiver or environment;

c. Modifications that involve addition of or change in technology of a treatment process or that may involve reassessment of the treatment train process design;

d. Modifications that require changes to be made to the emergency response, spill prevention and contingency plan; or

e. Modifications that are required pursuant to an order issued by the Ministry.

11. **REPORTING**

1. The Owner shall report to the District Manager orally as soon as possible any non-compliance with the compliance limits, and in writing within seven (7) days of non-compliance.

2. The Owner shall, within fifteen (15) days of occurrence of a spill within the meaning of Part X of the EPA, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation, in addition to fulfilling the requirements under the EPA and O. Reg. 675/98 "Classification and Exemption of Spills and Reporting of Discharges".

3. The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

4. The Owner shall prepare performance reports on a calendar year basis and submit to the District Manager by March 31 of the calendar year following the period being reported upon. The reports shall contain, but shall not be limited to, the following information pertaining to the reporting period:

    a. a summary and interpretation of all Influent, Imported Sewage monitoring data, and a review of the historical trend of the sewage characteristics and flow rates;

    b. a summary and interpretation of all Final Effluent monitoring data, including concentration, flow rates, loading and a comparison to the design objectives and compliance limits in this Approval, including an overview of the success and adequacy of the Works;

    c. a summary of all operating issues encountered and corrective actions taken;

    d. a summary of all normal and emergency repairs and maintenance activities carried out on any major structure, equipment, apparatus or mechanism forming part of the Works;

    e. a summary of any effluent quality assurance or control measures undertaken;

    f. a summary of the calibration and maintenance carried out on all Influent, Imported Sewage and Final Effluent monitoring equipment to ensure that the accuracy is within the tolerance of that equipment as required in this Approval or recommended by the manufacturer;

    g. a summary of efforts made to achieve the design objectives in this Approval, including an assessment of the issues and recommendations for pro-active actions if any are required under the following situations:

        a. when any of the design objectives is not achieved more than 50% of the time in a year, or there is an increasing trend in deterioration of Final Effluent quality;

        b. when the Annual Average Daily Influent Flow reaches 80% of the Rated Capacity;

    h. a tabulation of the measured volume of sludge accumulated in the lagoon cells in five year intervals and the estimated volume in the interim years and when sludge was disposed of during the reporting period, a summary of disposal locations and volumes of sludge disposed at each location;

    i. a summary of any complaints received and any steps taken to address the complaints;

    j. a summary of all Bypasses, Overflows, other situations outside Normal Operating Conditions and spills within the meaning of Part X of EPA and abnormal discharge events;

    k. a summary of all Notice of Modifications to Sewage Works completed under Paragraph 1.d. of Condition

10, including a report on status of implementation of all modification;

l. a summary of efforts made to achieve conformance with Procedure F-5-1 including but not limited to projects undertaken and completed in the sanitary sewer system that result in overall Bypass/Overflow elimination including expenditures and proposed projects to eliminate Bypass/Overflows with estimated budget forecast for the year following that for which the report is submitted;

m. any changes or updates to the schedule for the completion of construction and commissioning operation of major process(es) / equipment groups in the Proposed Works;

n. a summary of any deviation from the monitoring schedule and reasons for the current reporting year and a schedule for the next reporting year.

REASONS

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

1. Condition 1 regarding general provisions is imposed to ensure that the Works are constructed and operated in the manner in which they were described and upon which approval was granted.

2. Condition 2 regarding change of Owner and Operating Agency is included to ensure that the Ministry records are kept accurate and current with respect to ownership and Operating Agency of the Works and to ensure that subsequent owners of the Works are made aware of the Approval and continue to operate the Works in compliance with it.

3. Condition 3 regarding construction of Proposed Works is included to ensure that the Works are constructed in a timely manner so that standards applicable at the time of Approval of the Works are still applicable at the time of construction to ensure the ongoing protection of the environment, and also ensure that the Works are constructed in accordance with the Approval and that record drawings of the Works "as constructed" are updated and maintained for future references.

4. Condition 4 regarding Bypasses is included to indicate that Bypass is prohibited, except in circumstances where the failure to Bypass could result in greater damage to the environment than the Bypass itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Bypass Events.

5. Condition 5 regarding Overflows is included to indicate that Overflow of untreated or partially treated sewage to the receiver is prohibited, except in circumstances where the failure to Overflow could result in greater damage to the environment than the Overflow itself. The notification and documentation requirements allow the Ministry to take action in an informed manner and will ensure the Owner is aware of the extent and frequency of Overflow Events.

6. Condition 6 regarding design objectives is imposed to establish non-enforceable design objectives to be used as a mechanism to trigger corrective action proactively and voluntarily before environmental impairment occurs.

7. Condition 7 regarding compliance limits is imposed to ensure that the Final Effluent discharged from the Works to the environment meets the Ministry's effluent quality requirements.

8. Condition 8 regarding operation and maintenance is included to require that the Works be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, injury or damage to any person or property is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the Owner. Such a manual is an integral part of the operation of the Works. Its compilation and use should assist the Owner in staff training, in proper plant operation and in identifying and planning for contingencies during possible abnormal conditions. The manual will also act as a benchmark for Ministry staff when reviewing the Owner's operation of the Works.

9. Condition 9 regarding monitoring and recording is included to enable the Owner to evaluate and demonstrate the performance of the Works, on a continual basis, so that the Works are properly operated and maintained at a level which is consistent with the design objectives and compliance limits.

10. Condition 10 regarding Limited Operational Flexibility is included to ensure that the Works are constructed, maintained and operated in accordance with the Approval, and that any pre-approved modification will not negatively impact on the performance of the Works.

11. Condition 11 regarding reporting is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for this Approval.

APPEAL PROVISIONS

In accordance with Section 139 of the *Environmental Protection Act*, you may by written notice served upon me and the Ontario Land Tribunal within 15 days after receipt of this notice, require a hearing by the Tribunal. Section 142 of the *Environmental Protection Act* provides that the notice requiring the hearing ("the Notice") shall state:

I. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;

II. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the *Environmental Protection Act*, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.
The Notice should also include:

I. The name of the appellant;

II. The address of the appellant;

III. The environmental compliance approval number;

IV. The date of the environmental compliance approval;

V. The name of the Director, and;

VI. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

Registrar* Ontario Land Tribunal 655 Bay Street, Suite 1500 Toronto, Ontario M5G 1E5 OLT.Registrar@ontario.ca	and	The Director appointed for the purposes of Part II.1 of the *Environmental Protection Act* Ministry of the Environment, Conservation and Parks 135 St. Clair Avenue West, 1st Floor Toronto, Ontario M4V 1P5

*** Further information on the Ontario Land Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349 or 1 (866) 448-2248, or www.olt.gov.on.ca**
The above noted activity is approved under s.20.3 of Part II.1 of the *Environmental Protection Act*.

Dated at Toronto this 11th day of February, 2022

A. Ahmed

Aziz Ahmed

Director

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

c: Andrew Garland, B. M. Ross and Associates Ltd.
Adam Weishar, Municipality of Kincardine

The following schedules are a part of this environmental compliance approval:

SCHEDULE 1

Schedule A

Application for Environmental Compliance Approval submitted by Adam Weishar of The Corporation of the Municipality of Kincardine received on March 16, 2021 for the proposed upgrade of the lagoon aeration system, including all supporting information and documentation, final plans and specifications provided by B.M. Ross and Associates Limited.

SCHEDULE 2

Schedule B

Final Effluent Design Objectives

Concentration Objectives

Final Effluent Parameter	**Averaging Calculator**	**Objective** (milligrams per litre unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	25 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	30 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	1.0 mg/L
E. coli	Monthly Geometric Mean Density	*150 CFU/100 mL
pH	Single Sample Result	6.5 - 9.0 inclusive

*If the MPN method is utilized for *E.coli* analysis the objective shall be 150 MPN/100 mL

SCHEDULE 3

Schedule C

Final Effluent Compliance Limits

Concentration Limits

Effluent Parameter	**Averaging Calculator**	**Limit** (maximum unless otherwise indicated)
CBOD5	Monthly Average Effluent Concentration	30 mg/L
Total Suspended Solids	Monthly Average Effluent Concentration	40 mg/L
Total Phosphorus	Monthly Average Effluent Concentration	1.0 mg/L
E. coli	Monthly Geometric Mean Density	*200 CFU/100 mL
pH	Single Sample Result	between 6.0 - 9.5 inclusive

*If the MPN method is utilized for *E.coli* analysis the limit shall be 200 MPN/100 mL

Loading Limits

Final Effluent Parameter	**Averaging Calculator**	**Limit** (maximum unless otherwise indicated)
CBOD5	Monthly Average Daily Effluent Loading	177.0 kg/d
Total Suspended Solids	Monthly Average Daily Effluent Loading	236.0 kg/d
Total Phosphorus	Monthly Average Daily Effluent Loading	5.9 kg/d

SCHEDULE 4

Schedule D

Monitoring Program

Influent - Influent sampling point

Parameters	Sample Type	Minimum Frequency
BOD5	Grab	Bi-weekly
Total Suspended Solids	Grab	Bi-weekly
Total Phosphorus	Grab	Bi-weekly
Total Kjeldahl Nitrogen	Grab	Bi-weekly
Alkalinity	Grab	Bi-weekly

Final Effluent - Final Effluent sampling point

Parameters	Sample Type	Minimum Frequency
CBOD5	Grab	Bi-weekly
Total Suspended Solids	Grab	Bi-weekly
Total Phosphorus	Grab	Bi-weekly
Total Ammonia	Grab	Bi-weekly
Total Kjeldahl Nitrogen	Grab	Bi-weekly
Nitrate as Nitrogen	Grab	Bi-weekly
Nitrite as Nitrogen	Grab	Bi-weekly
Alkalinity	Grab	Bi-weekly
E. coli	Grab	Bi-weekly
pH	Grab	Bi-weekly
Temperature	Grab	Bi-weekly
Chloride	Grab	Semi-annually
COD	Grab	Semi-annually
DOC	Grab	Semi-annually
Hardness	Grab	Semi-annually
Phenols	Grab	Semi-annually
Metals (total): ICP Metal Scan	Grab	Semi-annually
Volatile Organic Compounds (VOC) US EPA 624 Parameters	Grab	Semi-annually
Conductivity	Grab	Semi-annually

Landfill Leachate*

Parameters	Sample Type	Minimum Frequency
Alkalinity	Grab	Semi-annually
BOD5	Grab	Semi-annually
Chloride	Grab	Semi-annually
COD	Grab	Semi-annually
DOC	Grab	Semi-annually
Hardness	Grab	Semi-annually
Nitrate as Nitrogen	Grab	Semi-annually
Nitrite as Nitrogen	Grab	Semi-annually
Total Kjeldahl Nitrogen	Grab	Semi-annually
Ammonia	Grab	Semi-annually
Metals (Total): ICP 24 Metal Scan	Grab	Semi-annually
Volatile Organic Compounds (VOC): US EPA 624 Parameters	Grab	Semi-annually
pH	Grab	Semi-annually
Conductivity	Grab	Semi-annually
Temperature	Grab	Semi-annually

*Note

1. Samples of the leachate and groundwater contaminated with leachate to be collected from Valentine Avenue Landfill and Kincardine Waste Management Centre leachate pumping station, the discharge end of leachate forcemain, or at the point of addition to the sewer system or to the Works.

2. Representative samples of landfill leachate shall be collected for analysis on a semi-annually basis, subject to availability of the leachate requiring co-treatment at the Sewage Treatment Plant.

3. The Owner can use applicable existing samples collected from Valentine Avenue Landfill site of groundwater (contaminated) as required by Environmental Compliance Approval No. 3-0408-93-006 and of leachate as required by Environmental Compliance Approval No. 3-0354-94-006 and analyze for parameters as specified.

SCHEDULE 5

Schedule E

Limited Operational Flexibility

Protocol for Pre-Authorized Modifications to Municipal Sewage Works

1. **General**
    1. Pre-authorized modifications are permitted only where Limited Operational Flexibility has already been granted in the Approval and only permitted to be made at the pumping stations and sewage treatment plant in the Works, subject to the conditions of the Approval.
    2. Where there is a conflict between the types and scope of pre-authorized modifications listed in this document, and the Approval where Limited Operational Flexibility has been granted, the Approval shall take precedence.
    3. The Owner shall consult the District Manager on any proposed modifications that may fall within the scope and intention of the Limited Operational Flexibility but is not listed explicitly or included as an example in this document.
    4. The Owner shall ensure that any pre-authorized modifications will not:
        a. adversely affect the hydraulic profile of the Sewage Treatment Plant or the performance of any upstream or downstream processes, both in terms of hydraulics and treatment performance;
        b. result in new Overflow or Bypass locations, or any potential increase in frequency or quantity of Overflow(s) or Bypass(es).
        c. result in a reduction in the required Peak Flow Rate of the treatment process or equipment as originally designed.

2. **Modifications that do not require pre-authorization:**
    1. Sewage works that are exempt from Ministry approval requirements;
    2. Modifications to the electrical system, instrumentation and control system.

3. **Pre-authorized modifications that do not require preparation of "Notice of Modification to Sewage Works"**
    1. Normal or emergency maintenance activities, such as repairs, renovations, refurbishments and replacements with Equivalent Equipment, or other improvements to an existing approved piece of equipment of a treatment process do not require pre-authorization. Examples of these activities are:
        a. Repairing a piece of equipment and putting it back into operation, including replacement of minor components such as belts, gear boxes, seals, bearings;
        b. Repairing a piece of equipment by replacing a major component of the equipment such as motor, with the same make and model or another with the same or very close power rating but the capacity of the pump or blower will still be essentially the same as originally designed and approved;
        c. Replacing the entire piece of equipment with Equivalent Equipment.
    2. Improvements to equipment efficiency or treatment process control do not require pre-authorization. Examples of these activities are:
        a. Adding variable frequency drive to pumps;
        b. Adding on-line analyzer, dissolved oxygen probe, ORP probe, flow measurement or other process control device.

4. **Pre-Authorized Modifications that require preparation of "Notice of Modification to Sewage Works"**

1. Pumping Stations
    a. Replacement, realignment of existing sewers including manholes, valves, gates, weirs and associated appurtenances provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved.
    b. Extension or partition of wetwell to increase retention time for emergency response and improve station maintenance and pump operation;
    c. Replacement or installation of inlet screens to the wetwell;
    d. Replacement or installation of flowmeters, construction of station bypass;
    e. Replacement, reconfiguration or addition of pumps and modifications to pump suctions and discharge pipings including valve, gates, motors, variable frequency drives and associated appurtenances to maintain firm pumping capacity or modulate the pump rate provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head or an increase in the peak pumping rate of the pumping station as originally designed;
    f. Replacement, realignment of existing forcemain(s) including valves, gates, and associated appurtenances provided that the modifications will not reduce the flow capacity or increase the total dynamic head and transient in the forcemain.

2. Sewage Treatment Plant
    1. Sewers and appurtenances
        a. Replacement, realignment of existing sewers (including pipes and channels) or construction of new sewers, including manholes, valves, gates, weirs and associated appurtenances within the a sewage treatment plant, provided that the modifications will not add new influent source(s) or result in an increase in flow from existing sources as originally approved and that the modifications will remove hydraulic bottlenecks or improve the conveyance of sewage into and through the Works.
    2. Flow Distribution Chambers/Splitters
        a. Replacement or modification of existing flow distribution chamber/splitters or construction of new flow distribution chamber/splitters, including replacements or installation of sluice gates, weirs, valves for distribution of flows to the downstream process trains, provided that the modifications will not result in a change in flow distribution ratio to the downstream process trains as originally designed.
    3. Imported Sewage Receiving Facility
        a. Replacement, relocation or installation of loading bays, connect/disconnect hook-up systems and unloading/transferring systems;
        b. Replacement, relocation or installation of screens, grit removal units and compactors;
        c. Replacement, relocation or installation of pumps, such as dosing pumps and transfer pumps, valves, piping and appurtenances;
        d. Replacement, relocation or installation of storage tanks/chambers and spill containment systems;
        e. Replacement, relocation or installation of flow measurement and sampling equipment;
        f. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity and waste loading of each type of Imported Sewage already approved for co-treatment.
    4. Preliminary Treatment System

a. Replacement of existing screens and grit removal units with equipment of the same or higher process performance technology, including where necessary replacement or upgrading of existing screenings dewatering washing compactors, hydrocyclones, grit classifiers, grit pumps, air blowers conveyor system, disposal bins and other ancillary equipment to the screening and grit removal processes.

b. Replacement or installation of channel aeration systems, including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers.

5. Primary Treatment System

a. Replacement of existing sludge removal mechanism, including sludge chamber;

b. Replacement or installation of scum removal mechanism, including scum chamber;

c. Replacement or installation of primary sludge pumps, scum pumps, provided that:the modifications will not result in a reduction in the firm pumping capacity or discharge head that the primary sludge pump(s) and scum pump(s) are originally designed to handle.

6. Secondary Treatment System

1. Biological Treatment

a. Conversion of complete mix aeration tank to plug-flow multi-pass aeration tank, including modifications to internal structural configuration;

b. Addition of inlet gates in multi-pass aeration tank for step-feed operation mode;

c. Partitioning of an anoxic/flip zone in the inlet of the aeration tank, including installation of submersible mixer(s);

d. Replacement of aeration system including air blowers, air supply main, air headers, air laterals, air distribution grids and diffusers, provided that the modifications will not result in a reduction in the firm capacity or discharge pressure that the blowers are originally designed to supply or in the net oxygen transferred to the wastewater required for biological treatment as originally required.

2. Secondary Sedimentation

a. Replacement of sludge removal mechanism, including sludge chamber;

b. Replacement or installation of scum removal mechanism, including scum chamber;

c. Replacement or installation of return activated sludge pump(s), waste activated sludge pump(s), scum pump(s), provided that the modifications will not result in a reduction in the firm pumping capacity or discharge head that the activated sludge pump(s) and scum pump(s) are originally designed to handle.

7. Post-Secondary Treatment System

a. Replacement of filtration system with equipment of the same filtration technology, including feed pumps, backwash pumps, filter reject pumps, filtrate extract pumps, holding tanks associated with the pumping system, provided that the modifications will not result in a reduction in the capacity of the filtration system as originally designed.

8. Disinfection System

1. UV Irradiation

a. Replacement of UV irradiation system, provided that the modifications will not result in a reduction in the design capacity of the disinfection system or the radiation level as originally

designed.

2. Chlorination/Dechlorination and Ozonation Systems
    a. Extension and reconfiguration of contact tank to increase retention time for effective disinfection and reduce dead zones and minimize short-circuiting;
    b. Replacement or installation of chemical storage tanks, provided that the tanks are provided with effective spill containment.

9. Supplementary Treatment Systems
    1. Chemical systems
        a. Replacement, relocation or installation of chemical storage tanks for existing chemical systems only, provided that the tanks are sited with effective spill containment;
        b. Replacement or installation of chemical dosing pumps provided that the modifications will not result in a reduction in the firm capacity that the dosing pumps are originally designed to handle.
        c. Relocation and addition of chemical dosing point(s) including chemical feed pipes and valves and controls, to improve phosphorus removal efficiency;
        d. Use of an alternate chemical provided that it is a non-proprietary product and is a commonly used alternative to the chemical approved in the Works, provided that the chemical storage tanks, chemical dosing pumps, feed pipes and controls are also upgraded, as necessary.

10. Sludge Management System
    1. Sludge Holding and Thickening
        a. Replacement or installation of sludge holding tanks, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;
    2. Sludge Digestion
        a. Replacement or installation of digesters, sludge handling pumps, such as transfer pumps, feed pumps, recirculation pumps, provided that modifications will not result in reduction in the solids storage or handling capacities;
        b. replacement of sludge digester covers.
    3. Sludge Dewatering and Disposal
        a. Replacement of sludge dewatering equipment, sludge handling pumps, such as transfer pumps, feed pumps, cake pumps, loading pumps, provided that modifications will not result in reduction in solids storage or handling capacities.
    4. Processed Organic Waste
        a. Changes to the source(s) or quantity from each source, provided that changes will not result in an increase in the total quantity already approved for co-processing.

11. Standby Power System
    a. Replacement or installation of standby power system, including feed from alternate power grid, emergency power generator, fuel supply and storage systems, provided that the existing standby power generation capacity is not reduced.

12. Pilot Study
    1. Small side-stream pilot study for existing or new technologies, alternative treatment process or chemical, provided:
        a. all effluent from the pilot system is hauled off-site for proper disposal or returned back to the sewage treatment plant for at a point no further than immediately downstream of the location from where the side-stream is drawn;
        b. no proprietary treatment process or propriety chemical is involved in the pilot study;
        c. the effluent from the pilot system returned to the sewage treatment plant does not significantly alter the composition/concentration of or add any new contaminant/inhibiting substances to the sewage to be treated in the downstream process;
        d. the pilot study will not have any negative impacts on the operation of the sewage treatment plant or cause a deterioration of effluent quality;
        e. the pilot study does not exceed a maximum of two years and a notification of completion shall be submitted to the District Manager within one month of completion of the pilot project.

13. Lagoons
    a. installing baffles in lagoon provided that the operating capacity of the lagoon system is not reduced;
    b. raise top elevation of lagoon berms to increase free-board;
    c. replace or install interconnecting pipes and chambers between cells, provided that the process design operating sequence is not changed;
    d. replace or install mechanical aerators, or replace mechanical aerators with diffused aeration system provided that the mixing and aeration capacity are not reduced;
    e. removal of accumulated sludge and disposal to an approved location offsite.

3. Final Effluent Disposal Facilities
    a. Replacement or realignment of the Final Effluent channel, sewer or forcemain, including manholes, valves and appurtenances from the end of the treatment train to the discharge outfall section, provided that the sewer conveys only effluent discharged from the Sewage Treatment Plant and that the replacement or re-aligned sewer has similar dimensions and performance criteria and is in the same or approximately the same location and that the hydraulic capacity will not be reduced.

Please contact the District Manager for a copy of the form entitled "Notice of Modification to Sewage Works".

SCHEDULE 6

Schedule F
Methodology for Calculating and Reporting Monthly Average Effluent Concentration, Annual Average Effluent Concentration and Monthly Geometric Mean Density

1. Monthly Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed as follows depending on the result of the calculation:

a. Group No Bypass Days (NBPD) data and Bypass Days (BPD) data during a calendar month separately;

b. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar month, then report and use this arithmetic mean as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval;

d. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, then proceed to Step 2;

e. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar month, the Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar month and proceed depending on the result of the calculation:

a. Group No Bypass Days (NBPD) data and Bypass Days (BPD) data during a calendar month separately

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar month and record it as Monthly Average NBPD Effluent Concentration;

c. Obtain the “Total Monthly NBPD Flow” which is the total amount of Final Effluent discharged on all NBPD during the calendar month;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar month and record it as Monthly Average BPD Effluent Concentration;

e. Obtain the “Total Monthly BPD Flow” which is the total amount of Final Effluent discharged on all BPD during the calendar month;

f. Calculate the flow-weighted arithmetic mean using the following formula:
[(Monthly Average NBPD Effluent Concentration × Total Monthly NBPD Flow) + (Monthly Average BPD Effluent Concentration × Total Monthly BPD Flow)] ÷ (Total Monthly NBPD Flow + Total Monthly BPD Flow)
It should be noted that in this method, if there are no Bypass Event for the month, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Monthly Average Effluent Concentration for this parameter where applicable in this Approval.

2. Annual Average Effluent Concentration

Step 1: Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed as follows depending on the result of the calculation:

a. If the arithmetic mean does not exceed the compliance limit for the contaminant, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

b. If the arithmetic mean exceeds the compliance limit for the contaminant and there was no Bypass Event during the calendar year, then report and use this arithmetic mean as the Annual Average Effluent Concentration for this parameter where applicable in this Approval;

c. If the arithmetic mean exceeds the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, then proceed to Step 2;

d. If the arithmetic mean does not exceed the compliance limit for the contaminant and there was Bypass Event(s) during the calendar year, the Owner may still elect to proceed to Step 2 calculation of the flow-weighted arithmetic mean.

Step 2: Calculate the flow-weighted arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured during a calendar year and proceed depending on the result of the calculation:

a. Group No Bypass Days (NBPD) data and Bypass Days (BPD) data during a calendar year separately;

b. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all NBPD during a calendar year and record it as Annual Average NBPD Effluent Concentration;

c. Obtain the “Total Annual NBPD Flow” which is the total amount of Final Effluent discharged on all NBPD during the calendar year;

d. Calculate the arithmetic mean of all Single Sample Results of the concentration of a contaminant in the Final Effluent sampled or measured on all BPD during a calendar year and record it as Annual Average BPD Effluent Concentration;

e. Obtain the “Total Annual BPD Flow” which is the total amount of Final Effluent discharged on all BPD during the calendar year;

f. Calculate the flow-weighted arithmetic mean using the following formula:
[(Annual Average NBPD Effluent Concentration × Total Annual NBPD Flow) + (Annual Average BPD Effluent Concentration × Total Annual BPD Flow)] ÷ (Total Annual NBPD Flow + Total Annual BPD Flow)
It should be noted that in this method, if there are no Bypass Event for the calendar year, the calculated result would be the same as the non-flow-weighted arithmetic mean method;

g. Report and use the lesser of the flow-weighted arithmetic mean obtained in Step 2 and the arithmetic mean obtained in Step 1 as the Annual Average Effluent Concentration for this parameter where applicable in this Approval.

3. Monthly Geometric Mean Density

Geometric mean is defined as the nth root of the product of n numbers. In the context of calculating Monthly Geometric Mean Density for E. coli, the following formula shall be used:

$$\sqrt[n]{(x_1 x_x x_3 \ldots x_n)}$$

(nth root of left-parenthesis x_1 multiplied by x_2 multiplied by x_3 multiplied by x_n right-parenthesis)

in which,
"n" is the number of samples collected during the calendar month; and
"x" is the value of each Single Sample Result.
For example, four weekly grab samples were collected and tested for E. coli during the calendar month. The E. coli densities in the Final Effluent were found below:

Sample Number	*E. coli* Densities* (CFU /100 mL)
1	10
2	100
3	300
4	50

The Geometric Mean Density for these data:

$$\sqrt[4]{(10 \times 100 \times 300 \times 50)} = 62$$

*If a particular result is zero (0), then a value of one (1) will be substituted into the calculation of the Monthly Geometric Mean Density. If the MPN method is utilized for E. coli analysis, values in the table shall be MPN/100 mL.

SCHEDULE 7

Schedule G

Municipal and Local Services Board Wastewater System Profile Information Form

Please contact the District Manager for a copy of the form entitled "Municipal and Local Services Board Wastewater System Profile Information Form".

Ontario

ENVIRONMENTAL COMPLIANCE APPROVAL
For a Municipal Sewage Collection System

ECA Number: 088-W601
Issue Number: 1

Pursuant to the *Environmental Protection Act*, R.S.O 1990, c. E. 19 (EPA*),* and the regulations made thereunder and subject to the limitations thereof, this environmental compliance approval is issued under section 20.3 of Part II.1 of the EPA to:

Kincardine, The Corporation of the Municipality of

1475 Concession #5 Conc R.R. 5
Kincardine, ON N2Z 2X6

For the following Sewage Works:

Kincardine and BEC Wastewater Collection System

This Environmental Compliance Approval (ECA) includes the following:

Schedule	Description
Schedule A	System Information
Schedule B	Municipal Sewage Collection System Description
Schedule C	List of Notices of Amendment to this ECA: Additional Approved Works
Schedule D	General
Schedule E	Operating Conditions
Schedule F	Residue Management

All prior ECAs, or portions thereof, issued by the Director for Sewage Works described in section 1 of Schedule B are revoked and replaced by this Approval.

DATED at TORONTO this 10th day of November, 2022

Signature

Aziz Ahmed, P.Eng.
Director, Part II.1, *Environmental Protection Act*

Schedule A: System Information

System Owner	**Kincardine, The Corporation of the Municipality of**
ECA Number	**088-W601**
System Name	**Kincardine and BEC Wastewater Collection System**
ECA Issue Date	**November 10th, 2022**

1.0 ECA Information and Mandatory Review Date

ECA Issue Date	November 10th, 2022
Application for ECA Review Due Date	June 15, 2028

1.1 Pursuant to section 20.12 of the EPA, the Owner shall submit an application for review of the Approval no later than the Application for ECA Review Date indicated above.

2.0 Related Documents

2.1 STPs, Satellite Treatment Facilities, and Pumping Stations connected to the Authorized System that are not part of the Authorized System:

System/Facility Name	Wastewater System Number	Location	ECA Number	Issue Date
Kincardine Wastewater Treatment Facility	110000864	520 Bruce Avenue, Kincardine	A-500-1121679176	February 11, 2022
Kincardine Wastewater Treatment -Effluent Station	110000864	169 Mahood-Johnston Drive	A-500-1121679176	February 11, 2022
Bruce Energy Center Wastewater Treatment Facility	110002700	1842 Concession 2, Tiverton	2362-BXVTJS	February 26, 2021

2.2 Other Documents

Document Title	Version
Design Criteria for Sanitary Sewers, Storm Sewers, and Forcemains for future Alterations Authorized under ECA	v.1.1 (Jul.28, 2022)

3.0 Asset Management Plan

Document Title	Version
The 2022 Asset Management Plan for the Municipality of Kincardine	June 2022

4.0 Pollution Prevention and Control Plan (if applicable)

Document Title	Version
N/A	

5.0 Operating Authority

System	Operating Authority
Kincardine and BEC Wastewater Collection System	The Municipality of Kincardine

Schedule B: Municipal Sewage Collection System Description

System Owner	**Kincardine, The Corporation of the Municipality of**
ECA Number	**088-W601**
System Name	**Kincardine and BEC Wastewater Collection System**
ECA Issue Date	**November 10th, 2022**

1.0 System Description

1.1 The following is a summary description of the Sewage Works comprising the Municipal Sewage Collection System:

Overview

The Kincardine and BEC Wastewater Collection System consists of works for the collection and transmission of sewage.

The Kincardine Wastewater Collection System consists of trunk sewers, separate sewers, 0 Kms of combined sewers, 11 sewage pumping stations, and forcemains, with discharge into the Kincardine Wastewater Treatment Plant. Treated wastewater then flows over to the Kincardine Wastewater Treatment Effluent Station before discharging to Lake Huron

The Bruce Energy Center (BEC) Wastewater Collection System consists of trunk sewers, separate sewers, 0 KM of combined sewers, 4 sewage pumping stations, and forcemains, with discharge into the Bruce Energy Center Wastewater Treatment Plant. Treated wastewater flows from the BEC Wastewater Treatment Plant to Lake Huron.

Sewage Collection System

1.2 The Authorized System comprises:

1.2.1 The Sewage Works described and depicted in each document or file identified in column 1 of Table B1.

Table B1: Infrastructure Map

Column 1 Document or File Name	Column 2 Date
Kincardine Wastewater Collection System	2022-02-07
BEC Wastewater Collection System	2022-02-04

1.2.2 Sewers, forcemains, pumping stations and other Sewage Works that have been added, modified, replaced, or extended through authorization provided in a Schedule C Notice respecting this Approval, where Completion occurs on or after the date identified in column 2 of Table B1 for each document or file identified in column 1.

1.2.3 Sewers, forcemains, pumping stations and other Sewage Works that have been added, modified, replaced, or extended through authorization provided in Schedule D of this Approval, where Completion occurs on or after the date identified in column 2 of Table B1 for each document or file identified in column 1.

1.2.4 Any Sewage Works described in conditions 1.3, through 1.7 below.

Sewage Pumping Stations

1.3 The following are Sewage pumping stations in the Authorized System:

[Kincardine Wastewater Collection-Connaught Park Sewage Pumping Station]

Asset ID and Name	S-CPPS Kincardine Wastewater Collection-Connaught Park Sewage Pumping Station
Site Location	141 Broadway Street, Kincardine
Latitude and Longitude	Lat: 44.18412 Lon: 81.63664
Coordinates (optional)	N 4892519.0259 E449116.1074 NAD1983 Zone 17N
Description	A wet well sewage pumping station located in Connaught Park, adjacent to the southeast portion of the former horse racing track, consisting of a two (2) cell wet well having a dimension of 8m by 4m with associated building
Pumping Station Capacity	88.5L/s
Equipment	Three (3) variable speed submersible pumps, two (2) duty, one (1) standby, having a firm design capacity of 88.5L/s at 25.2m Total Dynamic Head (TDH), one (1) space for future pump, complete with electrical and electronic control systems, a radar level transmitter with back-up float switches for each cell, discharge piping, ventilation system, air release valves and flow meter
Emergency Storage	
Equipment: Associated controls and appurtenances	Equipped with an automated rake bar screen; complete with electrical and electronic control systems, a radar level transmitter with back-up float switches for each cell, discharge piping, ventilation system, air release valves and flow meter, and all other appurtenances necessary to have a complete and operable pumping station
Sewage Pumping Station – Collection System Overflow	A 375mm overflow pipe discharges to Lake Huron via the stormwater system on Broadway Street. The emergency storage volume is 284.8m^3, the response time prior to overflow at peak flow is 53.6 minutes.
Receiving Stations (if applicable)	None
Odour Control Units	None

Standby Power	A 150 kW standby diesel generator set with a 1265L fuel tank.
Notes	Pumps sewage via a 250mm forcemain to Broadway and Huron Terrace, sewage then flows through the gravity sewers over to the Huron Terrace Pumping Station.

[Kincardine Wastewater Collection-Durham Street Sewage Pumping Station]

Asset ID and Name	S-DSPS Kincardine Wastewater Collection-Durham Street Sewage Pumping Station
Site Location	867 Olde Victoria Street, Kincardine
Latitude and Longitude	Lat: 44.17738 Lon: 81.63061
Coordinates (optional)	N 4891766.5085 E 449594.5897 NAD83 Zone 17N
Description	A submersible sewage pumping station with building located on part of Lot "A" south of Durham Street, east of Olde Victoria Street, in the town of Kincardine
Pumping Station Capacity	26.7L/s
Equipment	Two (2) submersible centrifugal non-clog sewage pumps, (one as standby), each rated to deliver 26.7 L/s against a total dynamic head of 14.6m, the 2.7m diameter wet well has 8.7 m^3 capacity. The station is connected to a 150mm forcemain discharging to the gravity sewer on Durham Street at Princes St.
Emergency Storage	
Equipment: Associated controls and appurtenances	
Sewage Pumping Station – Collection System Overflow	Overflow provided from the bypass sewage chamber to the Penetangore River. The emergency storage volume is approximately 5.7m^3, the response time prior to overflow at peak flow is 1.6 minutes.
Receiving Stations Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	A 25kW standby Diesel generator set with a 450L fuel tank
Notes	Discharges to a 150mm forcemain on Durham street, sewage flows through the gravity sewers on Princes Street and over to the Huron Terrace Sewage Pumping Station.

[Kincardine Wastewater Collection-Goderich Street Sewage Pumping Station]

Asset ID and Name	S-GSPS Kincardine Wastewater Collection-Goderich Street Sewage Pumping Station

Site Location	7 Goderich Street, Kincardine
Latitude and Longitude	Lat: 44.16045 Lon: 81.65676
Coordinates (optional)	N 4889900.1874 E 447486.4265 NAD1983 Zone 17N
Description	A wet well-dry well type sewage pumping station with building located on Goderich approximately 290 meters west of Bruce Avenue
Pumping Station Capacity	38.7 L/s
Equipment	Two (2) raw sewage pumps each capable of 38.7 L/s against a total dynamic head of 30.1m, one (1) bar screen, 4.9m by 3.2m wet well of 38.1 m^3 capacity. The station is connected to one 250mm diameter forcemain on Goderich Street discharging to the Kincardine Lagoon system.
Emergency Storage	
Equipment: Associated controls and appurtenances	Interconnecting piping between the wet well and dry well, associated valves, appurtenances and electrical controls, high level alarm system
Sewage Pumping Station – Collection System Overflow	One 375mm valved overflow pipe discharging to Lake Huron The emergency storage volume is 37.2 m^3, the response time prior to overflow at peak flow is 10.7 minutes.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	One 75 kW Diesel generator set with a 910L fuel tank
Notes	Discharging to the Wastewater Treatment Plant located at 520 Bruce Avenue via a 250mm forcemain.

[Kincardine Wastewater Collection-Harbour Lift Sewage Pumping Station]

Asset ID and Name	S-HLPS Kincardine Wastewater Collection-Harbour Lift Sewage Pumping Station
Site Location	249 Station Beach Road, Kincardine
Latitude and Longitude	Lat: 44.17618 Lon: 81.63871
Coordinates (optional)	N 4891638.9009 E 448945.3474 NAD1983 Zone 17N
Description	A sewage pumping station serving the Kincardine Marina Area, located on the west side of Huron Terrace in the Municipality of Kincardine; consisting of a 1.8m diameter wetwell with above ground weatherproof pump control panel (no building)
Pumping Station Capacity	5.7L/s
Equipment	Consisting of a 1.8m diameter wetwell with two (2) submersible pumps (one standby), each rated at approx. 5.7L/s at 6.4 Total Dynamic Head, complete with an air vent pipe and approx. 5m of 100mm diameter forcemain to

	connect to existing 100mm forcemain discharging to the Huron Terrace Sewage Pumping Station
Emergency Storage	
Equipment: Associated controls and appurtenances	
Sewage Pumping Station – Collection System Overflow	No overflow location. Sewage would backup into gravity sewer system on Station Beach Road.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	None
Notes	Discharging to the Huron Terrace Pumping Station via a 100mm diameter forcemain.

[Kincardine Wastewater Collection-Hunter's Ridge Sewage Pumping Station]

Asset ID and Name	S-HRPS Kincardine Wastewater Collection-Hunter's Ridge Sewage Pumping Station
Site Location	540 Hunter Street, Kincardine
Latitude and Longitude	Lat: 44.16621 Lon: 81.62666
Coordinates (optional)	N 4890522.6538 E 449898.9295 NAD1983 Zone 17N
Description	A Sanitary sewage pumping station construction in the centre of Hunter Street Cul-de-Sac consisting of an inground wet well, adjacent above ground weatherproof pump control panel, with adjacent inground chamber housing piping and valves and gravity drain pipe back to sewage pumping station wet well.
Pumping Station Capacity	3.53 L/s
Equipment	Two (2) submersible sewage pumps, each with a rated capacity of 3.53 L/s at a Total Dynamic Head of 12.2m, the 3.0m diameter wet well has approximately 12.7 m^3 of capacity. The station is connected to a 75mm diameter forcemain discharging to the gravity sewers on Hunter Street located approximately 45m south of Palmateer Drive.
Emergency Storage	
Equipment: Associated controls and appurtenances	Above ground weatherproof pump control panel with connection for portable generator; liquid level and alarm level float control system
Sewage Pumping Station – Collection System Overflow	Valved gravity overflow pipe connected to storm piping that discharges to the Penetengore River with the final receiving body being Lake Huron. The emergency storage volume is

	approximately 25m^3, the response time prior to overflow at peak flow is approximately 145.5 minutes.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	None
Notes	Discharges via a 75mm forcemain on Hunter Street to the gravity sewers approx. 45m south of Palmateer, sewage flows to the Park Street Pumping Station.

[Kincardine Wastewater Collection-Huron Terrace Sewage Pumping Station]

Asset ID and Name	S-HTPS Kincardine Wastewater Collection-Huron Terrace Sewage Pumping Station
Site Location	733 Huron Terrace, Kincardine
Latitude and Longitude	Lat: 44.17616 Lon: 81.63819
Coordinates (optional)	N 4891635.7805 E 448984.051 NAD1983 Zone 17N
Description	The main sewage pumping station consisting of a wet well and screen building; valve chamber and electrical building located on Huron Terrace
Pumping Station Capacity	300L/s
Equipment	A submersible type sewage pumping station equipped with three (3) submersible pumps (two (2) duty + one (1) standby) with variable frequency drives, each rated at 150 L/s at a total Dynamic Head of 45.6m, 1 automated bar screen, the 2 cell (5.2m by 3.25m and 5.5m by 3.6m) wet well of 155.6 m^3 capacity. The station is connected to a 450mm forcemain discharging to the Kincardine Wastewater Treatment Facility.
Emergency Storage	
Equipment: Associated controls and appurtenances	All mechanical, electrical, instrumentation and control systems, standby power, piping, pumps, valves, automated bar screen and appurtenances essential for the proper, safe and reliable operation of the works.
Sewage Pumping Station – Collection System Overflow	A 400mm emergency overflow pipe from the wet well to the Penetangore River, with the final received being Lake Huron. The emergency storage volume is 47.4m^3, the response time prior to overflow at peak flow is 2.6 minutes.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	One 450 kW Diesel generator set with a 3218 L fuel tank
Notes	Discharging to a 450mm diameter forcemain on Huron

	Terrace, sewage flows through approx. 2.6km of forcemain over to the Kincardine Wastewater Treatment Plant. New pumping station under ECA 2627-BRRGZQ to be constructed in 2022 Former C of A 3-1077-80-006

[Kincardine Wastewater Collection-Kincardine Avenue Pumping Station]

Asset ID and Name	S-KAPS Kincardine Wastewater Collection-Kincardine Avenue Pumping Station
Site Location	570 Kincardine Avenue, Kincardine
Latitude and Longitude	Lat: 44.16191 Lon: 81.63509
Coordinates (optional)	N 4890051.3422 E 449223.6042 NAD1983 Zone 17N
Description	A wet well-dry well type sewage pumping station with building located on Kincardine Avenue approximately 220m east of Park Street.
Pumping Station Capacity	39.3L/s
Equipment	A wet well/dry well with two (2) sewage pumps each capable of 39.3 L/s against a total dynamic head of 19.9m, one(1) bar screen, 4.9m by 2.7m wet well of 30.9 m^3 capacity. The station is connected to a 250mm diameter forcemain discharging to Kincardine Avenue then over to the Kincardine Wastewater Treatment Facility
Emergency Storage	
Equipment: Associated controls and appurtenances	Interconnecting piping between the wet well and dry well, associated valves, appurtenances and electrical controls, high level alarm system
Sewage Pumping Station – Collection System Overflow	One 375mm overflow pipe located approximately 95m west of the pumping station flowing to the Stewart Drain, then over to the Penetangore River which flows to Lake Huron. The emergency storage volume is approx. 1.32m^3, the response time prior to overflow at peak flow is 34 secs.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	One 40kW diesel generator set with a 910L fuel tank
Notes	Discharges to a 250mm diameter forcemain which connects to the Kincardine Wastewater Treatment Plant.

[Kincardine Wastewater Collection-Park Street Sewage Pumping Station]

Asset ID and Name	S-PSPS Kincardine Wastewater Collection-Park Street Sewage Pumping Station
Site Location	494 Scott Street, Kincardine

Latitude and Longitude	Lat: 44.16852 Lon: 81.63334
Coordinates (optional)	N 4890783.5448 E 449368.6488 NAD1983 Zone 17N
Description	Sewage Pumping Station with building located on the unopened Park Street Road allowance approximately 40m south of Scott Street.
Pumping Station Capacity	99.2 L/s
Equipment	Three (3) 66.3 L/s sewage pumps (two of which having a capacity of pumping 99.2 L/s when operated in parallel, one pump as standby, one bar screen, 2.44m by 6.3 wet well of 38.4 m^3 capacity. The station is connected to a 300mm diameter forcemain discharging to the Kincardine Wastewater Treatment Plant.
Emergency Storage	
Equipment: Associated controls and appurtenances	
Sewage Pumping Station – Collection System Overflow	A 300mm diameter emergency overflow pipe from the wet well discharges to the Stewart Drain which flows into the Penetangore River with the final receiving body being Lake Huron. The emergency storage volume is 55.5m^3, the response time prior to overflow at peak flow is 17.2 minutes.
Receiving Stations (if applicable)	Septage receiving station for hauled sewage, deposited directly into wet well via a manhole.
Odour Control Units	None
Standby Power	One 75 kW Diesel Generator set with a 910L fuel tank
Notes	Discharging via a 300mm diameter forcemain to the Kincardine Wastewater Treatment Facility.

[Kincardine Wastewater Collection-Queen Street Sewage Pumping Station]

Asset ID and Name	S-QSPS Kincardine Wastewater Collection-Queen Street Sewage Pumping Station
Site Location	601 Queen Street, Kincardine
Latitude and Longitude	Lat: 44.17221 Lon: 81.63831
Coordinates (optional)	N 4891192.4408 E 448976.9324 NAD1983 Zone 17N
Description	A sewage pumping station consisting of a 1.3m diameter wet well located on the unopened road allowance north of 601 Queen Street with an aboveground weatherproof pump control panel (no building) and an overflow pipe.
Pumping Station Capacity	1.6L/s
Equipment	One 2 HP submersible pump with an estimated pump capacity of 1.6 L/s, (presumed) grinder and a 1.2m wet well of approx. 1.7m^3 capacity. The station is connected to

	50mm diameter forcemain discharging to Queen Street then over to the Kincardine Wastewater Treatment Facility.
Emergency Storage	
Equipment: Associated controls and appurtenances	
Sewage Pumping Station – Collection System Overflow	A 150 diameter overflow pipe discharges to the Penetangore River and flows to Lake Huron.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	None
Notes	Discharges to a forcemain on Queen Street which leads to the Gravity sewer system which then flows over to the Huron Terrace Sewage Pumping Station.

[Kincardine Wastewater Collection-Groundwater Pumping Station]

Asset ID and Name	S-GWPS Kincardine Wastewater Collection-Groundwater Pumping Station
Site Location	139 Valentine Avenue, Kincardine
Latitude and Longitude	Lat: 44.15435 Lon: 81.64148
Coordinates (optional)	N 4889214.6691 E 448704.1416 NAD1983 Zone 17N
Description	A 1.5m diameter precast concrete pumping station with aboveground pump control panel (no building), located at 139 Valentine Avenue, the former landfill site.
Pumping Station Capacity	3.0 L/s
Equipment	One (1) 3.0 L/s submersible pump. The Station is connected to a 75mm forcemain discharging to the Kincardine Wastewater Treatment Plant Aeration Pond.
Emergency Storage	
Equipment: Associated controls and appurtenances	Above ground pump control panel with valve chamber, piping, and electrical
Sewage Pumping Station – Collection System Overflow	No Overflow chamber or piping.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	None

Notes	Discharges to a 75mm forcemain into the aeration pond at the Kincardine Wastewater Treatment Plant.

[Kincardine Wastewater Collection-Leachate Pumping Station]

Asset ID and Name	S-LPS Kincardine Wastewater Collection-Leachate Pumping Station
Site Location	139 Valentine Avenue, Kincardine
Latitude and Longitude	Lat: 44.15369 Lon: 81.63914
Coordinates (optional)	N 4889141.2421 E 448889.7012 NAD1983 Zone 17N
Description	A 1.5m diameter precast concrete pumping station with aboveground pump control panel (no building), located at 139 Valentine Avenue, the former landfill site.
Pumping Station Capacity	2.8 L/s
Equipment	One (1) 2.8 L/s submersible pump, 1.5m diameter wet well of 2.8m^3 capacity. The Station is connected to a 75mm forcemain discharging to the Kincardine Wastewater Treatment Plant Aeration Pond. Emergency storage tank/pipe volume is approx. 6.6m^3
Emergency Storage	
Equipment: Associated controls and appurtenances	Above ground pump control panel with valve chamber, piping, and electrical
Sewage Pumping Station – Collection System Overflow	No Overflow chamber or piping
Receiving Stations (if applicable)	Leachate collection receiving station from Kincardine Waste Management Center. Maximum allowable leachate received 33m3/day.
Odour Control Units	None
Standby Power	None
Notes	Discharges to a 75mm forcemain into the aeration pond at the Kincardine Wastewater Treatment Plant.

[BEC Wastewater Collection-Inverhuron Park Sewage Pumping Station]

Asset ID and Name	S-IPPS BEC Wastewater Collection-Inverhuron Park Sewage Pumping Station
Site Location	19 Jordan Road, Inverhuron
Latitude and Longitude	Lat: 44.29975 Lon: 81.58761
Coordinates (optional)	N 4905333.0978 E 453127.6209 NAD1983 Zone 17N
Description	A Sewage Pumping Station consisting of an in-ground pre-manufactured fiberglass reinforced plastic wet well 1.8m in diameter with an aboveground weatherproof pump control panel (no building) located near the gatehouse inside the

	boundary of the Inverhuron Provincial Park
Pumping Station Capacity	9.8 L/s
Equipment	Two (2) 18 HP submersible pumps (one duty and one standby), 1.8m wet well of 3.5 m^3 capacity. The station is connected to a 100mm forcemain discharging to Albert Road then over to the Bruce Energy Center Treatment Plant.
Emergency Storage	
Equipment: Associated controls and appurtenances	Aboveground Pump control Panel, electrical equipment, instrumentation, piping, pumps, valves, and appurtenances essential for the proper operation of the sewage works.
Sewage Pumping Station – Collection System Overflow	A 1.5m diameter precast bypass chamber located on the forcemain immediately downstream of the pumping station. There is no overflow from the SPS. In event of an emergency, sewage flow to the SPS halts. The Inverhuron Provincial Park has installed emergency overflow tanks at their major SPS within the Park, this allows for 75m^3 of upstream emergency storage. Note: there is also about 2.5m^3 of emergency storage at the SPS.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	None
Notes	Discharges to a 100mm forcemain that connects to the 200mm forcemain on Albert Street then goes to the Bruce Energy Center Treatment Facility.

[BEC Wastewater Collection-King Street Sewage Pumping Station]

Asset ID and Name	S-KSPS BEC Wastewater Collection-King Street Sewage Pumping Station
Site Location	41 King Street, Tiverton
Latitude and Longitude	Lat: 44.27242 Lon: 8154054
Coordinates (optional)	N 4902270.3353 E 456860.5855 NAD1983 Zone 17N
Description	Submersible type sewage pumping station located on Lot 36 west of King Street in Tiverton approximately 244m south of Lois Street with concrete block control building structure with yard piping, bypass chamber and overflow pipe.
Pumping Station Capacity	13.8 L/s
Equipment	Two (2) submersible pumps (1 duty and 1 standby) each rated at 13.8 L/s at 22.2m Total Dynamic Head, one bar screen, 2438mm diameter wet well of 6.4 m^3 capacity. The

	station is connected to a 100mm forcemain on King Street that connects to the gravity sewage system approximately 244m south and then flows to the Maple Street pumping station.
Emergency Storage	
Equipment: Associated controls and appurtenances	
Sewage Pumping Station – Collection System Overflow	A 200mm overflow pipe discharges from the bypass chamber to a stream which flows west to Little Sauble River then to Lake Huron. The emergency storage volume is 14.4m^3, the response time prior to overflow at peak flow is 46.2 minutes.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	A 10 kW diesel generator with a 454L fuel tank
Notes	Discharges via a 100mm forcemain on King Street to the gravity sanitary system approximately 244m south then flows over to maple street pumping station.

[BEC Wastewater Collection-Lake Street Sewage Pumping Station]

Asset ID and Name	S-LSPS BEC Wastewater Collection-Lake Street Sewage Pumping Station
Site Location	125 Lake Street
Latitude and Longitude	Lat: 44.28502 Lon: 81.59308
Coordinates (optional)	N 4903699.6602 E 452679.8117 NAD1983 Zone 17N
Description	Sewage pumping station consisting of approximately 3.5m diameter wet well, with aboveground weatherproof pump control panel (no building)
Pumping Station Capacity	5.6L/s
Equipment	Two (2) submersible centrifugal sewage pumps (one to act as standby), each rated at 5.6 L/s at 27.5m total dynamic head, 3.0m diameter wet well of 8.1m^3 capacity. The station is connected to a 75mm forcemain discharging to the Bruce Energy Center Treatment Facility.
Emergency Storage	
Equipment: Associated controls and appurtenances	Above ground pump control panel, emergency overflow, temporary bypass connection and surge relief valve;
Sewage Pumping Station – Collection System Overflow	Overflow to valve/Bypass chamber with 200mm overflow pipe to Lake Huron. The emergency storage volume is

	9.2m^3, the response time prior to overflow at peak flow is 47.8 minutes.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	None
Notes	Discharges via a 75mm forcemain to the Bruce Energy Center Wastewater Treatment Facility.

[BEC Wastewater Collection-Maple Street Sewage Pumping Station]

Asset ID and Name	S-MSPS BEC Wastewater Collection-Maple Street Sewage Pumping Station
Site Location	21 Maple Street, Tiverton
Latitude and Longitude	Lat: 44.26788 Lon: 81.54953
Coordinates (optional)	N 4901771.2456 E 456144.0079 NAD1983 Zone 17N
Description	Submersible type sewage pumping station located at 21 Maple Street with a concrete block control building structure, yard piping, bypass chamber, and overflow pipe
Pumping Station Capacity	29.6 L/s
Equipment	Two (2) submersible pumps (1 duty and 1 standby) each rated at 29.6 L/s at 10.0 Total dynamic head. one bar screen, 2438mm diameter wet well of 9.2 m^3 capacity. The Station is connected to a 200mm forcemain discharging to the Bruce Energy Center Wastewater Treatment Facility.
Emergency Storage	
Equipment: Associated controls and appurtenances	
Sewage Pumping Station – Collection System Overflow	The 300mm overflow pipe discharges into a creek that flows into Tiverton Creek then west to Lake Huron. The emergency storage volume is 19.2m^3, the response time prior to overflow at peak flow is 7.2 minutes.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	A 10 kW Diesel Generator with a 454 L fuel tank
Notes	Discharges via a 200mm forcemain to the Bruce Energy Center Wastewater Treatment Facility.

[Combined Sewage Pumping Stations] Not Applicable

Asset ID and Name	N/A
Site Location	
Latitude and Longitude	
Coordinates (optional)	
Description	
Pumping Station Capacity	
Equipment	
Emergency Storage	
Equipment: Associated controls and Appurtenances	
Sewage Pumping Station – Collection System Overflow	
Receiving Stations (if applicable)	
Odor Control Units	
Standby Power	
Notes	

Real-Time Control

1.4 The following are identified Real-Time Control Systems in the Authorized System:

	Description
Process Equipment/System Elements	Radar Level Measurement for pump control Ultrasonic level measurement for pump control
Flow Measurement Locations	Where present at SPS's, flow meters are used for monitoring purposes but do not provide operational control
Level Measurement Locations	Radar level measurement for control of pumps at: Connaught Park SPS Huron Terrace SPS Ultrasonic level measurement for control of pumps at: Durham Street SPS Goderich Street SPS Harbour Lift SPS Hunter's Ridge SPS Kincardine Ave SPS Park Street SPS Queen Street SPS Groundwater Leachate

	King Street SPS Inverhuron Park SPS Lake Street SPS Maple Street SPS
Other Instrumentation and Controls	Float switches are provided for pump control (primary control for stations without ultrasonic or radar level measurement, backup control for stations with ultrasonic or radar level measurement)

Combined Sewage Structures

1.5 The following are regulators and combined Sewage storage structures in the Authorized System:

Table B2: Identified Combined Sewer Overflow Regulators			
Column 1 Asset ID/Name	Column 2 Site Location (Latitude & Longitude)	Column 3 Regulator Capacity (m^3/s)	Column 4 Overflow Location (Latitude & Longitude)
N/A			

Table B3: Identified Combined Sewage Storage Tanks and Storage Structures			
Column 1 Asset ID/Name	Column 2 Site Location (Latitude & Longitude)	Column 3 Regulator Capacity (m^3/s)	Column 4 Overflow Location (Latitude & Longitude)
N/A			

Collection System Overflow Points

1.6 The following are Collection System Overflow points in the Authorized System:

Table B4: Identified Combined Sewer Overflow Points including Pumping Stations			
Column 1 Asset ID / Name	Column 2 Regulator or Combined Sewer Storage Asset ID	Column 3 Overflow Location (Latitude & Longitude)	Column 4 Point of Entry to Receiver (Latitude and Longitude)
STM-2358/ Connaught Park SPS Overflow		Lat: 44.18372 Lon: 81.63853	Lat: 44.18372 Lon: 81.63853
STM-1436/ Hunter's Ridge SPS Overflow		Lat: 44.16708 Lon: 81.62560	Lat: 44.17686 Lon: 81.63834
SM-850/ Park Street SPS Overflow		Lat: 44.16810 Lon: 81.63360	Lat: 44.17686 Lon: 81.63834

Table B5: Identified Sanitary Sewer Overflow Points including Pumping Stations			
Column 1 Asset ID	Column 2 Asset Name	Column 3 Overflow Location (Latitude & Longitude)	Column 4 Point of Entry to Receiver (Latitude and Longitude)
SM-851	Sanitary Main-Kincardine WWC Durham Street SPS Overflow Pipe	Lat: 44.17710 Lon: 81.63025	Lat: 44.17686 Lon: 81.63834
SM-947	Sanitary Main-Kincardine WWC Goderich Street SPS Overflow Pipe	Lat: 44.16057 Lon: 81.65708	Lat: 44.16057 Lon: 81.65708
SM-1000	Sanitary Main-Kincardine WWC Huron Terrace SPS Overflow Pipe	Lat: 44.17659 Lon: 81.63801	Lat: 44.17686 Lon: 81.63834
SM-17	Sanitary Main-Kincardine WWC Kincardine Avenue SPS Overflow Pipe	Lat: 44.16240 Lon: 81.63623	Lat: 44.17686 Lon: 81.63834
SM-1167	Sanitary Main-Kincardine WWC Queen Street SPS Overflow Pipe	Lat: 44.17212 Lon: 81.63808	Lat: 44.17686 Lon: 81.63834
SM-255	Sanitary Main- BEC WWC King Street SPS Overflow Pipe	Lat: 44.27198 Lon: 81.54066	Lat: 44.29102 Lon: 81.59161
SM-1133	Sanitary Main-BEC WWC Maple Street SPS Overflow Pipe	Lat: 44.26794 Lon: 81.54933	Lat: 44.27230 Lon: 81.60427
SM-1134	Sanitary Main-BEC WWC Lake Street SPS Overflow Pipe	Lat: 44.28514 Lon: 81.59328	Lat: 44.28514 Lon: 81.59328

Other Works:

1.7 The following works are part of Authorized System:

Table B6: Other Works			
Column 1 Asset ID / Name	Column 2 Site Location (Latitude & Longitude)	Column 3 Component	Column 4 Description
N/A			

Schedule C: List of Notices of Amendment to this ECA: Additional Approved Sewage Works

System Owner	**Kincardine, The Corporation of the Municipality of**
ECA Number	**088-W601**
System Name	**Kincardine and BEC Wastewater Collection System**
ECA Issue Date	**November 10th, 2022**

1.0 General

1.1 Table C1 provides a list of all notices of amendment to this Approval that have been issued pursuant to clause 20.3(1) of the EPA that impose terms and conditions in respect of the Authorized System after consideration of an application by the Director (Schedule C Notices).

Table C1: Schedule C Notices

Column 1 Issue #	Column 2 Issue Date	Column 3 Description	Column 4 Status	Column 5 DN#
N/A	N/A	N/A	N/A	N/A

Schedule D: General

System Owner	**Kincardine, The Corporation of the Municipality of**
ECA Number	**088-W601**
System Name	**Kincardine and BEC Wastewater Collection System**
ECA Issue Date	**November 10th, 2022**

1.0 Definitions

1.1 For the purpose of this Approval, the following definitions apply:

"Adverse Effect(s)" has the same meaning as defined in section 1 of the EPA.

"Alteration(s)" includes the following, in respect of the Authorized System, but does not include repairs to the system:

a) An extension of the system,

b) A replacement or retirement of part of the system, or

c) A modification of, addition to, or enlargement of the system.

"Approval" means this Environmental Compliance Approval including any Schedules attached to it.

"Appurtenance(s)" has the same meaning as defined in O. Reg. 525/98 (Approval Exemptions) made under the OWRA.

"Authorized System" means the Sewage Works comprising the Municipal Sewage Collection System authorized under this Approval".

"Average Year" means the long term average of flow based on:

a) Simulation of at least twenty years of rainfall data;

b) A year in which the rainfall pattern (e.g., intensity, volume, and frequency) is consistent with the long-term mean of the area;

c) A year in which the runoff pattern resulting from the rainfall (e.g., rate, volume, and frequency) is consistent with the long-term mean of the area; or

d) Any combination of a), b) and c).

"Collection System Overflow(s)" means a discharge (SSO or CSO) to the environment at designed location(s) from the Authorized System.

“Combined Sewer(s)” means pipes that collect and transmit both sanitary Sewage and other Sewage from residential, commercial, institutional and industrial buildings, and facilities and Stormwater through a single-pipe system, but does not include Nominally Separate Sewers.

“Completion” means substantial performance as described in s.2 (1) of the *Construction Act*, R.S.O. 1990, c. C.30.

“Compound of Concern” means a Contaminant that is discharged from the Facility in an amount that is not negligible.

“Contaminant” has the same meaning as defined in section 1 of the EPA.

“CSO” means a combined sewer overflow which is a discharge to the environment at designated location(s) from a Combined Sewer or Partially Separated Sewer as per Table B4 that usually occurs as a result of precipitation when the capacity of the Sewer is exceeded. An intervening time of twelve hours or greater separating a CSO from the last prior CSO at the same location is considered to separate one overflow Event from another.

"CWA" means the *Clean Water Act*, R.S.O. 2006, c.22.

“Design Criteria” means the design criteria set out in the Ministry’s publication “Design Criteria for Sanitary Sewers, Storm Sewers and Forcemains for Alterations Authorized under Environmental Compliance Approval”, (as amended from time to time).

“Design Guidelines for Sewage Works” means the Ministry document titled “Design Guidelines for Sewage Works”, 2008 (as amended from time to time).

"Director" means a person appointed by the Minister pursuant to section 5 of the EPA for the purposes of Part II.1 of EPA (Environmental Compliance Approvals).

“Director Notification Form” means the most recent version of the Ministry form titled Director Notification – Alterations to a Municipal Sewage Collection System, as obtained directly from the Ministry or from the Ministry’s website.

"District Manager" means the district manager or a designated representative of the Local Ministry Office.

“Dry Weather Flow(s)” means Sewage flow resulting from both sanitary Sewage, and infiltration and inflows from foundation drains or other drains occurring during periods with an absence of rainfall or snowmelt.

"EAA" means the *Environmental Assessment Act*, R.S.O. 1990, c. E.18.

"EPA" means the *Environmental Protection Act*, R.S.O. 1990, c.E.19.

"Emergency Situation" means a structural, mechanical, electrical failure, or operational health and safety incident, that causes a temporary reduction in the capacity, function, or performance of any part of the Authorized System or an unforeseen flow condition that may result in:

a) Danger to the health or safety of any person;

b) Injury or damage to any property, or serious risk of injury or damage to any property;

c) Adverse Effect to the Natural Environment; or

d) Spill.

"Equipment" means equipment or processes described in this Approval and any other equipment or process that supports the operation or maintenance of the Authorized System.

"ESC" means erosion and sediment control.

"Event(s)" means an action or occurrence, at any given location within the Authorized System that causes a Collection System Overflow. An Event ends when there is no recurrence of a CSO or SSO in the Collection System at the same location in the 12-hour period following the last Collection System Overflow.

"Facility" means the entire operation located on the property where the Sewage Works or Equipment is located.

"Form A1" means the most recent version of the Ministry form titled Record of Future Alteration Authorized for Equipment Discharging a Contaminant of Concern to the Atmosphere from a Municipal Sewage Collection System, as obtained directly from the Ministry or from the Ministry's website.

"Form CS1" means the most recent version of the Ministry form titled Record of Future Alteration Authorized for Combined Sewers/Partially Separated Sewers/Combined Sewage Storage Tanks and Storage Structures as obtained directly from the Ministry or from the Ministry's website.

"Form SS1" means the most recent version of the Ministry form titled Record of Future Alteration Authorized for Separate Sewers/Nominally Separate Sewers/Forcemains, as obtained directly from the Ministry or from the Ministry's website.

"Form SS2" means the most recent version of the Ministry form titled Record of Future Alteration Authorized for Components of the Municipal Sewage Collection System, as obtained directly from the Ministry or from the Ministry's website.

"Hauled Sewage" has the same meaning as defined in section 1 of Regulation 347 (General – Waste Management) made under the EPA.

"Licensed Engineering Practitioner" means a person who holds a licence, limited licence, or temporary licence under the *Ontario Professional Engineers Act* R.S.O. 1990, c. P.28.

"Local Ministry Office" means the local office of the Ministry responsible for the geographic area where the Authorized System is located.

"Minister" means the Minister of the Ministry, or such other member of the Executive Council as may be assigned the administration of the EPA and OWRA under the *Executive Council Act*, R.S.O. 1990, c. E.25.

"Ministry" means the Ministry of the Minister and includes all employees or other persons acting on its behalf.

"Municipal Sewage Collection System" means all Sewage Works, located in the geographical area of a municipality that collect and transmit Sewage and are owned, or may be owned pursuant to an agreement with a municipality entered into under the *Planning Act* or *Development Charges Act*, 1997, by:

a) A municipality, a municipal service board established under the *Municipal Act*, 2001 or a city board established under the *City of Toronto Act*, 2006; or

b) A corporation established under sections 9, 10, and 11 of the *Municipal Act*, 2001 in accordance with section 203 of that Act or under sections 7 and 8 of the *City of Toronto Act*, 2006 in accordance with sections 148 and 154 of that Act.

"Natural Environment" has the same meaning as defined in section 1 of the EPA.

"Nominally Separate Sewer(s)" mean Separate Sewers that also have connections from roof leaders and foundation drains, and are not considered to be Combined Sewers.

"Operating Authority" means, in respect of the Authorized System, the person, entity, or assignee that is given responsibility by the Owner for the operation, management, maintenance or Alteration of the Authorized System or a portion of the Authorized System.

"Owner" for the purposes of this Approval The Corporation of the Municipality of Kincardine, and includes its successors and assigns.

"OWRA" means the *Ontario Water Resources Act*, R.S.O. 1990, c. O.40.

"O&M Manual" means the operation and maintenance manual prepared and maintained by the Owner under condition 3.2 in Schedule E of this Approval.

"Partially Separated Sewer(s)" means Combined Sewers that have been retrofitted to transmit sanitary Sewage but in which roof leaders or foundation drains still contribute Stormwater inflow to the Partially Separated Sewer.

"Peak Hourly Flow" means the the largest volume of flow to be received during a one-hour period expressed as a volume per unit time. This is also referred to as maximum hourly flow or maximum hour flow.

"Point of Entry" has same meaning as in the Wastewater Systems Effluent Regulations (SOR/2012-139) under the *Fisheries Act*, R.S.C 1985, c. F-14.

“Pollution Prevention and Control Plan” or “PPCP” means a plan developed for Combined Sewers in the Authorized System to meet the goals of Procedure F-5-5.

"Prescribed Person” means a person prescribed in O. Reg. 208/19 (Environmental Compliance Approval in Respect of Sewage Works) for the purpose of ss. 20.6 (1) of the EPA, and where the alteration, extension, enlargement, or replacement is carried out under an agreement with the Owner.

"Procedure F-5-1" means the Ministry document titled “F-5-1 Determination of Treatment Requirements for Municipal and Private Sewage Treatment Works” (as amended from time to time).

"Procedure F-5-5" means the Ministry document titled “F-5-5 Determination of Treatment Requirements for Municipal and Private Combined and Partially Separated Sewer System” (as amended from time to time).

"Publication NPC-207" means the Ministry draft technical publication "Impulse Vibration in Residential Buildings", November 1983, supplementing the Model Municipal Noise Control By-Law, Final Report, August 1978, (as amended from time to time).

“Publication NPC-300” means the Ministry publication NPC-300, “Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning” August 2013, (as amended from time to time).

“Pumping Station Capacity” means the design Peak Hourly Flow of Sewage which the Sewage pumping station is designed to handle.

“Real-time Control System” means the dynamic operation of the collection system, including Real-Time Physical Control Structures, by responding to continuous field monitoring to maintain and achieve performance and operational objectives, during dry and wet weather conditions.

“Real-time Physical Control Structure” means a structure (e.g., pumps, gates, and weirs) that reacts in real-time based on direction from the Real-Time Control System.

“Regulator Capacity” means the flowrate (m^3/s) at which Collection System Overflow begins.

“SAC” means the Ministry’s Spills Action Centre.

“SCADA” means a supervisory control and data acquisition system used for process monitoring, control, automation, recording, and/or reporting within the Sewage system.

“Schedule C Notice(s)” means a notice(s) of amendment to this Approval issued pursuant to clause 20.3(1) of the EPA that imposes terms and conditions in respect of the Authorized System after consideration of an application by the Director.

“Separate Sewer(s)” means pipes that collect and transmit sanitary Sewage and other Sewage from residential, commercial, institutional, and industrial buildings.

“Sewage” has the same meaning as defined in section 1 of the OWRA.

“Sewage Works” has the same meaning as defined in section 1 of the OWRA.

“Sewer” has the same meaning as defined in section 1 of O. Reg. 525/98 under the OWRA.

"Significant Drinking Water Threat" has the same meaning as defined in section 2 of the CWA.

“Significant Snowmelt Event(s)” means the melting of snow at a rate which adversely affects the performance and function of the Authorized System and/or the STP(s) identified in Schedule A of this Approval.

“Significant Storm Event(s)” means a minimum of 25 mm of rain in any 24 hours period.

“Source Protection Authority” has the same meaning as defined in section 2 of the CWA.

"Source Protection Plan" means a drinking water source protection plan prepared under the CWA.

“Spill(s)” has the same meaning as defined in subsection 91(1) of the EPA.

“SSO” means a sanitary sewer overflow which is a discharge of Sewage from a Separate Sewer or Nominally Separate Sewer to the environment from designated location(s) in the Authorized System as per Table B5.

“Standard Operating Policy for Sewage Works” means the standard operating policy developed by the Ministry to assist in the implementation of Source Protection Plan policies related to Sewage Works and providing minimum design and operational standards and considerations to mitigate risks to sources of drinking water, as amended from time to time.

“Storm Sewer” means Sewers that collect and transmit, but not exfiltrate or lose by design, Stormwater resulting from precipitation and snowmelt.

“Stormwater” means rainwater runoff, water runoff from roofs, snowmelt, and surface runoff.

“Stormwater Management Facility(ies)” means a Facility for the treatment, retention, infiltration, or control of Stormwater.

“STP” means sewage treatment plant.

“STP Bypass(es)” means diversion of Sewage around one or more treatment processes, excluding preliminary treatment system, within the STP with the diverted Sewage flows being returned to the STP treatment train upstream of the

final effluent sampling point(s) and discharged via the approved effluent disposal facilities.

“STP Overflow(s)” means a discharge to the environment from the STP at designed location(s) other than the approved effluent disposal facilities or via the effluent disposal facilities downstream of the final effluent sampling point.

“Uncommitted Reserve Hydraulic Capacity” means uncommitted reserve capacity as described in the Ministry document titled “D-5-1 Calculating and Reporting Uncommitted Reserve Capacity at Sewage and Water Treatment Plants” (as amended from time to time).

"Undertaking" has the same meaning as in the EAA.

“Vulnerable Area(s)” has the same meaning as in the CWA.

“Wet Weather Flow(s)” means the flow resulting from the combination of sanitary Sewage and extraneous flows resulting from the inflow and infiltration of groundwater, rainfall or snowmelt, and snow or ice melt that enters the Authorized System.

2.0 General Conditions

2.1 The works comprising the Authorized System shall be constructed, installed, used, operated, maintained, replaced, or retired in accordance with the conditions of this Approval, which includes the following Schedules:

Schedule A – System Information

Schedule B – Municipal Sewage Collection System Description

Schedule C – List of Notices of Amendment to this ECA

Schedule D – General

Schedule E – Operating Conditions

Schedule F – Residue Management

2.2 The issuance of this Approval does not negate the requirements of other regulatory bodies, which includes but is not limited to, the Ministry of Northern Development, Mines, Natural Resources and Forestry and the local Conservation Authority.

2.3 Where there is a conflict between a provision of any document referred to in this Approval and the conditions of this Approval, the conditions in this Approval shall take precedence. Where there is a conflict between the information in a Schedule C Notice and another section of this Approval, the document bearing the most recent date shall prevail.

2.4 The Owner shall ensure that any person authorized to carry out work on or operate any aspect of the Authorized System is provided with a print or electronic copy of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

2.5 The conditions of this Approval are severable. If any condition of this Approval, or the application of any requirement of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

3.0 Alterations to the Municipal Sewage Collection System

3.1 Any Schedule C Notice shall provide authority to alter the Authorized System in accordance with the conditions of this Approval.

3.2 All Schedule C Notices issued by the Director for the Municipal Sewage Collection System shall form part of this Approval.

3.3 The Owner and a Prescribed Person shall ensure that the documentation required through conditions in this Approval and the documentation required in the Design Criteria are prepared for any Alteration of the Authorized System.

3.4 The Owner shall notify the Director within thirty (30) calendar days of the placing into service or Completion of any Alteration of the Authorized System which had been authorized:

3.4.1 Under Schedule D to this Approval where the Alteration results in a change to Sewage Works or Equipment specifically described in Schedule B of this Approval;

3.4.2 Through a Schedule C Notice respecting Sewage Works other than Sewers or forcemains; or

3.4.3 Through another approval that was issued under the EPA prior to the issue date of this Approval.

3.5 The notification requirements set out in condition 3.4 do not apply to any Alteration in respect of the Authorized System which:

3.5.1 Is exempt under section 53(6) of the OWRA or by O. Reg. 525/98;

3.5.2 Constitutes maintenance or repair of the Authorized System; or

3.5.3 Is a Sewer or forcemain authorized by condition 4.1 of Schedule D of this Approval.

3.6 The Owner shall notify the Director within ninety (90) calendar days of:

3.6.1 The discovery of existing Sewage Works not described or depicted in Schedule B, or

3.6.2 Additional or revised information becoming available for any Sewage Works or Equipment described in Schedule B of this Approval.

3.7 The notifications required in condition 3.4 and 3.6 shall be submitted to the Director using the Director Notification Form.

3.8 The Owner shall ensure that an ESC plan is prepared, and temporary ESC measures are installed in advance of and maintained during any construction activity on the Authorized System, subject to the following conditions:

3.8.1 Inspections of ESC measures are to be conducted at a frequency specified per the ESC plan, for dry weather periods (active and inactive construction phases), after Significant Storm Events and Significant Snowmelt Events, and after any extreme weather events.

3.8.2 Any deficiencies shall be addressed, and any required maintenance actions(s) shall be undertaken as soon as practicable once they have been identified.

3.8.3 Inspections and maintenance of the temporary ESC measures shall continue until they are no longer required.

3.8.4 The ESC plan, ESC measures and its installation, inspections and maintenance shall have regard to at least one of the following:

a) CSA W202 Erosion and Sediment Control Inspection and Monitoring Standard, as amended from time to time;

b) Erosion and Sediment Control Guideline for Urban Construction (2019), as amended from time to time, prepared by the Toronto Region Conservation Authority; or

c) CSA W208 Erosion and Sediment Control Installation and Maintenance, as amended from time to time.

3.9 The Owner shall ensure that records of inspections required by this Approval during any construction activity, including those required under condition 3.8:

3.9.1 Include the name of the inspector, date of inspection, visual observations, and the remedial measures, if any, undertaken to maintain the temporary ESC measures.

3.9.2 Be retained with records relating to the Alteration that the construction relates to, such as the form required in conditions 4.3.1, 5.4.1, 6.9.1, or 7.6.1 of Schedule D, or the Schedule C Notice.

3.9.3 Be retrievable and made available to the Ministry upon request.

3.10 The document(s) or file(s) referenced in Table B1 of Schedule B of this Approval shall:

3.10.1 Be retained by the Owner;

3.10.2 Include at a minimum:

a) Identification of the type of Sewers in the Municipal Sewage Collection System (e.g., Separate Sewer; Combined Sewer; Partially Separated Sewer; Nominally Separate Sewer) including:

i Location of Sewers relative to street names or easements;

ii Sewer and/or forcemain diameters;

iii Identification of pumping stations and storage structures, including asset IDs;

iv Identification of SSO and/or CSO locations, including asset IDs;

v Identification of small-bore systems, if any; and

vi Identification of any source protection Vulnerable Areas.

3.10.3 Be updated to include:

a) Alterations authorized under Schedule D of this Approval or through a Schedule C Notice within twelve (12) months of the Alteration being placed into service.

b) Updates to information contained in the document(s) or files(s) not associated with an Alteration within twelve (12) months of becoming aware of the updated information.

3.11 An Alteration is not authorized under Schedule D of this ECA for projects that impact Indigenous treaty rights or asserted rights where:

3.11.1 The project is on Crown land or would alter access to Crown land;

3.11.2 The project is in an open or forested area where hunting, trapping or plant gathering occur;

3.11.3 The project involves the clearing of forested land unless the clearing has been authorized by relevant municipal, provincial, or federal authorities, where applicable;

3.11.4 The project alters access to a water body;

3.11.5 The proponent is aware of any concerns from Indigenous communities about the proposed project and these concerns have not been resolved; or

3.11.6 Conditions respecting Indigenous consultation in relation to the project were placed in another permit or approval and have not been met.

3.12 No less than 60 days prior to construction associated with an Alteration the Director may notify the Owner in writing that a project is not authorized through Schedule D of this ECA where:

3.12.1 Concerns regarding treaty rights or asserted rights have been raised by one or more Indigenous communities that may be impacted by the Alteration; or

3.12.2 The Director believes that it is in the public interest due to site specific, system specific, or project specific considerations.

3.13 Where an Alteration is not authorized under condition 3.11 or 3.12 above:

3.13.1 An application respecting the Alteration shall be submitted to the Ministry; and,

3.13.2 The Alteration shall not proceed unless:

a) Approval for the Alteration is granted by the Ministry (i.e., a Schedule C Notice); or,

b) The Director provides written notice that the Alteration may proceed in accordance with conditions in Schedule D of this ECA.

4.0 Authorizations of Future Alterations for Separate Sewers, Nominally Separate Sewers and Forcemains - Additions, Modifications, Replacements and Extensions

4.1 The Owner or a Prescribed Person may alter the Authorized System by adding, modifying, replacing, or extending a Separate Sewer, Nominally Separate Sewer or forcemain within the Authorized System subject to the following conditions and condition 4.2 below:

4.1.1 The design of the addition, modification, replacement, or extension:

a) Has been prepared by a Licensed Engineering Practitioner;

b) Has been designed only to collect and transmit Sewage and has not been designed to treat Sewage;

c) Satisfies the Design Criteria or any municipal criteria that have been established that exceed the minimum requirements set out in the Design Criteria;

d) Is consistent with or otherwise addresses the design objectives contained within the Design Guidelines for Sewage Works; and

e) Includes design considerations to protect sources of drinking water, including those set out in the Standard Operating Policy for Sewage Works, and any applicable local Source Protection Plan policies.

4.1.2 The addition, modification, replacement, or extension shall be designed so that it will:

a) Not cause overflows or backups nor increase surcharging at any maintenance holes or privately owned infrastructure (e.g., service connections to basements) connected to the Authorized System or any Municipal Sewage Collection System connected to it;

b) Provide smooth flow transition to existing gravity Sewers; and

c) Not increase the generation of sulfides and other odourous compounds in the Municipal Sewage Collection System.

4.1.3 The maximum discharge/generation of Sewage by users who will be served by the addition, modification, replacement, or extension will not result in:

a) An exceedance of the Authorized System hydraulic capacity, STP Uncommitted Reserve Hydraulic Capacity, or the downstream Pumping Station Capacity as specified in this Approval;

b) Adverse Effects;

c) Any increase in Collection System Overflows that is not offset by measures; or

d) Any increase in the frequency or volume of STP Bypasses or STP Overflows that is not offset by measures.

4.1.4 The addition, modification, replacement, or extension is wholly located within the municipal boundary over which the Owner has jurisdiction or there is a written agreement in place with the adjacent municipality respecting the Alteration and resulting Sewage Works.

4.1.5 The Owner consents in writing to the addition, modification, replacement, or extension.

4.1.6 A Licensed Engineering Practitioner has verified in writing that the addition, modification, replacement, or extension meets the requirements of conditions 4.1.1 a) to d).

4.1.7 The Owner has verified in writing that the addition, modification, replacement, or extension has complied with inspection and testing requirements in the Design Criteria.

4.1.8 The Owner has verified in writing that the addition, modification, replacement, or extension meets the requirements of conditions 4.1.4 e) and 4.1.2 to 4.1.6.

4.2 The Owner or a Prescribed Person is not authorized to undertake an Alteration described above in condition 4.1 where the Alteration relates to the addition,

modification, replacement or extension of a Separate Sewer, Nominally Separate Sewer, or forcemain that:

4.2.1 Passes under or through a body of surface water unless trenchless construction methods are used, or the local Conservation Authority has authorized an alternative construction method.

4.2.2 Has a nominal diameter greater than 750 mm for a Separate Sewer or Nominally Separate Sewer.

4.2.3 Has a nominal diameter greater than 350 mm for a forcemain.

4.2.4 Is a Combined Sewer or Partially Separated Sewer.

4.2.5 Connects to another Municipal Sewage Collection System, unless:

a) Prior to construction, the Owner of the Authorized System obtains written consent from the Owner or Owner's delegate of the Municipal Sewage Collection System being connected to; and

b) The Owner of the Authorized System retains a copy of the written consent from the Owner or Owner's delegate of the Municipal Sewage Collection System being connected to as part of the record that is recorded and retained under condition 4.3.

4.2.6 Creates a new discharge point to the Natural Environment.

4.2.7 Is part of an Undertaking in respect of which:

a) A request under s.16(6) of the EAA has been made, namely a request that the Minister make an order under s.16;

b) The Minister has made an order under s.16; or

c) The Director under that EAA has given notice under s.16.1 (2) that the Minister is considering making an order under s.16.

4.3 The consents and verifications required in conditions 4.1 and 4.2, if applicable, shall be:

4.3.1 Recorded on Form SS1 prior to the Separate Sewer, Nominally Separate Sewer or forcemain addition, modification, replacement, or extension being placed into service; and

4.3.2 Retained for a period of at least ten (10) years by the Owner.

4.4 For greater certainty, the verification requirements set out in condition 4.3 do not apply to any Alteration in respect of the Authorized System which:

4.4.1 Is exempt under section 53(6) of the OWRA or by O. Reg. 525/98; or

4.4.2 Constitutes maintenance or repair of the Authorized System.

5.0 Authorizations of Future Alterations for Combined Sewers, Partially Separated Sewers and Combined Sewage Storage Tanks and Storage Structures

5.1 Subject to conditions 5.2 and 5.3, the Owner or a Prescribed Person may alter the Combined Sewers, Partially Separated Sewers and combined Sewage storage tanks and storage structures in the Authorized System by:

5.1.1 Modifying or replacing Combined Sewers, Partially Separated Sewers, overflow Regulators and/or outfalls if the purpose of the project is to restore the Sewage Works to good condition.

5.1.2 Replacing Combined Sewers with Separate Sewers for Stormwater and sanitary Sewage.

5.1.3 Modify or replace Combined Sewers, Partially Separated Sewers, overflow regulators, outfalls, or combined Sewage storage tanks, provided that:

a) The Alteration is designed in such a manner that will contribute to the ultimate attainment of the capture and treatment for an Average Year all the Dry Weather Flow plus a minimum of 90% of the volume resulting from Wet Weather Flow that is above Dry Weather Flow;

b) The volume control criterion described in 5.1.3 a) is applied:

i For a consecutive seven (7) month period commencing within fifteen (15) calendar days of April 1; and

ii To the flows collected by the Authorized System immediately above each Collection System Overflow location unless it can be shown through modelling that the criterion is being achieved on a system-wide basis.

c) The Alteration is designed in a manner that will not increase CSO volumes above existing levels at each outfall except where the increase is due to the elimination of upstream CSO outfalls as part of the Alteration; and

d) During the remainder of the year following the seven (7) month period described in condition 5.1.3 b) above, at least the same storage and treatment capacity are maintained for treating Wet Weather Flow.

5.1.4 Add oversized pipes provided they are designed to alleviate local / neighbourhood basement flooding and the Alteration satisfies condition 5.1.3 a), b), c), and d).

5.2 Any Alteration to the Authorized System authorized under condition 5.1 is subject to the following conditions:

5.2.1 The design of the Alteration shall:

a) Be prepared by a Licensed Engineering Practitioner;

b) Be designed only to collect and transmit Sewage and shall not be designed to treat Sewage;

c) Satisfy the Design Criteria or any municipal criteria that have been established that exceed the minimum requirements set out in the Design Criteria;

d) Be consistent with or otherwise address the design objectives contained within the Design Guidelines for Sewage Works; and

e) Include design considerations to protect sources of drinking water, including those set out in the Standard Operating Policy for Sewage Works and any applicable local Source Protection Plan policies.

5.2.2 The design of the Alteration shall be:

a) Undertaken in accordance with a Pollution Prevention and Control Plan; or

b) If no Pollution Prevention and Control Plan is available, undertaken in accordance with an interim detailed plan for the local sewershed that:

i Describes the location, frequency, and volume of the CSOs, as well as the concentrations and mass pollutant loadings resulting from CSOs from the study area.

ii Includes the following minimum information:

1. Location and physical description of CSO outfalls in the Authorized System, Collection System Overflows at pumping stations in Emergency Situations, STP Bypass and STP overflows locations;
2. Location and identification of receiving water bodies, including sensitive receivers, for all Combined Sewer outfalls;
3. Authorized System flow and STP treatment component capacities, present and future expected peak flow rates during dry weather and wet weather;
4. Capacity of all regulators; and
5. Location of cross connections between Sewage and Stormwater infrastructure.

iii Is intended to reduce the overall CSO volume, frequency, duration, or by-pass of treatment in the Authorized and/or municipal STP; and

iv If there is a temporary Storm Sewer connection to a combined system as part of a Combined Sewer separation project, the construction plan includes a timeline to disconnect the Storm Sewer to a separated storm outlet.

5.2.3 The Alteration shall not result in:

a) An exceedance of hydraulic capacity of the Authorized System, STP Uncommitted Reserve Hydraulic Capacity, or the Pumping Station Capacity as specified in this Approval;

b) Adverse Effects;

c) Any increase in Collection System Overflows that is not offset by measures elsewhere in the Authorized System; or

d) Any increase in the frequency and/or volume of STP Bypasses or STP Overflows that is not offset by measures.

5.2.4 Where replacement of pipes to achieve Combined Sewer separation has been authorized under conditions 5.1.2 or 5.1.3, the following conditions apply:

a) Stormwater quantity, quality and water balance control shall be provided such that Combined Sewer separation shall not result in an overall increase in pollutants discharged to the Natural Environment;

b) Any new Storm Sewers that result from the Combined Sewer separation can be constructed but not operated until the proposed Stormwater Management Facilities designed to satisfy condition 5.2.4 a) are in operation; and

c) Where any temporary structures have been installed to facilitate Combined Sewer separation, the Owner shall ensure that immediately upon Completion of the Combined Sewer separation, the temporary structure connection shall be disconnected and decommissioned.

5.2.5 The Alteration shall:

a) Not cause overflows or backups nor increase surcharging at any maintenance holes or privately owned infrastructure (e.g., service connections to basements) connected to the Authorized System or any Municipal Sewage Collection System connected to it;

b) Provide smooth flow transition to existing gravity sewers; and

c) Not increase the generation of sulfides and other odourous compounds in the Authorized System.

5.2.6 The Alteration is wholly located within the municipal boundary over which the Owner has jurisdiction or there is a written agreement in place with the adjacent municipality respecting the Alteration and resulting Sewage Works.

5.2.7 The Owner consents in writing to the Alteration authorized under condition 5.1.

5.2.8 A Licensed Engineering Practitioner has verified in writing that the Alteration authorized under condition 5.1 meets the design requirements of conditions 5.2.1 a) to e) and to 5.2.2.

5.2.9 The Owner has verified in writing that the Alteration authorized under condition 5.1 has complied with inspection and testing requirements in the Design Criteria.

5.2.10 The Owner has verified in writing that the Alteration authorized under condition 5.1 meets the requirements of conditions 5.2.1 f) and 5.2.3 to 5.2.8.

5.3 The authorization in condition 5.1 does not apply:

5.3.1 To the modification or replacement of a Combined Sewer or Partially Separated Sewer that has a nominal diameter greater than 750 mm.

5.3.2 To the modification or replacement of a Combined Sewer or Partially Separated Sewer that connects to another Municipal Sewage Collection System, unless:

a) Prior to construction, the Owner of the Authorized System seeking the connection obtains written consent from the Owner or Owner's delegate of the Municipal Sewage Collection System being connected to; and

b) The Owner of the Authorized System retains a copy of the written consent from the Owner or Owner's delegate of the Municipal Sewage Collection System being connected to as part of the record that is recorded and retained under condition 5.4.

5.3.3 Where the Alteration would create a new discharge point to the Natural Environment.

5.3.4 Where the Alteration would result in the addition of a new combined Sewage storage tank in the Authorized System.

5.4 The consents and verifications required in conditions 5.2.7 to 5.2.10, and 5.3.2 if applicable, shall be:

5.4.1 Recorded on Form CS1, prior to the Combined Sewer or Partially Separated Sewer modification or replacement being placed into service; and

5.4.2 Retained for a period of at least ten (10) years by the Owner.

5.5 For greater certainty, the verification requirements set out in condition 5.4 do not apply to any Alteration in respect of the Authorized System which:

5.5.1 Is exempt under section 53(6) of the OWRA or by O. Reg. 525/98; or,

5.5.2 Constitutes maintenance or repair of the Authorized System.

6.0 Authorizations of Future Alterations to Components of the Municipal Sewage Collection System

6.1 The Owner or a Prescribed Person may make the following Alterations to the Authorized System subject to conditions 6.4 through 6.7:

6.1.1 Adding, modifying, or replacing storage the following components of Sewage pumping stations, Separate Sewers, or Nominally Separate Sewers:

a) In-line and/or off-line storage to manage peak flow / inflow and infiltration that does not require pumping;

b) Off-line storage to manage peak flow / inflow and infiltration that only requires electricity to empty the structure;

c) Any associated Equipment for cleaning; and

d) All Appurtenances associated with in-line or off-line storage facilities, including odour, and corrosion control.

6.1.2 Modifying existing Sewage pumping stations and odour control units / Facilities, including adding, replacing, or modifying the following components:

a) Pumps, including replacement parts, in an existing pumping system;

b) Grinders and screens;

c) Aeration and/or mixing Equipment;

d) Chemicals and associated Equipment and tanks (including secondary containment);

e) Odour and corrosion control structures;

f) Instrumentation and controls;

g) Discharge and process piping;

h) Valves;

i) Wet-wells; and

j) Fat, oil, and grease separators (FOGs).

6.1.3 Adding new Sewage pumping stations, where they:

a) Are designed to transmit a Peak Hourly Flow of no greater than 30 L/s;

b) Include emergency stand-by power, Spill containment, and emergency alarms (SCADA, if applicable);

c) Include emergency storage designed to provide at minimum two (2) hours of response time at peak design flow;

d) Include odour and corrosion control, as applicable;

e) Would serve a new residential development (or new phased residential development), which may include existing residential development that has no Combined or Partially Separated Sewers;

f) Are designed to only collect sanitary Sewage and not Stormwater; and

g) Do not include an emergency sanitary overflow or piping to a municipal Stormwater management system or a natural receiver to prevent the discharge to the Natural Environment.

6.1.4 Adding, modifying, or replacing Equipment associated with Real-time Control Systems, where:

a) The Equipment is designed and implemented as part of the Owner's CSO reduction strategy or to optimize use of Sewage Works comprising the Authorized System;

b) The Real-Time Control System is designed and integrated with fail-safe procedures such that they are automatically activated when the requirements of the current mode of operation cannot be met;

c) Risk management procedures are in place or will be in place prior to use of the Real-time Control System; and

d) Station alarms to control center are in place or will be in place prior to use of the Real-time Control System.

6.1.5 Adding, modifying, replacing, or removing chemical storage tanks (including fuel storage tanks) with Spill containment and associated Equipment.

6.1.6 Adding, modifying, replacing, or removing Motor Control Centre (MCC) and/or associated electrical.

6.2 The Owner or a Prescribed Person may alter the Authorized System by adding, modifying, replacing, or removing the following components subject to conditions 6.4 through 6.7:

6.2.1 Valves and their associated controls installed for maintenance purposes;

6.2.2 Instrumentation for monitoring and controls, including SCADA systems, and hardware associated with these monitoring devices;

6.2.3 Spill containment works for chemicals used within the Authorized System;

6.2.4 Chemical metering pumps and chemical handling pumps;

6.2.5 Measuring and monitoring devices that are not required by regulation, by a condition in this Approval, or by a condition otherwise imposed by the Ministry;

6.2.6 Process piping within a Sewage pumping station, storage tank, or other structures; and

6.2.7 Valve chambers or maintenance holes.

6.3 The Owner or a Prescribed Person may alter the Authorized System by adding, modifying, or replacing the following components subject to conditions 6.4 through 6.7:

6.3.1 Measuring and monitoring devices that are required by regulation, by a condition in this Approval, or by a condition otherwise imposed by the Ministry.

6.4 The design of the Alteration shall:

6.4.1 Be prepared by a Licensed Engineering Practitioner, where the Alteration falls within the practice of professional engineering as defined in the *Professional Engineers Act*, R.S.O. 1990;

6.4.2 Be consistent with or otherwise address the design objectives contained within the Design Guidelines for Sewage Works; and

6.4.3 Include design considerations to protect sources of drinking water, such as those included in the Standard Operating Policy for Sewage Works, and any applicable local Source Protection Plan policies.

6.5 The Alteration shall:

6.5.1 Not cause overflows or backups nor increase surcharging at any maintenance holes or privately owned infrastructure (e.g., service connections to basements) connected to the Authorized System or any Municipal Sewage Collection System connected to it;

6.5.2 Provide smooth flow transition to existing gravity Sewers;

6.5.3 Not increase the generation of sulfides and other odourous compounds in the Authorized System; and

6.5.4 Be wholly located within the municipal boundary over which the Owner has jurisdiction or there is a written agreement in place with the adjacent municipality respecting the Alteration and resulting Sewage Works.

6.6 Any Alteration of the Authorized System made under conditions 6.1, 6.2, or 6.3 shall not result in:

6.6.1 Exceedance of hydraulic capacity (including Uncommitted Reserve Hydraulic Capacity, as applicable) of the downstream:

a) Municipal Sewage Collection System; or

b) Receiving STPs.

6.6.2 Exceedance of any downstream Pumping Station Capacity as specified in Schedule B of this Approval.

6.6.3 An increase in the capacity of an existing Pumping Station Capacity of greater than 30%.

6.6.4 Any increase in Collection System Overflows that is not offset by measures taken elsewhere in the Authorized System.

6.6.5 Any increase in the frequency and/or volume of STP Bypasses or STP Overflows that is not offset by measures.

6.6.6 Deterioration of the normal operation of municipal STPs and/or the Authorized System.

6.6.7 A negative impact on the ability to undertake monitoring necessary for the operation of the Authorized System.

6.6.8 Adverse Effects.

6.7 The Alteration is subject to the following conditions:

6.7.1 The Owner consents in writing to the Alteration.

6.7.2 The person responsible for the design has verified in writing that the Alterations meets the requirements of conditions 6.4.1 and 6.4.2, as applicable.

6.7.3 The Owner has verified in writing that the Alteration meets the requirements of conditions 6.4.3, 6.7.1, and 6.7.2.

6.8 The Owner shall verify in writing that any Alteration of the Authorized System in accordance with conditions 6.1 or 6.2 has met the requirements of the conditions listed in conditions 6.5 and 6.6.

6.9 The consents, verifications and documentation required in conditions 6.7 and 6.8 shall be:

6.9.1 Recorded on Form SS2 prior to undertaking the Alteration; and

6.9.2 Retained for a period of at least ten (10) years by the Owner.

6.10 For greater certainty, the verification requirements set out in condition 6.9 do not apply to any Alteration in respect of the Authorized System which:

6.10.1 Is exempt under section 53(6) of the OWRA or by O. Reg. 525/98; or

6.10.2 Constitutes maintenance or repair of the Authorized System, including changes to software for an existing SCADA system resulting from Alterations authorized in condition 6.2.

6.11 The Owner shall update, within twelve (12) months of the Alteration of the Sewage Works being placed into service, any drawings maintained for the Municipal Sewage Collection System to reflect the Alterations of the Sewage Works, where applicable.

7.0 Authorizations of Future Alterations to Equipment with Emissions to the Air

7.1 The Owner and a Prescribed Person may alter the Authorized System by adding, modifying, or replacing the following Equipment in the Municipal Sewage Collection System:

7.1.1 Venting for odour control using solid scavenging or carbon adsorption units;

7.1.2 Venting for odour control by replacing existing or wet air scrubbing systems, including any components, with Equipment of the same or better performance characteristics; and

7.1.3 Emergency generators that fire No. 2 fuel oil (diesel fuel) with a sulphur content of 0.5 per cent or less measured by weight, natural gas, propane, gasoline, or biofuel, and that are used for emergency duty only with periodic testing.

7.2 Any Alteration of the Municipal Sewage Collection System made under condition 7.1 that may discharge or alter the rate or manner of a discharge of a Compound of Concern to the atmosphere is subject to the following conditions:

7.2.1 The Owner shall, at all times, take all reasonable measures to minimize odorous emissions and odour impacts from all potential sources at the Facility.

7.2.2 The Owner shall ensure that the noise emissions from the Facility comply with the limits set out in Publication NPC-300.

7.2.3 The Owner shall ensure that the vibration emissions from the Facility comply with the limits set out in Publication NPC-207.

7.3 The Owner shall not add, modify, or replace Equipment in the Municipal Sewage Collection System as set out in condition 7.1 unless the Equipment performs an activity that is directly related to municipal Sewage collection and transmission.

7.4 The emergency generators identified in condition 7.1.3 shall not be used for non-emergency purposes (excluding generator testing) including the generation of electricity for sale or for peak shaving purposes.

7.5 The Owner shall verify in writing that any addition, modification, or replacement of Equipment in accordance with condition 7.1 has met the requirements of the conditions listed in conditions 7.2, 7.3, and 7.4.

7.6 The verifications and documentation required in condition 7.5 shall be:

7.6.1 Recorded on Form A1 prior to the additional, modified or replacement Equipment being placed into service; and

7.6.2 Retained for a period of at least ten (10) years by the Owner.

7.7 For greater certainty, the verification and documentation requirements set out in condition 7.5 and 7.6 do not apply to any addition, modification, or replacement in respect of the Authorized System which:

7.7.1 Is exempt from the requirements of the EPA, or for Equipment that is exempt from s.9 of the EPA under O. Reg. 524/98; or

7.7.2 Constitutes maintenance or repair of the Authorized System.

8.0 Previously Approved Sewage Works

8.1 If approval for an Alteration to the Authorized System was issued under the EPA and is revoked by this Approval, the Owner may make the Alteration in accordance with:

8.1.1 The terms of this Approval; or

8.1.2 The terms and conditions of the revoked approval as of the date this approval was issued, provided that the Alteration is commenced within five (5) years of the date that the revoked approval was issued.

9.0 Transition

9.1 An Alteration of the Authorized System is exempt from the requirements in clause (c) of condition 4.1.1 and clause (c) of condition 5.2.1 where:

9.1.1 Effort to undertake the Alteration, such as tendering or commencement of construction of the Sewage Works associated with the Alteration, begins on or before June 14, 2023.

9.1.2 The design of the Alteration conforms to the Design Guidelines for Sewage Works;

9.1.3 The design of the Alteration was completed on or before the issue date of this Approval or a Class Environmental Assessment was completed for the Alteration and changes to the design result in significant cost increase or significant project delays; and

9.1.4 The Alteration would be otherwise authorized under this Approval.

Schedule E: Operating Conditions

System Owner	**Kincardine, The Corporation of the Municipality of**
ECA Number	**088-W601**
System Name	**Kincardine and BEC Wastewater Collection System**
ECA Issue Date	**November 10th, 2022**

1.0 General Operations

1.1 The Owner shall ensure that, at all times, the Sewage Works comprising the Authorized System and the related Equipment and Appurtenances used to achieve compliance with this Approval are properly operated and maintained.

1.2 Prescribed Persons and Operating Authorities shall ensure that, at all times, the Sewage Works under their care and control and the related Equipment and Appurtenances used to achieve compliance with this Approval are properly operated and maintained.

1.3 In conditions 1.1 and 1.2 “properly operated and maintained” includes effective performance, adequate funding, adequate operator staffing and training, including training in applicable procedures and other requirements of this Approval and the EPA, OWRA, CWA, and regulations, adequate laboratory services, process controls and alarms and the use of process chemicals and other substances used in the Authorized System.

2.0 Duties of Owners and Operating Authorities

2.1 The Owner, Prescribed Persons and any Operating Authority shall ensure the following:

2.1.1 At all times that the Sewage Works within the Authorized System are in service the Sewage Works are:

a) Operated in accordance with the requirements under the EPA and OWRA, and

b) Maintained in a state of good repair.

2.1.2 The Authorized System is operated by persons having the training or expertise for their operating functions that is required by O. Reg. 129/04 (Licensing of Sewage Works Operators) under the OWRA and this Approval.

2.1.3 All sampling, testing, monitoring, and reporting requirements under the EPA and this Approval that relate to the Authorized System are complied with.

2.1.4 Any person who is operating the Sewage Works within the Authorized System is supervised by an operator-in-charge as described in O. Reg. 129/04 under the OWRA.

2.2 For clarity, the requirements outlined in the above conditions 2.1.1 through 2.1.4 for Prescribed Persons and any Operating Authority only apply to Sewage Works within the Authorized System where they are responsible for the operation.

2.3 The Owner, Prescribed Persons and Operating Authority shall take all reasonable steps to minimize and ameliorate any Adverse Effect on the Natural Environment or impairment of the quality of water of any waters resulting from the operation of the Authorized System, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

3.0 Operations and Maintenance

3.1 Inspection

3.1.1 The Owner shall ensure that all Sewage Works within the Authorized System are inspected at the frequency and in accordance with procedures set out in their O&M Manual.

3.1.2 The Owner shall ensure that:

a) Any pumping stations, combined Sewage storage tanks, and any Collection System Overflow within the Authorized System as of the date of issuance of this Approval are inspected at least once per calendar year starting the year after the O&M Manual is required to be prepared and implemented as per condition 3.2.1 in Schedule E of this Approval, and more frequently if required by the O&M Manual; and

b) Any pumping stations, combined Sewage storage tanks, and any Collection System Overflow established or replaced within the Authorized System after the date of issuance of this Approval are inspected within one year of being placed into service and thereafter once per calendar year and more frequency if required by the O&M Manual.

3.1.3 The inspection of the combined Sewage storage tanks required in condition 3.1.2 shall include physical inspection at the Point of Entry, including looking for signs of unplanned discharges from Wet Weather Flow and Dry Weather Flow.

3.1.4 The Owner shall clean and maintain Sewage Works within the Authorized System to ensure the Sewage Works perform as designed.

3.1.5 The Owner shall maintain records of the results of the inspections required in condition 3.1.1, 3.1.2, and 3.1.3, monitoring (if applicable) and any cleaning and maintenance operations undertaken, and shall make

available the records for inspection by the Ministry upon request. The records shall include the following:

a) Asset ID and name of the Sewage Works;

b) Date and results of each inspection, maintenance, or cleaning; and

c) Name of person who conducted the inspection, maintenance, or the name of the inspecting official, where applicable.

3.2 Operations & Maintenance (O&M) Manual

3.2.1 The Owner shall prepare and implement an operations and maintenance manual for Sewage Works within the Authorized System on or before June 14, 2023, that includes or references, but is not necessarily limited to, the following information:

a) Procedures for the routine operation of the Sewage Works;

b) Inspection programs, including the frequency of inspection, and the methods or tests employed to detect when maintenance is necessary;

c) Maintenance and repair programs, including:

i The frequency of maintenance and repair for the Sewage Works.

ii Clean out requirements for any storage or overflow tanks, if applicable.

d) Operational and maintenance requirements to protect sources of drinking water, such as those included in the Standard Operating Policy for Sewage Works, and any applicable local Source Protection Plan policies;

e) Procedures for routine physical inspection and checks of controlling systems (e.g., SCADA) to ensure the mechanical integrity of Equipment and its accuracy on the controlling system.

f) Procedures for preventing odours and odour impacts;

g) Procedures for calibration of monitoring Equipment (e.g., flow, level, pressure);

h) Emergency Response, Spill Reporting and Contingency Plans and Procedures for dealing with Equipment breakdowns, potential Spills and any other abnormal situations, including notification to the SAC, the Medical Officer of Health, and the District Manager, as applicable;

i) Procedures for receiving, responding and recording public complaints, including recording any follow-up actions taken; and

j) As-built drawings or record drawings of the Sewage Works.

3.2.2 The Owner shall review and update the O&M Manual and ensure that operating staff have access, as per O. Reg 129/04 (Licensing of Sewage Works Operators) under the OWRA. Upon request, the Owner shall make the O&M Manual available to Ministry staff.

3.2.3 The Owner shall revise the O&M Manual to include procedures necessary for the operation and maintenance of any Sewage Works within the Authorized System that are established, altered, extended, replaced, or enlarged after the date of issuance of this approval prior to placing into service those Sewage Works.

3.2.4 For greater certainty, the O&M Manual may be a single document or a collection of documents that, when considered together, apply to all parts of the Authorized System.

3.3 Collection System Overflows

3.3.1 Any CSO at a point listed in Table B4 of Schedule B is considered a Class 1 approved discharge type Spill under O.Reg.675/98:

a) Where the CSO is as a result of wet weather events when the designed capacity of the Authorized System is exceeded;

b) Where the CSO is a direct and unavoidable result of a planned repair and/or maintenance procedure, the Owner has notified the Local Ministry Office fifteen at least (15) calendar days prior to the CSO and the Local Ministry Office has provided written consent of the CSO; or

c) Where the CSO is planned for research or training purposes, the Owner has notified the Local Ministry Office fifteen at least (15) calendar days prior to the CSO and the Local Ministry Office has provided written consent of the CSO.

3.3.2 Any SSO at a point listed in Table B5 of Schedule B is considered a Class 1 approved discharge type Spill under O.Reg. 675/98:

a) Where the SSO is a direct and unavoidable result of a planned repair or maintenance procedure and the Owner has notified the Local Ministry Office at least fifteen (15) calendar days prior to the SSO and the Director for the purposes of s.4 of O. Reg. 675/98 under the EPA has provided written consent of the SSO; or

b) Where the SSO is planned for research or training purposes, the Owner has notified the Local Ministry Office at least fifteen (15) calendar days prior to the SSO and the Director for the purposes of

s.4 of O. Reg. 675/98 under the EPA has provided written consent of the SSO.

3.3.3 On or before June 14, 2025, the Owner shall establish signage to notify the public, at the nearest publicly accessible point(s) downstream of any CSO outfall location identified in Schedule B, Table B4, and any SSO when the overflow is piped to a specified outlet point. If the nearest publicly accessible point is more than 100m away, then signage shall be established at the CSO or SSO outfall location. The signage shall include the following minimum information:

a) Type of Collection System Overflow;

b) Identification of potential hazards and limitations of water use, as applicable;

c) ECA number and/or asset ID; and

d) The Owner's contact information.

3.4 Monitoring

3.4.1 For a Collection System Overflow that occurs at a designated location, the following conditions apply:

a) For CSO storage tanks/facilities listed in Table B3, the Owner shall:

i On or before December 14, 2022 or within six (6) months of the date of the publication of the Ministry's monitoring guidance, whichever is later, collect a composite sample of the combined Sewage from the CSO tank whenever the tank(s) is(are) in operation. If there is more than one tank, the tank nearest to the discharge point shall be sampled. The composite sample shall consist, at a minimum, of one sample at the beginning of the Event, and one sample at approximately every 8-hours until the end of the Event. The composite sample shall be analyzed, at a minimum, for Biochemical Oxygen Demand (BOD) (or Chemical Oxygen Demand (COD) if agreed upon by the District Manager), total suspended solids, total phosphorus and total Kjeldahl nitrogen. If the CSO continues for more than one day, multiple composite samples are allowed.

ii If 3.4.1 a) i) cannot be achieved, then surrogate sampling may be used to determine the contamination concentrations of the discharge CSO tank overflow, at a minimum, for BOD (or COD), total suspended solids, total phosphorus and total Kjeldahl nitrogen. The methodology in determining, applying, and analyzing surrogate sampling shall be proposed by the Owner and subject to the written approval of the District Manager.

b) For CSO regulator structures listed in Table B2, and for any CSO or SSO locations listed under Table B4 or Table B5, the Owner shall:

i On or before December 14, 2022 or within six (6) months of the date of publication of the Ministry's monitoring guidance, whichever is later, take at least one (1) grab sample, for BOD (or COD, if agreed upon by the District Manager), total suspended solids, total phosphorus, total Kjeldahl nitrogen, and E. Coli, or

ii On or before December 14, 2022 or within six (6) months of the date of publication of the Ministry's monitoring guidance, whichever is later, use surrogate sampling to determine the Contaminant concentrations of the discharged Collection System Overflow, at a minimum, for BOD (or COD), total suspended solids, total phosphorus, total Kjeldahl nitrogen, and E. Coli. The methodology in determining, applying, and analyzing surrogate sampling shall be proposed by the Owner and subject to the written approval of the District Manager.

c) The Owner shall use the Event discharged volume and the concentrations as determined in condition 3.4.1 to calculate the loading to the Natural Environment for each parameter.

3.4.2 For any Spill of Sewage that does not meet 3.4.1 a) or b):

a) Where practicable, take a least one (1) grab sample, for BOD (or COD, if agreed upon by the District Manager), total suspended solids, total phosphorus, total Kjeldahl nitrogen, and E. Coli

b) The Owner shall use the discharged volume, where possible, and the concentrations as determined in condition 3.4.2 a) to calculate the loading to the Natural Environment for each parameter.

3.4.3 If COD sampling was completed, the equivalent BOD values are required to be included with the data reported to the Ministry.

3.4.4 The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following documents and all analysis shall be conducted by a laboratory accredited to the ISO/IEC:17025 standard or as directed by the District Manager:

a) Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only)", as amended from time to time.

b) The Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), as amended from time to time.

c) The publication "Standard Methods for the Examination of Water and Wastewater", as amended from time to time.

4.0 Reporting

4.1 The Owner shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to Ministry staff.

4.2 Collection System Overflows

4.2.1 If the Collection System Overflow meets the criteria listed in condition 3.3.1 or 3.3.2:

a) The Owner shall report the Event as a Class 1 approved discharge type Spill as soon as practicable to the Ministry either by a verbal to SAC or in an electronic format if the Ministry makes a system available;

b) The Owner shall report the Event to the local Medical Officer of Health in a manner agreed upon with the local Medical Officer of Health;

c) The manner of notification to the Ministry shall be in two (2) stages and include, at a minimum, the following information:

i The Asset ID, infrastructure description as detailed in Table B5 in Schedule B, the outfall location, and the Point of Entry (as applicable), and the reason(s) for the Event.

ii First stage of reporting:

a. The date and time (start) of the Event.

iii Second stage of reporting (as soon as practicable and may be reported at same time as first stage):

a. The date, duration, and time (start and end) of the Event;

b. The estimated or measured volume of the Event, accurate to at least +/- 20% of the volume;

i. If the volume of the Event is not readily available at the time of the second stage of reporting, the estimated volume can be provided to the Ministry within seven (7) calendar days of the second stage of reporting;

c. If any, summary of complaints, observed adverse impacts, any additional sampling obtained, disinfection, and any corrective measures taken;

d) Upon request of the local office, the Owner shall within fifteen (15) calendar days of the occurrence of any Collection System Overflow, the Owner shall submit a full written report of the occurrence to the District Manager describing the cause and discovery of the Collection System Overflow, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation, or an alternate report as agreed to in writing by the District Manager.

4.3 Spills

4.3.1 If the Collection System Overflow does not meet the criteria listed in condition 3.3.1 or 3.3.2, or is otherwise considered a Spill of Sewage:

a) The Owner shall report the Spill to SAC pursuant to O.Reg.675/98 and Part X of the EPA;

b) The Owner shall report the Event to the local Medical Officer of Health in a manner agreed upon with the local Medical Officer of Health;

c) In addition to the obligations under Part X of the Environmental Protection Act, the Owner shall, within fifteen (15) calendar days of the occurrence of any reportable Spill, submit a full written report of the occurrence to the District Manager describing the cause and discovery of the spill or loss, actual/estimated volume of the Spill, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.

4.4 If the Owner is unable to determine the volume of a Collection System Overflow for the purpose of reporting, the Owner shall develop procedures that enable estimated or measured volumes to be included in the required reporting for any Collection System Overflow occurring on or after June 14, 2023.

4.5 The Owner shall follow the direction of the Ministry and the local Medical Officer of Health regarding any Collection System Overflows.

4.6 The Owner shall prepare an annual performance report for the Authorized System that:

4.6.1 Is submitted to the Director on or before March 31st of each year and covers the period from January 1st to December 31st of the preceding calendar year.

a) For clarity, the first report shall cover the period of January 1st, 2023 to December 31st, 2023 and be submitted to the Director on or before March 31st, 2024.

b) For the transitional period of January 1, 2022 to December 31, 2022, annual reporting requirements from previous ECAs pertaining

to Spills only, where these occurred in the reporting period, and that have been revoked through issuance of this ECA shall apply.

i For the transitional period, condition 4.7.2 does not apply.

4.6.2 Is also submitted to the District Manager where a Collection System Overflow or Spill of Sewage has occurred in the reporting period.

4.6.3 If applicable, includes a summary of all required monitoring data along with an interpretation of the data and any conclusion drawn from the data evaluation about the need for future modifications to the Authorized System or system operations.

4.6.4 Includes a summary of any operating problems encountered and corrective actions taken.

4.6.5 Includes a summary of all calibration, maintenance, and repairs carried out on any major structure, Equipment, apparatus, mechanism, or thing forming part of the Municipal Sewage Collection System.

4.6.6 Includes a summary of any complaints related to the Sewage Works received during the reporting period and any steps taken to address the complaints.

4.6.7 Includes a summary of all Alterations to the Authorized System within the reporting period that are authorized by this Approval including a list of Alterations that pose a Significant Drinking Water Threat.

4.6.8 Includes a summary of all Collection System Overflow(s) and Spill(s) of Sewage, including:

a) Dates;

b) Volumes and durations;

c) If applicable, loadings for total suspended solids, BOD, total phosphorus, and total Kjeldahl nitrogen, and sampling results for E.coli;

d) Disinfection, if any; and

e) Any adverse impact(s) and any corrective actions, if applicable.

4.6.9 Includes a summary of efforts made to reduce Collection System Overflows, Spills, STP Overflows, and/or STP Bypasses, including the following items, as applicable:

a) A description of projects undertaken and completed in the Authorized System that result in overall overflow reduction or elimination including expenditures and proposed projects to

eliminate overflows with estimated budget forecast for the year following that for which the report is submitted.

b) Details of the establishment and maintenance of a PPCP, including a summary of project progresses compared to the PPCP's timelines.

c) An assessment of the effectiveness of each action taken.

d) An assessment of the ability to meet Procedure F-5-1 or Procedure F-5-5 objectives (as applicable) and if able to meet the objectives, an overview of next steps and estimated timelines to meet the objectives.

e) Public reporting approach including proactive efforts.

4.7 The report described in condition 4.6 shall be:

4.7.1 Made available, on request and without charge, to members of the public who are served by the Authorized System; and

4.7.2 Made available, by June 1st of the same reporting year, to members of the public without charge by publishing the report on the Internet, if the Owner maintains a website on the Internet.

5.0 Record Keeping

5.1 The Owner shall retain for a minimum of ten (10) years from the date of their creation:

5.1.1 All records, reports and information required by this Approval and related to or resulting Alterations to the Authorized System, and

5.1.2 All records, report and information related to the operation, maintenance and monitoring activities required by this Approval.

5.2 The Owner shall update, within twelve (12) months of any Alteration to the Authorized System being placed into service, any drawings maintained for the Municipal Sewage Collection System to reflect the Alteration of the Sewage Works, where applicable.

6.0 Review of this Approval

6.1 No later than the date specified in Condition 1 of Schedule A of this Approval, the Owner shall submit to the Director an application to have the Approval reviewed. The application shall, at minimum:

6.1.1 Include an updated description of the Sewage Works within the Authorized System, including any Alterations to the Sewage Works that were made since the Approval was last issued; and

6.1.2 Be submitted in the manner specified by Director and include any other information requested by the Director.

7.0 Source Water Protection

7.1 The Owner shall ensure that any Alteration in the Authorized System is designed, constructed, and operated in such a way as to be protective of sources of drinking water in Vulnerable Areas as identified in the Source Protection Plan, if available.

7.2 The Owner shall prepare a "Significant Drinking Water Threat Assessment Report for Proposed Alterations" for the Authorized System on or before June 14, 2023 that includes, but is not necessarily limited to:

7.2.1 An outline of the circumstances under which the proposed Alterations could pose a Significant Drinking Water Threat based on the Director's Technical Rules established under the CWA.

7.2.2 An outline of how the Owner assesses the proposed Alterations to identify drinking water threats under the CWA.

7.2.3 For any proposed Alteration a list of components, Equipment, or Sewage Works that are being altered and have been identified as a Significant Drinking Water Threat.

7.2.4 A summary of design considerations and other measures that have been put into place to mitigate risks resulting from construction or operation of the components, Equipment or Sewage Works identified in condition 7.2.3, such as those included in the Standard Operating Policy for Sewage Works.

7.3 The Owner shall make any necessary updates to the report required in condition 7.2 at least once every twelve (12) months.

7.4 Any components, Equipment or Sewage Works added to the report required in condition 7.2 shall be include in the report for the operational life of the Sewage Works.

7.5 Upon request, the Owner shall make a copy of the report required in condition 7.2 available to the Ministry or Source Protection Authority staff.

8.0 Additional Studies

Assessment of Wet Weather Flows Compared to Dry Weather Flows

8.1 This condition and the following requirements apply where:

a) The Authorized System has no Combined Sewers or Partially Separated Sewers; and

b) There has been one or more of: an STP Overflow, STP Bypass, or Collection System Overflow within the ten (10) year period starting January 1, 2012 and ending December 31, 2021.

The following requirements do not apply if:

a) The Collection System Overflow is a result of emergency overflows at pumping stations during power outage or Equipment failure; and

b) There has been no STP Overflow or STP Bypass.

8.1.1 The Owner shall conduct an assessment of Wet Weather Flows compared to the Dry Weather Flows in the Authorized System and/or to the STP(s) described in Schedule A, as per the following conditions:

a) The assessment shall evaluate available data from the ten (10) year period starting January 1, 2012 and ending December 31, 2021.

b) The assessment shall be completed and submitted to the Director by December 14, 2023.

c) In the event that Wet Weather Flows in the ten (10) year period described above have created STP Bypasses or STP Overflows at the STP(s) specified in Schedule A or Collection System Overflows in an Average Year, then the study shall include:

i Actions and timelines to meeting the Procedure F-5-1 objectives;

ii Review of causes of STP Overflow, STP Bypass and/or Collection System Overflow Events, including inflow and infiltration, sewer use, and characteristics of rainfall events, as applicable;

iii Inspection of the Sewers and bypass structures; and

iv Identification of any near and/or long-term corrective actions with anticipated timelines.

Assessment of Conformance to Procedure F-5-1 and F-5-5

8.2 This condition and the following requirements apply where:

a) The Authorized System includes Combined Sewers or Partially Separated Sewers, and

b) The Authorized System experienced a Collection System Overflow, an STP Bypass, or STP Overflow within the ten (10) year period starting January 1, 2012 and ending December 31, 2021.

8.2.1 The Owner shall conduct an assessment to demonstrate conformance of the Authorized System to Procedure F-5-1 or Procedure F-5-5, as applicable, in accordance with the following conditions:

a) The assessment shall:

i Be prepared by a Licensed Engineering Practitioner and be submitted to the Director by December 14, 2023;

ii Be performed for each of the years 2012 through to 2021;

iii Include the number of Collection System Overflows as a result of storms that are not Significant Storm Events for each year;

iv Include the estimated length of Combined Sewers and Separate Sewers within the collection system;

v Include the date of the most recent PPCP;

vi Include the status of each action items specified in the PPCP, as applicable;

vii Include a summary of additional action items not specified in a PPCP which have been taken to prevent Collection System Overflows in the ten (10) year period starting January 1, 2012 and ending December 31, 2021; and

viii Identify timelines for achieving conformance to Procedure F-5-1 or Procedure F-5-5 objectives, as applicable.

8.2.2 The Owner shall submit a new or updated PPCP to the Director, no later than June 14, 2027, if:

a) No PPCP exists for the Authorized System, or

b) The PPCP for the Authorized System is older than ten (10) years as of November 10th, 2022.

8.2.3 The PPCP shall include, at minimum:

a) Characterization of the Combined Sewer System (CSS) – Monitoring, modeling and other appropriate means shall be used to characterize the CSS and the response of the CSS to precipitation events. The characterization shall be based on the ten (10) year period starting January 1, 2012 and ending December 31, 2021 and include the determination of the location, frequency and volume of the CSOs, concentrations and mass pollutants resulting from CSOs, and identification and severity of suspected CSS deficiencies. Records shall be kept for CCS including the following:

i Location and physical description of CSO and SSO outfalls in the collection systems, emergency overflows at pumping stations, and bypass locations at STPs;

ii Location and identification of receiving water bodies, including sensitive receivers, for all Combined Sewer outfalls;

iii Combined Sewer system flow and STP treatment capacities, present and future (20-year timeframe) expected peak flow rates during dry weather and wet weather;

iv Capacity of all regulators;

v Location of cross connections between sanitary Sewage and Stormwater infrastructure; and

vi Location and identification of infrastructure in the CSS where monitoring Equipment is installed.

b) Operational procedures shall be developed including the following:

i Combined Sewer maintenance program; and

ii Regulator inspection and maintenance programs.

c) An examination of non-structural and structural CSO control alternatives that may include:

i Source control;

ii Inflow/Infiltration reduction;

iii Operation and maintenance improvements;

iv Control structure improvements;

v Collection system improvements;

vi Storage technologies;

vii Treatment technologies; and

viii Sewer separation.

d) An implementation plan with a schedule of all practical measures to eliminate dry weather overflows and minimize wet weather overflows, as well as an overflow percent reduction target.

i The implementation plan shall show how the minimum CSO prevention and control requirements and other criteria in Procedure F-5-5 are being achieved.

8.2.4 The Owner shall ensure that an updated PPCP for the Authorized System is prepared within ten (10) years of the date of that the previous PPCP was finalized.

Sewer Model

8.3 The Owner shall prepare a new/updated Sewer model, within three (3) years of November 10th, 2022, if any of the following pertain to the Authorized System:

8.3.1 It includes Combined Sewers;

8.3.2 It services a population greater than 10,000; or

8.3.3 The Sewer model for the Authorized System was last updated prior to 2012 and 8.3.1 or 8.3.2 apply.

Schedule F: Residue Management

System Owner	**Kincardine, The Corporation of the Municipality of**
ECA Number	**088-W601**
System Name	**Kincardine and BEC Wastewater Collection System**
ECA Issue Date	**November 10th, 2022**

1.0 Residue Management System

1.1 Not Applicable:

Ontario

Ministry of the Environment, Conservation and Parks

Form SS2
Record of Future Alteration Authorized for Components of the Municipal Sewage Collection System

RETAIN COMPLETED FORM - DO NOT SEND TO THE MINISTRY

Part 1 - Environmental Compliance Approval Number

(Insert the Environmental Compliance Approval number authorizing the future alteration of components of the municipal sewage collection system)

088-W601

Part 2 - Description of alteration of components of the municipal sewage collection system (Use attachments if required)

The replacement of the existing Queen Street Sewage Pumping Station (S-QSPS) with a new low pressure Quadplex Grinder Pumping Station (E/One W-Series WF48X150QDL-078 FRP). The new station is 6 metres north of the old station on the unopened road allowance north of 601 Queen Street. Refer to additional details for works and capacity.
Refer to attached BM ROSS drawings for project 17318A - Municipality of Kincardine, Queen Street Reconstruction, drawing 593, 595, 601 Queen Street Sanitary Plan and Details.

The description shall include:

1) A brief description above of the undertaking (e.g. street name(s); subdivision name; project name);
2) An identification of the system component being altered;
3) The location of the works being altered: and
4) Any associated drawings, if applicable.

Part 3 - Verification by Licensed Engineering Practitioner (as applicable to the undertaking) or Technical Representative

I hereby verify that I am a Licensed Engineering Practitioner who is licensed to practice in the Province of Ontario (as applicable to the undertaking) or the technical representative and the design of the alteration of the components of the municipal sewage collection system:

1) Has been prepared by a Licensed Engineering Practitioner who is licensed to practice in the Province of Ontario, where the Alteration falls within the practice of professional engineering as defined in the Professional Engineers Act, R.S.O. 1990, OR has been prepared by a technical representative with the required qualifications.
2) Has been documented in a design report and any other applicable design forms;
3) Is consistent with, or otherwise addresses, the design objectives contained within the Ministry of the Environment, Conservation and Parks publication "Design Guidelines for Sewage Works", as amended and as applicable;

Name (Print)	PEO Licence Number
Dale Erb, P.Eng.	90408295
Signature 	Date (yyyy/mm/dd) 2023/04/12

Part 4 - Verification by Owner

I hereby verify that:

1) The alteration of the municipal sewage collection system made shall not result in:
   a) Exceedance of hydraulic capacity (including uncommitted reserve hydraulic capacity, as applicable) of the downstream:
      i) Municipal sewage collection system; or
      ii) Receiving sewage treatment plants (STP).
   b) Exceedance of any downstream pumping station capacity, unless verified under Part 3 of this form;
   c) Any increase in collection system overflows, that is not offset by measures taken elsewhere in the municipal sewage collection system, and have documented any offset measures used;
   d) Any increase in the frequency and/or volume of STP bypasses or STP overflows that is not offset by measures, and have documented any offset measures used; (Alternatively, if the wastewater flows to a STP not owned by the Owner, then the wastewater volume or flow rate is as agreed to with the Owner of the STP.)
   e) Deterioration of the normal operation of municipal STPs (as applicable) and/or municipal sewage collection system;

f) A negative impact on the ability to undertake monitoring necessary for the operation of the municipal sewage collection system; and

g) Adverse effects.

2) The alteration will:

a) Not cause overflows or backups, nor increase surcharging at any maintenance holes or privately owned infrastructure (e.g. basements) within the municipal sewage collection system or any collection system connected to it; and

b) Provide smooth flow transition to existing gravity sewers.

3) An assessment of the proposed works has been completed to determine if the works pose a significant drinking water threat. The proposed works do not pose any threats to sources of drinking water or design includes features that mitigate the threat to s ources of drinking water, such as those included in: Ministry's Standard Operating Policy for Sewage Works, as amended from time to time; and Source Protection Plan policies pertaining to the works;

4) The alteration is wholly located within the municipal boundary over which the owner has jurisdiction, except where there is an agreement existed between municipalities;

5) The owner consents to the alteration of components to the municipal sewage collection system; and

6) I am an authorized representative of the owner to complete this verification.

Name of Owner (Print)	Name of Owner Representative (Print)
Municipality of Kincardine	Mark O'Leary
Signature	Date (yyyy/mm/dd)
M. O'Leary	2023/07/20

Part 5 - Post Construction Verification by Owner for Inspection

I hereby verify that:

1) Any alterations the Municipal Sewage Collection System have been inspected before operation to ensure that the works as constructed will continue to conform to the Design Criteria and the ECA, and have documentation of the inspection results.

Name of Owner (Print)	Name of Owner Representative (Print)
Municipality of Kincardine	Mark O'Leary
Signature	Date (yyyy/mm/dd)
M. O'Leary	2023/07/20

Note: Parts 1 to 4 above shall be completed before construction.
Part 5 is to be completed after the inspection and testing have been undertaken.

B. M. ROSS AND ASSOCIATES LIMITED
Engineers and Planners
62 North Street, Goderich, ON N7A 2T4
p. (519) 524-2641 www.bmross.net

File No. 17318A

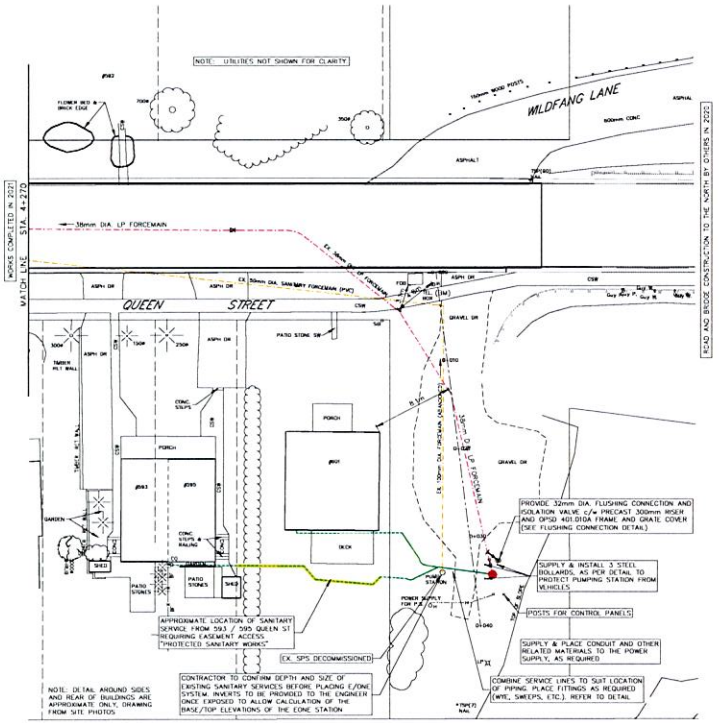
QUEEN STREET
SEWAGE PUMPING STATION REPLACEMENT
DESCRIPTION OF WORKS

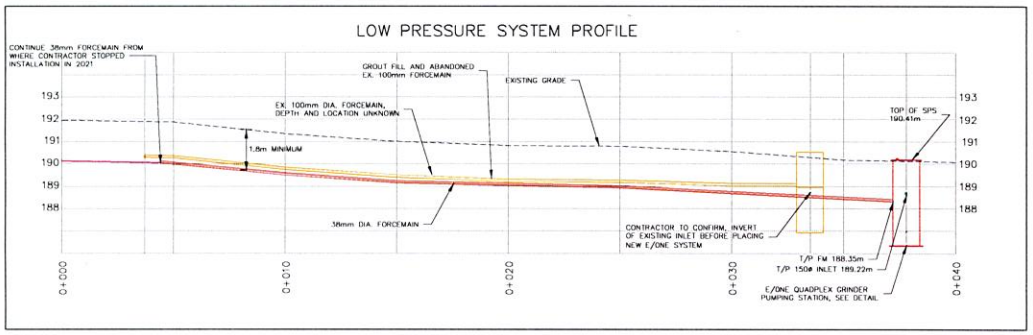
Asset ID and Name	S-QSPS Kincardine Wastewater Collection-Queen Street Sewage Pumping Station
Site Location	601 Queen Street, Kincardine
Latitude and Longitude	Lat: 44.17221 Lon: 81.63831
Coordinates (optional)	N 4891192.4408 E 448976.9324 NAD1983 Zone 17N
Description	A sewage pumping station consisting of a 1.2m diameter wet well located on the unopened road allowance north of 601 Queen Street with an aboveground weatherproof pump control panel (no building). Station is a prefabricated Environment One (E/One) W-Series Quadplex Fiberglass Grinder Pump Station model#WF48X150QDL-078 FRP
Pumping Station Capacity	1.4 L/s with two pumps operation, in an emergency all four pumps would operate at 2.8 L/s
Equipment	Four 1 HP submersible grinder pumps with an estimated pump capacity of 0.70 L/s each and a 1.2 m wet well of approx.. 2.5m^3 capacity. The station is connected to a 38mm diameter low pressure forcemain discharging to the Queen Street gravity sewer and ultimately to the Kincardine Wastewater Treatment Plant
Emergency Storage	
Equipment: Associated controls and appurtenances	Aboveground pump control panel with alarm system.
Sewage Pumping Station-Collection System Overflow	No overflow.
Receiving Stations (if applicable)	None
Odour Control Units	None
Standby Power	None
Notes	Discharges to a forcemain which leads to the Gravity sewer system on Queen Street. Ultimately the sewage is conveyed to the Huron Terrace Sewage Pumping Station.

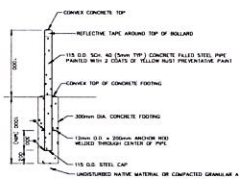
CURB STOPS/CHECK (UNI-LATERAL) VALVES CURB BOX:

1. THE CONTRACTOR SHALL SUPPLY ALL LABOUR, EQUIPMENT AND MATERIAL REQUIRES TO INSTALL THE LOW-PRESSURE SANITARY SERVICE COMBINATION CURB STOP/CHECK VALVES AND SERVICE BOX INCLUDING ALL REQUIRED FITTINGS. THE COMBINATION CURB STOP/CHECK VALVES SHALL BE THE E/ONE SEWER SYSTEMS UNI-LATERAL CURB STOP C/W INTEGRAL STAINLESS STEEL CHECK VALVE OR APPROVED EQUIVALENT. SERVICE BOX SHALL HAVE A STAINLESS-STEEL STEM AND THE SERVICE BOX COVER SHALL BE STAMPED "SEWER". ISOLATION VALVES SHALL BE LOCATED AS SHOWN. THE LOCATION OF THE CURB STOP/CHECK VALVES SHALL BE MARKED WITH WOODEN 50X100MM WOODEN POSTS WHICH SHALL EXTEND A MINIMUM OF 0.6M ABOVE THE GRADE. THE CURB STOP/CHECK VALVES AND BOXES SHALL BE INSTALLED AS PER MANUFACTURES RECOMMENDATIONS.

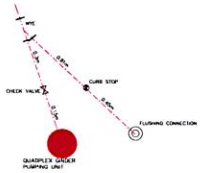
2. THE CURB STOP/CHECK VALVES SHALL INCLUDE THE COST TO SUPPLY AND INSTALL SERVICE TAILS FROM THE CURB STOP/CHECK VALVES TO A MINIMUM OF 0.6M ABOVE GRADE. THE SERVICE TAILS SHALL BE SECURED TO THE WOODEN MARKER POSTS AND SHALL B UTILIZED FOR FLUSHING AND TO BLOW OFF AIR DURING THE PRESSURE TESTING OF THE SYSTEM. BECAUSE THE UNI-LATERAL CHECK VALVE THE CONTRACTOR MAY NEED TO FLUSH WATER INTO THE FORCEMAIN OUTLET ON QUEEN STREET AT SAN MH 395 IN ORDER TO FORCE ANY AIR IN THE SERVICES OUT TO THE TOP OF THE SYSTEM PRIOR TO THE PRESSURE TEST.



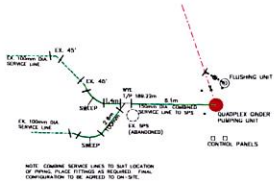




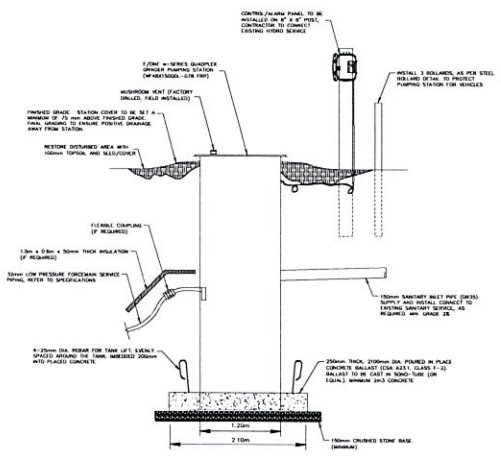
STEEL BOLLARD DETAIL
NOT TO SCALE



FLUSHING CONNECTION DETAIL
NOT TO SCALE



COMBINED SERVICES DETAIL
NOT TO SCALE



QUADPLEX GRINDER PUMPING UNIT

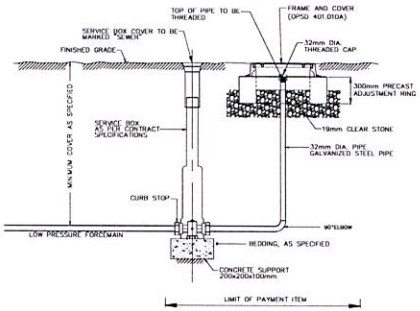
NOTES:

1. BEDDING, COVER AND BACKFILL MATERIAL TO BE AS PER THE SPECIFICATIONS. BACKFILL AND BEDDING FOR GRINDER PUMPING UNIT TO BE GRANULAR 'A' COMPACTED TO 95% SPMDD.
2. CATHODIC PROTECTION FOR FITTINGS TO BE THE SAME AS THAT SPECIFIED ELSEWHERE FOR L.P. MAIN.
3. SANITARY INLET PIPE TO BE CONNECTED USING EPDM GROMMET FITTING (SUPPLIED WITH UNIT). GROMMET TO BE INSTALLED FOLLOWING MANUFACTURER RECOMMENDATIONS AND SITUATED AT ANGLE DETERMINED IN THE FIELD. FOR THE QUADPLEX STATION THE GROMMET CAN BE FIELD INSTALLED.
4. MANUFACTURER RECOMMENDATIONS ARE TO BE FOLLOWED FOR INSTALLATION OF PUMPING UNIT INCLUDING BALLAST PLACEMENT.
5. ELECTRICAL WIRING AND RELATED MATERIALS REQUIRED TO COMPLETE THE ELECTRICAL SUPPLY AND CONNECTIONS ARE TO MEET ESA REQUIREMENTS. CONTRACTOR TO OBTAIN ALL RELATED ESA PERMITS. CONTROL PANEL, POWER SUPPLY, ANCILLARY WORK, AND RELATED MATERIALS ARE TO BE INSTALLED AS PER ESA AND MANUFACTURER RECOMMENDATIONS.

TYPICAL GRINDER PUMP AND SERVICE DETAIL
NOT TO SCALE

GENERAL NOTES:

1. WORK ACTIVITIES AND THE EXCAVATION FOR THE UNDERTAKING OF THE PROPOSED WORKS IS NOT TO COMMENCE UNTIL ALL RESOURCES NECESSARY FOR THE CONSTRUCTION ARE IN PLACE AND THE WORK IS READY TO COMMENCE IN EARNEST. ONCE COMMENCED, CONSTRUCTION IS PROCEED IN A CONTINUES AND DILIGENT MANNER IN ORDER TO MINIMIZE THE DURATION OF THE DISTURBANCE TO THE AREA.
2. CONTRACTOR TO RESTRICT EQUIPMENT TRAFFIC AND STOCKPILE/WORK AREAS AS CLOSE TO THE WORKING LIMITS AS FEASIBLE. MAINTAIN ACCESS FOR LOCAL RESIDENT(S) AND PROVIDE NOTIFICATIONS WHEN ACCESS IS TEMPORARILY RESTRICTED DUE TO CONSTRUCTION ACTIVITIES.
3. EONE STATION TO BE COMMISSIONED PRIOR TO DISCONNECTING SERVICE CONNECTIONS FROM EX. PUMP STATION AND MAKING NEW CONNECTIONS TO EONE SYSTEM.



FLUSHING CONNECTION DETAIL
NOT TO SCALE

LEGEND

- EXISTING GENERAL SANITARY
- MANHOLE and CATCHBASIN
- WATERMAIN
- GASMAIN
- UNDERGROUND TELEPHONE
- UNDERGROUND HYDRO
- UNDERGROUND T.V. CABLE
- UTILITY POLES
- UPLOADING
- REMOVE EXISTING CONC. SIDEWALK AND DRIVES
- REMOVE AND PLACE CONC. SIDEWALK AND DRIVES
- PLACE CONC. SIDEWALK AND DRIVES
- REMOVE EXISTING ASPHALT PAVT
- PLACE HOT MIX ASPHALT
- REMOVE EXISTING CONC. CURB

1:250 5m 0 5m 10m
1:50 1m 0 1m 2m

NOTE

The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work and agrees to be fully responsible for any damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

BENCHMARK INFORMATION
B.M. Elev 196.961
Nail & Flag in West face of HP, East side of Queen Street, accross from house #578.

BENCHMARK INFORMATION
B.M. Elev. 192.488
Nail & Flag in West face of HP on East side of Queen Street, near house #601

Design By: J.M.W. Checked By: D.L.E.

AS RECORDED
The information on this record drawing is believed to be reliable, however it may be based, in part, upon information provided by others, which can not be verified by B.M. Ross and Associates Limited. Those relying on this record drawing are advised to obtain additional verification of its accuracy before applying it for any purpose.
MAY 17, 2023
Date

No.	DATE	REVISION
1	April 30, 2020	Issued for Tender
2	May 11, 2020	Issued for Approval
3	June 30, 2020	Issued for Construction
4	Feb. 19, 2021	Reissued for Construction
5	Mar. 7, 2023	Revised for Quadplex EOne System

BMROSS engineering better communities

Goderich | Mount Forest | Sarnia

THE MUNICIPALITY OF great energy balanced life KINCARDINE

Municipality of Kincardine

Queen Street Reconstruction

593, 595, 601 Queen Street Sanitary Plan and Details

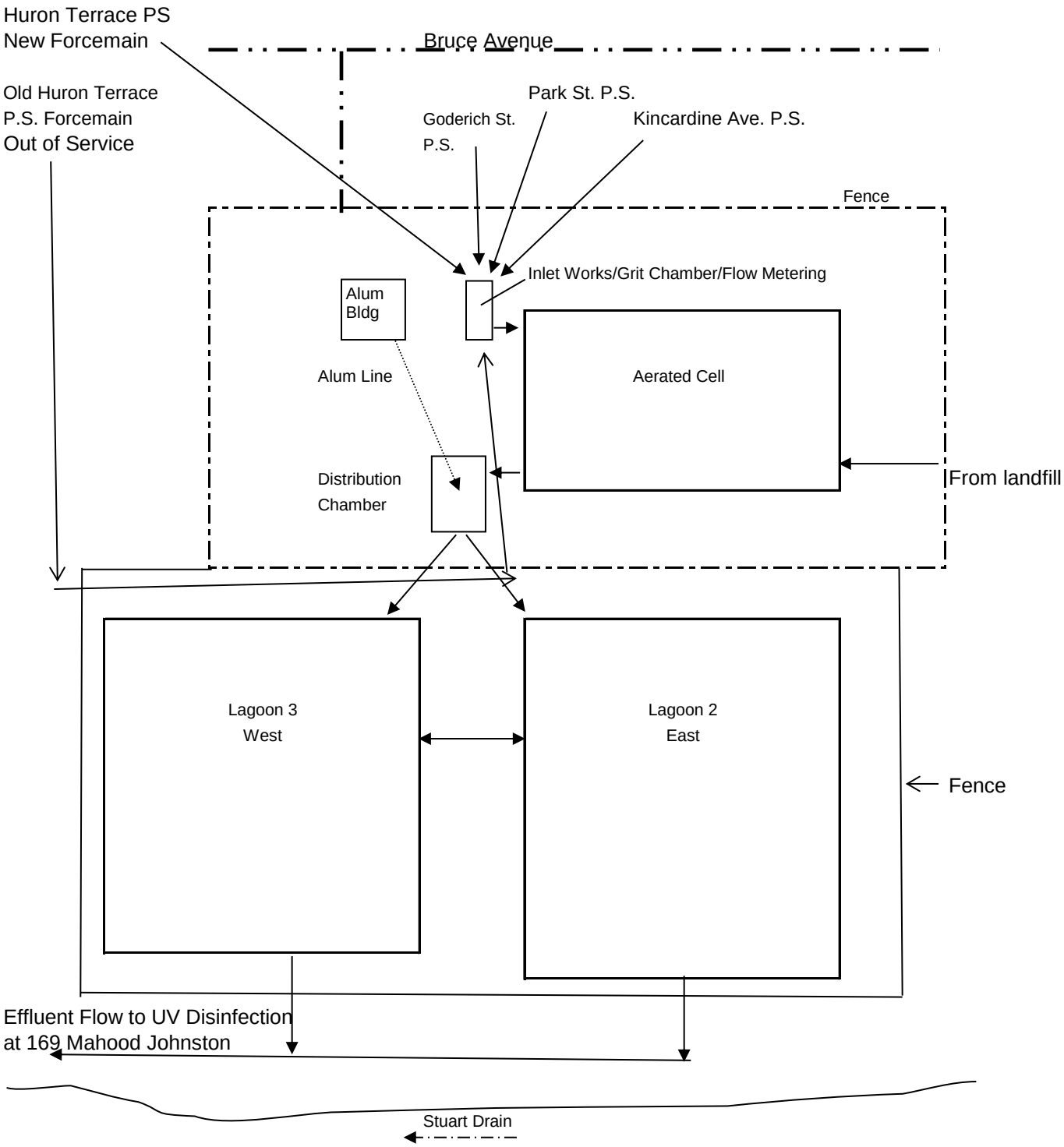
Part	Project No.
3	17318

Scale (24x36)
Horizontal : 1 : 250
Vertical : 1 : 100

Drawing No. 15R

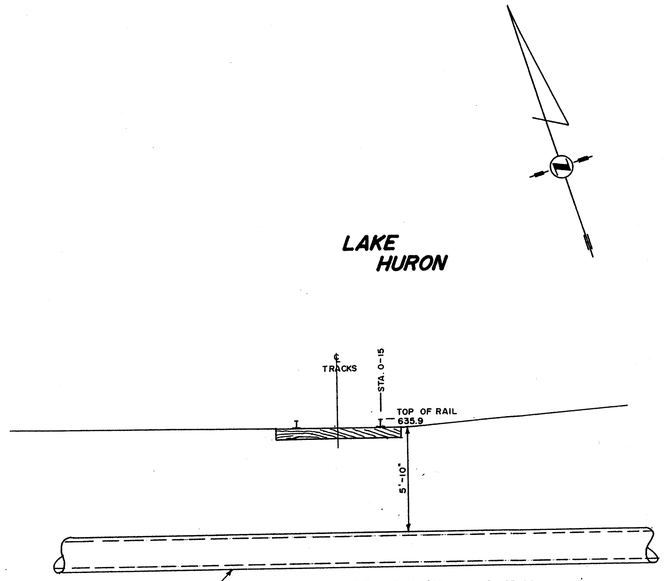
APPENDIX B

SCHEMATIC DIAGRAM OF THE WASTEWATER TREATMENT FACILITY



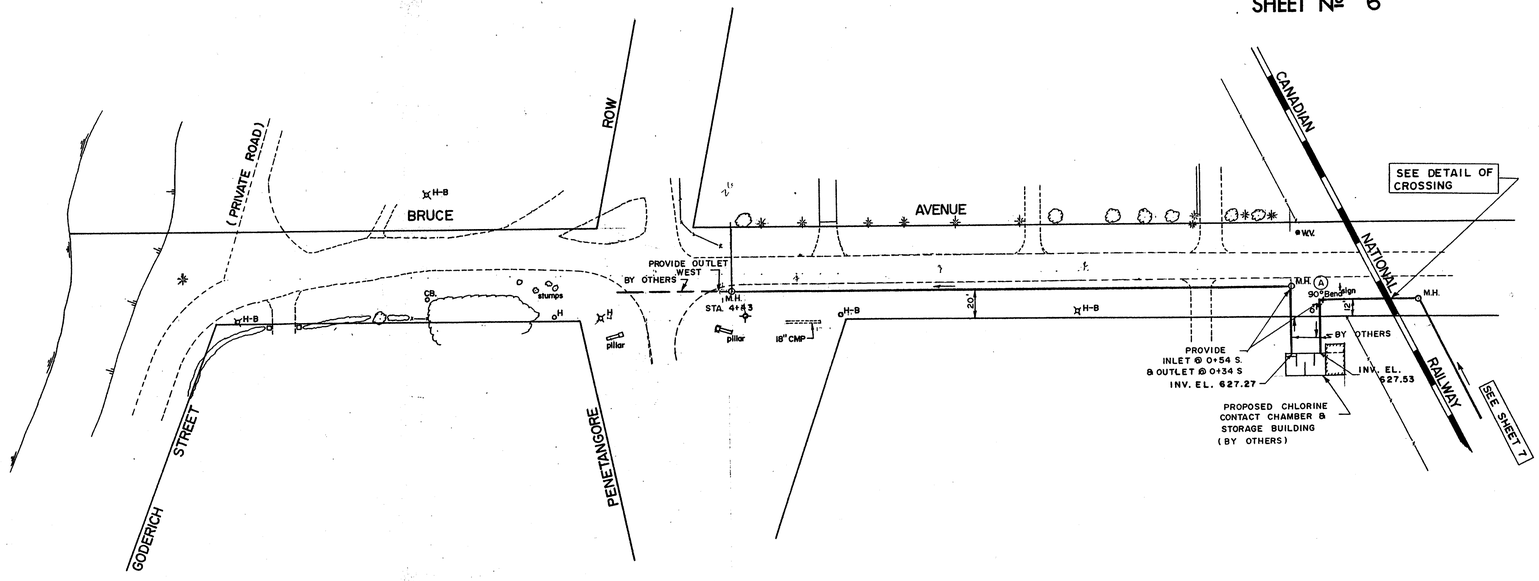
Revision 2
October 24, 2023

CONTRACT Nº M75-56A
SHEET Nº 6

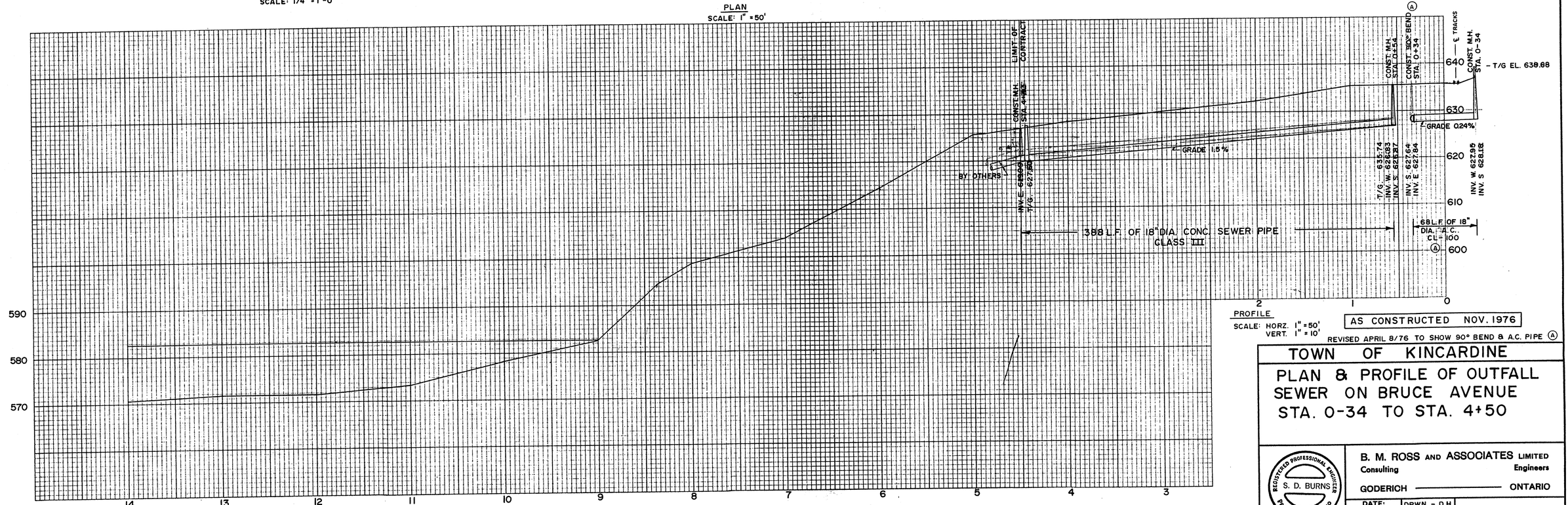


NOTE:
INSTALLATION TO BE IN ACCORDANCE WITH GENERAL ORDER E-10 CANADIAN TRANSPORT COMMISSION

SECTION AT MI. 56.80 KINCARDINE SUBDIVISION
SCALE: 1/4" = 1'-0"



PLAN
SCALE: 1" = 50'



PROFILE
SCALE: HORZ. 1" = 50'
VERT. 1" = 10'

AS CONSTRUCTED NOV. 1976
REVISED APRIL 8/76 TO SHOW 90° BEND & A.C. PIPE (A)

TOWN OF KINCARDINE

PLAN & PROFILE OF OUTFALL SEWER ON BRUCE AVENUE STA. 0-34 TO STA. 4+50

REGISTERED PROFESSIONAL ENGINEER S. D. BURNS PROVINCE OF ONTARIO

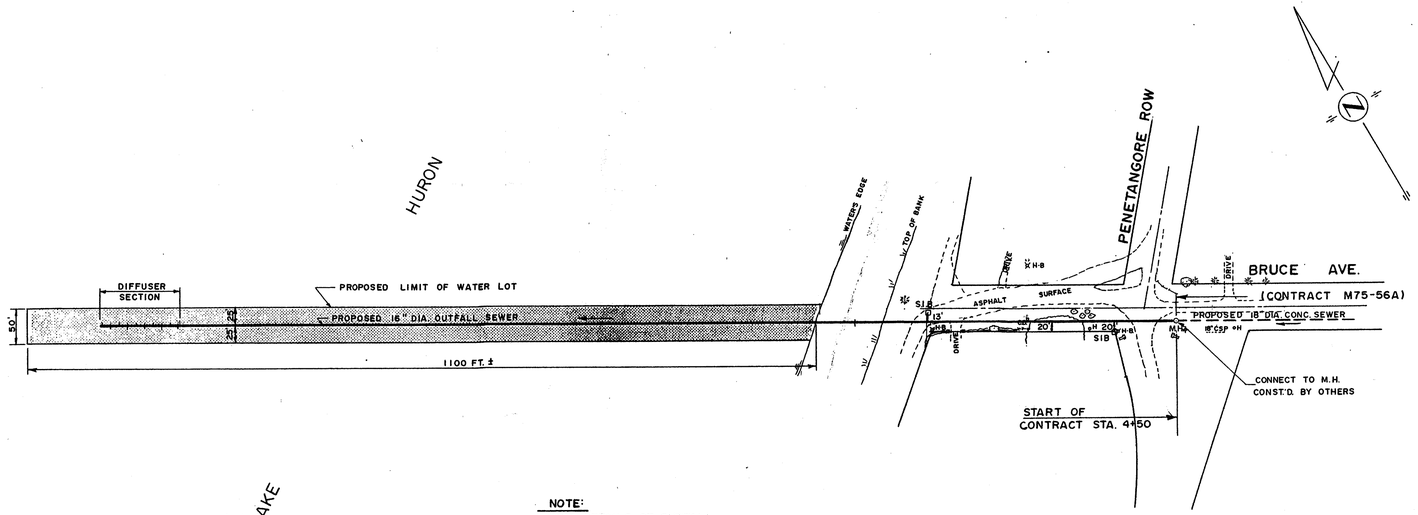
B. M. ROSS AND ASSOCIATES LIMITED
Consulting Engineers
GODERICH — ONTARIO

DATE: JAN. 1976
DRWN. - D.H.
CHK'D. - S.D.B.

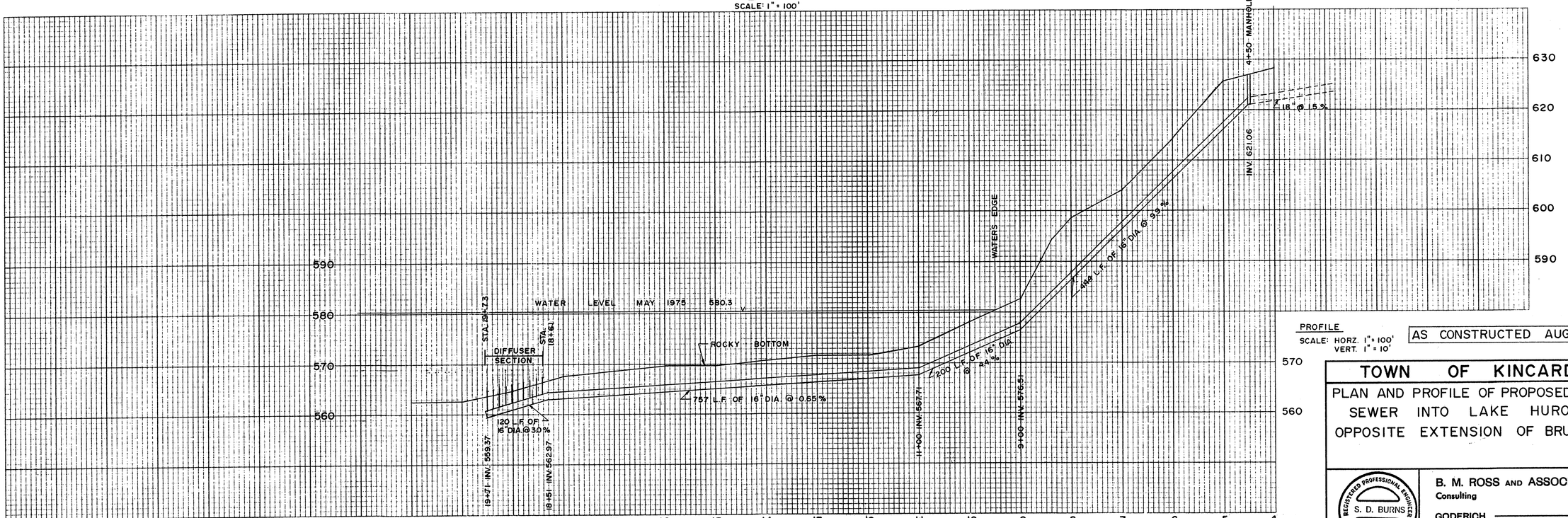
M-15

BRUNING

CONTRACT Nº M75-56C
SHEET Nº 2



PLAN
SCALE: 1" = 100'



PROFILE
SCALE: HORZ. 1" = 100'
VERT. 1" = 10'

AS CONSTRUCTED AUG. 1977

TOWN OF KINCARDINE

PLAN AND PROFILE OF PROPOSED OUTFALL SEWER INTO LAKE HURON OPPOSITE EXTENSION OF BRUCE AVENUE

REGISTERED PROFESSIONAL ENGINEER S. D. BURNS PROVINCE OF ONTARIO

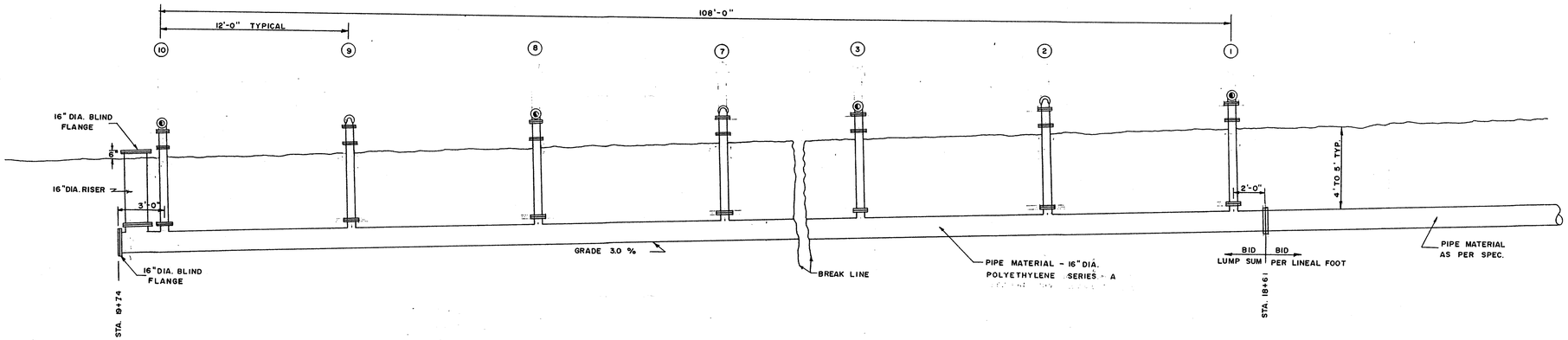
B. M. ROSS AND ASSOCIATES LIMITED
Consulting Engineers
GODERICH ——— ONTARIO

DATE: FEB. 1976
DRWN. - D. H.
CHK'D - B. M. R.

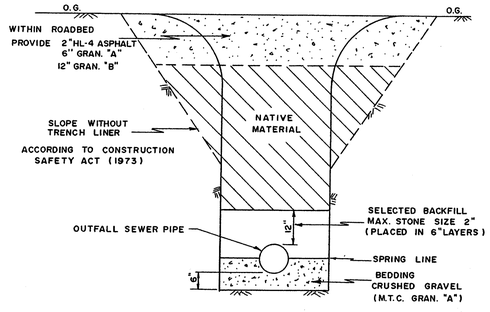
M-17

BRUNINO

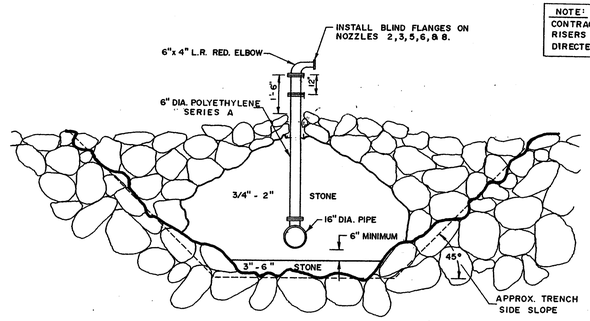
CONTRACT № M 75-56-C
SHEET № 3



DIFFUSER SECTION
SCALE: 1/4" = 1'-0"

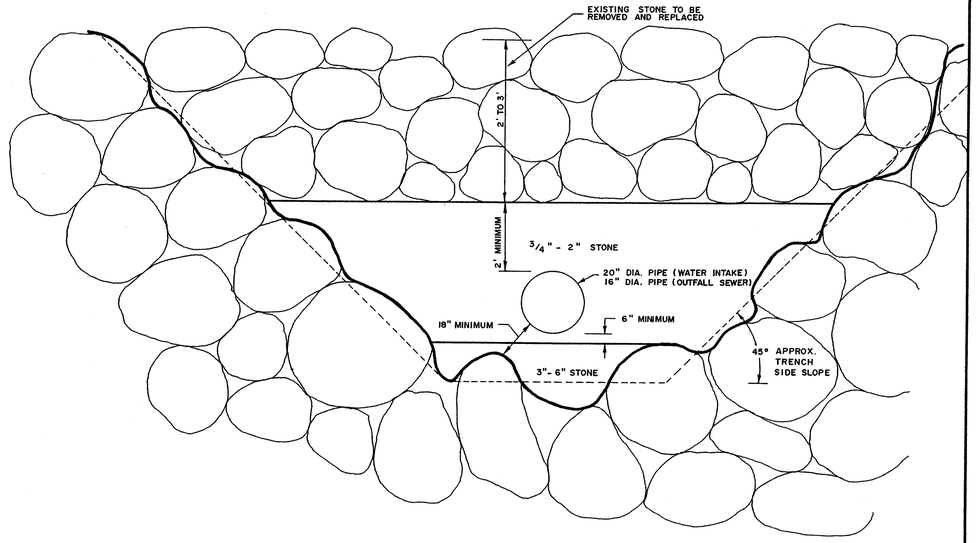


SECTION THROUGH OUTFALL SEWER
STA. 4+50 TO STA. 9+50 ±
N. T. S.



NOTE:
CONTRACTOR TO SUPPORT DIFFUSER RISERS DURING BACKFILLING AS DIRECTED BY THE ENGINEER.

SECTION THROUGH DIFFUSER PORTION OF OUTFALL SEWER
N.T.S.



SECTION THROUGH OUTFALL SEWER AND WATER INTAKE
N.T.S.

AS CONSTRUCTED AUG. 1977

TOWN OF KINCARDINE

PLAN SHOWING DETAILS OF OUTFALL SEWER

REGISTERED PROFESSIONAL ENGINEER
S. D. BURNS
PROVINCE OF ONTARIO

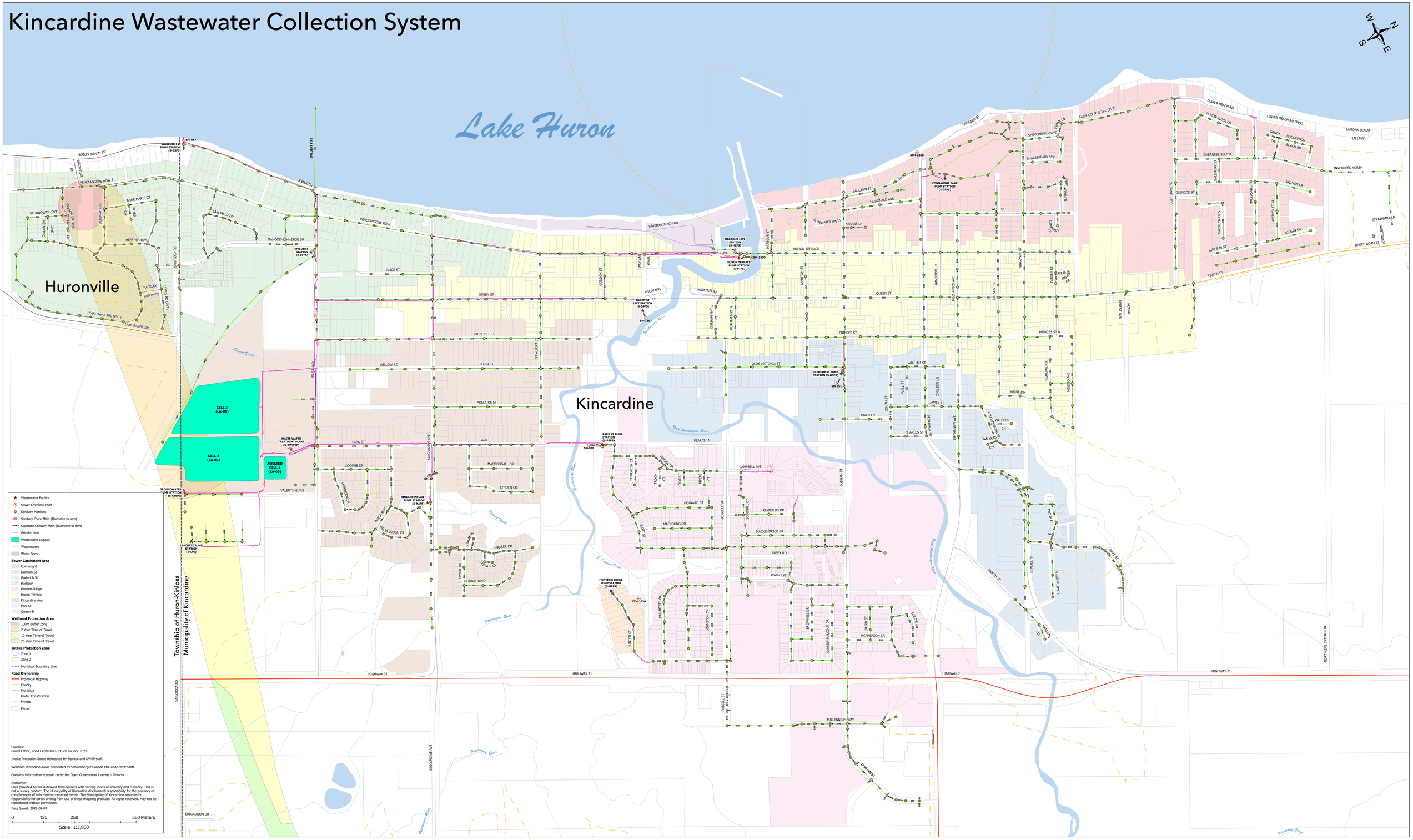
B. M. ROSS AND ASSOCIATES LIMITED
Consulting Engineers
GODERICH — ONTARIO

DATE:	DRWN. - L. M.	SCALE
MARCH 1976	CHK'D. - S.D.B.	AS SHOWN

BRUNING 40-105 250-1-74 x

m-17

Kincardine Wastewater Collection System



APPENDIX C

AVERAGE MONTHLY ANALYTICAL RESULTS

Kincardine Wastewater Treatment Plant

2023	INFLUENT FLOWS			RAW INFLUENT						FINAL EFFLUENT												
				Monthly Average						Monthly Average												
Month	Total Flow m3	Max Flow m3/day	Avg. Flows m3/Day	BOD5 mg/L	TSS mg/L	TKN mg/L	Total P mg/L	pH	Alkalinity CaCO3 mg/L	CBOD5 mg/L	TSS mg/L	TKN mg/L	Total P mg/L	Alkalinity CaCO3 mg/L	Nitrite NO2 mg/L	Nitrate NO3 mg/L	Ammonia+ Ammonium NH3+NH4 mg/L	E-Coli /100 mL (Geomean)	pH	Temper-ature C	Conduct-ivity u S/cm	Unionized Ammonia ug/L
January	132898	7420	4287	176	135	45.9	4.98	8.05	338	14.5	17.5	16.6	0.27	212	0.06	0.49	15.8	2	7.60	3.4	915	0.070
February	119807	8497	4278.8	65	123	15.5	1.20	7.80	274	14.0	18.0	18.5	0.23	222	0.06	0.50	16.8	2	7.60	3.5	975	0.073
March	131268	8372	4234.5	101	115	27.6	2.48	7.90	301	20.5	25.5	18.6	0.26	216	0.07	0.62	15.6	2	7.75	9.1	955	0.187
April	149103	12756	4970.1	64	114	28.1	2.32	7.95	293	26.5	37.3	15.6	0.22	195	0.10	0.71	11.8	4	7.90	12.7	434	0.268
May	118944	5917	3836.9	120	202	40.9	4.09	7.93	325	11.0	14.7	20.0	0.24	223	0.20	0.43	17.8	3	7.50	17.7	970	0.209
June	97571	4411	3252.4	57	106	15.5	1.48	7.40	233	5.5	5.5	29.0	0.28	175	0.33	0.43	25.5	2	7.70	20.3	1065	0.549
July	109820	4761	3542.6	106	109	27.8	2.17	7.55	239	18.0	15.5	26.8	0.26	180	0.18	0.43	22.1	3	7.75	24.1	985	0.646
August	108906	4364	3513.1	152	209	36.1	3.74	7.85	285	22.0	20.0	18.8	0.24	155	0.10	0.44	17.0	94	8.00	20.9	880	0.685
September	91168	3738	3038.9	255	177	44.7	4.48	8.15	301	20.5	33.5	18.8	0.32	161	0.10	0.37	15.3	5	8.10	20.8	855	0.803
October	104928	4716	3384.8	125	183	42.9	4.45	8.03	319	17.3	27.7	17.5	0.40	168	0.19	0.64	15.6	3	7.97	14.4	843	0.375
November	110169	4665	3672.3	107	127	21.9	2.37	7.90	267	23.5	30.0	18.4	0.42	198	0.13	0.56	16.5	9	8.65	6.3	855	0.985
December	127519	5994	4113.5	82	78	13.4	1.20	8.10	214	23.0	25.0	18.8	0.61	229	0.16	0.51	16.6	13	8.20	6.2	439	0.373
Annual	1402103	12756	3843.7	117	140	30.0	2.91	7.88	282	18.0	22.5	19.8	0.31	194	0.14	0.51	17.2	5	7.89	13.3	848	0.435

refers to <

NAUTILUS ENVIRONMENTAL

Certificate of Analysis

ACUTE LETHALITY BIOASSAY REPORT
(Single-Concentration Test)

CLIENT:

Municipality of Kincardine, Water Services Department, 1475 Concession 5, Kincardine, ON N2Z 2X6

TEST RESULTS:

Sample Name[1]	Sample Number	Date Collected	Date Received	Date Tested	Test Species[2]	Percent Mortality[3]	Method Deviations
KWWTP	1660-0012301	14-Nov-23	16-Nov-23	17-Nov-23	RBT	0%	None

1 - Results relate only to the sample tested. Tested as received from client.
2 - Test Type and Species RBT = Rainbow Trout 96-hour 100% Effluent Concentration Acute Lethality Test
3 - Most regulations regard ≤50% mortality to be a "pass". Check your applicable regulatory requirements.

TEST PROTOCOLS:

Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/13 Second Edition - December 2000, including May 2007 and February 2016 Amendments. (Nautilus Test Method RT-SC-R1.7)

REFERENCE/HEALTH DATA:

Trout: Refer attached report

TEST RESULTS APPROVED BY:

Date: December 5, 2023

C. D'Andrea

Carol D'Andrea
Laboratory Supervisor

Y:\bioassays\2023\1000\1660-001\1660-0012301 T

704 Mara Street Point Edward, ON N7V 1X4
519-339-8787

NAUTILUS ENVIRONMENTAL
B-11 Nicholas Beaver Road
Puslinch, ON N0B 2J0
Tel. (519) 763-4412
Fax. (519) 763-4419

TOXICITY TEST REPORT

Rainbow Trout
EPS 1/RM/13
EPS 1/RM/50

Work Order : 253340
Sample Number : 80379

SAMPLE IDENTIFICATION

Company :	Nautilus Environmental, Point Edward	Sampling Date :	2023-11-14
Location :	Point Edward ON	Sampling Time :	13:08
Substance :	1660-0012301	Date Received :	2023-11-16
Sampling Method :	Grab	Time Received :	15:30
Sampled By :	Not provided	Temperature at Receipt :	9 °C
Sample Description :	Cloudy, green.	Date Tested :	2023-11-17

Test Method(s) : Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout. Environment Canada, EPS 1/RM/13 (2nd Edition, December 2000, with May 2007 and February 2016 amendments).

Procedure for pH Stabilization During the Testing of Acute Lethality of Wastewater Effluent to Rainbow Trout. Environment Canada, EPS 1/RM/50 (March 2008), with deviation(s) as noted.

96-HOUR TEST RESULTS

Substance	Effect	Value
Control	Mean Impairment	0.0 %
	Mean Mortality	0.0 %
100%	Mean Impairment	0.0 %
	Mean Mortality	10.0 %

The results reported relate only to the sample tested and as received.

TEST ORGANISM

Test Organism :	*Oncorhynchus mykiss*	Mean Fork Length :	38.2 mm
Organism Batch :	T23-25	Range of Fork Lengths :	32 - 42 mm
Control Sample Size :	10	Mean Wet Weight :	0.4 g
Cumulative stock tank mortality rate :	0% (previous 7 days)	Organism Loading Rate :	0.2 g/L
Control organisms showing stress :	0 (at test completion)		

TEST CONDITIONS

Sample Treatment :	pH Stabilization	Number of Replicates :	1
pH Adjustment :	Yes (as per EPS 1/RM/50)	Organisms Per Replicate :	10
pH Stabilization Technique :	pH Controller	Organisms Per Test Level :	10
Gas Mixture Used :	100% CO_2	Pre-aeration/Aeration Rate :	6.5 ± 1 mL/min/L
Test Aeration :	Yes	Total Pre-Aeration Time :	30 minutes
Volume Tested (L) :	20	Test Method Deviation(s) :	Yes (see 'COMMENTS')

REFERENCE TOXICANT DATA

Toxicant :	Potassium Chloride		
Organism Batch :	T23-25	LC50 :	3370 mg/L
Date Tested :	2023-11-15	95% Confidence Limits :	3197 - 3551 mg/L
Analyst(s) :	AJS, PG	Historical Mean LC50 :	3509 mg/L
Statistical Method :	Spearman-Kärber	Warning Limits (± 2SD) :	2938 - 4189 mg/L

COMMENTS

• All test validity criteria as specified in the test method were satisfied.

• Noted Deviation: pH controllers are calibrated at the start of the test, and not daily as described in the test method. Extensive internal method validation of this approach has confirmed the accuracy and stability of the pH controllers over the course of the 96-h test. Additionally, pH of the test and control solutions is measured daily throughout the test.

Approved By : _____

Project Manager

NAUTILUS ENVIRONMENTAL

TOXICITY TEST REPORT

Rainbow Trout
EPS 1/RM/13
EPS 1/RM/50

Work Order : 253340
Sample Number : 80379

TEST DATA

	pH	Dissolved O_2 (mg/L)	Conductivity (µmhos/cm)	Temperature (°C)	O_2 Saturation (%)[3]	TAN (mg/L)[1]	NH3 (mg/L)[2]
Initial Water Chemistry (100%) :	7.9	8.5	786	15	91	17.7	0.379
After 30 min pre-aeration :	8.0	8.7	786	15	93	–	–

0 HOURS

Date & Time 2023-11-17 11:45
Analyst(s) : PG/AJS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	O_2 Saturation[3]	Hardness (mg/L as $CaCO_3$)	Total Chlorine (mg/L)
100%	0	0	8.0	8.7	786	15	93	220	–
Control	0	0	8.3	9.5	737	14	97	–	–

Notes:

24 HOURS

Date & Time 2023-11-18 11:45
Analyst(s) : AJS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	TAN (mg/L)[1]	NH3 (mg/L)[2]
100%	0	0	8.0	–	–	15	–	–
Control	0	0	8.2	–	–	15	–	–

Notes:

48 HOURS

Date & Time 2023-11-19 11:45
Analyst(s) : AJS

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	TAN (mg/L)[1]	NH3 (mg/L)[2]
100%	1	0	8.0	–	–	15	–	–
Control	0	0	8.2	–	–	15	–	–

Notes:

72 HOURS

Date & Time 2023-11-20 11:45
Analyst(s) : PG

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	TAN (mg/L)[1]	NH3 (mg/L)[2]
100%	1	0	8.0	–	–	15	–	–
Control	0	0	8.2	–	–	15	–	–

Notes:

96 HOURS

Date & Time 2023-11-21 11:45
Analyst(s) : PG

Concentration	Dead	Impaired	pH	Dissolved O_2	Conductivity	Temperature	TAN (mg/L)[1]	NH3 (mg/L)[2]	Average pH (0 - 96 h)
100%	1	0	8.0	9.4	802	15	–	–	8.0
Control	0	0	8.2	9.5	601	15	–	–	8.2

Notes:

[1] TAN = Total ammonia (as N); analysis conducted by Bureau Veritas S.A., Mississauga ON; MDL = 0.05 mg/L.

[2] NH3 = Un-ionized ammonia (calculated from TAN, pH, and temperature according to the test method).

[3] adjusted for temperature and barometric pressure

"–" = not measured/not required

Number impaired does not include number dead.

Test Data Reviewed By : FS

Date : 2023-11-25

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

Works #: 110000864

28-April-2023

Mun of Kincardine (WWTP)
Attn : Lisa Crimmings

155 Durham St.
Kincardine, ON
N2Z 1A4, Canada

Phone: 519-396-4660
Fax:

Date Rec. : 19 April 2023
LR Report: **CA13649-APR23**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Final Effluent
Sample Date & Time					18-Apr-23 08:30
Temperature Upon Receipt [°C]	---	---	---	---	6.0
Chloride [mg/L]	24-Apr-23	15:34	26-Apr-23	07:50	130
Chemical Oxygen Demand [mg/L]	20-Apr-23	14:47	21-Apr-23	08:56	66
Dissolved Organic Carbon [mg/L]	20-Apr-23	14:32	24-Apr-23	11:44	10
4AAP-Phenolics [mg/L]	20-Apr-23	08:36	21-Apr-23	08:39	< 0.002
Hardness [mg/L as CaCO3]	23-Apr-23	11:57	28-Apr-23	13:16	231
Silver (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	< 0.00005
Aluminum (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.784
Arsenic (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.0004
Barium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.0120
Beryllium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	< 0.000007
Boron (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.107
Bismuth (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00004
Calcium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	63.9
Cadmium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.000009
Cobalt (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.000211
Chromium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00064
Copper (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.0025
Iron (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.149
Potassium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	8.56
Lithium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.0026
Magnesium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	17.4
Manganese (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.0506
Molybdenum (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00082
Sodium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	67.3
Nickel (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.0011
Phosphorus (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.402
Lead (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00017
Antimony (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	< 0.0009
Selenium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00021
Silicon (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	1.99

OnLine LIMS

0003316261

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

Works #: 110000864

LR Report : **CA13649-APR23**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Final Effluent
Tin (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00010
Strontium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.831
Titanium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00069
Thallium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	< 0.000005
Uranium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.000460
Vanadium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00043
Tungsten (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	< 0.00002
Yttrium (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.00003
Zinc (total) [mg/L]	23-Apr-23	11:57	28-Apr-23	13:16	0.006
Benzene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Bromodichloromethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Bromoform [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Bromomethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Carbon tetrachloride [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.2
Chlorobenzene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Chloroethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 5
Chloroform [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Chloromethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 5
Dibromochloromethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,2-Dichlorobenzene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,3-Dichlorobenzene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,4-Dichlorobenzene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,1-Dichloroethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,2-Dichloroethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,1-Dichloroethylene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,2-Dichloropropane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
trans-1,2-Dichloroethene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
cis-1,2-Dichloroethene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
cis-1,3-Dichloropropene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
trans-1,3-Dichloropropene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Ethylbenzene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Ethylenedibromide [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.2
Dichloromethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Styrene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,1,2,2-Tetrachloroethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Tetrachloroethene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Toluene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Trichloroethylene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Vinyl Chloride [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.2
Trichlorofluoromethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 5
1,1,1-Trichloroethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
1,1,2-Trichloroethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
Xylene (total) [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
o-xylene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
m/p-xylene [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5
2-Chloroethylvinylether [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 5
1,1,1,2-Tetrachloroethane [ug/L]	21-Apr-23	15:08	24-Apr-23	12:58	< 0.5

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

Works #: 110000864

LR Report : **CA13649-APR23**

Hawley Anderson, Hon.B.Sc
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003316261

SGS Canada Inc.
P.O. Box 4300 - 185 Concession St.
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Phone: 705-652-2000 FAX: 705-652-6365

Works #: 110000864

30-October-2023

Mun of Kincardine (WWTP)
Attn : Lisa Crimmings

155 Durham St.
Kincardine, ON
N2Z 1A4, Canada

Phone: 519-396-4660
Fax:

Date Rec. : 18 October 2023
LR Report: **CA12607-OCT23**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Final Effluent
Sample Date & Time					17-Oct-23 09:33
Temperature Upon Receipt [°C]	---	---	---	---	9.0
Field pH [no unit]	---	---	---	---	7.9
Field Temperature [celcius]	---	---	---	---	13.2
Chloride [mg/L]	30-Oct-23	10:01	30-Oct-23	12:51	94
Chemical Oxygen Demand [mg/L]	19-Oct-23	09:59	19-Oct-23	13:35	95
Dissolved Organic Carbon [mg/L]	19-Oct-23	15:35	23-Oct-23	10:26	9
4AAP-Phenolics [mg/L]	19-Oct-23	18:13	20-Oct-23	15:16	< 0.002
Hardness [mg/L as CaCO3]	23-Oct-23	12:00	25-Oct-23	11:10	235
Silver (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	< 0.00005
Aluminum (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.503
Arsenic (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.0006
Barium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.01132
Beryllium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	< 0.000007
Boron (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.178
Bismuth (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00007
Calcium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	65.1
Cadmium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.000011
Cobalt (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.000238
Chromium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00038
Copper (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.0023
Iron (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.101
Potassium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	14.6
Lithium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.0023
Magnesium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	17.6
Manganese (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.0289
Molybdenum (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00088
Sodium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	77.3
Nickel (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.0014
Phosphorus (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.956
Lead (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00018
Antimony (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	< 0.0009

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Works #: 110000864

LR Report : **CA12607-OCT23**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Final Effluent
Selenium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00028
Silicon (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	1.69
Tin (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00019
Strontium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.923
Titanium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00083
Thallium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	< 0.000005
Uranium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.000282
Vanadium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00047
Tungsten (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	< 0.00002
Yttrium (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.00005
Zinc (total) [mg/L]	23-Oct-23	12:00	25-Oct-23	11:10	0.008
Benzene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Bromodichloromethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Bromoform [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Bromomethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Carbon tetrachloride [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.2
Chlorobenzene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Chloroethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 5
Chloroform [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Chloromethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 5
Dibromochloromethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,2-Dichlorobenzene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,3-Dichlorobenzene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,4-Dichlorobenzene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,1-Dichloroethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,2-Dichloroethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,1-Dichloroethylene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,2-Dichloropropane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
trans-1,2-Dichloroethene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
cis-1,2-Dichloroethene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
cis-1,3-Dichloropropene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
trans-1,3-Dichloropropene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Ethylbenzene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Ethylenedibromide [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.2
Dichloromethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Styrene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,1,2,2-Tetrachloroethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Tetrachloroethene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Toluene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Trichloroethylene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Vinyl Chloride [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.2
Trichlorofluoromethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 5
1,1,1-Trichloroethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
1,1,2-Trichloroethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
Xylene (total) [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
o-xylene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5
m/p-xylene [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5

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Works #: 110000864

LR Report : **CA12607-OCT23**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Final Effluent
2-Chloroethylvinylether [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 5
1,1,1,2-Tetrachloroethane [ug/L]	19-Oct-23	11:28	20-Oct-23	10:42	< 0.5

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003517030

Wastewater Sampling Requirements 2023

		Bi-weekly	Monthly	Quarterly	Semi-annual	Annual
Kincardine WWTP	Raw	**Grab Samples:** **3 - 500 mL chemical bottles** BOD5 Total Suspended Solids Total Phosphorous Total Kjeldahl Nitrogen Alkalinity				
	Final Effluent	**Grab Samples:** **5 - 500 mL chemical bottles** CBOD5 Total Suspended Solids Total Phosphorous Total Ammonia Nitrogen as N Total Kjeldahl Nitrogen NO2/NO3 Alkalinity Provincial Unionized Ammonia **1 - bacti bottle for:** E. coli **Field Tests:** pH Temperature			As per ECA Chloride COD DOC Hardness Phenols ICP 24 metal scan US EPA 624 parameters VOC **Field Tests:** pH Conductivity Temperature (April and October)	Acute Lethality Testing (WSER) November
Bruce Energy Centre Lagoons	Raw	**24-hour composite samples:** **3 - 500 mL chemical bottles** BOD5 Total Suspended Solids Total Phosphorous Total Kjeldahl Nitrogen				
	Final Effluent	**Grab samples:** **4 - 500 mL chemical bottles** CBOD5 Total Suspended Solids Total Phosphorous Total Kjeldahl Nitrogen Total Ammonia Nitrogen NO2/NO3 Alkalinity **1 - bacti bottle for:** E. coli **Field Tests:** pH Temperature **Calculate:** Provincial Un-ionized Ammonia				
	Septage	BOD5 Total Phosphorous Total Suspended Solids TKN Oil and Grease Field Tests: pH Temperature **(During Each event-Grab sample)**				
	Leachate Hauled to BEC	BOD5 Total Phosphorous Total Suspended Solids TKN Boron Zinc Iron Field Tests: pH Temperature **(Only as required if LTF is out of service)**				
Valentine Ave. Landfill	Groundwater Collection System				**Sampling As per GWCS C of A:** BOD5 Suspended Solids Total Phosphorous TKN Ammonia Heavy metals **(GHD Samples)**	
	Leachate Collection System			**As per LCS C of A:** BOD5 Total Phosphorous Suspended Solids NO2/NO3 Ammonia TKN VOCs COD DOC Alkalinity Chloride Hardness Phenols Metals **Field Tests:** pH Conductivity Temperature **(GHD samples May and November)**	**As per WWTP ECA:** Alkalinity BOD5 Chloride COD DOC Hardness NO2/NO3 TKN Ammonia ICP 24 metal scan US EPA 624 parameters VOC **Field Tests:** pH Conductivity Temperature (January and July-covers quarterly samples for this time frame too) **MOK Samples**	
Kincardine Waste Management Centre Leachate Treatment Facility	Influent		**Grab Samples:** **3 - 500 mL chemical bottles** BOD5 Total Suspended Solids Total Phosphorous Total Kjeldahl Nitrogen			
	Effluent (Clarifier Discharge)	**Grab samples:** **4 - 500 mL chemical bottles** CBOD5 Total Suspended Solids Total Phosphorous Total Ammonia Nitrogen Nitrate Nitrogen **1 - bacti bottle for:** E. coli **Field Tests:** pH Temperature **Calculate:** Provincial Un-ionized Ammonia				**Spring sampling:** **Grab samples** BOD5 COD DOC Phenol VOCs Inorganics (Table 6 of ECA) (Due April)
	SW4 (Surface Water 4)	Grab samples: 1-500mL chemical bottles Nitrate Nitrogen				

Revision 2023-01 November 30, 2022

SAMPLING SCHEDULE 2023

JANUARY

S	M	T	W	T	F	S
1	2	3 Raw HDS	4	5	6	7
8	9 319 Q	10 WW	11	12	13	14
15	16 As	17	18	19	20	21
22	23 319	24 WW LQ	25	26	27	28
29	30	31				

FEBRUARY

S	M	T	W	T	F	S
			1	2	3	4
5	6 Raw HDS 319	7 WW	8	9	10	11
12	13 As	14	15	16	17	18
19	20	21 319 WW	22	23	24	25
26	27	28				

MARCH

S	M	T	W	T	F	S
			1	2	3	4
5	6 Raw HDS 319	7 WW	8	9	10	11
12	13 As	14	15	16	17	18
19	20 319	21 WW	22	23	24	25
26	27	28	29	30	31	

APRIL

S	M	T	W	T	F	S
						1
2	3 Raw pH/Alk HDS 319	4 WW	5	6	7	8
9	10	11 Q F As	12	13	14	15
16	17 319	18 WW SA LTF	19	20	21	22
23	24	25	26	27	28	29
30						

MAY

S	M	T	W	T	F	S
	1 Raw HDS 319	2 WW	3	4	5	6
7	8 As	9	10	11	12	13
14	15 319 THM	16 WW	17	18	19	20
21	22	23	24	25	26	27
28	29 319	30 WW	31			

JUNE

S	M	T	W	T	F	S
				1	2	3
4	5 Raw HDS	6	7	8	9	10
11	12 319 As THM	13 WW	14	15	16	17
18	19	20	21	22	23	24
25	26 319	27 WW	28	29	30	

JULY

S	M	T	W	T	F	S
						1
2	3	4 Raw HDS	5	6	7	8
9	10 319 Q NA IO	11 WW LQ	12	13	14	15
16	17 As THM	18	19	20	21	22
23	24 319	25 WW	26	27	28	29
30	31					

AUGUST

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8 Raw HDS 319 WW	9	10	11	12
13	14 pH/Alk THM As	15	16	17	18	19
20	21 319	22 WW	23	24	25	26
27	28	29	30	31		

SEPTEMBER

S	M	T	W	T	F	S
					1	2
3	4	5 Raw HDS 319 WW	6	7	8	9
10	11 THM As	12	13	14	15	16
17	18 319	19 WW	20	21	22	23
24	25	26	27	28	29	30

OCTOBER

S	M	T	W	T	F	S
1	2 Raw HDS 319	3 WW	4	5	6	7
8	9	10 THM Q A	11	12	13	14
15	16 319 As	17 WW SA	18	19	20	21
22	23	24	25	26	27	28
29	30 319	31 WW				

NOVEMBER

S	M	T	W	T	F	S
			1	2	3	4
5	6 Raw HDS	7	8	9	10	11
12	13 319 As	14 WW AL	15	16	17	18
19	20	21	22	23	24	25
26	27 319	28 WW	29	30		

DECEMBER

S	M	T	W	T	F	S
					1	2
3	4 Raw HDS	5	6	7	8	9
10	11 319 As	12 WW	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27 319 WW	28	29	30
31						

Weekly bacti sampling
All DWS

Tuesdays: Wells - Raw NTU; Well Depths

Raw — Raw Well Sample (Armow, Scott Point)

HDS — Huronville Distribution System

319 — Biweekly Bacti Sampling (MAC, Airport, Brucedale)

pH/Alk — pH/Alkalinity - All DWS

THM — Treated Water during Zebra Mussel Prechlorination

Q — 3 month Sampling - KDWS, SPDWS, UDWS, TDWS, ADWS

F — Fluoride for SPDWS, TDWS, UDWS

A — Annual Sampling - KDWS includes Sodium and Fluoride in 2023

As — Armow Arsenic

NA — North Annual Sampling Tiv- Dent Well

IO — Scott's and Underwood Inorganics and Organics (5 year)-July

WW — Biweekly Wastewater Sampling KWWTP / BEC / LTF

SA — KWWTP Semiannual Effluent Sampling

LQ — Leachate Quarterly Sampling (Valentine Ave site)

LTF — Annual Sampling Leachate Treatment Facility

AL — KWWTP Acute Lethality Testing

Holiday

Municipality of Kincardine Environmental Services
Revision 2023-01 November 2022

SAMPLING SCHEDULE 2024

JANUARY

S	M	T	W	T	F	S
	1	2 Raw HDS	3	4	5	6
7	8 319	9 WW	10	11	12	13
14	15 Q As	16	17	18	19	20
21	22 319	23 WW LQ	24	25	26	27
28	29	30	31			

FEBRUARY

S	M	T	W	T	F	S
				1	2	3
4	5 Raw HDS 319	6 WW	7	8	9	10
11	12 As	13	14	15	16	17
18	19	20 319 WW	21	22	23	24
25	26	27	28	29		

MARCH

S	M	T	W	T	F	S
					1	2
3	4 Raw HDS 319	5 WW	6	7	8	9
10	11 As	12	13	14	15	16
17	18 319	19 WW	20	21	22	23
24	25 Lead	26	27	28	29	30
31						

APRIL

S	M	T	W	T	F	S
	1	2 Raw HDS 319	3 WW SA LTF	4	5	6
7	8 Q As	9	10	11	12	13
14	15 319	16 WW	17	18	19	20
21	22	23	24	25	26	27
28	29 319	30 WW				

MAY

S	M	T	W	T	F	S
			1	2	3	4
5	6 Raw HDS	7	8	9	10	11
12	13 319 As	14 WW	15	16	17	18
19	20	21	22	23	24	25
26	27 319 THM	28 WW	29	30	31	

JUNE

S	M	T	W	T	F	S
						1
2	3 Raw HDS	4	5	6	7	8
9	10 319 As	11 WW	12	13	14	15
16	17 THM M	18	19	20	21	22
23	24 319	25 WW	26	27	28	29
30						

JULY

S	M	T	W	T	F	S
	1	2 Raw HDS	3	4	5	6
7	8 319 Q NA	9 WW LQ	10	11	12	13
14	15 THM As M	16	17	18	19	20
21	22 319	23 WW	24	25	26	27
28	29	30	31			

AUGUST

S	M	T	W	T	F	S
				1	2	3
4	5	6 Raw HDS 319	7 WW	8	9	10
11	12 Lead THM As	13	14	15	16	17
18	19 319 M	20 WW	21	22	23	24
25	26	27	28	29	30	31

SEPTEMBER

S	M	T	W	T	F	S
1	2	3 Raw HDS 319	4 WW	5	6	7
8	9 THM As	10	11	12	13	14
15	16 319 M	17 WW	18	19	20	21
22	23	24	25	26	27	28
29	30 319					

OCTOBER

S	M	T	W	T	F	S
		1 WW	2	3	4	5
6	7 Raw HDS Q A	8	9	10	11	12
13	14	15 319 THM As	16 WW SA	17	18	19
20	21 M	22	23	24	25	26
27	28 319	29 WW	30	31		

NOVEMBER

S	M	T	W	T	F	S
					1	2
3	4 Raw HDS	5	6	7	8	9
10	11 319 As	12 WW AL	13	14	15	16
17	18	19	20	21	22	23
24	25 319	26 WW	27	28	29	30

DECEMBER

S	M	T	W	T	F	S
1	2 Raw HDS	3	4	5	6	7
8	9 319	10 WW	11	12	13	14
15	16 As	17	18	19	20	21
22	23 319 WW	24	25	26	27	28
29	30	31				

Holiday

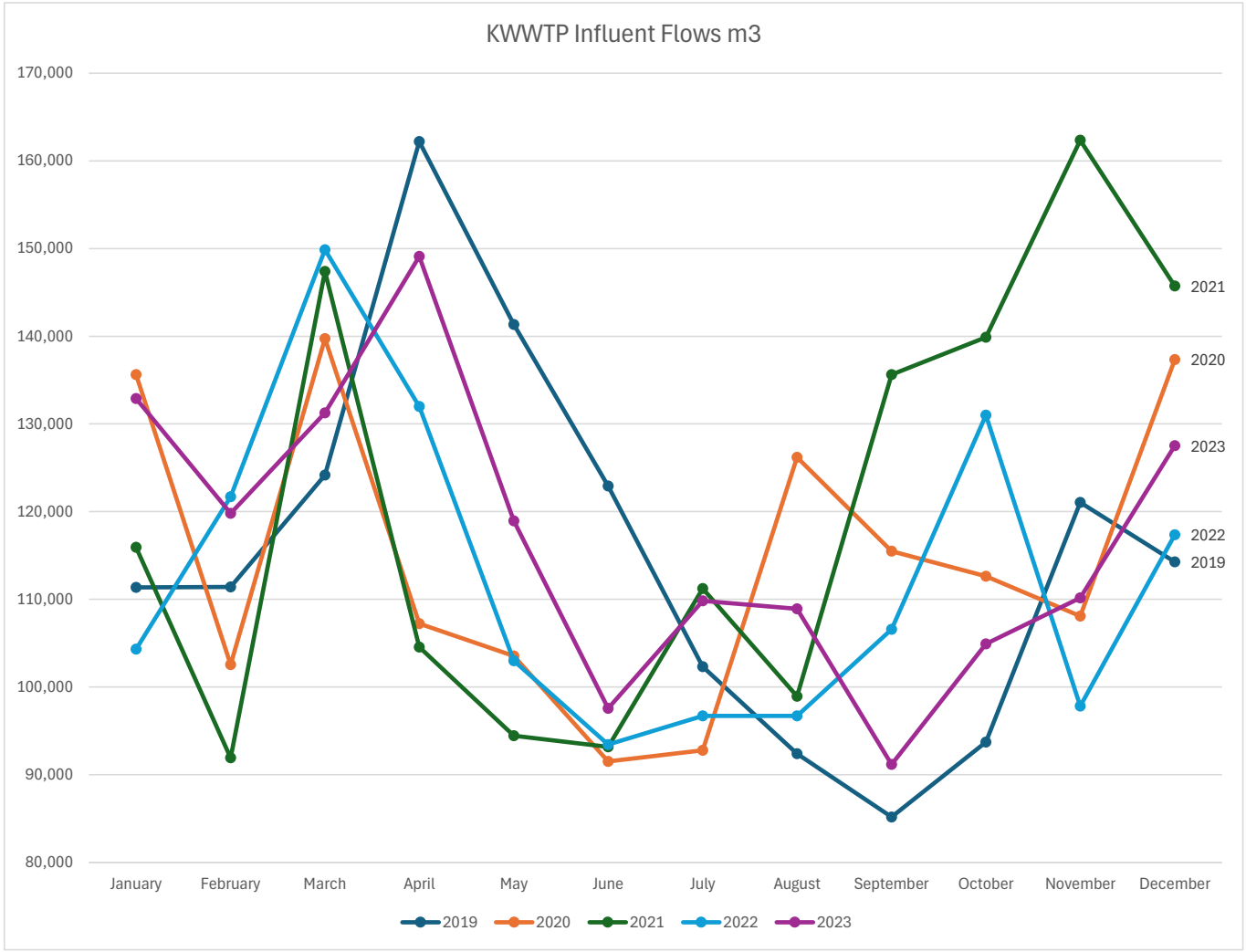
Weekly bacti sampling All DWS

Tuesdays: Wells - Raw NTU; Well Depths

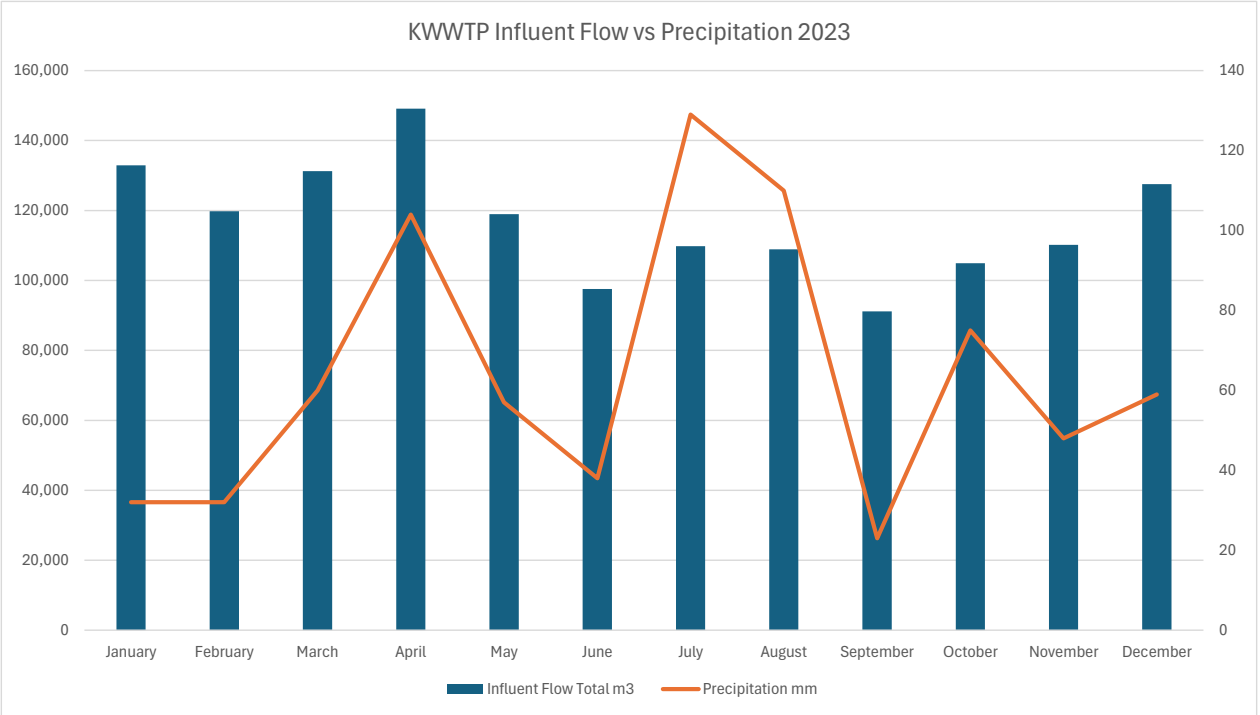
Raw	Raw Well Sample (Scott Point)
HDS	Huronville Distribution System
319	Biweekly Bacti Sampling (MAC, Airport, Brucedale)
Lead	pH/Alkalinity/Lead - All DWS
THM	Treated Water during Zebra Mussel Prechlorination
Q	3 month Sampling - KDWS, SPDWS, UDWS, TDWS, ADWS
A	Annual Sampling - KDWS
As	Armow Arsenic
NA	North Annual Sampling Tiv- Briar #1 Well
M	Microsystin-KWTP (June to October)
WW	Biweekly Wastewater Sampling KWWTP / BEC / LTF
SA	KWWTP Semiannual Effluent Sampling
LQ	Leachate Quarterly Sampling (Valentine Ave site)
LTF	Annual Sampling Leachate Treatment Facility
AL	KWWTP Acute Lethality Testing

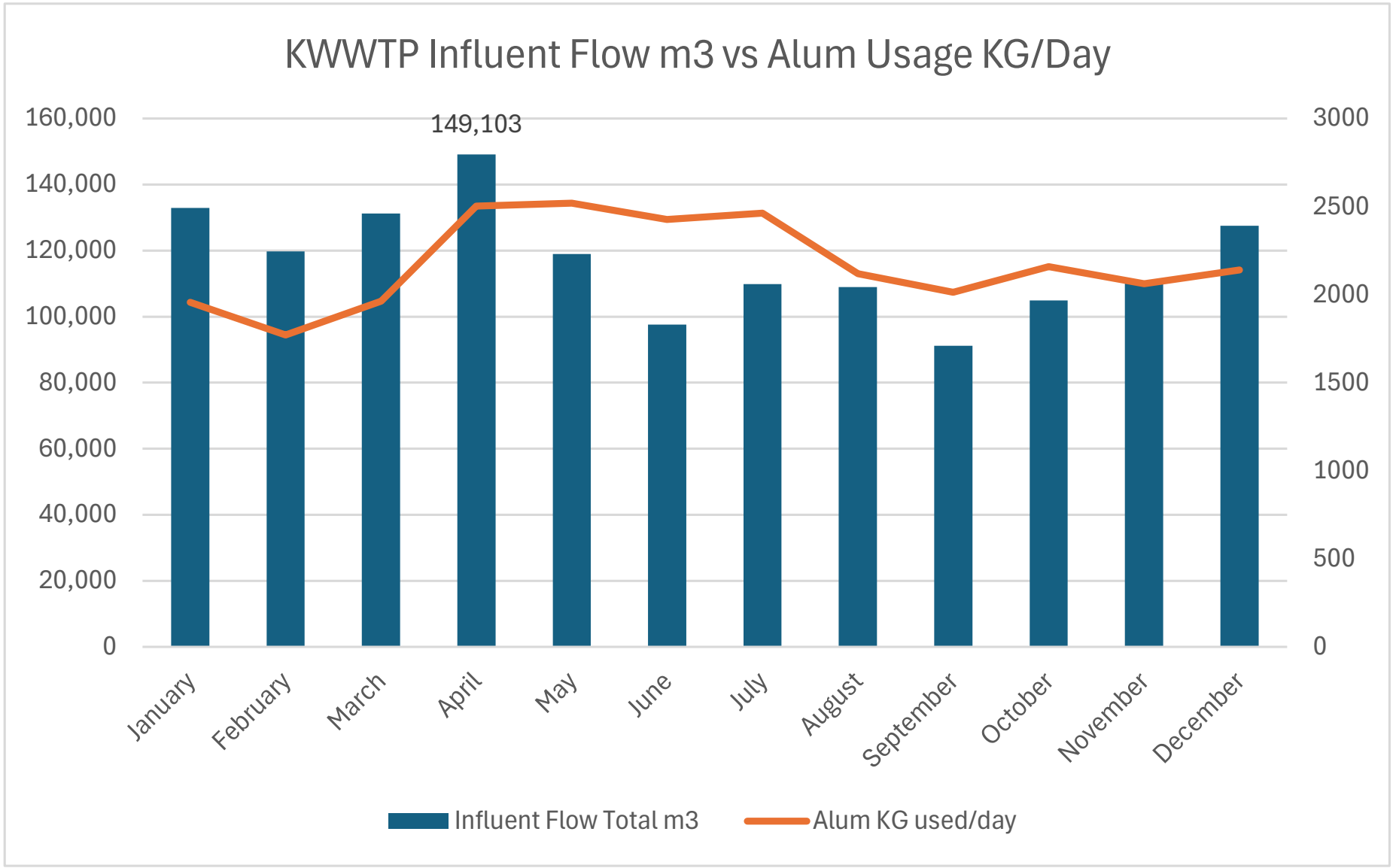
Municipality of Kincardine Environmental Services
Revision 2024-01 December 2023

APPENDIX D


KWWTP Influent Flows m3
170,000
160,000
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
January
February
March
April
May
June
July
August
September
October
November
December
2021
2020
2023
2022
2019
2019
2020
2021
2022
2023

Month	Influent Flow Total m3	Precipitation mm
January	132,898	32
February	119,807	32
March	131,268	60
April	149,103	104
May	118,944	57
June	97,571	38
July	109,820	129
August	108,906	110
September	91,168	23
October	104,928	75
November	110,169	48
December	127,519	59
Totals	1,402,103	765




KWWTP Influent Flow m3 vs Alum Usage KG/Day
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
3000
2500
2000
1500
1000
500
0
149,103
January
February
March
April
May
June
July
August
September
October
November
December
Influent Flow Total m3
Alum KG used/day

APPENDIX E

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

Works #: 110000864

06-February-2023

Mun of Kincardine (WWTP)
Attn : Lisa Crimmings

155 Durham St.
Kincardine, ON
N2Z 1A4, Canada

Phone: 519-396-4660
Fax:

Date Rec. : 25 January 2023
LR Report: **CA13758-JAN23**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Leachate
Sample Date & Time					24-Jan-23 09:32
Temperature Upon Receipt [°C]	---	---	---	---	6.0
Biochemical Oxygen Demand (BOD5) [mg/L]	31-Jan-23	16:14	06-Feb-23	11:18	19
Total Suspended Solids [mg/L]	26-Jan-23	08:00	26-Jan-23	16:22	36
Alkalinity [mg/L as CaCO3]	26-Jan-23	09:31	27-Jan-23	12:53	1900
Total Kjeldahl Nitrogen [as N mg/L]	26-Jan-23	14:40	31-Jan-23	10:20	158
Ammonia+Ammonium (N) [as N mg/L]	26-Jan-23	16:41	30-Jan-23	08:51	153
Nitrite (as N) [mg/L]	26-Jan-23	12:26	31-Jan-23	17:40	< 0.3
Nitrate (as N) [mg/L]	26-Jan-23	12:26	30-Jan-23	17:40	< 0.06
Nitrate + Nitrite (as N) [mg/L]	26-Jan-23	12:26	31-Jan-23	17:40	< 0.3
Chloride [mg/L]	26-Jan-23	10:51	30-Jan-23	13:42	390
Chemical Oxygen Demand [mg/L]	27-Jan-23	11:07	06-Feb-23	11:18	214
Dissolved Organic Carbon [mg/L]	25-Jan-23	11:37	27-Jan-23	08:35	70
4AAP-Phenolics [mg/L]	26-Jan-23	08:08	27-Jan-23	11:39	0.010
Hardness [mg/L as CaCO3]	26-Jan-23	12:12	27-Jan-23	14:14	1050
Silver (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	< 0.00005
Aluminum (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.083
Arsenic (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.0066
Barium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.320
Beryllium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.000109
Boron (total) [mg/L]	26-Jan-23	12:12	30-Jan-23	15:49	1.17
Bismuth (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00001
Calcium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	257
Cadmium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.000077
Cobalt (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00794
Chromium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00816
Copper (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.0010
Iron (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	9.74
Potassium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	124
Lithium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.0179
Magnesium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	100
Manganese (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.359

OnLine LIMS

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

Works #: 110000864

LR Report : **CA13758-JAN23**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Leachate
Molybdenum (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00172
Sodium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	258
Nickel (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.0136
Phosphorus (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	1.88
Lead (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00111
Antimony (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	< 0.0009
Selenium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00162
Silicon (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	13.9
Tin (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00080
Strontium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	2.81
Titanium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.0126
Thallium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.000010
Uranium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.000110
Vanadium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.0101
Tungsten (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00045
Yttrium (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.00057
Zinc (total) [mg/L]	26-Jan-23	12:12	27-Jan-23	14:14	0.296
Benzene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	1.2
Bromodichloromethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Bromoform [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Bromomethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Carbon tetrachloride [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.2
Chlorobenzene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	1.5
Chloroethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 5
Chloroform [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Chloromethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 5
Dibromochloromethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,2-Dichlorobenzene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,3-Dichlorobenzene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,4-Dichlorobenzene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	1.3
1,1-Dichloroethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,2-Dichloroethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,1-Dichloroethylene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,2-Dichloropropane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
trans-1,2-Dichloroethene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
cis-1,2-Dichloroethene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
cis-1,3-Dichloropropene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
trans-1,3-Dichloropropene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Ethylbenzene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	0.7
Ethylenedibromide [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.2
Dichloromethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Styrene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,1,2,2-Tetrachloroethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Tetrachloroethene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Toluene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Trichloroethylene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Vinyl Chloride [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.2

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

Works #: 110000864

LR Report : **CA13758-JAN23**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Leachate
Trichlorofluoromethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 5
1,1,1-Trichloroethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
1,1,2-Trichloroethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5
Xylene (total) [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	6.8
o-xylene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	2.0
m/p-xylene [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	4.8
2-Chloroethylvinylether [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 5
1,1,1,2-Tetrachloroethane [ug/L]	27-Jan-23	10:21	31-Jan-23	13:26	< 0.5

Hawley Anderson, Hon.B.Sc
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003220529

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

Works #: 110000864

19-July-2023

Mun of Kincardine (WWTP)
Attn : Lisa Crimmings

155 Durham St.
Kincardine, ON
N2Z 1A4, Canada

Phone: 519-396-4660
Fax:

Date Rec. : 12 July 2023
LR Report: **CA13444-JUL23**

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Leachate
Sample Date & Time					11-Jul-23 08:55
Temperature Upon Receipt [°C]	---	---	---	---	10.0
Field pH [no unit]					6.9
Field Temperature [celcius]					18.6
Field Conductivity [uS/cm]					3.20
Biochemical Oxygen Demand (BOD5) [mg/L]	13-Jul-23	17:07	18-Jul-23	11:43	< 12
Total Suspended Solids [mg/L]	15-Jul-23	09:58	17-Jul-23	15:20	21
Alkalinity [mg/L as CaCO3]	12-Jul-23	16:21	13-Jul-23	14:40	1390
Total Kjeldahl Nitrogen [as N mg/L]	13-Jul-23	12:57	17-Jul-23	10:52	108
Ammonia+Ammonium (N) [as N mg/L]	12-Jul-23	17:29	14-Jul-23	10:45	102
Nitrite (as N) [mg/L]	14-Jul-23	10:03	18-Jul-23	18:07	< 0.3
Nitrate (as N) [mg/L]	14-Jul-23	10:03	18-Jul-23	14:46	< 0.06
Nitrate + Nitrite (as N) [mg/L]	14-Jul-23	10:03	18-Jul-23	18:07	<0.3
Chloride [mg/L]	14-Jul-23	11:44	18-Jul-23	15:37	270
Chemical Oxygen Demand [mg/L]	13-Jul-23	08:16	18-Jul-23	11:43	148
Dissolved Organic Carbon [mg/L]	13-Jul-23	18:31	17-Jul-23	09:54	56
4AAP-Phenolics [mg/L]	13-Jul-23	08:09	17-Jul-23	09:44	0.006
Hardness [mg/L as CaCO3]	17-Jul-23	15:25	19-Jul-23	13:14	991
Silver (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	< 0.00005
Aluminum (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.621
Arsenic (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.0040
Barium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.235
Beryllium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	< 0.000007
Boron (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.836
Bismuth (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	< 0.00001
Calcium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	225
Cadmium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.000012
Cobalt (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00701
Chromium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00561
Copper (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.0009
Iron (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	7.51
Potassium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	85.9

OnLine LIMS

0003405246

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

Works #: 110000864

LR Report : **CA13444-JUL23**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Leachate
Lithium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.0128
Magnesium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	104
Manganese (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.607
Molybdenum (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00059
Sodium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	201
Nickel (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.0131
Phosphorus (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.749
Lead (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00030
Antimony (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	< 0.0009
Selenium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00046
Silicon (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	11.0
Tin (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00056
Strontium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	2.32
Titanium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00889
Thallium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	< 0.000005
Uranium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.000165
Vanadium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00447
Tungsten (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00042
Yttrium (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.00022
Zinc (total) [mg/L]	17-Jul-23	15:25	19-Jul-23	13:14	0.035
Benzene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Bromodichloromethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Bromoform [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Bromomethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Carbon tetrachloride [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.2
Chlorobenzene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Chloroethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 5
Chloroform [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Chloromethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 5
Dibromochloromethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,2-Dichlorobenzene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,3-Dichlorobenzene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,4-Dichlorobenzene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	0.6
1,1-Dichloroethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,2-Dichloroethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,1-Dichloroethylene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,2-Dichloropropane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
trans-1,2-Dichloroethene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
cis-1,2-Dichloroethene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
cis-1,3-Dichloropropene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
trans-1,3-Dichloropropene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Ethylbenzene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Ethylenedibromide [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.2
Dichloromethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Styrene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,1,2,2-Tetrachloroethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Tetrachloroethene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5

SGS Canada Inc.
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Works #: 110000864

LR Report : **CA13444-JUL23**

Analysis	1: Analysis Start Date	2: Analysis Start Time	3: Analysis Completed Date	4: Analysis Completed Time	5: Leachate
Toluene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Trichloroethylene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Vinyl Chloride [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.2
Trichlorofluoromethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 5
1,1,1-Trichloroethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
1,1,2-Trichloroethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
Xylene (total) [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	1.8
o-xylene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5
m/p-xylene [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	1.4
2-Chloroethylvinylether [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 5
1,1,1,2-Tetrachloroethane [ug/L]	14-Jul-23	21:23	17-Jul-23	09:49	< 0.5

Carrie Greenlaw
Project Specialist,
Environment, Health & Safety

OnLine LIMS

0003405246

APPENDIX F

	Maintenance Schedule	KWW Treatment	
Frequency	**Equipment**	**Activity**	**Performed By**
	Kincardine Lagoons		
Daily	Blowers	Inspection	Staff
Daily	Aeration System	Inspection	Staff
As needed	Vegetation & Debris	Cleaned	Staff
Weekly	Blowers	Inspection-Oil level/Filter/Pressure/Belt Guard	Staff
Monthly	Blowers	Greased	Staff
Monthly	Alum Line	Flushed	Staff
Quarterly	Aeration System	Blowout Procedure/Clean diffusers	Staff
Every 6 months or 4,000 hours	Blower System	Inspect and repair-Exhaust/Safety Valve/Belts/Sheaves/Oil Change/Grease	Staff or 3rd party
Twice yearly or, as needed (whichever comes 1st)	Splitter Box	Sucked out w/ Vactor	Staff
Twice Yearly	Alum Pumps	Cleaned/Tested for accuracy	Staff
Annually	Aeration System	Clean Aerator Wands	Staff
Annually	Lagoon Sludge Depths	Inspected	Staff
Annually	Influent Flow Meter	Calibration	3rd Party
Annually	Alum Pumps	Tested/Rebuilt	Staff
Annually	Dialer Channel	Tested and Batteries replaced	Staff
Annually	SCADA Alarms/Win911	Tested	Staff
5 years	UPS Backup units	Replaced	Staff
6 Years	Blowers	Replace Hose lines	Staff or 3rd party
10 Years or as required	Aeration Coarse Bubble Diffusers	Replaced	Staff or 3rd party
15 Years or as required	Aeration System Diffuser Membranes	Replaced	Staff or 3rd party
15 Years or as required	Lagoon Sludge Removal	Removal	3rd Party
	Kincardine Effluent Station		
Daily	UV Equipment	Inspection	Staff
Weekly	UV Channel Mounted Equipment	Inspect and remove debris	Staff
As needed	UV Sensors	Maintenance	Staff
Quarterly	UV Lamps	Inspected	Staff
after 12,000 hrs	UV Lamps	Replaced	Staff
Quarterly	UV Sensors	Racks pulled & cleaned	Staff
Quarterly	UV Automatic Cleaning System	Inspect and maintain	Staff
Quarterly	UV Power Distribution Center	Inspect and maintain	Staff
Quarterly	UV System Control Center	Inspect and maintain	Staff
Annually	Flow meter	Calibration	3rd Party
Annually	Dialer Channel	Tested and Batteries replaced	Staff
5 years	UPS Backup units	Replaced	Staff

Updated October 23, 2023

	Maintenance Schedule	WW Collection	
Frequency	**Equipment**	**Activity**	**Performed By**
	Pump Stations		
2 wks	Bar Screens	Raked and inspected	Staff
As needed	Bar Screens; **Connaught** and **Huron Terrace** - have automatic bars screens	Change & Empty bins they dump into	Staff
Annually	Automatic Bar Screens	Inspected	Staff
Monthly	Gensets	Ran for Inspection	Staff
Annually	Pumps	Greased	Staff
Annually	Pumps	Inspection	Staff
Annually	Valves	Operated	Staff
Annually	Dialer Channel	Tested and Batteries replaced	Staff
Annually	Gensets	Inspected	3rd Party
Annually	Dialer Channel and SCADA	Tested	Staff
Annually	Overflow Pipe	Inspected	Staff
Annually	Overflow Signage	Inspected	Staff
Biennial	Flow meters (pump stations)	Calibration (on a rotating 2 year schedule)	3rd Party
Annually	Wet Well	Cleaned out (on a rotating 3 year schedule)	3rd Party
5 years	UPS Backup units	Replaced	Staff
	Groundwater Collection System		
Annually or as needed	Discharge piping and forcemain	Removal of sediment when flow rate is 1.58 L/s or lower	Staff
	Leachate Collection System		
Annually or as needed	Discharge piping and forcemain	Removal of sediment when flow rate is 1.58 L/s or lower	Staff
	Collection Systems		
Annually	Air Relief Valves	Inspected (on a rotating 3 year schedule)	Staff
Annually	Forcemain Chambers	Inspected (on a rotating 3 year schedule)	Staff
Annually	Sewermain	Flush mains (on a rotating 5 year schedule)	staff or 3rd party
Annually	Sewermain	Inspect with CCTV (on a rotaing 5 year schedule)	staff or 3rd party
Annually	Manholes	Inspected (on a rotating 5 year schedule)	Staff
Annually	Manholes	Flushed (on a rotating 5 year schedule)	staff or 3rd party
Annually	Sanitary Valves	Operated (on a rotating 3 year schedule)	Staff

*ECA requirement is to have any pumping station and collection system overflow inspected at least once per calendar year

Updated May 9, 2023

APPENDIX G

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT - **OCM III**
OPEN CHANNEL FLOW MEASUREMENT

Customer Name:	Municipality of Kincardine	Site/Plant Address:	520, Bruce Avenue
Plant Name:	Kincardine WWTP		Kincardine, ON, N2Z 1A4

Device Information		Service Information	
Make:	Siemens	Date:	June 20, 2023
Model:	Multiranger 200	Report No:	CO1453-2304-09
Serial No.:	PB-P6150012	Job No:	CO1453-2304

Flow Details	
Unit:	L/S
Flow Range:	0-368.1
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	368

Inst. Reading	AS FOUND	AS LEFT
TOTALIZER (m3)	210190.98	210231.67
FLOW (L/S)	144.3	0.18

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Discription	Value	Discription	Value
Access Code	N/A	Height of Max. Head	0.500
Dimension Unit (m)	3	Empty Distance	1.220
Exponential Device	1.6	Span	0.500
Cal. Method -Ratiometric	1	Blanking Distance	0.300
Flow Unit	l/sec		
Max Flow rate	368.1		

Instrument Test Information and Results

Input (%)	Calculated Flow(L/S)	Calculated Input (mA)	Flow on UUT (L/S)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	4.02	-0.02
25	92.03	8.00	91.94	7.93	0.07
50	184.05	12.00	184.89	12.09	-0.09
75	276.08	16.00	275.95	15.96	0.04
100	368.10	20.00	367.95	19.95	0.05

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program parameters verified. Verification Test Performed.

Service Technician :	Sanket Trada	Stamp/Signature	
Printed Date:	June 20, 2023		

End of Report

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT - **OCM III**
OPEN CHANNEL FLOW MEASUREMENT

Customer Name:	Municipality of Kincardine	Site/Plant Address:	169 Mahood - Johnson Dr
Plant Name:	Kincardine WWTP		Kincardine, ON, N2Z 1A4

Device Information		Service Information	
Make:	Siemens	Date:	June 20, 2023
Model:	Miltronics OCM III	Report No:	CO1453-2304-10
Tag:	WWTP Effluent	Job No:	CO1453-2304

Flow Details	
Unit:	L/S
Flow Range:	0-400.5
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	400.5

Inst. Reading	AS FOUND	AS LEFT
TOTALIZER (m3)	42081	42092
FLOW (L/S)	13.23	13.88

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	1	P7	Height of Max. Head	61.00
P1	Dimension Unit (cm)	0	P32	Totalizer Multiplier	6X1000
P3	Exponential Device	0	P42	Head by OCM III	0
P4	Cal. Method -Ratiometric	1	P45	Low Flow Cut-off	0
P5	Flow Unit	l/sec	P46	Range at Zero Head	143.7769
P6	Max Flow rate	400.5	P47	Blanking Distance	50

Instrument Test Information and Results

Input (%)	Calculated Flow(L/S)	Calculated Input (mA)	Flow on UUT (L/S)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	3.97	0.03
25	100.00	8.00	97.76	7.98	0.02
50	200.00	12.00	197.54	11.92	0.08
75	300.00	16.00	297.02	15.94	0.06
100	400.00	20.00	398.01	19.98	0.02

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program parameters verified/Limited verification Performed, Measurement works as per specification

Service Technician :	Sanket Trada	Stamp/Signature	
Printed Date:	June 20, 2023		

End of Report

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- LEVEL MEASUREMENT
MULTIRANGER PLUS

Customer Name:	Municipality of Kincardine	Site/Plant Address:	139 Valentine Avenue
Plant Name:	Groundwater Lift		Kincardine, ON, N2Z 2Y6

Device Information		Service Information	
Make:	Milltronics	Date:	June 20, 2023
Model:	Multiranger Plus	Report No:	CO1453-2304-15
Order Code:	N/A	Job No:	CO1453-2304
Serial No.:	071890074-14		
Tag:	N/A		
Job Location:	Groundwater Lift		

Inst. Reading	AS FOUND	AS LEFT
Level (m)	1.634	1.667

Flow Details	
Unit:	Meter
Level Range:	0-1.8
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	1.8

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	0.00000	P40	Parshall Flume	1.00
P1	Dimension Unit (m)	1.000	P41	flow rate (per day)	4.00
P2	Mode	4	P42	OCM exponent	0.00
P3	Empty Distance	2.20	P43	Flume dimension	1
P4	Span	1.80	P45	Maximum head	1.80
P5	near blanking	0.4	P46	Maximum flow rate	1000.00

Instrument Test Information and Results

Input (%)	Calculated Distance (m)	Calculated Input (mA)	Level on UUT Display (m)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	4.00	0.00
25	0.45	8.00	0.44	7.97	0.03
50	0.90	12.00	0.90	12.00	0.00
75	1.35	16.00	1.34	16.00	0.00
100	1.80	20.00	1.80	19.99	0.01

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks: Program parameters verified. Instrument works within specification.

Service Technician : Sanket Trada

Printed Date: June 20, 2023

Stamp/Signature

End of Report

Version: 19-12

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- LEVEL MEASUREMENT
MULTIRANGER PLUS

Customer Name:	Municipality of Kincardine	Site/Plant Address:	139 Valentine Avenue
Plant Name:	Leachate Lift		Kincardine, ON, N2Z 2Y6

Device Information	
Make:	Milltronics
Model:	Multiranger Plus
Order Code:	N/A
Serial No.:	06-19-97 169MW
Tag:	N/A
Job Location:	Leachate Lift

Service Information	
Date:	June 20, 2023
Report No:	CO1453-2304-16
Job No:	CO1453-2304

Inst. Reading	AS FOUND	AS LEFT
Level (m)	0.99	1.08

Flow Details	
Unit:	Meter
Level Range:	0-3.9
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	3.9

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	0.00000	P40	Parshall Flume	1.00
P1	Dimension Unit (m)	1.000	P41	flow rate (per day)	4.00
P2	Mode	4	P42	OCM exponent	1.55
P3	Empty Distance	4.29	P43	Flume dimension	1
P4	Span	3.99	P45	Maximum head	3.99
P5	near blanking	0.3	P46	Maximum flow rate	1000.00

Instrument Test Information and Results

Input (%)	Calculated Distance (m)	Calculated Input (mA)	Level on UUT Display (m)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	3.99	-0.01
25	0.98	8.00	0.97	7.99	-0.01
50	1.95	12.00	1.93	11.97	-0.03
75	2.93	16.00	2.93	16.00	0.00
100	3.90	20.00	3.90	20.00	0.00

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks: Program parameters verified. Limited Verification Performed as Sensor Immersed in water. Transmitter Test Passed.

Service Technician : Sanket Trada

Printed Date: June 20, 2023

Stamp/Signature

End of Report

Version: 19-12

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- MULTIRANGER 100
OPEN CHANNEL LEVEL MEASUREMENT

Customer Name:	Municipality of Kincardine	Site/Plant Address	141 Broadway St.,
Plant Name:	Connaught Park Lift		Kincardine, ON

Device Information		Service Information	
Make:	Siemens Milltronics	Date:	June 26, 2023
Model:	Multiranger 100	Report No:	CO1453-2304-17
Order Code:	7ML50331AA001A	Job No:	CO1453-2304
Serial No.:	PBD/K4260463		
Tag:	LIT 01	Flow Details	
		Unit:	millimetres
		Range:	0-1230
		Current Output:	4 to 20 mA
		4 mA Set Point	0
		20 mA Set Point	1230.00

Inst. Reading	AS FOUND	AS LEFT
Level (mm)	238.13	241.94

Maintenance Checklist			Remarks
Visual Inspection:	☑ OK	☐ NOT OK	
Electrical Inspection:	☑ OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
P001	Operation	Level	P007	Span	1230 mm
P002	Material	Liquid	P062	Offset Reading	0.000 mm
P004	Transducer	104(XPS_15)	P211	20 mA Setpoint	1230 mm
P005	Units	millimetres	P701	Max. empty rate	1000 mm
P006	Empty	1670 mm	P800	Near Blanking	300 mm

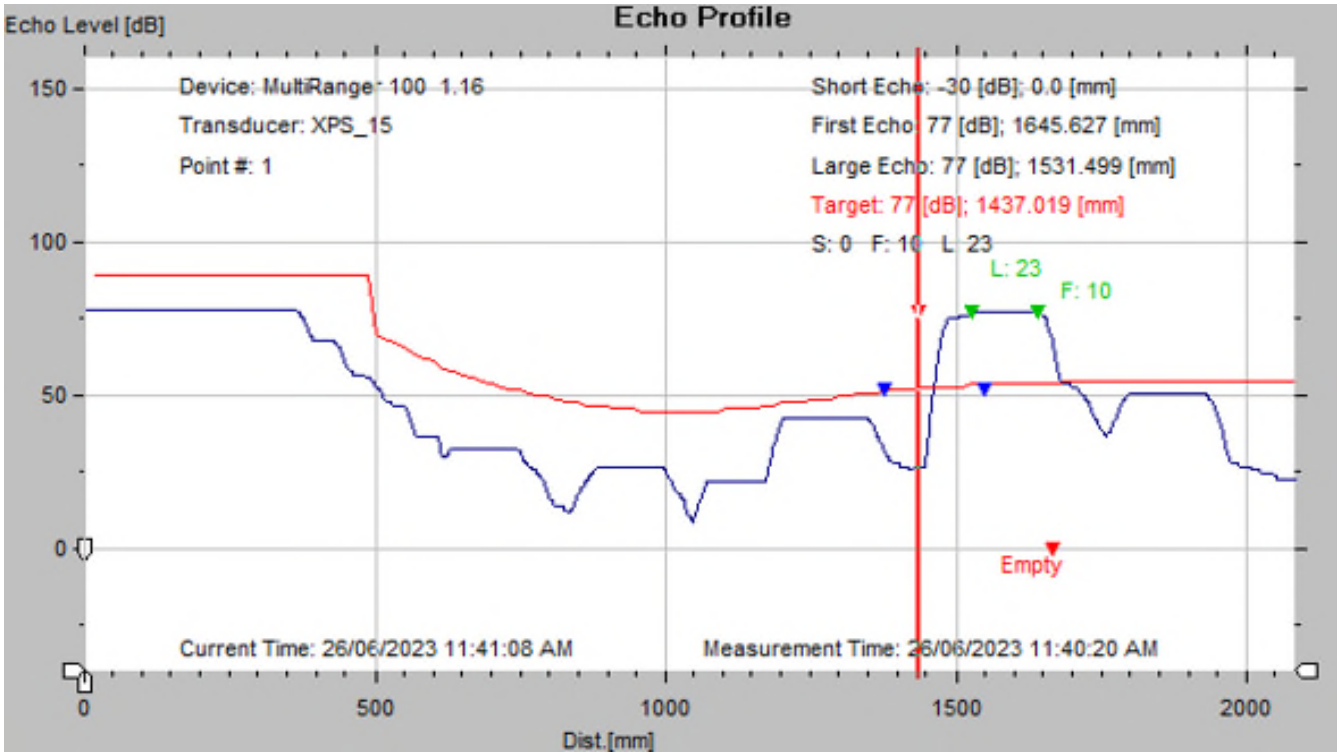
Instrument Test Information and Results

Input (%)	Calculated Level(mm)	Calculated Input (mA)	UUT Measured level (mm)	UUT Measured Output (mA)	Deviation (m)
0	0.00	4.00	0.00	4.00	0.00
25	307.50	8.00	307.46	7.98	0.04
50	615.00	12.00	614.94	11.99	0.06
75	922.50	16.00	922.43	15.96	0.07
100	1230.00	20.00	1229.98	19.99	0.02

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- MULTIRANGER 100
OPEN CHANNEL LEVEL MEASUREMENT

Echo Profile



Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model	Serial No:
Electrical Multimeter	Fluke	179	As per Provided

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program Parameters Verified. Verification Test Passed.

Service Technician : Sanket Trada

Stamp/Signature

Printed Date: June 26, 2023

End of Report

Version: 20-01

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- LEVEL MEASUREMENT
MULTIRANGER PLUS

Customer Name:	Municipality of Kincardine	Site/Plant Address:	867 Olde Victoria St
Plant Name:	Durham St.		Kincardine, ON

Device Information	
Make:	Milltronics
Model:	Multiranger Plus
Order Code:	N/A
Serial No.:	102191049-13
Tag:	N/A
Job Location:	Durham St.

Service Information	
Date:	June 26, 2023
Report No:	CO1453-2304-18
Job No:	CO1453-2304

Inst. Reading	AS FOUND	AS LEFT
Level (in)	6.5	7.370

Flow Details	
Unit:	inches
Level Range:	0-94
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	94

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	0.00000	P40	Parshall Flume	1.00
P1	Dimension Unit (in)	4.000	P41	flow rate (per day)	4.00
P2	Mode	4	P42	OCM exponent	1.55
P3	Empty Distance	106.00	P43	Flume dimension	39.37
P4	Span	94.00	P45	Maximum head	94.00
P5	near blanking	12	P46	Maximum flow rate	1000.00

Instrument Test Information and Results

Input (%)	Calculated Distance (in)	Calculated Input (mA)	Level on UUT Display (in)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	4.00	0.00
25	23.50	8.00	23.44	7.98	0.02
50	47.00	12.00	46.92	11.97	0.03
75	70.50	16.00	70.48	15.99	0.01
100	94.00	20.00	93.99	20.00	0.00

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks: Program parameters verified. Instrument works within specification.

Service Technician : Sanket Trada

Printed Date: June 26, 2023

Stamp/Signature

End of Report

Version: 19-12

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- LEVEL MEASUREMENT
MULTIRANGER PLUS

Customer Name:	Municipality of Kincardine	Site/Plant Address:	7 Goderich St.,
Plant Name:	Goderich St		Kincardine, ON

Device Information		Service Information	
Make:	Milltronics	Date:	June 20, 2023
Model:	Multiranger Plus	Report No:	CO1453-2304-19
Order Code:	N/A	Job No:	CO1453-2304
Serial No.:	013092011-14		
Tag:	N/A	**Flow Details**	
Job Location:	Goderich St.	Unit:	inches
		Level Range:	0-129
Inst. Reading	AS FOUND / AS LEFT	Current Output:	4-20 mA
Level (in)	28.42 / 27.340	4 mA Set Point	0
		20 mA Set Point	129

Maintenance Checklist			Remarks
Visual Inspection:	☑ OK	☐ NOT OK	
Electrical Inspection:	☑ OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	0.00000	P40	Parshall Flume	1.00
P1	Dimension Unit (in)	4.000	P41	flow rate (per day)	4.00
P2	Mode	4	P42	OCM exponent	1.55
P3	Empty Distance	141.00	P43	Flume dimension	39.37
P4	Span	129.00	P45	Maximum head	129.00
P5	near blanking	12	P46	Maximum flow rate	1000.00

Instrument Test Information and Results

Input (%)	Calculated Distance (in)	Calculated Input (mA)	Level on UUT Display (in)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	3.99	0.01
25	32.25	8.00	32.16	7.98	0.02
50	64.50	12.00	64.47	11.48	0.52
75	96.75	16.00	96.73	15.99	0.01
100	129.00	20.00	124.98	19.99	0.01

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks: Program parameters verified. Instrument works within specification. Limited Verification Performed

Service Technician : Sanket Trada

Printed Date: June 20, 2023

Stamp/Signature

End of Report

Version: 19-12

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- LEVEL MEASUREMENT
MULTIRANGER PLUS

Customer Name:	Municipality of Kincardine	Site/Plant Address:	249 Station beach Rd.,
Plant Name:	Harbour Lift		Kincardine, ON

Device Information	
Make:	Milltronics
Model:	Multiranger Plus
Order Code:	N/A
Serial No.:	080603173VR
Tag:	N/A
Job Location:	Harbour Lift

Service Information	
Date:	June 20, 2023
Report No:	CO1453-2304-20
Job No:	CO1453-2304

Inst. Reading	AS FOUND	AS LEFT
Level (m)	1.626	1.374

Flow Details	
Unit:	meters
Level Range:	0-1.53
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	1.53

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	0.00000	P40	Parshall Flume	1.00
P1	Dimension Unit (m)	1.000	P41	flow rate (per day)	4.00
P2	Mode	4	P42	OCM exponent	1.549
P3	Empty Distance	1.83	P43	Flume dimension	1.00
P4	Span	1.53	P45	Maximum head	1.53
P5	near blanking	0.3	P46	Maximum flow rate	1000.00

Instrument Test Information and Results

Input (%)	Calculated Distance (m)	Calculated Input (mA)	Level on UUT Display (m)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	3.99	0.01
25	0.38	8.00	0.43	7.97	0.03
50	0.77	12.00	0.81	12.01	-0.01
75	1.15	16.00	1.18	16.01	-0.01
100	1.53	20.00	1.52	19.99	0.01

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program parameters verified. Instrument works within specification.

Service Technician :	Sanket Trada	Stamp/Signature	
Printed Date:	June 20, 2023		

End of Report

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- MULTIRANGER 100
OPEN CHANNEL LEVEL MEASUREMENT

Customer Name:	Municipality of Kincardine	Site/Plant Address	540 Hunters St,
Plant Name:	Hunters Ridge		Kincardine, ON

Device Information		Service Information	
Make:	Siemens Milltronics	Date:	June 20, 2023
Model:	Multiranger 100	Report No:	CO1453-2304-21
Order Code:	7ML10331AA002A	Job No:	CO1453-2304
Serial No.:	PBD/UN080633		
Tag:	LIT 01	Flow Details	
		Unit:	metres
		Range:	0-1230
		Current Output:	4 to 20 mA
		4 mA Set Point	0
		20 mA Set Point	1230.00

Inst. Reading	AS FOUND	AS LEFT
Level (m)	1.43	1.447

Maintenance Checklist			Remarks
Visual Inspection:	☑ OK	☐ NOT OK	
Electrical Inspection:	☑ OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
P001	Operation	Level	P007	Span	3.32 m
P002	Material	Liquid	P062	Offset Reading	0.00 m
P004	Transducer	112(XRS_5)	P211	20 mA Setpoint	3.20 m
P005	Units	metres	P701	Max. empty rate	0.50 m
P006	Empty	3.45 m	P800	Near Blanking	0.30 m

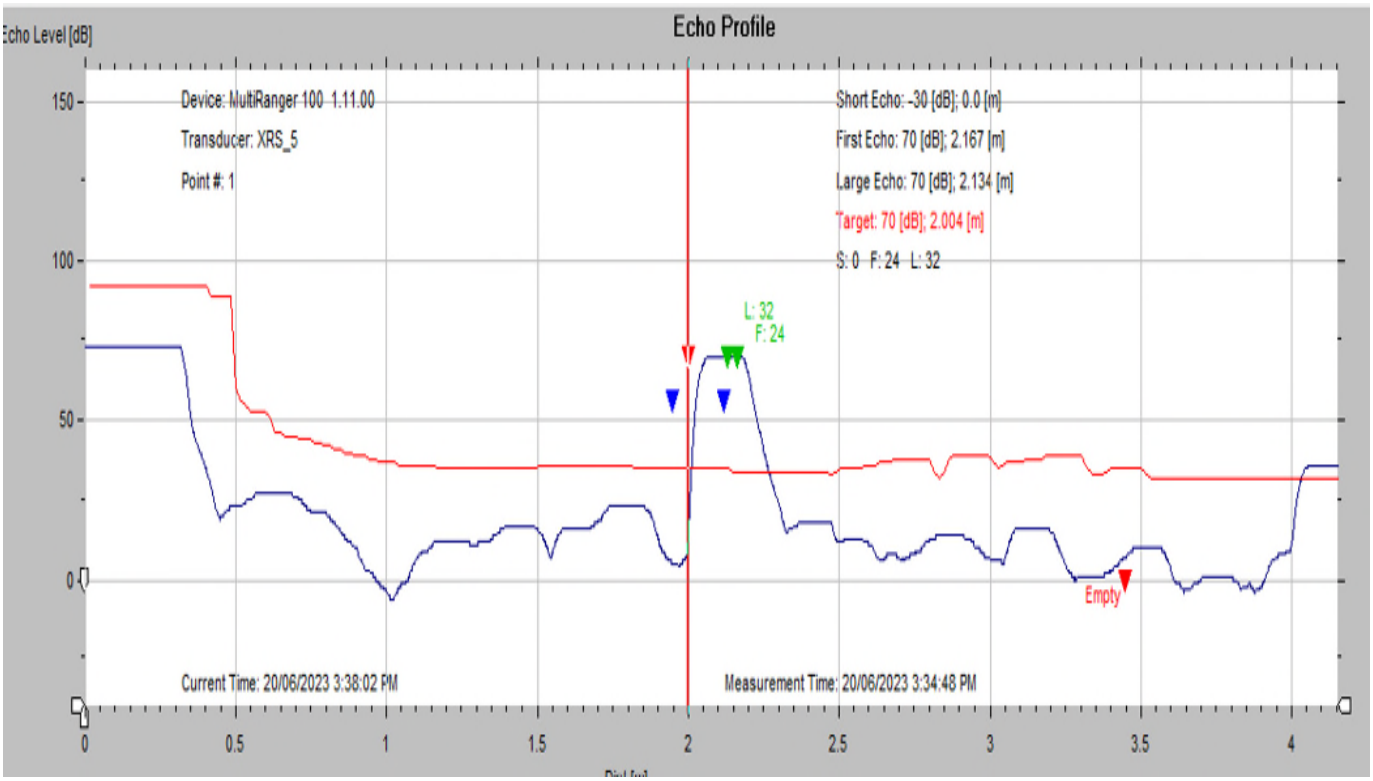
Instrument Test Information and Results

Input (%)	Calculated Level(m)	Calculated Input (mA)	UUT Measured level (m)	UUT Measured Output (mA)	Deviation (m)
0	0.00	4.00	0.00	3.99	0.00
25	0.83	8.00	0.82	8.00	0.01
50	1.66	12.00	1.63	11.98	0.03
75	2.49	16.00	2.51	16.01	-0.02
100	3.32	20.00	3.31	19.99	0.01

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- MULTIRANGER 100
OPEN CHANNEL LEVEL MEASUREMENT

Echo Profile



Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model	Serial No:
Electrical Multimeter	Fluke	179	As per Provided

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program Parameters Verified. Verification Test Passed.

Service Technician : Sanket Trada

Stamp/Signature

Printed Date: June 20, 2023

End of Report

Version: 20-01

Verification report Promag 500

Endress+Hauser
People for Process Automation

Plant operator: IndusControl Inc.

Device information

Location	Hurron Terracce
Device tag	FIT01
Module name	C300-01
Nominal diameter	DN400 / 16"
Device name	Promag 500
Order code	5W5B4H-3MT6/0
Serial number	SC1E7419000
Firmware version	01.01.06

Heartbeat Technology

Calibration

Calibration factor	1.1184
Zero point	4

Verification information

Operating time (counter)	165d14h09m42s
Date/time (manually recorded)	26.06.23 10:19
Verification ID	5
Verification mode	Internal verification

Overall verification result*

☑ Passed	Details see next page

*Result of the complete device functionality test via Heartbeat Technology

Confirmation

Heartbeat Verification verifies the function of the flowmeter within the specified measuring tolerance, over the useful lifetime of the device, with a total test coverage > 94 %, and complies with the requirements for traceable verification according to DIN EN ISO 9001:2008 – Section 7.6 a. (attested by TÜV-SÜD Industrieservices GmbH)

Notes

26.06.23		
Date	Operator's signature	Inspector's signature

Verification report Promag 500

Endress+Hauser
People for Process Automation

Plant operator: IndusControl Inc.

Device identification and verification identification

Serial number	SC1E7419000
Device tag	FIT01
Verification ID	5

Heartbeat Technology

Sensor		☑ Passed
Shot time symmetry		☑ Passed
Hold voltage symmetry		☑ Passed
Coil current loss		☑ Passed
Coil current stability		☑ Passed
Coil resistance		☑ Passed
Electrode circuit 1		☑ Passed
Electrode circuit 2		☑ Passed
Electrode circuit EPD		☑ Passed
Sensor electronic module (ISEM)		☑ **Passed**
Supply voltage		☑ Passed
External reference voltage		☑ Passed
Linearity and reference voltage		☑ Passed
Offset of electrode measuring circuit		☑ Passed
Hold voltage feedback		☑ Passed
Shot voltage feedback		☑ Passed
Electronic current loss		☑ Passed
Coil circuit measurement		☑ Passed
Shot control circuit		☑ Passed
Electrode signal integrity		☑ Passed
System status		☑ **Passed**
I/O module		☑ **Passed**
Input/output 1	26-27 (I/O 1)	☑ Passed
Input/output 2	24-25 (I/O 2)	? Not used
Input/output 3	22-23 (I/O 3)	? Not used
Input/output 4	20-21 (I/O 4)	☒ Not plugged

Plant operator: IndusControl Inc.

Device identification and verification identification

Serial number	SC1E7419000
Device tag	FIT01
Verification ID	5

Heartbeat Technology

Test item with value	Unit	Actual	Min.	Max.	Visualization
Sensor					
Shot time symmetry deviation		0.9996	0.9000	1.1000	
Hold voltage symmetry deviation		1.0000	0.9000	1.1000	
Coil current loss deviation	%	0.08811	-10.0000	10.0000	
Coil current offset	%	0.0081	-0.1	0.1	
Coil current deviation	%	0.00	-0.1	0.1	
Coil resistance value	Ohm	136.2	50.0	240.0	
Electrode impedance 1	Ohm	654.01			
Electrode impedance 2	Ohm	687.49			
Electrode EPD impedance	Ohm	16290.73			
Electrode impedance E1/E2 on E1	Ohm	652.93			
Electrode impedance E1/E2 on E2	Ohm	685.15			
Sensor electronic module (ISEM)					
External reference voltage 1	V	-nan			
Linearity and reference voltage 1		0.9996			
Linearity and reference voltage 2		0.9997			
Measuring point offset		-0.5357	-100.0000	100.0000	
Hold voltage feedback value	%	0.84	-10.0	10.0	
Shot voltage feedback value	%	-0.55	-20.0	20.0	
Electronic current loss deviation	%	-0.12	-10.0000	10.0000	
Coil circuit value	%	0.055	-1.0	1.0	
Shot control circuit value	%	-0.079	-10.0	10.0	
Electrode signal integrity deviation	%	-0.53	-40.0	40.0	
System status					

Test item with value		Unit	Actual	Min.	Max.	Visualization
I/O module						
I/O module 1 terminal numbers	26-27 (I/O 1)					
Output 1 value 1		mA	0.004922	-0.1400	0.1400	
Output 1 value 2			0.0000	0.0000	0.0000	
I/O module 2 terminal numbers	24-25 (I/O 2)					
Output 2 value 1			0.0000	0.0000	0.0000	
Output 2 value 2			0.0000	0.0000	0.0000	
I/O module 3 terminal numbers	22-23 (I/O 3)					
Output 3 value 1			0.0000	0.0000	0.0000	
Output 3 value 2			0.0000	0.0000	0.0000	

Plant operator: IndusControl Inc.

Device identification and verification identification	
Serial number	SC1E7419000
Device tag	FIT01
Verification ID	5

Heartbeat Technology

Test item with value	Unit	Actual
Process conditions		
Volume flow value verification	l/s	0.0000
Conductivity value verification	µS/cm	-nan
Electronic temperature	°F	78.8741

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- MULTIRANGER 100
OPEN CHANNEL LEVEL MEASUREMENT

Customer Name:	Municipality of Kincardine	Site/Plant Address	733 Hurron terrace,
Plant Name:	Hurron Terrace		Kincardine, ON

Device Information		Service Information	
Make:	Siemens Milltronics	Date:	June 26, 2023
Model:	Multiranger 100	Report No:	CO1453-2304-23
Order Code:	7ML50331AA001A	Job No:	CO1453-2304
Serial No.:	PBD/P4110021		
Tag:	LIT 01	Flow Details	
		Unit:	metres
		Range:	0-1230
		Current Output:	4 to 20 mA
		4 mA Set Point	0
		20 mA Set Point	1230.00

Inst. Reading	AS FOUND	AS LEFT
Level (m)	0.44	0.44

Maintenance Checklist			Remarks
Visual Inspection:	☑ OK	☐ NOT OK	
Electrical Inspection:	☑ OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
P001	Operation	Level	P007	Span	3.32 m
P002	Material	Liquid	P062	Offset Reading	0.00 m
P004	Transducer	104(XPS_15)	P211	20 mA Setpoint	3.20 m
P005	Units	metres	P701	Max. empty rate	0.50 m
P006	Empty	3.45 m	P800	Near Blanking	0.30 m

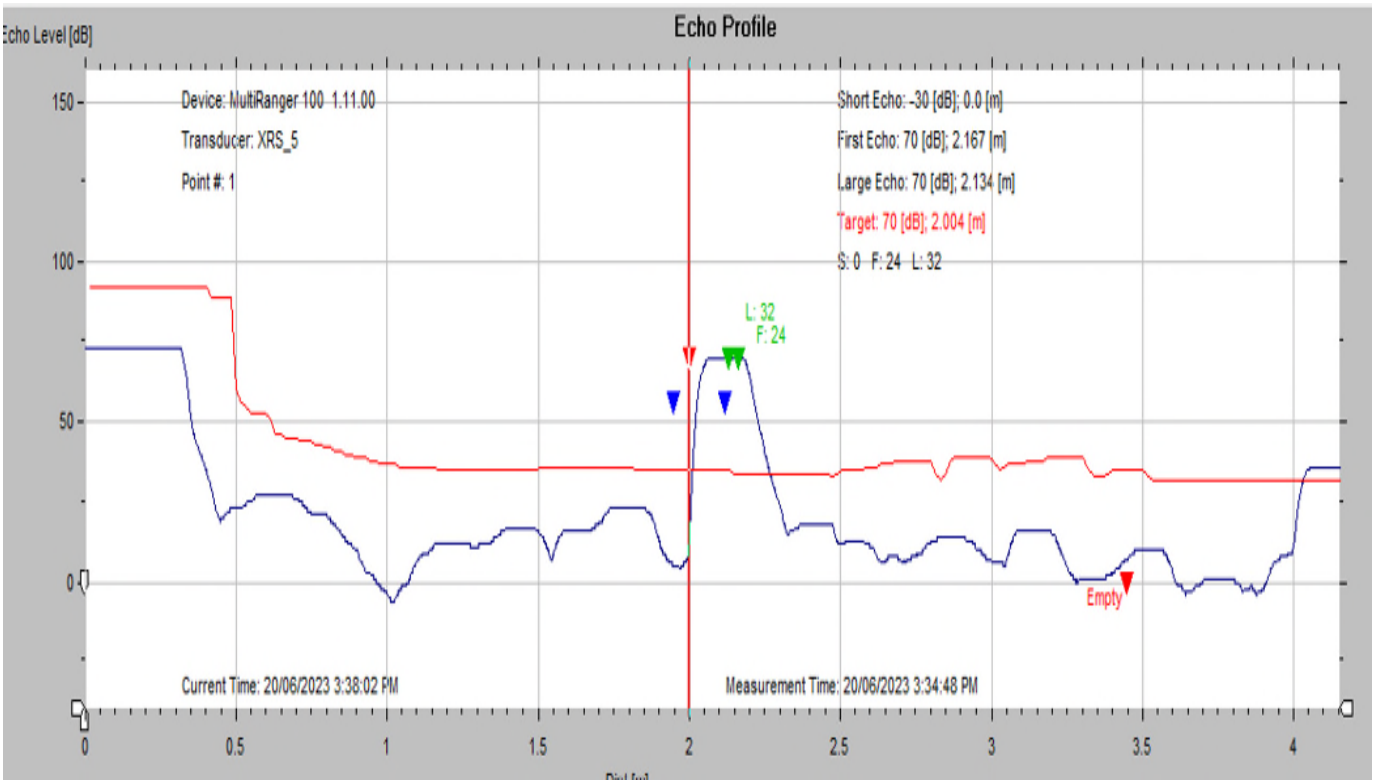
Instrument Test Information and Results

Input (%)	Calculated Level(m)	Calculated Input (mA)	UUT Measured level (m)	UUT Measured Output (mA)	Deviation (m)
0	0.00	4.00	0.00	3.99	0.00
25	0.83	8.00	0.82	8.00	0.01
50	1.66	12.00	1.63	11.98	0.03
75	2.49	16.00	2.51	16.01	-0.02
100	3.32	20.00	3.31	19.99	0.01

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- MULTIRANGER 100
OPEN CHANNEL LEVEL MEASUREMENT

Echo Profile



Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model	Serial No:
Electrical Multimeter	Fluke	179	As per Provided

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program Parameters Verified. Verification Test Passed.

Service Technician : Sanket Trada

Stamp/Signature

Printed Date: June 26, 2023

End of Report

Version: 20-01

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- LEVEL MEASUREMENT
MULTIRANGER PLUS

Customer Name:	Municipality of Kincardine	Site/Plant Address:	570 Kincardine St.,
Plant Name:	Kincardine Ave		Kincardine, ON

Device Information	
Make:	Milltronics
Model:	Multiranger Plus
Order Code:	N/A
Serial No.:	012694217-GD
Tag:	N/A
Job Location:	Kincardine Ave

Service Information	
Date:	June 20, 2023
Report No:	CO1453-2304-24
Job No:	CO1453-2304

Inst. Reading	AS FOUND	AS LEFT
Level (in)	15.63	18.810

Flow Details	
Unit:	inches
Level Range:	0-114
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	114

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	0.00000	P40	Parshall Flume	1.00
P1	Dimension Unit (in)	4.000	P41	flow rate (per day)	4.00
P2	Mode	4	P42	OCM exponent	1.550
P3	Empty Distance	126.00	P43	Flume dimension	39.37
P4	Span	114.00	P45	Maximum head	114.00
P5	near blanking	12	P46	Maximum flow rate	1000.00

Instrument Test Information and Results

Input (%)	Calculated Distance (in)	Calculated Input (mA)	Level on UUT Display (in)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.00	4.00	0.00
25	28.50	8.00	28.95	7.97	0.03
50	57.00	12.00	56.97	11.98	0.02
75	85.50	16.00	85.48	15.99	0.01
100	114.00	20.00	113.98	19.99	0.01

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program parameters verified. Instrument works within specification.

Service Technician :	Sanket Trada	Stamp/Signature	
Printed Date:	June 20, 2023		

End of Report

IndusControl Inc
3170 Ridgeway Drive, Unit 11
Mississauga, ON, L5L 5R4

VERIFICATION REPORT- LEVEL MEASUREMENT
MULTIRANGER PLUS

Customer Name:	Municipality of Kincardine	Site/Plant Address:	494 Scott St.,
Plant Name:	Kincardine PS		Kincardine, ON

Device Information		Service Information	
Make:	Milltronics	Date:	June 20, 2023
Model:	Multiranger Plus	Report No:	CO1453-2304-25
Order Code:	N/A	Job No:	CO1453-2304
Serial No.:	012990149-12		
Tag:	N/A		
Job Location:	Park St.		

Inst. Reading	AS FOUND	AS LEFT
Level (in)	16.4	24.8

Flow Details	
Unit:	inches
Level Range:	0-107
Current Output:	4-20 mA
4 mA Set Point	0
20 mA Set Point	107

Maintenance Checklist				Remarks
Visual Inspection:	☑	OK	☐ NOT OK	
Electrical Inspection:	☑	OK	☐ NOT OK	

Programming Parameter of Instrument

Parameter	Discription	Value	Parameter	Discription	Value
F0	Access Code	0.00000	P40	Parshall Flume	1.00
P1	Dimension Unit (in)	4.000	P41	flow rate (per day)	4.00
P2	Mode	4	P42	OCM exponent	1.550
P3	Empty Distance	119.00	P43	Flume dimension	39.37
P4	Span	107.00	P45	Maximum head	107.00
P5	near blanking	12	P46	Maximum flow rate	1000.00

Instrument Test Information and Results

Input (%)	Calculated Distance (in)	Calculated Input (mA)	Level on UUT Display (in)	UUT Measured Output (mA)	Deviation (mA)
0	0.00	4.00	0.01	4.00	0.00
25	26.75	8.00	26.72	7.98	0.02
50	53.50	12.00	53.47	11.99	0.01
75	80.25	16.00	80.20	15.98	0.02
100	107.00	20.00	106.98	19.99	0.01

Information of Tools used for Verification of the Instruments

Device Description:	Manufacturer	Model
Electrical Multimeter	Fluke	179

* Refer Calibration Tools Certificates submittal for more Information

Verification Test Result:	☑ Passed	☐ Fail	☐ Not Verified

Overall Remarks:	Program parameters verified. Instrument works within specification.

Service Technician :	Sanket Trada	Stamp/Signature	
Printed Date:	June 20, 2023		

End of Report

APPENDIX H

Date Initiated	Description	Address	Comments	Actual Finish	Comments
2023-01-06 10:35 AM	Wastewater Backup/Blockage	81 Shevchenko Blvd	Q: Is the backup inside your home? A: Yes Q: Have you called a plumber? A: Yes	2023-01-06 11:30 AM	Toilet was pulled in the basement. Found roots in the pipe at 22.33m. Had staff locate the issue. The issue is on her side. Pasted on the information onto the homeowner, gave her measurement where the issue is. 3 years ago the property had the same issue
2023-01-29 05:30 PM	Wastewater Backup/Blockage	804 Andrew Malcom	Q: Is the backup inside your home? A: Yes Q: Have you called a plumber? A: No	2023-01-29 04:15 PM	Went on site and met home owner and plumber from SGS plumbing said sewage was backing up into basement. I inspected manhole in front of property and both up and down stream, they were all clear. Plumber was waiting on oncall to snake line. Homeowner said he would call back for a camera once it was unblocked
2023-02-13 11:04 AM	Wastewater Leak	1113 Sutton St, N2Z 2C5	Q: Where is the leak located? A: Street	2023-02-14 01:55 PM	Owner had plumber in, cleared blockage on his side but mentioned plumber believes there is a slight collapse on the municipal side. Staff tried to camera the line, marked camera location with green paint, showed employees where paint was, found a cleanout cap inside building by patio door, told him to snake out from there.Tried to follow up and left several messages but owner never called us back
2023-03-01 05:20 PM	Wastewater Backup/Blockage	6 mount forest	Q: Is the backup inside your home? A: Yes Q: Have you called a plumber? A: Yes	2023-03-02 07:20 PM	plumber had just cleared upon arrival, assumed to be from women products, Cameraed after and no issues found
2023-03-22 01:50 PM	Wastewater Backup/Blockage	336 Mechanics Ave, N2Z 1X9	Q: Is the backup inside your home? A: Yes Q: Have you called a plumber? A: Yes Plumber has cleared line but still very slow	2023-04-12 01:45 PM	When Reviewing the video from April 12th there are two separate videos. The distance stops around 20 m but Joel was able to get the camera to 25m where he said it appeared to drop into the sewer main.
2023-04-05 02:41 PM	Wastewater Backup/Blockage	704 Palmateer Dr, N2Z 1R3	Wastewater backup	2023-04-05 12:00 PM	Issue due to major rain storm. Multiple staff on site monitoring levels at Park lift station and thru out the collection system. Followed up after storm with sewermain flushing
2023-04-05 02:58 PM	Wastewater Backup/Blockage	708 Palmateer Dr, N2Z 1R3	Wastewater backup in house	2023-04-05 12:00 PM	These back ups were due to the park st pumping station being backed up due to extremely heavy rains in short time. Multiple operators working to resolve the issue.
2023-04-05 03:20 PM	Wastewater Backup/Blockage	712 Palmateer Dr, N2Z 1R3	Q: Is the backup inside your home? A: Yes	2023-04-05 12:00 PM	These back ups were due to the park pumping station being backed up due to extremely heavy rains in short time. Multiple operators working to resolve the issue.
2023-04-27 10:58 AM	Wastewater Backup/Blockage	929 Princes St, N2Z 1Y5	Plumber working to clear the line. Would like us to camera afterwords	2023-04-27 02:00 PM	Found roots in line. Also ran camera from the second clean out near property line to main. Found some debris, used water to flush it thru.
2023-07-24 08:52 AM	Wastewater Backup/Blockage	467 Broadway St, N2Z 2C2	Q: Is the backup inside your home? A: Yes Q: Have you called a plumber? A: Yes	2023-07-24 12:00 PM	Advised resident to call a plumber to snake the line. We cameraed using cleanout in basement, was immediately under water, went out until hit an obstruction. 2 cleanouts found in laneway, one closest to house we had located camera head and could not go further from there. Used cleanout closer to the road and cameraed out to the main. Recommended owner get it snaked again with a large cutter.
2023-08-07 03:02 PM	Wastewater Backup/Blockage	209 broadway	Q: Is the backup inside your home? A: Yes Q: Have you called a plumber? A: No	2023-08-07 10:50 AM	Called saying he had a backup. Manholes are flowing fine. Instructed him to get it snaked out and we can camera it. Located water and sanitary while on site. He will get it cleared and be gone for the week
2023-08-10 10:30 AM	Wastewater Backup/Blockage	583 Scott St, N2Z 1V2	Backing up in basement. Had this same issue about a month ago, had plumber in and said it was the municipal side. I advised resident to call a plumber to clear lateral and we can come camera.	2023-12-21 04:12 PM	Tried to camera, lots of grease build up and roots. Had to excavate and repair lateral on November 9, 2023
2023-09-06 01:59 PM	Wastewater Backup/Blockage	275 Mechanics Ave, N2Z 1E2	AZ Plumbing is currently at home augering 100ft and still water and sand in lateral.	2023-09-06 04:00 PM	Called by plumber after he had the water drained, found roots, could not get camera through. Located camera head right by sidewalk in front of house. Homeowner issue

Date Initiated	Description	Address	Comments	Actual Finish	Comments
2023-10-07 06:25 PM	Wastewater Backup/Blockage	887 Queen St	Q: Is the backup inside your home? A: Yes Q: Have you called a plumber? A: Yes	2023-10-07 11:25 PM	Plumber cleared line and brought back grease. Camera work confirmed large buildup of grease in line. Business owner was given a letter and a copy of the sewer use bylaw regarding grease traps
2023-10-17 08:56 AM	Wastewater Backup/Blockage	6 Inverness St S, N2Z 1K4	Has a plumber trying to snake the line but snake is not long enough to reach the main. Wondering if there is a cleanout outside.	2023-10-17 04:10 PM	Unable to get distance measurement as that feature wasn't working correctly. within the same room that we put the camera in (basement laundry room) we located the camera head and saw a check valve that had come loose and was just sitting in the pipe
2023-10-20 11:32 AM	Wastewater Backup/Blockage	747 Palmeteer Dr	Upstream and downstream manholes checked, flowing well . Told homeowner to call a plumber and we will camera it when it is opened up	2023-11-20 12:00 PM	"Upstream and downstream manholes checked, flowing well . Told homeowner to call a plumber and we will camera it when it is opened up"
2023-11-14 02:46 PM	Wastewater Backup/Blockage	392 Mcleod Ave, N2Z 1W7	Backup inside home	2023-11-11 11:00 AM	was called by owner, their lateral is tied with neighbour and flows into manhole, which was cleared ok, talked to home owner and suggested AZ Plumbing who they callled
2023-11-22 11:11 AM	Wastewater Backup/Blockage	1252 Queen St, N2Z	Have had multiple sewer backups within the past few years and would like us to camera the sewer to determine what the issue might be. The line has been cleared recently and is ready to camera. Homeowner will have toilet removed before we arrive onsit	2023-11-27 02:00 PM	Found partial plug on homeowner side. Discussed with homeowner some options and how to get a copy of the video
2023-07-31	Wastewater Backup/Blockage	216 Willow Rd	Kemptons called regarding Aecon hitting sewer	2023-07-31 06:00 PM	Connor from Kempton's called me that they had sewage coming to surface in front of 216 Willow Road. At arrival the landscaping company ran over a clean out and broke the top. This forced the sewage to leak out. Kemptons vactored and found Aecon had bored through the lateral. A small repair was made and lateral was flushed and sucked out at the next manhole downstream.
2023-07-29	Wastewater Backup/Blockage	1127 Knights Court	Water backing up in basement	2023-07-29 01:40 PM	home owner called and said after heavy rain he has water coming up from basement floor drain. checked up stream and down stream manholes - ok, was shown water in basement, suggested he call a plumber to snake his lateral. Cameraed lateral afterwards and issue was on homeowner side
	Sewage Odour	1126 Sutton St	Sewage odour inside restaurant	2023-10-12 01:30 PM	had smell coming from floor drains, they had put water down drains but still was blowing air up through, checked manhole out front and is ok, they were notified that it is a internal issue and would need a plumber to come out
2023-01-31	Wastewater Backup	804 Andrew Malcolm	Had backup on the weekend and plumber cleared the line	2023-01-31 04:00 PM	Cameraed but only got out about 10m. Looks like grease buildups. Homeowner issue
2023-01-30	Wastewater Backup	1133 Queen St	Sewer backup	2023-01-30 02:45 PM	Sent the camera down a clean out that was located outside by the deck. Found roots at 3m mark. Than clean all the way out towards the main. The camera was starting to fog up a bit. Issue is on homeowner side. Owner was on site and has seen the issue.
2023-05-24	Wastewater Backup	749 Russell St	Sewer backup	2023-05-24 08:30 AM	The video did not save on the memory stick. Everything was lit up on site that it was recording. Reviewed the image on site. No issues found. A bit of a low spot at the start, had some water there. Rest was fine. Went as far as man hole and a bit pas
2023-06-21	Wastewater Backup	275 Mechanics Ave	Sewer backup a month ago, called plumber to clear	2023-06-21 04:19 PM	Tried to camera but could not get past 9.69m. Located camera head, issue on homeowner side
2023-06-20	Wastewater Backup	751 Queen St	Sewer backup since construction	2023-06-20 03:30 PM	Camera lateral by entering the clean out that's located on the east side of the building out back. The clean out is outside beside the building. This camera was to confirm if where the sanitary lateral flows for the Queen Street project. The camera revealed that this line is capped at 1.65m from the cleanout.

Date Initiated	Description	Address	Comments	Actual Finish	Comments
2023-07-17	Wastewater Backup	914 Saugeen St	Plumber cleared line	2023-07-17 12:25 PM	It was determined that the dwelling was not hooked up to municipal service. They had a home made septic in the front lawn. Elliott's Construction ran a new line from dwelling and connected it to the sanitary line on property line.
2023-08-11	Wastewater Backup	209 Broadway st	Had plumber clear line	2023-08-11 08:32 AM	Camera lateral. Only seen remains of root ball. 31.67 m to main from basement bathroom cleanout. Homeowner issue
2023-11-14	Wastewater Backup	392 McLeod	Sewer blockage over the weekend. Had plumber clear the line	2023-11-14 01:50 PM	Ran into spring or coil just a few feet into the camera job. Could no go farther as camera wouldn't go past. Homeowner was there for camera and saw issue. Issue farther down the line can't be seen until coil/spring is removed.
2023-09-06	Wastewater Backup	398 Kingsway St	Sewer blockage, plumber could not clear the line	2023-09-06 02:00 PM	Cleanout had gravel in it. Sucked that out then tried flushing it. Did not work. Was able to see cleanout stack had 2 conduits through it. Damaged by Hurontel. Repaired and cameraed and all ok
2023-10-06	Wastewater Backup	674 Malcolm Dr	On Grinder line, need to make a repair to pump inside but no way to isolate the line	2023-10-06 10:32 AM	Spent all October 5/2023 trying to figure out how grinder line worked. Was able to eventually figure it out and drain force main so homeowner could effect repairs. Repaired and backfilled with an upgrade of encasing the valve box top and cleanout i
2023-03-31	Wastewater Spill	177 Harbour St	Grinder line leaking under road	2023-03-31 01:23 PM	Spill reported to SAC for sewage leak. Dug down and repaired line.

APPENDIX I

Municipality of Kincardine
Quarterly Report of Wastewater Bypasses, Overflows and Spills
Kincardine Wastewater System
2023 Q4

Date	Start Time	End Time	Location	Bypass/ Overflow/ Spill	Planned /Emergency	Reason	Duration (minutes)	Quantity (m3)	Estimated or Measured Volume	Treatment Processes Gone Through	Efforts Made to Maximize Flow through Treatment Process	Samples Collected	Grab or Composite	BOD mg/L	CBOD mg/L	TSS mg/L	TP mg/L	TKN mg/L	Alkalinity mg/L	Ammoniu m mg/L	Nitrate mg/L	Nitrite mg/L	pH	E. coli per 100 mL
March 30, 2023	1640	2020	200 Harbour Street	Spill	Emergency	Grinder Line Leak	240	0.1	Estimated	None	Removal of Soil, Disinfection of area	No	--	--	--	--	--	--	--	--	--	--	--	--
April 5, 2023	1235	1520	867 Olde Victoria St (Durham St SPS)	Overflow	Emergency	Significant Rainfall Event	165	74.25	Estimated	None	None	Yes	Grab	37	--	108	0.5	2.4	--	--	--	--	--	44000
April 5, 2023	1254	1600	494 Scott Street (Park Street SPS)	Overflow	Emergency	Significant Rainfall Event	186	26.9	Estimated	None	None	Yes	Grab	26	--	170	0.4	1.3	--	--	--	--	--	50000
July 7, 2023	1329	1609	169 Mahood Johnston (Effluent station)	Bypass	Emergency	Power Outage	150	498	Measured	All but disinfection	None	Yes	Grab	--	11	11	0.16	24.8	213	25.1	0.4	0.28	7.1	120
Nov. 19, 2023	0653	1053	169 Mahood Johnston (Effluent station)	Bypass	Emergency	Power Outage	240	47.9	Estimated	All but disinfection	Planned Power outage- lowered lagoon levels and boarded up outfall to attempt to stop flow	Yes	Grab	--	22	30	0.43	18.2	200	16.4	0.67	0.18	8.6	4600 UAL
Nov. 23, 2023	Unknown	0950	520 Bruce Ave (Lagoons)	Spill	Emergency	Plugged outlet at splitter box between aerated cell and lagoon	Unknown	0.5	Estimated	None	Unplugged outlet, Debris and contaminated soil removed	Yes	Grab	62	--	113	3.20	24.6	--	--	--	--	--	80000

Appendix I

Annual Monitoring Report Completion Checklist

Appendix D-Monitoring and Screening Checklist
General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.
Instructions: A complete checklist consists of:
(a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
(b) completed contact information for the Competent Environmental Practitioner (CEP)
(c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:
For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:
(a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
(b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..
Definition of Surface water CEP:
A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information	
Waste Disposal Site (WDS) Name	Ward 1 Landfill Site
Location (e.g. street address, lot, concession)	The Site is located west of Highway 21 and south of Bruce Avenue and north of the road allowance between the former Town of Kincardine and the Township of Huron Kinloss. The Site is located immediately east of the Municipality's Waste Water Treatment Plant (WWTP).
GPS Location (taken within the property boundary at front gate/ front entry)	Not available
Municipality	The Municipality of Kincardine
Client and/or Site Owner	The Municipality of Kincardine
Monitoring Period (Year)	2023
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	A270203 (Landfill), 3-0408-93-006 (Groundwater collection system), 3-0354-94-006 (Leachate collection system)
Director's Order No.:	none
Provincial Officer's Order No.:	none

Other:	Type Here		
Report Submission Frequency	◉ **Annual** ○ **Other**	Specify (Type Here):	
The site is: **(Operation Status)**	○ **Open** ○ **Inactive** ◉ **Closed**		
Is there an active waste transfer station at the site?	◉ **Yes** ○ **No**		
Does this WDS have a Closure Plan?	○ **Not yet submitted** ○ **Submitted and under review** ◉ **Submitted and approved**		
Total Approved Capacity		*Units*	
Maximum Approved Fill Rate		*Units*	
Total Waste Received within Monitoring Period (Year)		*Units*	
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity		*Units*	
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity *Date Last Determined*	Select Date		
Non-Hazardous Approved Waste Types	☐ Domestic ☐ Industrial, Commercial & Institutional (IC&I) ☐ Source Separated Organics (Green Bin) ☐ Tires	☐ Contaminated Soil ☐ Wood Waste ☐ Blue Box Material ☐ Processed Organics ☐ Leaf and Yard Waste	☐ Food Processing/Preparation Operations Waste ☐ Hauled Sewage Other:
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*			

Year Site Opened *(enter the Calendar Year only)*	1977	**Current ECA Issue Date**	10/1/2001
Is your Site required to submit Financial Assurance?		○ **Yes** ◉ **No**	
Describe how your WDS is designed.		○ Natural Attenuation only ○ Fully engineered Facility ◉ Partially engineered Facility	
Does your Site have an approved Contaminant Attenuation Zone?		○ **Yes** ◉ **No**	
If closed, specify ECA, control or authorizing document closure date:		11/1/2009	
Has the nature of the operations at the site changed during this monitoring period?	○ **Yes** ◉ **No**		
If yes, provide details:	Type Here		

Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)	○ Yes ◉ No

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	◉ **Yes** ○ **No**	If no, list exceptions (Type Here):
2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/ control document(s):	◉ **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
Numerous monitoring locations	Wells were dry or contained insufficient volumes of groundwater for sampling See body of text.	
		Select Date

		Select Date
Type Here	Type Here	Select Date

3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document.	◯ **Yes** ◉ **No** ◯ **Not Applicable**	
b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	◯ **Yes** ◯ **No** ◉ **Not Applicable**	If no, list exceptions below or attach additional information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	(●) **Yes** ( ) **No**	If no, specify (Type Here):
Sampling and Monitoring Program Results/WDS Conditions and Assessment:		
5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/ or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	(●) **Yes** ( ) **No**	
6) The site meets compliance and assessment criteria.	(●) **Yes** ( ) **No**	
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	(●) **Yes** ( ) **No**	

1) Is one or more of the following risk reduction practices in place at the site: ***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	◉ **Yes** ○ **No**	**Note which practice(s):**	☒ **(a)** ☐ **(b)** ☒ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ◉ **No** ○ **Not Applicable**		

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◉ **No changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/ are recommended:**	Type Here
◉ **No Changes to site design and operation are recommended** ○ **The following change(s) to the site design and operation is/are recommended:**	
Name:	Type Here
Seal:	Add Image

Signature:		**Date:**	Select Date
CEP Contact Information:	Type Here		
Company:	Type Here		
Address:	Type Here		
Telephone No.:	Type Here	Fax No. :	Type Here
E-mail Address:	Type Here		
Co-signers for additional expertise provided:			
Signature:		**Date:**	Select Date
Signature:		**Date:**	Select Date

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):	
Name (s)	Surface Water Management Ponds #1 and #2 On-Site drainage Ditches Sewage Stabilization Lagoon #1 Lake Huron (not directly connected to on-Site surface water bodies)

Distance(s)	onsite Northwest approximately 5km

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	◉ **Yes** ○ **No**	
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):	◉ **Yes** ○ **No** ○ **Not applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.	◉ **Yes** ○ **No** ○ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	○ **Yes** ○ **No** ◉ **Not Applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◉ **Yes** ○ **No**	If no, specify (Type Here):

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):	◉ **Yes** ○ **No**

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. ECA limit, PWQO, background	e.g. X% above PWQO
See report Tables for a complete listing of parameters found in excess of the PWQOs and the specific sampling locations.	Type Here	Type Here
Type Here	Type Here	Type Here
Type Here	Type Here	Type Here
Type Here	Type Here	Type Here
6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	(●) **Yes** ( ) **No**	Upgradient sources of impacts are present. Results show the presence of impacts due to agricultural and road salting activities.

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	◉ **Yes** ◯ **No**	
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	◯ Yes ◯ No ◯ Not Known ◉ Not Applicable	
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	◯ **Yes** ◯ **No** ◉ **Not Applicable**	

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

◉ **No Changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/are recommended:**	Type Here
◉ **No changes to the site design and operation are recommended** ○ **The following change(s) to the site design and operation is/ are recommended:**	Type Here

CEP Signature	
Relevant Discipline	Type Here
Date:	Select Date
CEP Contact Information:	Type Here
Company:	Type Here
Address:	Type Here
Telephone No.:	Type Here
Fax No. :	Type Here
E-mail Address:	Type Here

Save As		**Print Form**