2023 Annual Monitoring Report

Kincardine Ward 3 Landfill Site

Municipality of Kincardine

30 April 2024

→ The Power of Commitment

Contents

Figure Index

Table Index

Appendices

1. Introduction

On behalf of the Municipality of Kincardine (Municipality), GHD has prepared this report to present the environmental monitoring results from the Kincardine Ward 3 Landfill Site (Ward 3 Landfill or Site). This report discusses monitoring data from January 1, 2023 to December 31, 2023 (herein referred to as the current reporting period).

The Site is located approximately 13 kilometres (km) east of Lake Huron on the eastern half of Lot 17, Concession 2 in the former Township of Bruce in the Municipality of Kincardine. The Site location is provided on Figure 1.1.

The Site operates under Environmental Compliance Approval No. A272001 (ECA) which was issued on September 22, 1986. The ECA applies to a total Site area of 20.5 hectares (ha). The ECA was last amended February 19, 1998 to incorporate the Plan of Development and Operation (Maitland Engineering Ltd., 1993), which governs the Site's current operation and monitoring requirements. The amendment to the ECA in 1998 included the addition of a condition that waste placement is not to occur below an elevation of one-metre above the high seasonable water table and that the Site should be developed in accordance with the Plan of Development and Operation. No additional amendments have been made to the ECA since 1998.

Copies of the Site's original ECA and subsequent amendment are included in Appendix A.

2. Site Setting

The geographic, geologic, and hydrogeologic configuration for the Site has been described in previous reports completed by Burnside, Golder, AMEC, and Pryde (Pryde Schopp McComb, 2008). A summary of the Site setting is provided in the proceeding sections. The existing Site conditions, including the existing monitoring network locations, are illustrated on Figure 2.1.

2.1 Site Topography and Drainage

The Site is located on a gently westerly sloping area. Regionally, the overburden is incised by surface water bodies in gullies and channels. Shallow groundwater is interpreted to discharge to the surface water channels occupying the gullies and channels and thus shallow groundwater flow is anticipated to vary according to local surface drainage and topography. Drainage at the Site is conveyed to the northwest of the landfill footprint via three channels. First, a drainage swale which captures surface water from the western and southern portions of the Site, second, a short natural stream originating in the forested area to the west of the landfill footprint, and, finally, an intermittent stream that flows adjacent to the northern landfill footprint.

Regionally, this surface water will ultimately discharge to Lake Huron.

The land surrounding the Site is heavily vegetated with brush and trees or open pasture/farmland.

2.2 Geology

The Site is located within the physiographic region known as the Huron Slope. The Huron Slope consists of a bevelled clay till plain named the St. Joseph Till with the twin beaches of glacial Lake Warren and Wyoming Moraine (Chapman and Putnam, 1984). Typically, overlying this silty clay unit are more granular deposits such as silty sands of fine to medium grain size.

Regional geology mapping taken from the Soil Survey of Bruce County, Report No. 16 of the Ontario Soil Survey describe the surficial soils of the area as consisting of sandy loams of the Berrien and Donnybrook series overlying a

clay loam of the Perth series. The sandy loams show imperfect to good drainage and belong to the grey-brown Podzolic group while the clay loam shows imperfect drainage and belongs to the same group.

A review of water well records from nearby residential wells indicates that the bedrock surface is found at approximately 30 metres (m) (100 feet) below ground surface (mBGS). Due to highly variable ground surface the overburden thickness is believed to vary significantly in the region. The bedrock surface is at an approximate 210 m above mean sea level (AMSL) and consists of Middle Devonian Age, Paleozoic rock. The upper portion of the bedrock consists of a buff to brownish grey dolomite of the Detroit River Group. Regionally, bedrock dips southwesterly towards Lake Huron.

Previous soil investigations have revealed that the surficial overburden at the Ward 3 Site consists mainly of brown silty sand deposits with lenses of sand and gravel and an intermittent clayey silt unit. Underlying the Site is a massive grey clayey silt/silty clay till (the St. Joseph Till).

The available stratigraphic logs for the Site have been included in Appendix B.

An up-to-date geological cross-section is provided on Figure 2.2. The cross-section provides an illustration of the geology described above.

2.3 Hydrogeology

Groundwater flow in the overburden is controlled mainly by regional surface topography. The water table is found at depths of approximately 1 to 3 mBGS. Groundwater in the overburden materials (i.e., the silty sand and upper fractured zone of the massive grey silty clay till) forms a thick unconfined, water table aquifer with predominantly lateral flow. An un-monitored aquifer is expected to exist within the shallow bedrock below the grey clay till. The clay till forms a confining layer separating the shallow bedrock aquifer and the upper shallow groundwater unit. Due to the much lower conductivity observed in the massive lower clay till it is expected that groundwater flow within this unit is largely vertical and very slow. Regionally, the groundwater in the shallow bedrock aquifer is interpreted to flow to the northwest towards Lake Huron while flow in the overburden is largely influenced by surface water drainage channels.

Groundwater flow direction has been relatively consistent and in general, groundwater within the shallow flow zone flows to the north across the Site with some deflection of contours near the southwest corner of the Site. This is likely due to groundwater and leachate mounding associated with the waste mound and is consistent with observations of leachate-related water quality impacts at MW12 and MW14.

Horizontal hydraulic gradients in the water table aquifer are relatively consistent and, historically, have been on the order of 0.008 m/m. While no Site-specific hydraulic conductivity testing has been completed, hydraulic conductivities for the surficial silty sand aquifer at the Kincardine Waste Management Centre were reported in the Hydrogeologic Characterization and Design Assessment Report (CRA, 2010) to be approximately 6.4×10^{-4} centimetres per second (cm/sec) with a corresponding groundwater velocity of about 40 m/year using an effective porosity of 30 percent.

2.4 Landfill Details

The Ward 3 Site provides waste disposal for residents of the entire Municipality of Kincardine; however, Ward 3 only accepts waste dropped off by private vehicle (i.e., no curbside pickup). The current ECA allows for the disposal of domestic, non-hazardous, solid industrial wastes, and limited miscellaneous debris from agriculture such as wire, stumps, and scrap metal. The ECA also allows for the burning of some wastes namely, brush, lumber, and clean wood. See Figure 2.1 for the approximate area of the burning location.

3. Site Operations

During the current reporting period Site operations were completed in general accordance with the Development and Operations Plan (Maitland Engineering Ltd., 1993) and the conditions of the ECA. However, the Municipality has temporarily stopped accepting waste at the Site with waste being sent to KWMC instead. No waste was accepted at the Site. The Municipality has continued to incinerate wind-dried brush and untreated lumber under supervision as described below.

3.1 Daily Landfill Operations

Under normal operating conditions, daily landfill operations at the Site were conducted by Municipal staff. Daily operations included monitoring the origin of incoming waste, collecting tipping fees, disposing, and compacting waste, applying daily cover soil, and segregating recyclable and recoverable waste materials. Site staff were supplemented by other Municipal staff on an as-required basis for minor construction projects.

The sign at the Site entrance provides the hours of Site operation. During previous reporting periods, the hours of operation for the Site were as follows:

Tuesday 12:00 – 8:00 p.m. (Summer only)

Saturday 8:00 – 11:30 a.m. (Summer only)

In previous years, the Site operated only during the summer in order to streamline the Municipality's waste disposal operations. In 2022, receipt of waste began on the Saturday of Victoria weekend in May and ceased on the Thanksgiving weekend in October.

GHD prepared a letter describing the details of the closure for the Ministry of the Environment, Conservation and Parks (MECP). The letter, dated October 10, 2012, is included in Appendix C - MECP Correspondence.

The Municipality has also used the Site for disposal of impacted soils or large demolition projects. To GHD’s knowledge, no such waste was received at this site in 2023.

3.1.1 Waste Management Operations

Before temporarily closing in 2023, the Site accepted Municipal waste from private vehicles only. The waste was either recycled or disposed of, as discussed in the proceeding sections. Waste material separated for off-Site recycling/disposal was temporarily stored/stockpiled at the Site and these stockpiles are identified on Figure 2.1.

3.1.2 Incineration

Incineration operations consisted of incinerating wind-dried brush and untreated lumber. Incineration operations were conducted under full-time supervision by Municipal staff for short durations during appropriate weather conditions. Incineration operations were conducted when the Site was closed.

3.1.3 Waste Recycling

The waste recycling/diversion for the Municipality is conducted at the KWMC. A detailed discussion of the Municipality's waste recycling/diversion efforts (i.e., waste types, volumes, procedures) is provided in the 2023 Annual Monitoring Report for the KWMC (GHD, 2023).

3.1.4 Waste Disposal

In previous years, waste disposal operations were conducted by above-ground landfilling using the ramp method in accordance with the Plan of Development and Operations. The equipment used for waste disposal operations included a bulldozer to place and compact waste and daily cover soil.

Pending reopening and based on the remaining landfilling capacity (discussed in the following section), the following is the short-term fill plan that has been proposed for the Site:

– It is recommended that the Municipality continue placing waste in Stage 1 until reaching the final waste contours. Grade stakes should be placed to provide guidance.
– Once the final waste contours in Stage 1 are reached, landfilling operations should occur primarily within Stage 2. Proper grading is to be achieved in preparation for final cover placement. Grade stakes should be placed at this time to provide guidance to the Site operator to construct an appropriate waste lift thickness.
– Preparation for, and waste disposal activities within Stage 2 should be completed in accordance with the Plan of Development and Operation (Maitland Engineering Ltd., 2009) with the exception of the base of the trench which should be adjusted to be at least 1 m above the groundwater table.

Litter control fences are located in the vicinity of the active disposal area and are adjusted, as necessary to capture windblown litter. Throughout the reporting period, Municipal staff ensured that windblown litter and dust emission were minimized and completed regular inspection of Site conditions.

3.2 Site Capacity and Projected Site Life

The remaining waste capacity for the landfill was calculated based on a comparison between the December 2019 and August 3, 2021 topographic surveys, the proposed final contours for the landfill from the Development and Operations Plan, and the restrictions on the trench excavation to maintain the base of the trench approximately 1 m above the ground water table. As no waste was deposited at the Site in 2023, the following provides an overview of the remaining site capacity based on 2022 estimates:

Description	Area (m^2)	Volume (m^3)
Waste Disposal Footprint	68,700	
Active/ Completed Waste Disposal Area	24,611	
Above Grade Waste Disposal Volume		103,365
Below Grade Waste Disposal Volume		22,000
Estimated Remaining Waste Disposal Capacity		**93,197**

The amount of waste disposed of at the Site varies based on Site use. Using the December 2019 and August 2021 topographic surveys, it is estimated that 2,267.8 m^3 of waste were placed at the Site between these dates (municipal solid waste and waste soils). This corresponds to a waste fill rate of approximately 1,358 m^3/year. Waste fill rates and Site life are dependant on Site usage and waste settlement. Thus, it is recommended that the Site life estimates be revisited once the Municipality re-opens the Site. The next topographic survey should be completed 1 year following re-opening of the Site and should be used to support new Site life estimates.

3.3 Complaints

GHD is unaware of any complaints made during the current reporting period (i.e., there were no complaints received by Municipal staff members in regard to litter, odour, noise, or other operational aspects of the Site).

3.4 MECP Correspondence

In 2021, the MECP provided comments on the surface water portion of the 2019 AMR (GHD, 2020) in a letter dated February 23, 2021. In the letter, a number of additional surface water stations were proposed in order to further investigate surface water quality downstream of the landfill footprint. On behalf of the Municipality, GHD reviewed the MECP comments and provided an email response on February 24, 2021.

An additional four surface water monitoring stations were added to the 2021 monitoring program including:

– SW8 – drainage swale prior to SW3
– SW9 – intermittent creek prior to SW3
– SW10 – intermittent creek down stream of confluence with drainage swale
– SW11 – drainage swale prior to input from adjacent field (see Ward 3 screen shot to see what appears to be drainage/depression from adjacent field to drainage ditch along the property line)

The locations of the additional monitoring stations are illustrated on Figure 2.1.

Most recently, in an email dated December 28, 2023, the MECP requested the 2023 data for the additional surface water sampling stations. The data was requested to consider the municipality's proposal to remove these three additional sampling stations in response to GHD's 2022 Annual Monitoring Report for Ward 3. GHD responded to the MECP email on January 17, 2024. GHD notified the MECP that the 2023 Annual Monitoring Report was in progress and will include an assessment of the data. GHD also notified the MECP that SW8, SW9, and SW10 were dry or had insufficient flow/too turbid to collect a representative sample during 2023.

The 2021 through 2023 analytical results represent three years of data. Recommendations are provided for permanent changes to the surface water monitoring program.

For reference, a copy of the MECP letter is provided in Appendix C.

Previous to the February 23, 2021 letter, the MECP provided comments on the surface water portion of the 2010 and 2011 AMRs in letters dated December 7, 2011 and June 12, 2012. GHD received comments on the 2012 and 2013 AMRs in letters dated July 7, 2014 and August 11, 2014. MECP comments on the 2015 Annual Monitoring Report were received in a letter dated June 3, 2016. The letter states that the MECP generally concurs with the report.

At the time of writing this report, comments on the 2016, 2017, or 2018 AMR (GHD, 2017, GHD, 2018 and GHD, 2019) or groundwater portion of the 2019 AMR (GHD, 2020) have not been received by the Municipality or GHD. Comments on the 2020 and 2021 AMR (GHD, 2021 and GHD 2022) have not been received.

4. 2023 Water Quality Monitoring Program

The water quality monitoring program was conducted at the Ward 3 Landfill semi-annually, in May 19 and November 7, 2023 (spring and fall). The monitoring program consists of hydraulic (water level) monitoring, groundwater, surface water, and leachate sample collection and laboratory analysis for selected analytical parameters. Table 4.1 provides a list of monitoring locations and analytical parameters. The analytical parameter list and monitoring program was defined by the Municipality in the contract awarded to GHD for the monitoring of the three landfill sites located within the Municipality.

4.1 Monitoring Network

The on-Site monitoring well network has not been surveyed for geodetic ground surface and reference elevations. As such, the elevations provided in Tables 4.2 and 4.3 are relative to a chosen benchmark elevation.

The current monitoring network at the Ward 3 Landfill consists of 13 on-Site monitoring wells, 10 surface water monitoring locations, three leachate monitoring locations, and two gas probe monitors that are nested with two of the leachate wells. Figure 2.1 provides the monitoring locations. The previous monitoring network included two off-Site residential well locations; however, both were removed from the monitoring program in 2013 due to consistent analytical results showing no landfill-related impacts.

4.2 Water Quality Sampling Protocol

Following standard sample collection protocols, GHD personnel collected groundwater, surface water, and leachate quality samples. All groundwater wells were purged a total of three well volumes and then sampled, unless the well was purged dry, in which case the groundwater sample was collected the same day after allowing the well to recover for up to several hours. All groundwater samples collected for dissolved metals parameters were filtered in the field using a 0.45 micrometre (µm) in-line filter. As stipulated within the Provincial Water Quality Objectives (PWQO) (MOEE, revised 1999), surface water samples to be analyzed for aluminum and mercury are also field filtered.

Sampling protocols were designed to ensure representative water quality samples were obtained. During the monitoring events, field notes including water level, purging information, and field-measured parameters were recorded.

4.3 Sample Analysis

The groundwater, surface water, and leachate samples were analyzed for a comprehensive list of analytical parameters as stipulated in the monitoring contract. Table 4.1 lists the monitoring locations and analytical parameter list.

4.4 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 MW3 and MW5 during the spring and fall 2023 monitoring events, respectively.

All analytical data received were validated by a review of the standard quality control criteria including blind split sample analysis, blind field blank analysis, and trip blank analysis. 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 Fall 2023 duplicate and original samples were generally a good match. Only aluminum and orthophosphate were above the 30 percent RPD limit. However several metal parameters were above the 30 percent RPD limit in the Spring 2023 original and duplicate sample. This included aluminum, boron, calcium, iron, magnesium, manganese and potassium. Hardness also exceeded the 30 percent RPD limit in spring 2023. The analyses of each listed parameter, in their respective data sets, should be considered estimates. Several 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.

4.5 Monitoring Program Deviations

The following table details the deviations from the 2023 monitoring program.

2023 Monitoring Program Deviations

Monitoring Location(s)	Monitoring Event	Reason
GP1, GP2	Spring	Flooded screen
SW8, SW9, SW10	Spring, Fall	Dry, insufficient flow or too turbid
MW9	Spring	No access; unable to sample due to tubing jam. GHD was able to clear the jam during the fall event
MW10	Spring and Fall	Not Found

5. Monitoring Results

5.1 Hydrogeology

Groundwater elevations for the spring and fall 2023 monitoring events are presented in Table 4.3. The May and November 2023 groundwater contours for the landfill area are presented on Figures 2.3 and 2.4, respectively.

The 2023 groundwater flow direction is relatively consistent with historical results. In general, groundwater within the shallow flow zone flows to the north across the Site with some deflection of contours near the southwest corner of the Site. This is likely due to groundwater and leachate mounding associated with the waste mound and is consistent with observations of leachate-related water quality impacts at MW12 and MW14.

Horizontal hydraulic gradients in the water table aquifer in 2023 were relatively consistent from spring to fall monitoring periods. The average 2023 horizontal hydraulic gradient was 0.008 m/m and ranged from 0.006 m/m to 0.009 m/m.

5.2 Groundwater Quality

The results of the water quality monitoring program are discussed in the following sections. The groundwater quality is assessed using the MECP criteria listed in the Ontario Drinking Water Standards (ODWS) (MOE, 2003) for comparative reference. Surface water quality has historically been assessed with respect to MECP criteria listed in the PWQOs.

Groundwater quality is also assessed with respect to the MECP Guideline B-7 "Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities" (MOEE, 1994). The discussion with respect to this guideline is presented in Section 6.

Currently, several leachate indicator parameters have been selected to evaluate the effects of the landfill on surrounding water quality consisting of:

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
Iron	Caused by the oxidation and dissolution of iron materials including iron sulphide minerals and the reduction of ferric (Fe3+) iron oxides to ferrous (Fe2+) iron oxides (generally from mineral coatings on soil particles in native overburden deposits) during microbial degradation of naturally occurring and anthropogenic organic compounds
Manganese	Caused by the oxidation of various metallic materials and the breakdown of food wastes as well as from the reduction of naturally occurring manganese oxides
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 also change in leachate-impacted water, but not generally at the high levels of change as noted in the above-listed parameters. Ammonia, boron, sodium, and dissolved organic carbon (DOC) are also important supplementary indicator parameters. Concentrations of these parameters, combined with the above-referenced parameters, can provide valuable interpretive information regarding the presence and migration of landfill-derived water quality impacts.

The last 5 years (2019 – 2023) of water quality data for leachate, monitoring, and surface water quality are included in Tables 4.4 through 4.6. Historic water quality data is provided in Appendix E.

Concentration versus time plots which illustrate historic (and current) analytical results are provided for all locations in Appendix F. These plots are discussed in the sections below.

Alkalinity, hardness, and pH concentrations are given consideration in the evaluation of water quality; however, the ODWS criteria established for these parameters are operational guidelines set for water treatment plant operations and are thus not relevant to landfill water quality evaluations. As such exceedances of ODWS Operational Guidelines (OG) for alkalinity, hardness, and pH are not highlighted within the analytical data tables or in the summary tables embedded within the text.

The following sections discuss the groundwater quality results from the current reporting period. Water quality is discussed in an upgradient to downgradient fashion and focuses on a comparison of water quality between upgradient (non-impacted), leachate, and water quality at individual monitoring locations.

5.2.1 Upgradient and Background Groundwater Quality

Upgradient groundwater quality at the Site is represented by monitoring wells MW3 and MW11. Water quality at these locations has shown little to no evidence of landfill-related water quality impairments. Both wells are located near the eastern Site boundary. MW3 is located upgradient of the North Disposal Area and MW11 is located on the upgradient side of the current landfilling area in the southern portion of the Site.

The leachate indicator parameter concentrations from the background wells for the current reporting period are summarized in the tables below (spring │ fall):

Parameter (mg/L)	ODWS	Median Background (2019 – 2023)	MW3	MW11
Chloride (AO)	250	2	<1 (<1) | 2	3 │ 4
Alkalinity (OG)	30 – 500	190	160 (156) │ 156	235 │222
Hardness (OG)	80 – 100	191	502 (113) │ 109	232 │ 200
Iron (AO)	0.30	0.22	**1.87** (0.027) │ 0.035	**0.432** │ 0.22
Manganese (AO)	0.05	0.0025	**1.13** (0.00117) │ 0.00217	0.02143 │ 0.0171
Conductivity, lab (µS/cm)	--	485.5	396 (392) │393	626 │ 602

Notes:
Bold concentration exceeds ODWS
(1060) – Duplicate sample results
AO – Aesthetic Objective; OG – Operational Guideline
Concentrations are presented in mg/L with the exception of conductivity measured in units of µS/cm

The low concentrations of indicator parameters in these wells reported during 2023 are generally consistent with historical results and indicate that leachate impacts are not present in groundwater at these locations. These locations continue to provide suitable representations of background water quality at the Site.

The original spring 2023 results from MW3 did not match historical ranges for many metals parameters while the duplicate sample results did. It is unclear what influenced the results of the original sample; however, the median calculations have not been impacted and median results remain a good representation of water quality flowing onto the Site.

The concentration versus time plots in Appendix F show overall stable water quality at both MW3 and MW11 (with the exception of the abnormal results from the spring 2023 sample collected at MW3).

5.2.2 Leachate Quality

The current fill area is monitored by three wells, LW1-S, LW1-D, and LW2. LW1-S and LW1-D were completed at shallow and deep intervals respectively, on the northwestern, downgradient corner of the current landfill area. LW2 was originally installed as a nested shallow and deep monitoring well; however, the deep well was consistently dry and was removed from the monitoring network. LW2 is the shallower well located just northwest of the north disposal area.

The leachate indicator parameter concentrations from the leachate wells for the current reporting period is summarized in the table below (spring │ fall):

Parameter (mg/L)	LW1-S	LW1-D	LW2
Chloride	5 │ 6	8 │ 37	1 │1
Alkalinity	397 │ 165	305 │ 370	143 │ 143

Parameter (mg/L)	LW1-S	LW1-D	LW2
Hardness	2210 | 453	394 | 2750	121 | 128
Iron	86 | 7.07	28.6 | 48.3	0.897 | 1.66
Manganese	2.74 | 0.387	1.37 | 2.86	0.0637 | 0.0476
Conductivity, lab (µS/cm)	374 | 351	680| 975	369 | 366
Note: Concentrations are presented in mg/L with the exception of conductivity measured in units of µS/cm			

Given the proximity of LW2 to the waste footprint(s), indicator parameter concentrations indicate very weak leachate quality. Concentration of iron and manganese concentrations in LW1-S are elevated compared to the ODWS, but concentrations of chloride, alkalinity, and hardness are only slightly elevated above background. This indicates weak leachate.

LW1-D is screened within the silty clay unit (likely the massive St. Josephs Till unit) at a depth of 13.6 to 15.2 mBGS. Water quality at LW1-D shows little evidence of landfill related impacts in the immediate vicinity of the landfill footprint.

The concentration versus time plots in Appendix F show increasing trends in LW1-S; however, concentrations of key leachate indicator parameters are steady and low in LW1-D and LW2.

As illustrated in Appendix F, concentrations of several indicator parameters spiked in the spring 2023 sample collected from LW1-D and hardness and manganese spiked in the fall 2023 sample from LW1-S. The cause for the spikes is unknown but these results are likely anomalous. Continued monitoring will provide insight into long-term changes in leachate quality at the Site.

5.2.3 Southern Landfill Area Landfill Vicinity Groundwater Quality

Monitoring wells MW5, MW6, MW12, MW13, and MW14 represent groundwater quality in the vicinity of the southern landfill area.

Groundwater flow patterns in the southern landfill area are variable. Historically, groundwater flow was directed such that MW12 and MW13 were interpreted to be predominantly cross-gradient from the landfill and MW14 was located upgradient. However, several spring hydraulic monitoring events, have shown a semi-radial flow pattern centred on the landfill mound. The radial flow pattern places MW12 and MW14 in down to cross-gradient positions. The groundwater flow patterns are illustrated on Figures 2.3 and 2.4 for the spring and fall monitoring events, respectively.

The leachate indicator parameter concentrations from the southern landfill area wells for the current reporting period are summarized in the tables below (spring \| fall):

Parameter (mg/L)	ODWS	Median Background (2019 – 2023)	MW5	MW6
Chloride (AO)	250	2	7 | 3 (3)	8 | 7
Alkalinity (OG)	30 – 500	190	259 | 237 (260)	236 |139
Hardness (OG)	80 – 100	191	272 | 208 (207)	61.6 | 60.5
Iron (AO)	0.30	0.22	0.01 | <0.007 (0.014)	0.025 | 0.02
Manganese (AO)	0.05	0.0025	0.00151 | 0.00221 (0.00252)	0.00055 |0.00163
Conductivity, lab (µS/cm)	--	485.5	519 | 505 (500)	263 | 269
Note: **Bold** concentration exceeds ODWS				

Parameter (mg/L)	ODWS	Median Background (2019 – 2023)	MW5	MW6
(1060) – Duplicate sample results AO – Aesthetic Objective; OG – Operational Guideline Concentrations are presented in mg/L with the exception of conductivity measured in units of µS/cm				

Parameter (mg/L)	ODWS	Median Background (2019 – 2023)	MW12	MW13	MW14
Chloride (AO)	250	2	5 | 4	<1 | 2	2 | 7
Alkalinity (OG)	30 – 500	190	606 | 500	226 | 241	452 | 608
Hardness (OG)	80 – 100	191	607 | 461	259 | 238	161 | 552
Iron (AO)	0.30	0.22	**14.7** | **9.91**	0.017 | 0.023	**0.763** | **14.4**
Manganese (AO)	0.05	0.0025	**0.299** | **0.21**	0.00235 | 0.00286	**0.05598** | **1.54**
Conductivity, lab (µS/cm)	--	485.5	1090 | 933	418 | 457	929 | 1120
Notes: **Bold** concentration exceeds ODWS AO – Aesthetic Objective; OG – Operational Guideline Concentrations are presented in mg/L with the exception of conductivity measured in units of µS/cm					

The following observations are drawn based on the current water quality and a review of the concentration versus time plots (Appendix F):

– Water quality at monitoring wells MW6 and MW13 is stable and continues to remain comparable to background levels. There is no evidence of landfill-related water quality impairments at these locations.

– Indicator parameter concentrations at MW5 are generally similar to background with the exception of some recent increasing trends in concentrations of chloride, hardness, and alkalinity that returned to background levels in fall 2023.

– Indicator parameter concentrations at MW12 and MW14 are elevated in comparison to background water quality, with the exception of boron. Although chloride levels are close to background concentrations in recent years, chloride concentrations have also been consistently low in the leachate monitoring wells. Iron and manganese concentrations at MW12 and MW14 have shown some variability but remain well above background levels. Groundwater water quality at MW14 is seasonally variable with elevated concentrations in the spring sampling events.

– The water quality impairments observed at MW12 are interpreted to be primarily landfill-related but show potential decreasing trends.

– The results from MW14 show indicator parameters elevated above concentrations observed in LW2 and are comparable to LW1-S. Leachate-related water quality impairments are apparent at monitoring well MW14.

5.2.4 Northern Landfill Area Landfill Vicinity Groundwater Quality

Monitoring wells MW1 and MW2 represent groundwater quality in the vicinity of the northern landfill area. Based on the current groundwater flow directions, MW2 is located cross-gradient and MW1 is located downgradient of the landfill area.

The leachate indicator parameter concentrations from the northern landfill area wells for the current reporting period are summarized in the tables below (spring │ fall):

Parameter (mg/L)	ODWS	Median Background (2019 – 2023)	MW1	MW2
Chloride (AO)	250	2	18 │ 25	8 │ 7
Alkalinity (OG)	30 – 500	190	465 │ 530	306 │ 332
Hardness (OG)	80 – 100	191	604 │ 511	116 │ 316
Iron (AO)	0.30	0.22	0.118 │0.13	0.044 │ 0.17
Manganese (AO)	0.05	0.0025	0.00865 │ 0.0417	0.0104 │ 0.0245
Conductivity, lab (µS/cm)	--	485.5	946 │ 1120	597 │ 662
Notes: **Bold** concentration exceeds ODWS AO – Aesthetic Objective; OG – Operational Guideline Concentrations are presented in mg/L with the exception of conductivity measured in units of µS/cm				

The following observations are drawn based on the current water quality and a review of the concentration versus time plots (Appendix F):

– Indicator parameter concentrations at MW1 are slightly elevated relative to background levels; indicator parameter concentrations at MW2 are generally more comparable to background levels but are elevated in some parameters. This observation is consistent with historical results. The degree of impact is more pronounced in samples collected from MW1 than at MW2.

– MW2 is located cross-gradient to the current landfilling areas and based on the available information regarding the historic landfilling area, MW2 is located in an upgradient position. However, the actual extents of the historical landfilling area are not known. Based on the water quality reported, minor leachate-related water quality impacts are apparent at this location. As water quality flowing on-Site from the south is un-impacted (based on monitoring results from MW3 and MW11), it is likely that water quality at MW2 is affected in part by the historic landfilling area. Ongoing monitoring has shown concentration trends that are stable or slightly decreasing indicator parameter concentrations at this location.

5.2.5 Downgradient Groundwater Quality

Monitoring wells MW7, MW8, MW9, and MW10 represent groundwater quality downgradient from the landfilling areas of the Site.

The leachate indicator parameter concentrations from the downgradient wells for the current reporting period are summarized in the tables below (spring │ fall):

Parameter (mg/L)	ODWS	Median Background (2019 – 2023)	MW7	MW8
Chloride (AO)	250	2	6 │ 6	<1 │ 4
Alkalinity (OG)	30 – 500	190	217 │ 292	186 │ 180
Hardness (OG)	80 – 100	191	268 │ 149	115 │ 102
Iron (AO)	0.30	0.22	0.012 │ 0.042	0.018 │ 0.007
Manganese (AO)	0.05	0.0025	0.00165 │ **0.0657**	0.00127 │ 0.00281

Parameter (mg/L)	ODWS	Median Background (2019 – 2023)	MW7	MW8
Conductivity, lab (µS/cm)	--	485.5	479 | 600	441 | 431
Notes: **Bold** concentration exceeds ODWS AO – Aesthetic Objective; OG – Operational Guideline Concentrations are presented in mg/L with the exception of conductivity measured in units of µS/cm				

Parameter (mg/L)	ODWS	Median Background (2019– 2023)	MW9	MW10
Chloride (AO)	250	2	NA | <1	Not found
Alkalinity (OG)	30 - 500	190	NA | 174	
Hardness (OG)	80 - 100	191	NA | 112	
Iron (AO)	0.30	0.22	NA | 0.053	
Manganese (AO)	0.05	0.0025	NA | 0.0205	
Conductivity, lab (µS/cm)	--	485.5	NA | 436	
Notes: **Bold** concentration exceeds ODWS AO – Aesthetic Objective; OG – Operational Guideline; NA – No access Concentrations are presented in mg/L with the exception of conductivity measured in units of µS/cm				

The following observations are drawn based on the current water quality and a review of the concentration versus time plots (Appendix F):

– Indicator parameter concentrations in 2023 at MW7 and MW8 are comparable to background levels. Generally, MW7 concentrations are slightly greater and more variable over time than MW8 concentrations.
  - The fall 2023 results from MW7 show a large increase in ammonia levels. This is likely to be anomalous as all other indicator parameter concentrations remained similar to historical ranges.
– MW9 and MW10 concentrations are consistently at or below background concentrations with the exception of occasional data points currently interpreted to be anomalous.
– As indicated in the above summaries as well as in Table 4.5, water quality at the downgradient monitoring wells has consistently been at or near background levels. This indicates that landfill-related water quality impairments are not generally migrating a significant distance from the landfilled area.

5.3 Surface Water Quality

Drainage at the Site is conveyed to the northwest of the landfill footprint via three channels. First, a drainage swale which captures surface water from the western and southern portions of the Site, second, a short natural stream originating in the forested area to the west of the landfill footprint, and, finally, an intermittent stream that flows adjacent to the northern landfill footprint. The three drainage channels meet at the northwestern property boundary and continue to flow northwest ward on the adjoining property.

During 2023, surface water quality was monitored at 10 locations (SW1, SW2, SW3, SW4, SW5, SW7, SW8, SW9, SW10, and SW11).

Monitoring location, SW1 is located approximately 200 m upstream of the Site within the intermittent creek and is considered a background location. The remaining nine surface water monitors are located within the drainage swale,

short natural creek, the intermittent stream, and the flow channel on the adjoining property. SW8 is located within the short natural creek, SW5 and SW11 are located within the drainage swale prior to the confluence of three surface water bodies. SW2 and SW9 are located in the intermittent creek north of the landfill footprint. SW3 is located just after the confluence of the three flow channels and SW10 is located downstream of SW3 on the adjoining property.

SW8 through SW11 were added to the monitoring program in 2021 to refine the understanding of potential surface water impacts originating form the drainage swale, the natural creek, and intermittent creek. SW8 through SW10 were dry or contained insufficient water and GHD was unable to sample the locations in 2023.

The surface water monitoring locations are shown on Figure 2.1. Figure 2.1 also illustrates the drainage channels and flow directions. Surface water quality data is provided in Table 4.6. Concentration versus time plots for the key leachate indicator parameter concentrations for each surface water monitor are included in Appendix F.

SW2 is located within the intermittent stream, downgradient from the approximate landfill footprint and downstream from SW1. SW2 flows into SW9 which flows into SW3. SW3 is located just downstream of the confluence of the three surface water channels.

The leachate indicator parameter concentrations, including phenols, phosphorus, and total kjeldahl nitrogen (TKN), from SW1, SW2, and SW3 for the current reporting period are summarized in the tables below (spring │ fall). SW9 was dry in 2022 and 2023.

Parameter (mg/L)	PWQO	Median Background (2019 – 2023)	SW1	SW2	SW9	SW3
Chloride	--	4	9 │ 9	6 │ 6	Insufficient	18 │ 28
Alkalinity	--	317	402 │ 344	383 │ 371		391 │ 431
Hardness	--	361	437 │ 372	432 │ 403		411 │ 476
Iron	0.30	0.286	**3.22** │ **1.26**	**1.57** │ **0.836**		0.235 │ **1.28**
Manganese	-	0.060	0.44 │ 0.238	0.187 │ 0.206		0.0941 │ 0.708
Phenols	0.001	0.001	<0.001 │ <0.001	<0.001 │ <0.001		<0.001 │ <0.001
Phosphorus*	0.01 – 0.03	0.023	0.03 │ **0.066**	**0.039** │ 0.013		0.017 │ **0.273**
TKN	--	0.5	3.5 │ 0.8	1.6 │ 0.7		0.7 │ 3.4

Notes:
Bold concentration exceeds PWQO
*Phosphorus refers to total phosphorus metals parameter list
NM – Not monitored

After a review of the current analytical results and concentration versus time plots, the following observations are drawn:

– With the exception of a notable increase in indicator parameter concentrations in spring 2023, water quality at SW1 has been generally consistent over time and shown low concentrations of the leachate indicator parameters as well as phenols, phosphorus, and TKN. Indicator parameters decreased slightly in fall 2023.
– In 2022, a comparison of water quality between upstream, SW1, and SW2, located downgradient of the waste mound, showed an slight increase in several indicator parameter concentrations which likely indicates some minor landfill influence on the intermittent creek. However, in 2023, indicator parameter concentrations at SW2 were comparable to or lower than the concentrations found at SW1.
– Indicator parameters at SW3, located just past the confluence, show that chloride and phosphorus is elevated. Otherwise, water quality is generally comparable to upstream and shows little evidence of landfill impacts.

SW7 is located in a low-lying marshy area west of MW12. This area typically drains into a drainage swale during periods of high precipitation but remains stagnant and dries up during periods of low precipitation. The table below shows the concentrations of the leachate indicator parameters with phenols, phosphorus, and TKN. Analytical results from SW7 indicate concentrations that are generally similar to background, however in spring 2023, chloride, alkalinity, and hardness were elevated at SW7 relative to SW1. Minimal landfill-related water quality influence is apparent at this

location. Appendix F shows water quality has been generally consistent over time at SW7 with the exception of a spike in leachate indicator parameters in spring 2023 followed by a return to historical concentration ranges in fall 2023.

Parameter (mg/L)	PWQO	Median Background (2019 – 2023)	SW7
Chloride	--	4	31 | 6
Alkalinity	--	317	672 | 295
Hardness	--	361	736 | 318
Iron	0.30	0.286	**0.824 | 1.37**
Manganese	-	0.060	0.598 | 0.377
Phenols	0.001	0.001	**0.002 | 0.005**
Phosphorus	0.01 – 0.03	0.023	**0.157 | 0.063**
TKN	--	0.5	5.9 | 1.3
Notes: **Bold** concentration exceeds PWQO Phosphorus refers to total phosphorus located in the metals parameter list			

Surface water monitoring stations SW5 and SW11 are located in the drainage swale which flows from west of the waste mound into the intermittent swale just before SW3. SW8 is located in the short natural stream that also flows into the intermittent swale just before SW3.

The leachate indicator parameter concentrations, including phenols, phosphorus, and total kjeldahl nitrogen (TKN), from SW5, SW11, SW8, and SW3 for the current reporting period are summarized in the tables below (spring │ fall):

Parameter (mg/L)	PWQO	Median Background (2019 – 2023)	SW5	SW11	SW8	SW3
Chloride	--	4	33 │ 46	30 │ 35	Dry	18 │ 28
Alkalinity	--	317	449 │ 525	389 │ 456		391 │ 431
Hardness	--	361	478 │ 599	455 │ 481		411 │ 476
Iron	0.30	0.286	**1.18** │ **95.2**	0.159 │ **0.317**		0.235 │ **1.28**
Manganese	-	0.060	0.53 │ 2.2	0.239 │ 0.225		0.0941 │ 0.708
Phenols	0.001	0.001	**0.002** │ <0.001	0.001 │ <0.001		<0.001 │ 0.001
Phosphorus*	0.01 – 0.03	0.023	**0.008** │ **0.292**	**0.004** │ **0.005**		0.017 │ **0.273**
TKN	--	0.5	3.3 │ 8.1	2.2 │ 4.8		0.7 │ 3.4
Notes: **Bold** concentration exceeds PWQO *Phosphorus refers to total phosphorus located in the metals parameter list NM – Not monitored						

SW5 monitors the drainage swale that conveys water from the vicinity of the southern landfill area to the intermittent creek. Analytical results from this location consistently show concentrations of many parameters are elevated above background for chloride, alkalinity, hardness, and manganese. Other indicator parameters iron, phenols and phosphorus are below background. The elevated indicator parameters are interpreted to be the result of landfilling. Appendix F shows that there are some worsening trends in water quality at this location. GHD field staff have noted

visual impacts within the swale (sheen, odours, etc.) as well as leachate seepage draining from the waste mound towards the swale.

A comparison of water quality at SW5 and SW11, shows attenuation of the impacts observed at SW5. Concentrations of the leachate indicator parameters decrease between SW5 and SW11. Indicator parameters at SW3, located just past the confluence, show further attenuation of surface water flowing from SW11 to SW3. However, the fall 2023 samples show potential for minor landfill derived impacts (discussed below).

SW10 is located off-Site downstream from SW3. The leachate indicator parameter concentrations, including phenols, phosphorus, and total kjeldahl nitrogen (TKN), from SW3 and SW10 for the current reporting period are summarized in the tables below (spring │ fall):

Parameter (mg/L)	PWQO	Median Background (2019 – 2023)	SW3	SW10
Chloride	--	4	18 │ 28	Too turbid
Alkalinity	--	317	391 │431	
Hardness	--	361	411 │ 476	
Iron	0.30	0.286	0.235 │**1.28**	
Manganese	-	0.060	0.0941 │0.708	
Phenols	0.001	0.001	<0.001 │0.001	
Phosphorus*	0.01 – 0.03	0.023	0.017 │ **0.273**	
TKN	--	0.5	0.7 │ 3.4	

Notes:
Bold concentration exceeds PWQO
*Phosphorus refers to total phosphorus located in the metals parameter list
NM – Not monitored

In 2022 the analytical results from SW10 showed similar water quality to SW3 suggesting little evidence of landfill impact at SW10 similar to SW3. In 2023, concentrations reported in SW3 showed an increase in many indicator parameters including chloride, alkalinity, and boron. Concentrations of alkalinity, chloride, conductivity, and hardness were above those reported in background in the fall 2023 sample. This may be indicative of minor landfill related impacts.

SW4 is located within a pond to the northwest of the northern landfill area. Past results indicated elevated levels of iron, ammonia, chloride, phenols, phosphorus, pH, and TKN in comparison to background concentrations. In 2023, iron, ammonia, chloride were lower than background concentrations, phenols and phosphorous were comparable to background, and TKN was elevated.

The pond in which SW4 is located does not have an outlet and water quality at this location is potentially affected by several sources including agriculture (livestock), surface runoff from the northern portion of the Site, and the landfill area. Based on the results for this location, landfill-related water quality impairments at SW4 are interpreted to be minimal. The majority of the impacts are likely related to the agriculture and stagnant conditions of the closed pond.

Appendix F shows that water quality at SW4 is seasonally variable but stable, long term.

The leachate indicator parameter concentrations at SW4, including phenols, phosphorus, and total kjeldahl nitrogen (TKN) for the current reporting period are summarized in the tables below (spring │ fall):

Parameter (mg/L)	PWQO	Median Background (2019 – 2023)	SW4
Chloride	--	4	<1 │ 4
Alkalinity	--	317	115 │ 193

Parameter (mg/L)	PWQO	Median Background (2019 – 2023)	SW4
Hardness	--	361	117 | 239
Iron	0.30	0.286	**0.636** | **0.726**
Manganese	-	0.060	0.0363 | 0.0568
Phenols	0.001	0.001	<0.001 | <0.001
Phosphorus*	0.01 – 0.03	0.023	**0.146** | **0.066**
TKN	--	0.5	<0.5 | 0.9

Notes:
Bold concentration exceeds PWQO
*Phosphorus refers to total phosphorus located in the metals parameter list

Surface Water Quality Summary

Analytical results indicate the presence of minor impacts, unrelated to the landfill, within background surface quality water flowing onto the Site as compared to several PWQOs.

Water quality at SW5 shows the presence of landfill-derived impacts in the drainage swale adjacent to the waste mound. Results from SW11 show that these results attenuate with distance from the landfill mound. Minor landfill related impacts may be present within the intermittent creek at SW2 (north of the landfill footprint). Similar to the drainage swale, these impacts attenuate with distance from the landfill footprint.

The analytical data has shown that the minor surface water impacts at SW2 are attenuated prior to flowing to SW9 and the impacts at SW5 are largely attenuated prior to surface water flowing to SW11.

Past water quality at SW3, located after the confluence of the three surface water channels and on the adjoining property, showed that impacts are not flowing off-Site. During the fall 2023 concentrations of chloride, alkalinity, and boron increased. Concentrations of alkalinity, chloride, conductivity, and hardness at SW3 were above those reported in background in the fall 2023 sample. This may be indicative of minor landfill related impacts. Continued monitoring is recommended.

Given the severity of impacts at SW5, GHD recommends that SW11 be added to the routine semi-annual monitoring program. Given the similarities in water quality at SW8, SW10, and SW3, SW3 is sufficient to monitor surface water quality flowing off-Site and monitoring of SW8 and SW10 can be discontinued. Water quality in the Intermittent Creek should be monitored at the worst-case location, SW2. Therefore, continued monitoring at SW9 is not needed. Additional surface water sampling should continue until the MECP concurs with discontinuing.

5.4 Landfill Gas Monitoring

In order to address the concerns of methane gas migrating from the landfill area of the Site, methane monitoring is completed at two gas probes as part of the annual monitoring program.

The 2005 Annual Monitoring Report recommended that gas probes be installed and nested with the leachate monitoring wells LW1-S/D and LW2. These gas probes were completed in July 2006. GP-1 was installed adjacent to leachate well LW1-S/D while GP-2 was installed next to LW2. Both were constructed with 3.8-cm diameter PVC and were screened from 0.6 to 2.2 mBGS.

GP-1 and GP-2 were flooded during the spring 2023 monitoring event. To date, no methane has been detected in either of the gas probes; however, both are often flooded. In fall 2023, concentrations of 0.1 percent methane by volume were recorded at both GP-1 and GP-2, as shown in the table below. 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 (volume/volume [v/v]).

Well ID	Methane % v/v	CO_2 % v/v	O_2 % v/v
GP1	ND (0.1)	0.6	19.4
GP2	ND (0.1)	0.4	21.1

The need for a methane monitor in the Attendant's shed should be reassessed in the event that methane is detected in either gas probes.

6. Compliance Assessment of Water Quality Results

6.1 Groundwater Reasonable Use Criteria Assessment

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 (RUC) maximum concentration 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; this is the ODWS (ODWO before August 2000) 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.

MABC values have not been determined for Operational Guidelines parameters (alkalinity, hardness, and pH) as well as temperature as the ODWS limits apply more specifically to water treatment facilities and not groundwater sampled from monitoring wells. Applicable MABC values have been included in Table 4.5 for wells to which these criteria apply.

As previously mentioned, because of their upgradient position and the historical analytical results, monitoring wells MW3 and MW11 are considered representative of background water quality in the vicinity of the Ward 3 Landfill. MABC values have been calculated using the median value of concentrations from the 2017 to 2021 analytical data from MW3 and MW11. The MABC for all Aesthetic Objectives (AO), Maximum Acceptable Concentrations (MAC), and Interim Maximum Acceptable Concentrations (IMAC) parameters should be updated every 3 to 5 years to account for natural fluctuations in the background groundwater conditions.

Monitoring wells located along the downgradient property boundaries of the Site are generally selected for evaluating a site's compliance with respect to the Reasonable Use Guideline. While not all are specifically along the property

boundary, the following wells represent groundwater conditions closest to the downgradient property boundary: MW2, MW8, MW9, MW10, MW12, MW13, and MW14. Sample concentrations from these wells are compared to the calculated MABC for the purposes of the Site compliance assessment.

Parameters whose concentrations exceeded the MABC (see Table 4.5) within samples collected from the property boundary wells during 2023 are listed below:

Southern Property Boundary Wells

– MW12 – DOC (spring), iron, manganese
– MW13 – none
– MW14 – DOC, iron, manganese

Western/Northwestern Property Boundary Wells

– MW8 – none
– MW9 – none
– MW10 – not monitored

Eastern Property Boundary Wells

– MW2 – none

Similar to previous RUC assessments, exceedances of the MABC are noted along the southern property boundary.

Indicator parameter concentrations at MW12 are elevated above background conditions indicating a moderate level of leachate impacts just south of the Stage 2 landfilled area. The sample results from MW14 show concentrations are elevated above concentrations observed in LW2 and are comparable to LW1-S. This indicates that leachate impacts are migrating from the south of the landfill mound and across the southern Site boundary, therefore making the Site out of compliance with MECP Guideline B-7.

Current analytical data continues to demonstrate that impacts have not migrated to the southwest as far as MW13, as indicator parameter concentrations at this location are generally similar to background levels.

In the 2008 Annual Monitoring Report, it was reported that leachate impacts at MW12 were expected to diminish following the progressive closure and capping of the southern area of Stage 2. As indicated in Appendix F, trends of decreasing indicator parameter concentrations are apparent along the southern property boundary.

Monitoring during 2014 through 2023 confirmed landfill related water quality impacts at MW14 and, as such, additional actions need to be taken to ensure compliance with MECP Guideline B-7. As a first step, GHD has recommended that the Municipality determine the extents of landfill related groundwater impacts on the adjacent property to the south. In order to determine the approximate limits of the potential landfill related impacts; an additional monitoring well is required on the adjacent property to the south of the Site. The Municipality is currently in negotiations with the adjacent property owner to obtain access to install and monitor an additional monitoring well on their property.

Negotiations for additional property or a groundwater easement to the south can be made based on the future monitoring data obtained from MW14 and the recommended monitoring well. This additional data will ensure that the Municipality is able to take appropriate actions to restore the Site's long-term compliance with respect to the Reasonable Use Guideline (B-7).

GHD understands that the neighboring property owner has been uncooperative in regards to installing an additional monitoring well on the adjacent property. However, the Municipality continues to negotiate to obtain access.

During the fall 2022 monitoring event, GHD field staff noted a fence line, which may represent the neighboring property boundary, further to the south than the current Site figures show. It is recommended that the Municipality geodetically survey the monitoring wells at the Site. A geodetic survey of the wells combined with a legal Site survey will allow a confirmation that MW12 and MW14 accurately represent water quality along the southern Site boundary.

6.2 Surface Water

Results from the current reporting period, 2023, indicate the following PWQO exceedances:

– SW1 – aluminum (fall), boron (spring), iron (spring and fall), phosphorus (fall), dissolved oxygen, (spring and fall)
– SW2 – aluminum (spring and fall), boron (spring), iron (spring and fall), phosphorus (spring), dissolved oxygen (spring)
– SW3 – aluminum (spring and fall), iron (fall), phosphorus (fall), un-ionized ammonia (fall), dissolved oxygen (spring and fall)
– SW4 – aluminum (spring and fall), iron (spring and fall), phosphorus (spring, fall), dissolved oxygen (spring)
– SW5 – aluminum (fall), boron (spring and fall), iron (spring and fall), phosphorus (fall), phenolics (spring), un-ionized ammonia (spring and fall), dissolved oxygen (spring)
– SW7 – boron (spring and fall), iron (spring and fall), phosphorus (spring and fall), phenolics (spring and fall), un-ionized ammonia (spring), dissolved oxygen (spring and fall)
– SW11 – boron (fall), iron (fall), un-ionized ammonia (spring and fall), dissolved oxygen (spring)

During the current reporting period, upgradient surface water quality at SW1 exceeded five PWQO concentrations including, aluminum, boron, iron, phosphorus, and dissolved oxygen. Past results have indicated that field measured dissolved oxygen, iron, phenolics, and phosphorus often exceed the PWQO. Elevated concentrations of iron and aluminum are also typical at this location. Concentrations may be naturally occurring or attributable to upgradient sources such as the agricultural activities occurring in the pasture and crop lands upgradient and adjacent to the Site.

As discussed in Section 5.3, samples collected from the midstream location within the intermittent creek, including SW2 indicate the presence of minor landfill related water quality effects while the results from SW5 show elevated concentrations of a number of parameter and frequent PWQO exceedances. These impacts are attributable to the landfill. Analytical data from SW11 show that surface water quality is improved at the downstream location.

Recent monitoring results from SW3 confirmed that the landfill derived impacts observed in the drainage swale and intermittent stream were not flowing off-Site; however, the fall 2023 results showed increasing concentrations which may indicate minor landfill derived impacts. Continued monitoring is recommended.

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 G 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 possible, and is included for reference.

8. Conclusions

Based on the results of the water quality monitoring program conducted at the Ward 3 Landfill Site, the following conclusions are presented:

1. Site operations were completed in accordance with the D&O Plan approved for the Site. The Municipality has operated the Site in accordance with the Conditions of ECA No. A272001, and with the inspection and reporting requirements of the Conditions.
2. No major operational problems were identified at the Site during the current reporting period. No complaints were filed during the reporting period.
3. Waste deposition ceased temporarily in 2023 and no waste is known to have been added to the most recently active landfill area, Stage 1.
4. As of 2022, the remaining waste disposal capacity was estimated at approximately 93,197 m^3.
5. In general, groundwater within the shallow flow zone flows across the Site to the north. There is a deflection of groundwater flow to the south in the vicinity of MW12. This is likely due to hydraulic mounding associated with the landfilled waste and is consistent with observations of leachate-related water quality impacts at MW12 and MW14.
6. Landfill-related groundwater quality impairments were noted in the leachate wells and in groundwater monitoring wells located in close proximity to the landfilled area, in particular at MW12 and MW14.
7. There were no significant landfill-related water quality impairments noted in monitoring wells located further downgradient of the landfill areas.
8. Water quality at MW12 and MW14 is in exceedance of the RUC compliance criteria for numerous parameters. Exceedances have been attributed to the landfill. A Site compliance issue has been confirmed along the southern property boundary.
9. Surface water quality in the drainage swale, in close proximity to the landfill footprint, show evidence of landfill derived impacts. Very minor impacts are likely present at the midstream locations in the intermittent stream as well. These impacts attenuate as surface water flows away from the landfill footprint. Surface water quality flowing off-Site is greatly improved; however, the most recent monitoring results show that some minor landfill influences may be present in the surface water flowing off-Site.

9. Recommendations

Based on the results of the water quality monitoring program conducted at the Ward 3 Landfill, the following recommendations are presented:

1. The monitoring program should be continued through 2024, except as noted below:
    a. Continued sampling at the additional surface water monitoring stations SW8 through SW10 should be discontinued. SW11 should be added to the routine, semi-annual monitoring program.
    b. Monitoring at SW8 through SW10 should continue until the MECP concurs with discontinuing these locations.
2. Additional action to restore compliance along the southern property boundary should be undertaken. As impacts have been confirmed, an additional monitoring well should be installed on the adjacent property to the south of the Site. The additional well should be installed in a location that can be used to demonstrate the extent of the potential landfill-derived impacts. The Municipality should continue negotiations with the adjacent property owner to obtain access for the monitoring well installation and acquiring additional CAZ. A determination of the amount

of additional property or groundwater easement required for a CAZ to the south should be made based on additional sampling results from MW14 and the recommended monitoring well.

3. It is recommended that the Municipality geodetically survey the monitoring wells at the Site. A geodetic survey of the wells combined with a legal Site survey will allow a confirmation that MW12 and MW14 accurately represent water quality along the southern Site boundary.
4. As the landfill is not currently accepting waste, the next topographic survey and site life calculation should be completed one year after reopening of the Ward 3 landfill.

10. References

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GHD, 2018, 2017 Annual Monitoring Report, Kincardine Waste Management Centre, Kincardine, Ontario
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GHD, 2019, 2018 Annual Monitoring Report, Kincardine Waste Management Centre, Kincardine, Ontario
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All of Which is Respectfully Submitted,

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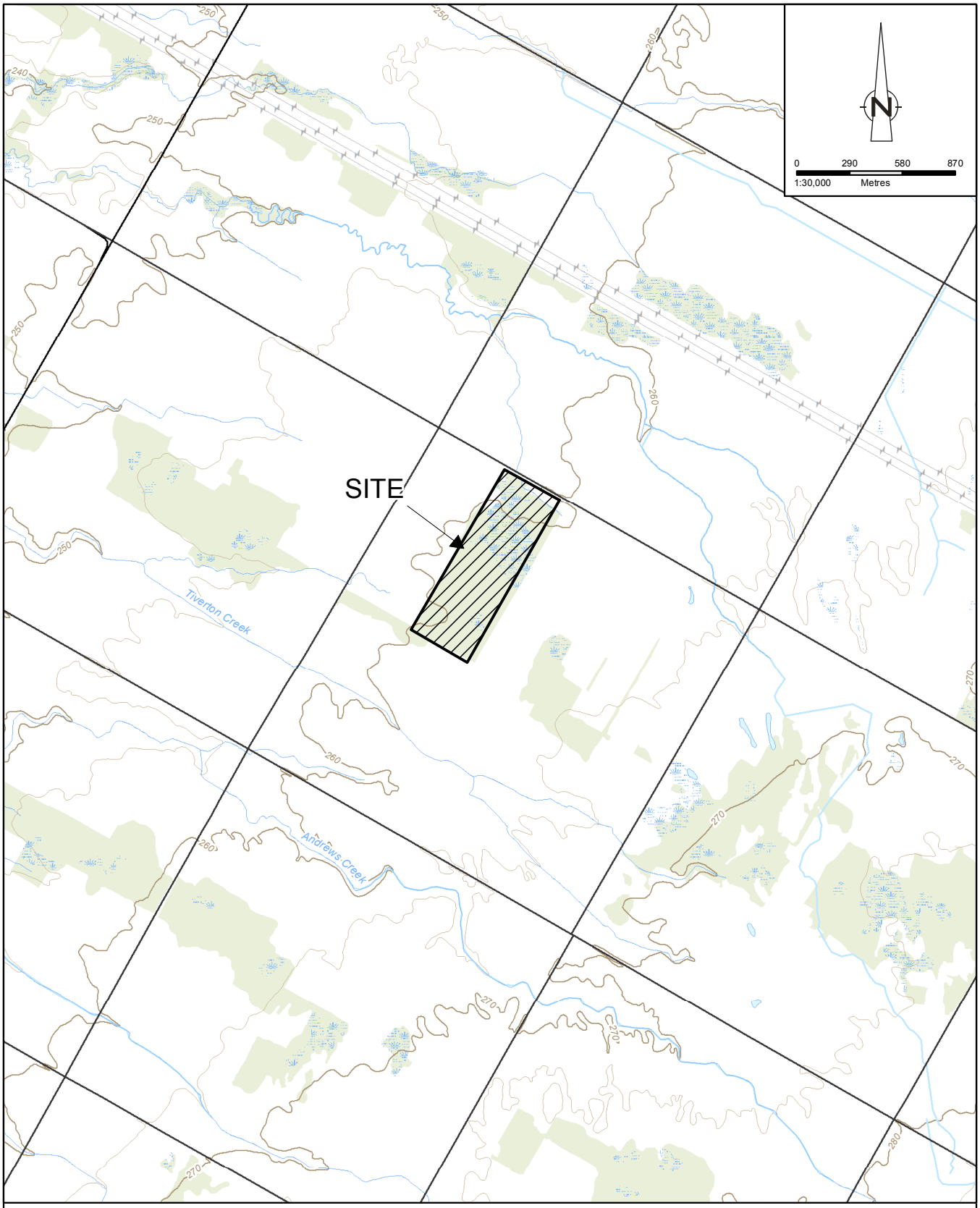
Figures



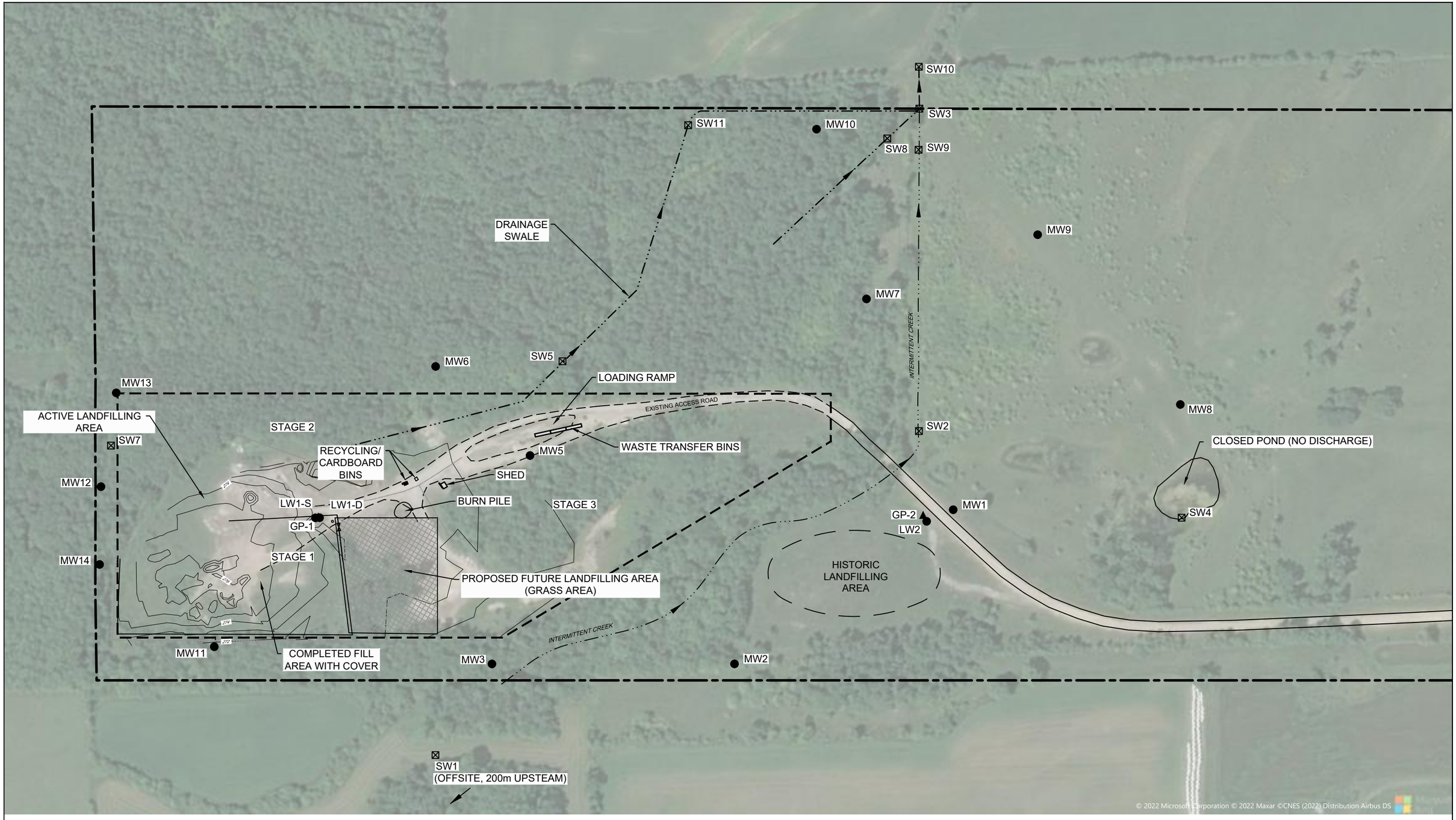
Source: MNRF NRVIS, 2014. Produced by GHD under licence from Ontario Ministry of Natural Resources and Forestry, © Queen's Printer 2018
Coordinate System: NAD 1983 UTM Zone 17N

Figure 1.1

SITE LOCATION
2023 ANNUAL MONITORING REPORT
KINCARDINE WARD 3 LANDFILL SITE
Municipality of Kincardine

GHD

04074-30(104)GIS-WA001 Thursday, March 22, 2019



LEGEND

- MONITORING WELL LOCATION
- GAS PROBE LOCATION
- SURFACE WATER SAMPLE LOCATION
- APPROXIMATE PROPERTY LINE
- APPROXIMATE LANDFILL FOOTPRINT
- APPROXIMATE CREEK LOCATION

0 25 50 75m

1:2500

GHD

KINCARDINE, ONTARIO
KINCARDINE WARD 3 LANDFILL SITE
2023 ANNUAL MONITORING REPORT

MONITORING LOCATIONS

Project No. **4074**
Date **April 2024**

Figure 2.1

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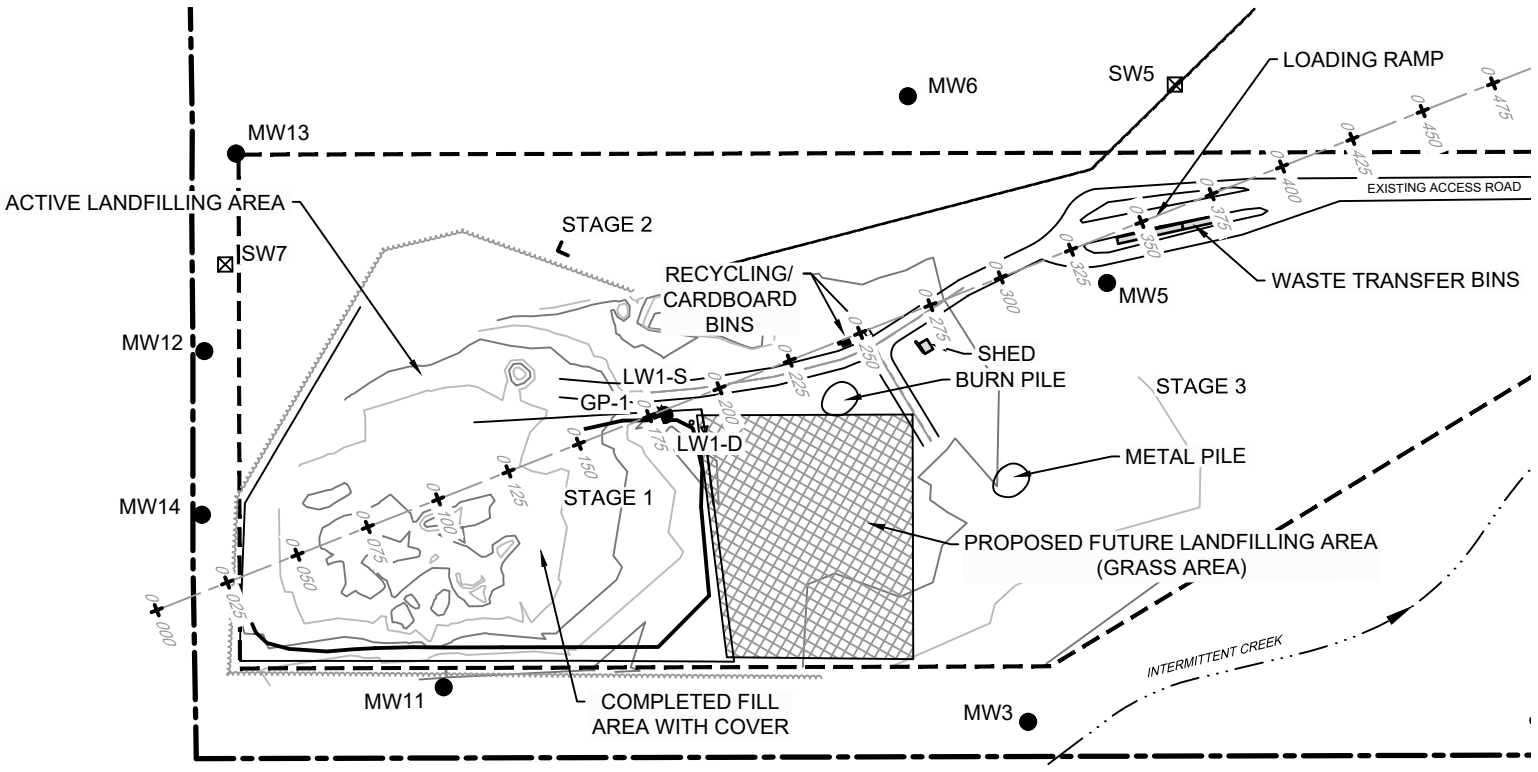
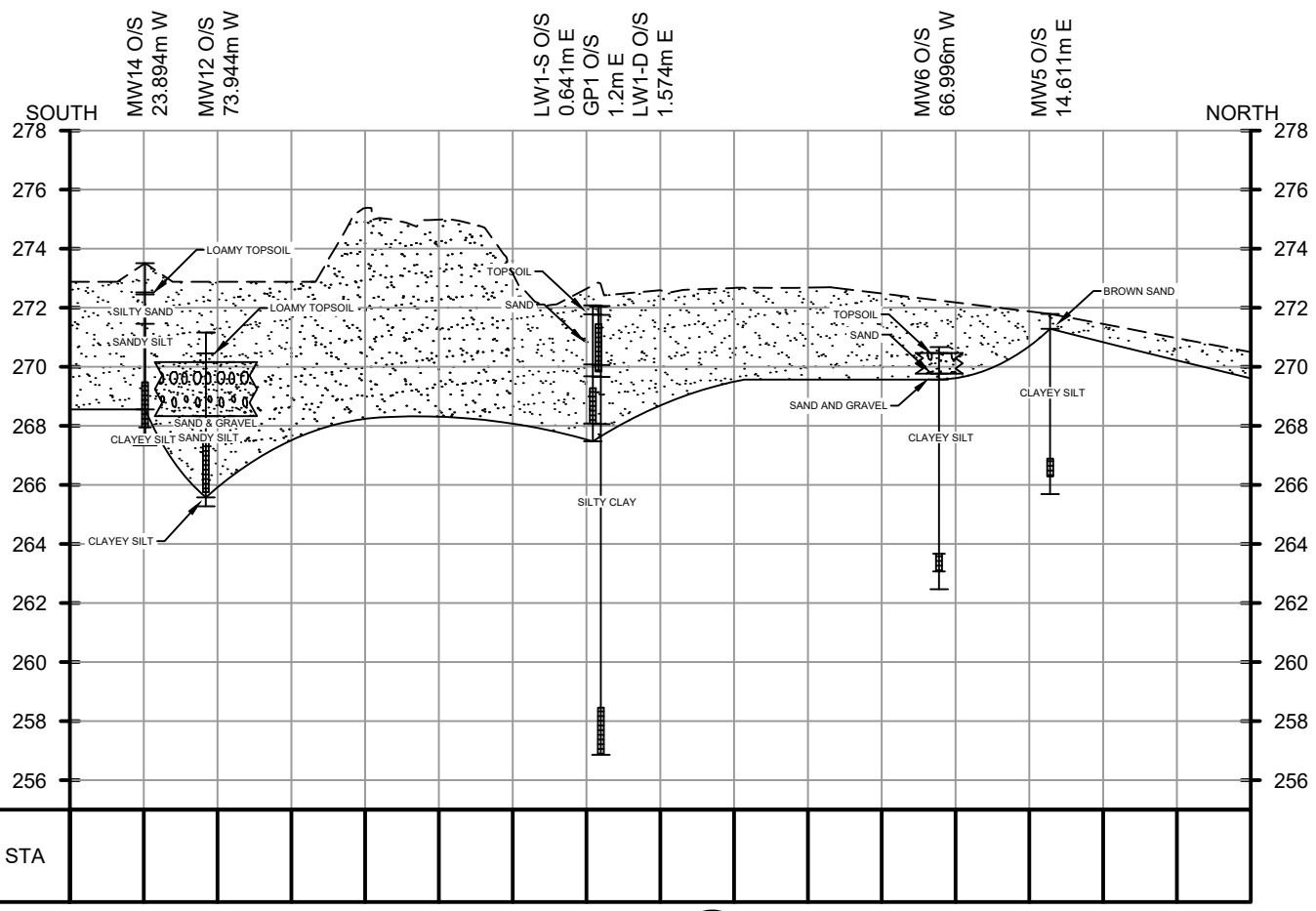
Plot Date: 05 April 2024 3:17 PM

Source: Ward 3 existing conditions Surveyed December 5, 2019 by GHD



SW1
(OFFSITE, 200m UPSTEAM)



SECTION A-A
VERT. 1:500
HORIZ. 1:2500
FIG. 2.1

LEGEND

- MONITORING WELL LOCATION
- GAS PROBE LOCATION
- SURFACE WATER SAMPLE LOCATION
- APPROXIMATE PROPERTY LINE
- APPROXIMATE LANDFILL FOOTPRINT
- APPROXIMATE CREEK LOCATION
- WELL SCREEN
- MEDIUM GRAINED SAND SILTY TO WITH SILT
- SAND AND GRAVEL
- CLAYEY SILT TO SILTY CLAY

0 25 50 75m
1:2500

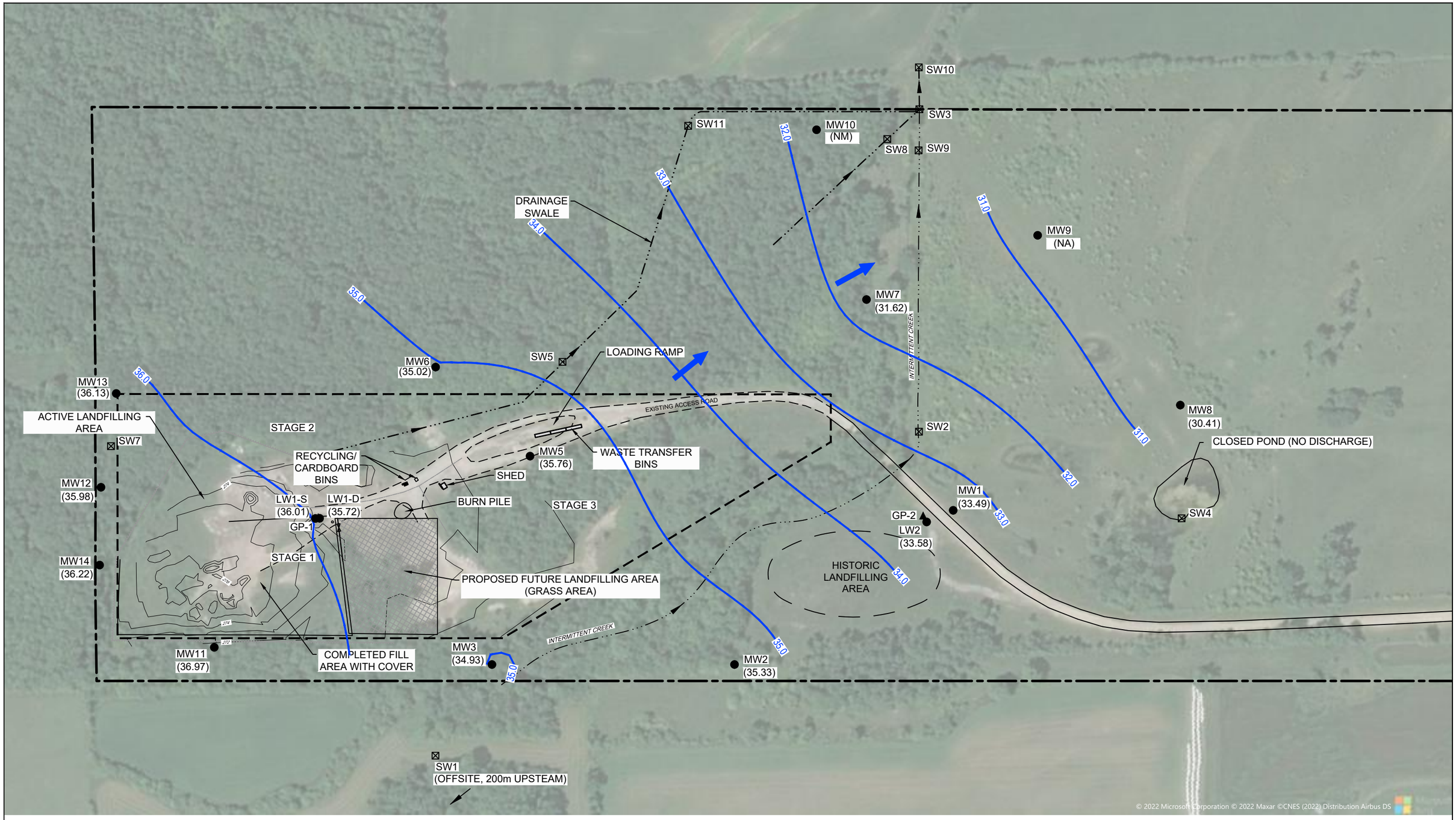
KINCARDINE, ONTARIO
KINCARDINE WARD 3 LANDFILL SITE
2023 ANNUAL MONITORING REPORT

GEOLOGICAL CROSS-SECTION A-A'

Project No. **4074**
Date **April 2024**

figure 2.2

Filename: N:\CA\Waterloo\Projects\662\004074\Digital_Design\ACAD\Figures\RPT123\004074-GHD-00-00-RPT-EN-D104_WA-123.dwg



LEGEND

- MONITORING WELL LOCATION
- GAS PROBE LOCATION
- SURFACE WATER SAMPLE LOCATION
- APPROXIMATE PROPERTY LINE
- APPROXIMATE LANDFILL FOOTPRINT
- APPROXIMATE CREEK LOCATION
- (33.00) GROUNDWATER ELEVATION (m)
- 35.00 GROUNDWATER CONTOUR (m)
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

0 25 50 75m

1:2500

GHD

KINCARDINE, ONTARIO
KINCARDINE WARD 3 LANDFILL SITE
2023 ANNUAL MONITORING REPORT

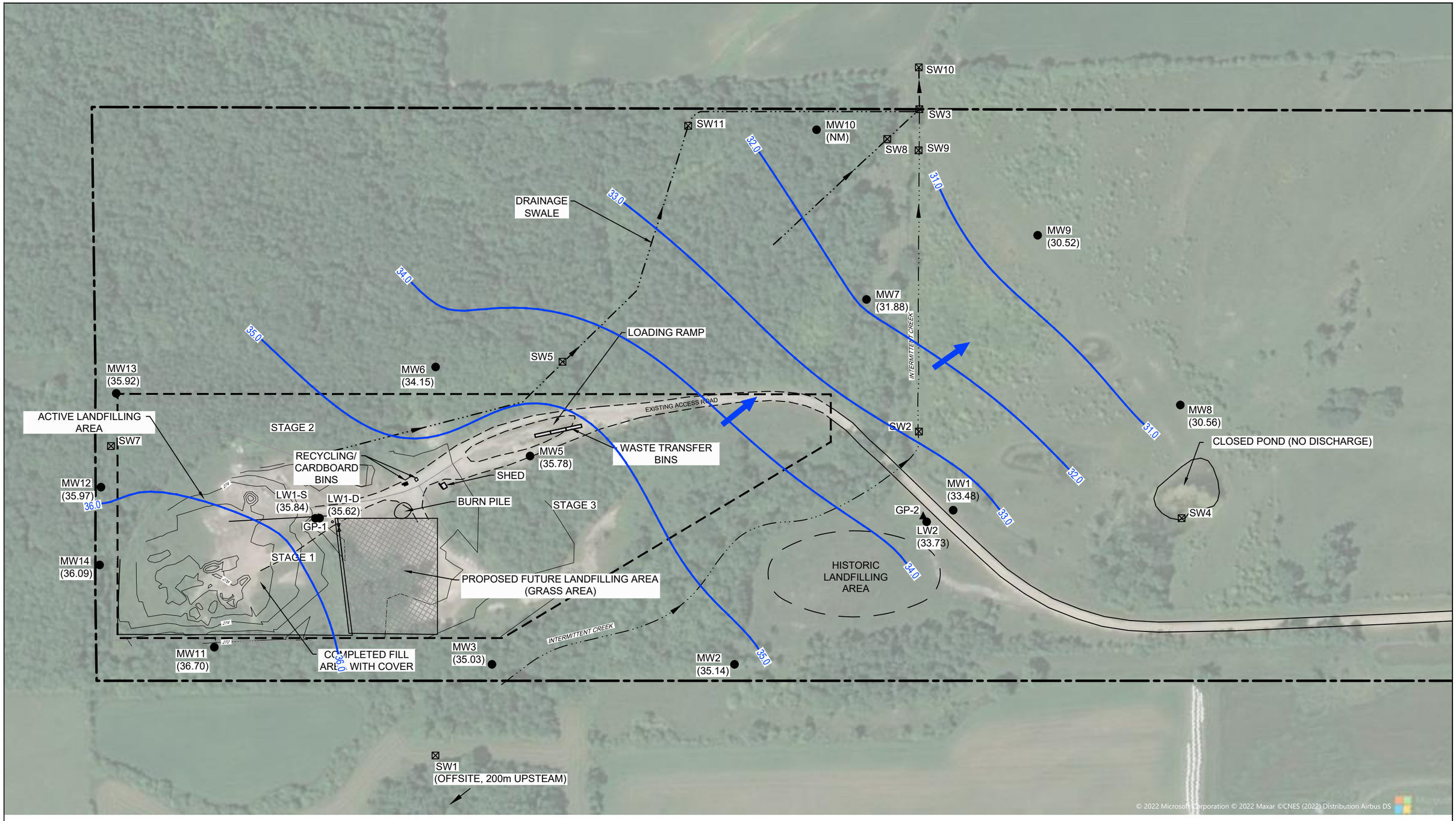
GROUNDWATER CONTOURS
MAY 19, 2023

Project No. **4074**
Date **April 2024**

FIGURE 2.3

Filename: N:\CA\Waterloo\Projects\662\004074\Digital_Design\ACAD\Figures\RPT123\004074-GHD-00-00-RPT-EN-D102_WA-123.dwg
Plot Date: 05 April 2024 3:11 PM

Source: Ward 3 existing conditions Surveyed December 5, 2019 by GHD



LEGEND

- MONITORING WELL LOCATION
- GAS PROBE LOCATION
- SURFACE WATER SAMPLE LOCATION
- APPROXIMATE PROPERTY LINE
- APPROXIMATE LANDFILL FOOTPRINT
- APPROXIMATE CREEK LOCATION
- (35.16) GROUNDWATER ELEVATION (m)
- (NA) NO ACCESS
- 35.00 GROUNDWATER CONTOUR (m)
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

0 25 50 75m

1:2500

GHD

KINCARDINE, ONTARIO
KINCARDINE WARD 3 LANDFILL SITE
2023 ANNUAL MONITORING REPORT

GROUNDWATER CONTOURS
NOVEMBER 7, 2023

Project No. **4074**
Date **April 2024**

FIGURE 2.4

Filename: N:\CA\Waterloo\Projects\662\004074\Digital_Design\ACAD\Figures\RPT123\004074-GHD-00-00-RPT-EN-D103_WA-123.dwg
Plot Date: 05 April 2024 3:10 PM

Source: Ward 3 existing conditions Surveyed December 5, 2019 by GHD

Tables

Table 4.1

Monitoring Program Summary
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

	Field Collected Parameters					Laboratory Test Parameters			
Location	**Hydraulic Monitoring**	**Water Level [1]**	**Field pH, Conductivity, Temperature**	**Field Dissolved Oxygen**	**% Methane**	**General Chemistry[2]**	**Dissolved Metals[3]**	**Total Metals[3]**	**Total Phosphorus**
Groundwater Monitoring Wells									
MW1	•	•	•			•	•		
MW2	•	•	•			•	•		
MW3	•	•	•			•	•		
MW5	•	•	•			•	•		
MW6	•	•	•			•	•		
MW7	•	•	•			•	•		
MW8	•	•	•			•	•		
MW9	•	•	•			•	•		
MW10	•	•	•			•	•		
MW11	•	•	•			•	•		
MW12	•	•	•			•	•		
MW13	•	•	•			•	•		
MW14	•	•	•			•	•		
Field Blank						•	•		
Field Duplicate						•	•		
Surface Water Monitoring									
SW1			•	•		•		•	•
SW2			•	•		•		•	•
SW3			•	•		•		•	•
SW4			•	•		•		•	•
SW5			•	•		•		•	•
SW7			•	•		•		•	•
SW8			•	•		•		•	•
SW9			•	•		•		•	•
SW10			•	•		•		•	•
SW11			•	•		•		•	•
Leachate Monitoring Wells									
LW1-S	•	•	•			•		•	
LW1-D	•	•	•			•		•	
LW2	•	•	•			•		•	
Gas Probe Monitoring									
GP1					•				
GP2					•				

Notes:

* Domestic wells PW2 and PW3 removed from monitoring program in 2013.

[1] Measure liquid levels for leachate wells

[2] General chemistry parameters include alkalinity, conductivity, hardness, pH, DOC, ammonia, TKN, total phenols, chloride, nitrite, nitrate, phosphate and sulphate

[3] Metals include aluminum, boron, calcium, iron, magnesium, manganese, phosphorus and potassium. Dissolved metals were field filtered.

Table 4.2

Monitoring Well Completion Details
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Well Location	Reference Elevation (mAREF)	Screened Interval (mBGS)	Screened Interval (mAREF)	Geologic Material
MW1	36.37	3.6 - 4.2	33.37 - 36.17	Clayey Silt (Till)
MW2	36.91	3.5 - 4.1	33.91 - 36.81	Clayey Silt (Till)
MW3	36.80	5.5 - 6.1	31.8 - 36.7	Clayey Silt (Till)
MW4	-	4.9 - 5.5	-	Clayey Silt (Till)
MW5	37.41	4.9 - 5.5	33.41 - 36.91	Clayey Silt (Till)
MW6	36.29	7.0 - 7.6	29.29 - 35.69	Clayey Silt (Till)
MW7	32.52	7.0 - 7.6	25.52 - 31.92	Clayey Silt (Till)
MW8	32.75	7.0 - 7.6	25.75 - 32.15	Clayey Silt (Till)
MW9	32.16	-	-	-
MW10	32.06	4.7 - 8.2	28.06 - 31.86	Clayey Silt (Till)
MW11	38.07	4.7 - 8.2	34.07 - 37.87	Clayey Silt (Till)
MW12	36.78	2.8 - 4.3	34.78 - 36.48	Silty Sand
MW13	38.18	2.6 - 4.4	36.18 - 37.78	Fine Sand / Silty Clay (Till)
MW14	39.01	3.1 - 4.6	36.006 - 38.406	Sandy Silt
Residential Monitoring Location*				
PW2	-	-	-	-
PW3	-	-	-	-
Leachate Monitoring Location				
LW1-S	38.66	2.8 - 4.4	36.66 - 38.26	Fine Sand / Silty Clay
LW1-D	38.65	13.6 - 15.2	25.65 - 38.45	Silty Clay
LW2	35.21	4.4 - 6.0	31.21 - 35.21	Silty Clay
Gas Probe Monitoring Location				
GP-1 (LW1-D)	-	0.6 - 2.2	-	Poorly Graded Sand and Gravel
GP-2 (LW2)	-	0.6 - 2.25	-	Silty Clay

Notes:

mBGS metres below ground surface
mAMSL metres Above Mean Sea Level
mAREF metres Above reference
\- No Information/not surveyed
* Domestic wells PW2 and PW3 removed from monitoring program in 2013.
Survey information taken from an assumed relative elevation. A complete geodetic survey has not been completed. All measurements are relative to a chosen elevation and measured in metres.

Table 4.3

Groundwater Elevations
2023 Monitoring Report
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	26-Apr-2016	4-Nov-2016	11-Apr-2017	23-Nov-2017	18-May-2018	4-Nov-2018	21-May-2019	7-Dec-2019	11-Aug-2020	29-Nov-2020	12-May-2021	12-Dec-2021	28-Jun-2022	2-Dec-2022	##########	7-Nov-2023
MW1	36.37	33.74	32.69	34.07	33.68	33.74	33.34	33.70	33.52	32.65	33.38	33.34	33.91	33.00	NA	33.49	33.48
MW2	36.91	35.62	34.41	35.72	35.36	35.53	34.96	35.49	35.14	34.61	35.01	35.25	35.57	34.98	35.16	35.33	35.14
MW3	36.80	35.13	34.50	34.76	35.08	34.85	34.97	35.05	34.60	34.72	34.79	34.90	35.07	34.96	34.65	34.93	35.03
MW5	37.41	NM	34.74	36.21	35.94	36.01	35.09	36.00	35.42	35.13	35.23	35.87	36.14	35.43	35.75	35.76	35.78
MW6	36.29	34.19	33.23	34.04	34.24	34.11	34.03	34.19	33.79	33.79	33.42	34.05	34.43	34.03	33.96	35.02	34.15
MW7	32.52	31.62	29.83	31.58	31.75	31.59	31.69	31.64	31.41	30.94	31.72	NA	31.84	31.51	31.54	31.62	31.88
MW8	32.75	30.83	NM	30.66	31.17	30.75	NA	30.70	30.65	29.91	30.92	NA	31.25	30.60	30.12	30.41	30.56
MW9	32.16	30.25	NM	30.19	30.62	30.16	NA	30.20	30.38	29.83	30.51	NA	30.66	30.13	30.45	NA	30.52
MW10	32.06	30.54	29.17	30.38	30.59	30.45	30.45	30.50	30.04	30.10	30.56	30.44	30.69	30.46	Dry	nm	nm
MW11	38.07	36.77	33.47	37.06	36.15	37.06	34.96	37.10	35.52	35.13	34.48	36.70	35.75	36.3	36.22	36.97	36.70
MW12	36.78	36.02	34.85	36.05	36.01	36.02	35.86	36.01	35.95	35.38	35.90	35.98	36.04	35.72	35.97	35.98	35.97
MW13	38.18	36.40	34.78	36.64	36.19	36.37	35.61	36.30	35.86	35.26	35.77	36.14	36.43	35.69	35.93	36.13	35.92
MW14	39.01	36.33	34.89	36.94	36.40	36.52	35.81	36.36	36.06	35.41	35.91	36.14	38.10	35.84	37.18	36.22	36.09
LW1-S	38.66	36.15	34.97	36.63	36.14	36.25	35.65	37.13	35.73	NM	35.37	35.88	36.59	35.70	35.98	36.01	35.84
LW1-D	38.65	35.85	34.78	35.96	35.69	35.82	35.36	35.85	35.48	NM	35.63	35.57	36.02	35.44	35.63	35.72	35.62
LW2	35.21	33.58	33.54	33.53	33.73	NM	33.71	33.62	33.96	33.46	33.67	33.48	33.83	33.57	NA	33.58	33.73

Notes:

mAMSL	metres above mean sea level.
mbtor	metres below top of riser pipe.
-	No information/not surveyed.
NA	No access
NM	Not monitored

Survey information taken from an assumed elevation. A complete geodetic survey has not been completed at the Ward 3 Site.
All measurements are relative to a chosen elevation and measured in metres.

Table 4.4

General Chemistry And Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-S	LW1-S	LW1-S
Sample ID:				LW-WARD3-19-003	LW-WARD3-19-003	LW-WARD3-19-003	LW1-D	LW-WARD 3-003	LW-WARD 3-017	LW-WARD 3-018	LW-WARD3-12/2/22-02	LW1-D	LW1-D	LW-WARD3-041117-002	LW-WARD3-112317-003	LW-WARD3-051818-003
Sample Date:				5/21/2019	12/7/2019	5/14/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum	mg/L	0.10 (OG)	-	0.511	0.664	0.354	0.453	0.509	1.49	0.766	0.591	56	5.09	6.61	6.04	5.81
Boron	mg/L	5	1.5	0.433	0.409	0.373	0.392	0.456	0.422	0.458	0.407	0.262	0.417	<0.1	<0.1	<0.1
Calcium	mg/L	--	-	22	18.4	18.3	18.2	26.7	32.2	23.7	20	608	114	157	152	151
Iron	mg/L	0.30 (AO)	0.17	**0.655**	**0.852**	**0.462**	**0.513**	**0.715**	**1.63**	**1.54**	**0.693**	**86**	**7.07**	**57.2**	**21.4**	**33.2**
Manganese	mg/L	0.05 (AO)	0.03	**0.0661**	-	**0.0531**	0.0457	**0.0687**	**0.0882**	**0.067**	0.0356	**2.74**	**0.387**	**1.17**	**0.753**	**1.43**
Phosphorus	mg/L	--	-	0.037	0.025	0.022	0.014	0.043	0.069	0.029	0.02	2.41	0.35	<0.5	<0.5	<0.5
Potassium	mg/L	--	-	1.14	1.12	0.99	1.04	1.12	1.37	1.33	1.11	10.4	2.52	5.71	5.85	5.13
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	-	175	171	165	164	168	176	173	178	397	165	269	359	243
Ammonia-N	mg/L	--	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.29	0.315	0.209
Chloride	mg/L	250 (AO)	126	3	2	3	3	3	3	5	4	5	6	26.6	10.9	34
Conductivity	uS/cm	--	-	368	341	344	366	360	345	371	382	374	351	589	660	544
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	2	2	<1	2	1	1	1	1	2	1.5	2.1	2.2
Hardness	mg/L	80-100 (OG)	-	85.8	74.1	71	69.8	106	132	92.5	77.1	2210	453	546	517	520
Nitrate (as N)	mg/L	10	2.6	0.14	0.14	0.14	0.12	0.1	0.11	0.11	0.11	0.14	0.11	<0.02	<0.02	<0.4
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.2
Orthophosphate	mg/L	--	-	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.08	<0.03	<0.003	<0.003	<0.003
pH	s.u.	6.5-8.5 (OG)	-	8.25	8.07	8.34	8.36	8.09	8.29	8.23	8.05	8.2	8.1	7.82	7.96	7.9
Phenolics (total)	mg/L	--	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.0019	<0.001	0.0116
Sulfate	mg/L	500 (AO)	269	17	16	15	15	21	19	20	17	17	16	11.8	6.25	12.4
Total kjeldahl nitrogen (TKN)	mg/L	--	-	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	5.5	3.4	0.45	<1.5	0.37
Field Parameters																
Conductivity, field	uS/cm	--	-	371	444	-	435	460	591	394	423	345000	367000	559	548	330
pH, field	s.u.	6.5-8.5 (OG)	-	7.79	7.89	NM	7.36	7.16	6.28	6.9	7.41	7.84	8.48	7.44	6.58	7.25
Temperature, field	Deg C	15 (AO)		8.85	8.54	-	9.78	9.7	8.9	13.1	8.55	10.54	9.56	7	10.2	7.39

Notes:
<

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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(a)	Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim 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.

Table 4.4

General Chemistry And Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW2	LW2
Sample ID:				LW-WARD3-110418-002	LW-WARD3-19-002	LW-WARD3-19-002	LW-WARD3-19-002	LW1-S	LW-WARD 3-001	LW-WARD 3-016	LW-WARD 3-017	LW-WARD3-12/2/22-01	LW1-S	LW1-S	LW-WARD3-041117-001	LW-WARD3-112317-001
Sample Date:				11/4/2018	5/21/2019	12/7/2019	5/14/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum	mg/L	0.10 (OG)	-	13.7	1.62	11.4	3.59	6.98	1.35	0.567	1.23	0.951	1.47	8.68	0.18	0.2
Boron	mg/L	5	1.5	0.13	0.049	0.062	0.056	0.066	0.054	0.141	0.08	0.287	0.045	0.192	0.4	0.38
Calcium	mg/L	--	-	363	167	309	167	203	171	190	111	301	120	823	21.7	21.5
Iron	mg/L	0.30 (AO)	0.17	52	39.9	32.9	36.7	22.8	8.98	9.38	21.2	17.5	28.6	48.3	<0.5	<0.5
Manganese	mg/L	0.05 (AO)	0.03	1.66	1.19	-	1.31	1.2	0.825	1.17	0.824	1.66	1.37	2.86	0.0386	0.0534
Phosphorus	mg/L	--	-	0.72	0.085	0.544	0.185	0.246	0.135	0.075	0.099	0.247	0.13	1.07	<0.5	<0.5
Potassium	mg/L	--	-	8.42	6.78	7.87	4.22	7.64	7.12	16.9	7.47	29.6	8.83	13.4	0.92	0.84
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	-	599	303	736	342	499	330	498	276	451	305	370	154	151
Ammonia-N	mg/L	--	-	0.553	0.6	0.2	0.4	0.4	0.5	0.9	0.6	2.8	0.7	0.5	<0.02	0.328
Chloride	mg/L	250 (AO)	126	40	15	18	29	32	98	150	18	92	8	37	1.18	1.19
Conductivity	uS/cm	--	-	1149	578	1030	628	1010	1000	1420	606	1570	680	975	379	366
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	5.52	2	3	2	3	6	11	2	14	4	6	2	1.4
Hardness	mg/L	80-100 (OG)	-	1240	544	1060	557	668	556	623	362	1030	394	2750	101	98
Nitrate (as N)	mg/L	10	2.6	<0.4	<0.06	<0.06	<0.06	0.11	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.022	<0.02
Nitrite (as N)	mg/L	1	0.3	<0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01
Orthophosphate	mg/L	--	-	<0.003	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.0117	0.0111
pH	s.u.	6.5-8.5 (OG)	-	6.88	7.86	7.08	7.55	7.45	8.07	7.62	8.01	7.51	7.9	7.7	8.24	8.24
Phenolics (total)	mg/L	--	-	0.0043	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.001	<0.001	<0.001	0.0013
Sulfate	mg/L	500 (AO)	269	10.3	9	3	10	23	44	170	49	500	30	230	42.3	42.4
Total kjeldahl nitrogen (TKN)	mg/L	--	-	1.34	<0.5	<0.5	1.4	<0.5	0.5	1.8	0.6	4	4.1	4.5	<0.15	0.32
Field Parameters																
Conductivity, field	uS/cm	--	-	957	611	898	-	1000	1060	1220	529	1650	536000	987000	353	326
pH, field	s.u.	6.5-8.5 (OG)	-	6.91	7.55	7.41	NM	6.72	6.72	6.92	6.63	6.86	7.13	7.33	8.02	6.45
Temperature, field	Deg C	15 (AO)		10.67	7.17	7.47	-	10.57	8.3	7.8	13.6	7.07	10.62	10.86	8.6	10.8

Notes:
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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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(a) Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L.
OG Operation Guideline (water treatment and distribution).
IMAC Interim 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.

Table 4.4

General Chemistry And Total Metals
Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2
Sample ID:				LW-WARD3-051818-001	LW-WARD3-110418-001	LW-WARD3-19-001	LW-WARD3-19-001	LW-WARD3-19-001	LW2	LW-WARD 3-002	LW-WARD 3-015	LW-WARD 3-016	LW2	LW2
Sample Date:				5/18/2018	11/4/2018	5/21/2019	12/7/2019	5/14/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	5/19/2023	11/7/2023
Parameters	**Units**	***ODWS*** [1]	**MABC**[2]											
Metals														
Aluminum	mg/L	0.10 (OG)	-	0.517	0.25	0.103	0.402	0.119	0.277	0.068	0.126	0.168	0.331	1.12
Boron	mg/L	5	1.5	0.44	0.45	0.389	0.339	0.363	0.383	0.39	0.409	0.464	0.348	0.38
Calcium	mg/L	--	-	25.8	23.3	25	26.3	24.6	24.8	24.5	23.8	24.2	29.3	30.5
Iron	mg/L	0.30 (AO)	0.17	**0.81**	**0.35**	0.184	**1.29**	0.228	**0.491**	0.151	0.206	**0.782**	**0.897**	**1.66**
Manganese	mg/L	0.05 (AO)	0.03	**0.109**	**0.0529**	**0.0523**	-	0.031	**0.0565**	0.0329	0.0349	**0.267**	**0.0637**	0.0476
Phosphorus	mg/L	--	-	<0.5	<0.5	0.013	0.044	0.023	0.017	0.015	0.026	0.043	0.042	0.059
Potassium	mg/L	--	-	0.95	0.91	0.839	0.894	0.798	0.858	0.835	0.867	0.911	0.899	1.23
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	-	146	143	149	149	141	142	145	149	148	143	143
Ammonia-N	mg/L	--	-	0.021	0.282	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	<10	<10	1	1	1	2	2	1	1	<1	1
Conductivity	uS/cm	--	-	350	343	389	352	353	375	368	354	370	369	366
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1.6	2.01	1	2	<1	1	1	1	<1	<1	1
Hardness	mg/L	80-100 (OG)	-	114	101	105	111	105	103	105	103	104	121	128
Nitrate (as N)	mg/L	10	2.6	<0.4	<0.4	<0.06	<0.06	<0.06	<0.06	<0.06	0.08	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.2	<0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	-	0.009	0.011	-	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	-	8.21	8.11	8.29	8.06	8.32	8.31	8.24	8.27	8.17	8.3	7.98
Phenolics (total)	mg/L	--	-	0.0058	0.0028	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.001	<0.001
Sulfate	mg/L	500 (AO)	269	53	62.1	46	43	46	44	49	52	50	47	51
Total kjeldahl nitrogen (TKN)	mg/L	--	-	<0.15	0.4	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5	3	2.1
Field Parameters														
Conductivity, field	uS/cm	--	-	226	458	376	444	-	447	479	390	389	346	379
pH, field	s.u.	6.5-8.5 (OG)	-	7.67	7.48	8.01	7.35	NM	7.77	7.4	7.55	7.94	8.23	8.49
Temperature, field	Deg C	15 (AO)		8.32	9.76	8.47	8.25	-	9.67	7.8	9.8	12.8	12.33	11.4

Notes:
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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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(a)	Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim 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.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW2	MW2	MW2	MW2
Sample ID:				GW-WARD3-19-003	GW-WARD3-19-004	GW-WARD3-19-005	MW1	GW-WARD 3-002	GW-WARD 3-004	GW-WARD 3-002	MW1	MW1	GW-WARD3-041117-009	GW-WARD3-112317-006	GW-WARD3-051818-006	GW-WARD3-110418-009
Sample Date:				5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.002	<0.001	0.003	0.002	<0.001	-	0.001	0.01	0.003	0.0786	<0.0294	0.0209	0.0513
Boron (dissolved)	mg/L	5	1.5	-	0.438	0.335	0.391	0.366	-	0.419	0.326	0.368	0.161	0.165	0.163	0.161
Calcium (dissolved)	mg/L	--	--	127	139	125	135	167	124	136	152	118	70.1	68.9	66	65.6
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.048	0.156	**0.618**	**1.03**	0.151	0.066	0.059	0.118	0.13	0.049	0.023	0.019	0.047
Magnesium (dissolved)	mg/L	--	--	51.6	53.3	53.5	53.2	57.8	55.9	60.2	54.8	52.7	32.4	34.6	34.3	34.8
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	**0.0534**	0.0405	**0.126**	**0.0932**	0.0104	0.00761	0.0155	0.00865	0.0417	0.012	0.00762	0.00448	0.00813
Phosphorus (dissolved)	mg/L	--	--	0.041	0.021	0.027	0.019	0.02	0.039	0.11	0.092	0.528	<0.05	<0.05	<0.05	<0.05
Potassium (dissolved)	mg/L	--	--	7.99	8.95	8.29	10.7	10.1	9.76	9.61	12.1	9.42	1.14	1.2	1.15	1.22
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	486	494	519	513	516	527	526	465	**530**	355	347	319	304
Ammonia-N	mg/L	--	--	<0.1	<0.1	0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.039	<0.02	<0.071	<0.628
Chloride	mg/L	250 (AO)	126	15	31	15	21	16	18	13	18	25	8.39	7.82	7.9	7.98
Conductivity	uS/cm	--	--	988	1000	963	1060	1040	1040	1040	946	1120	647	637	601	565
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	2	2	1	<2	2	1	2	2	2.2	2.1	2.1	3.36
Hardness	mg/L	80-100 (OG)	--	529	566	533	555	654	539	587	604	511	308	315	306	307
Nitrate (as N)	mg/L	10	2.6	<0.06	0.21	0.1	0.15	0.24	0.68	0.31	0.38	0.2	0.052	0.052	0.042	<0.02
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01
Orthophosphate	mg/L	--	--	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.0032	0.0045	<0.003	<0.003
pH	s.u.	6.5-8.5 (OG)	--	8.17	7.75	7.56	7.66	8.22	7.83	7.93	8.06	7.86	8.06	8.16	8.06	7.79
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0017	<0.001	<0.0182	<0.004
Sulfate	mg/L	500 (AO)	269	85	65	66	64	67	70	76	68	64	12.6	12.5	13	13.6
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	0.24	<0.22	0.42	<0.53
Field Parameters																
Conductivity, field	uS/cm	--	--	1420	1130	930	900	1120	975	875	922	1330	596	544	371	747
pH, field	s.u.	6.5-8.5 (OG)	--	7.52	6.68	7.06	6.99	6.68	6.9	6.8	7.23	7.82	8.04	6.52	7.33	7.3
Temperature, field	Deg C	15 (AO)	--	7.9	8.81	14.7	9.93	8.1	9.3	13.1	12.12	8.17	7.3	9.4	7.04	10.22

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
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.
R Rejected.
36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW3	MW3	MW3
Sample ID:				GW-WARD3-19-002	GW-WARD3-19-006	GW-WARD3-19-006	MW2	GW-WARD 3-001	GW-WARD 3-005	GW-WARD 3-001	GW-WARD3-12/2/22-15	MW2	MW2	GW-WARD3-041117-001	GW-WARD3-112317-009	GW-WARD3-051818-008
Sample Date:				5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.011	0.04	0.037	0.042	0.041	-	0.049	0.088	0.042	0.097	<0.005	<0.0076	0.0055
Boron (dissolved)	mg/L	5	1.5	-	0.184	0.151	0.183	0.163	-	0.194	0.167	0.394	0.149	0.268	0.301	0.308
Calcium (dissolved)	mg/L	--	--	72.9	76.9	78.9	75	83.8	68.7	63.5	61.8	24	70.6	29.9	29.9	28.6
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.011	0.041	0.046	0.042	0.036	0.071	0.07	0.173	0.044	0.17	<0.01	0.013	<0.01
Magnesium (dissolved)	mg/L	--	--	32.3	32.5	34.7	31.3	34.5	33.8	34.1	32.9	13.5	33.9	13.9	14.6	13.8
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00158	0.00713	0.01548	0.0139	0.0072	0.00615	0.00605	0.0192	0.0104	0.0245	<0.0005	0.00264	0.00121
Phosphorus (dissolved)	mg/L	--	--	<0.003	0.097	0.079	0.005	0.036	0.038	0.024	0.064	0.15	0.36	<0.05	<0.05	<0.05
Potassium (dissolved)	mg/L	--	--	1.09	4.01	1.36	1.19	1.32	1.26	1.18	1.34	1.45	1.2	0.87	1.25	0.888
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	328	318	334	318	317	317	296	330	306	332	184	186	176
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.046	<0.02
Chloride	mg/L	250 (AO)	126	8	7	7	7	9	10	10	9	8	7	1.62	1.42	1.41
Conductivity	uS/cm	--	--	614	587	613	628	621	581	578	597	597	662	427	407	388
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	3	2	2	2	<2	2	2	2	2	2	<1	<1	1
Hardness	mg/L	80-100 (OG)	--	315	326	340	316	351	311	299	290	116	316	132	135	128
Nitrate (as N)	mg/L	10	2.6	<0.06	0.12	0.16	0.07	0.11	0.13	0.13	0.27	0.47	0.09	0.076	0.072	0.103
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	0.0051	0.0063	0.0049
pH	s.u.	6.5-8.5 (OG)	--	8.22	8.14	8.08	8.14	8.32	8.31	8.18	8.11	8.17	8	8.22	8.25	8.2
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0011	<0.001	<0.0077
Sulfate	mg/L	500 (AO)	269	13	13	14	12	16	17	16	15	15	15	38.4	38.7	43.5
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.15	<0.15	<0.15
Field Parameters																
Conductivity, field	uS/cm	--	--	1110	730	695	710	950	681	458	463	565	800	398	357	239
pH, field	s.u.	6.5-8.5 (OG)	--	7.64	7.29	7.43	7.37	6.99	7.43	7.9	7.87	7.9	7.79	8.14	6.59	7.64
Temperature, field	Deg C	15 (AO)	--	7.23	7.5	**15.2**	8.81	6.9	8.4	14.8	7.78	11.48	3.65	7.7	8.6	7.79

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW5
Sample ID:				GW-WARD3-110418-001	GW-WARD3-19-008	GW-WARD3-19-010	GW-WARD3-19-001	MW3	GW-WARD 3-006	GW-WARD 3-007	GW-WARD 3-006	GW-WARD3-12/2/22-05	MW3	Field Duplicate	MW3	GW-WARD3-041117-002
Sample Date:				11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	5/19/2023 Duplicate	11/7/2023	4/11/2017
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.0085	0.002	0.006	0.008	0.022	<0.014	-	0.002	0.011	0.009	0.013	0.036	<0.005
Boron (dissolved)	mg/L	5	1.5	0.306	-	0.346	0.366	0.342	0.284	-	0.369	0.31	0.099	0.317	0.342	0.129
Calcium (dissolved)	mg/L	--	--	28.4	28.2	30	30.1	28.2	32.3	28.2	29.4	27.9	171	25.7	24.7	35.2
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.018	<0.007	0.008	0.033	0.032	0.027	<0.007	<0.007	0.019	**1.87**	0.027	0.035	<0.01
Magnesium (dissolved)	mg/L	--	--	13.8	12.7	12.7	13.4	11.8	13.1	13	13.1	12	18.4	11.9	11.4	13.2
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00236	<0.00017	0.00093	0.00326	0.00342	0.0024	0.0007	0.0002	0.00165	**1.13**	0.00117	0.00217	<0.0005
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.003	0.008	0.053	<0.003	0.011	0.025	0.007	0.017	<0.003	0.004	0.024	<0.05
Potassium (dissolved)	mg/L	--	--	0.881	0.776	0.891	1.57	0.779	0.939	0.916	0.812	0.871	3.75	0.734	0.808	1.88
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	173	172	162	165	155	159	161	162	162	160	156	156	208
Ammonia-N	mg/L	--	--	<0.229	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02
Chloride	mg/L	250 (AO)	126	1.43	2	1	<1	2	<1	<1	<1	<1	<1	<1	2	1.11
Conductivity	uS/cm	--	--	374	412	397	396	400	396	377	402	398	396	392	393	463
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1.89	<1	1	<1	<1	<1	<1	1	1	<1	<1	1	2
Hardness	mg/L	80-100 (OG)	--	128	123	127	130	119	134	124	127	119	502	113	109	142
Nitrate (as N)	mg/L	10	2.6	0.073	0.11	0.12	0.25	0.12	0.14	0.13	0.15	0.26	0.14	0.14	0.19	0.092
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01
Orthophosphate	mg/L	--	--	0.0066	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.0077
pH	s.u.	6.5-8.5 (OG)	--	8.01	8.17	8.16	8.25	8.35	8.12	8.34	8.25	8.09	8.3	8.3	7.96	8.25
Phenolics (total)	mg/L	--	--	<0.0043	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0012
Sulfate	mg/L	500 (AO)	269	44.2	54	44	45	45	49	51	50	48	47	47	43	35.8
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.31	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.15
Field Parameters																
Conductivity, field	uS/cm	--	--	489	400	575	451	451	593	450	397	476	365	365	401	431
pH, field	s.u.	6.5-8.5 (OG)	--	7.62	7.88	8.28	7.58	7.63	6.98	7.6	7.62	8.09	8.25	8.25	8.4	8.19
Temperature, field	Deg C	15 (AO)	--	9.56	8.19	6.86	13.8	9.02	8.4	8.6	12.5	8.39	11.64	11.64	9.97	7.5

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5
Sample ID:				GW-WARD3-112317-007	GW-WARD3-051818-001	GW-WARD3-110418-012	GW-WARD3-110418-014	GW-WARD3-19-015	GW-WARD3-19-009	GW-WARD3-19-002	MW5	GW-WARD 3-005	GW-WARD 3-008	GW-WARD 3-009	GW-WARD3-12/2/22-08	MW5
Sample Date:				11/23/2017	5/18/2018	11/4/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]				Duplicate									
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	<0.005	<0.005	<0.005	<0.005	<0.001	0.001	0.018	<0.001	<0.001	-	<0.001	0.003	0.004
Boron (dissolved)	mg/L	5	1.5	0.194	0.141	0.19	0.187	-	0.126	0.126	0.172	0.082	-	0.113	0.101	0.055
Calcium (dissolved)	mg/L	--	--	36	46.3	41	41	38.7	37.4	52.9	47.1	73.2	72.8	76.7	54	77.1
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.01	<0.01	<0.01	<0.01	<0.007	<0.007	0.023	<0.007	<0.007	<0.007	<0.007	<0.007	0.01
Magnesium (dissolved)	mg/L	--	--	18.2	22.1	20.3	20.9	17.7	12.7	18.9	17	21.3	22.5	22.4	17	19.4
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00066	0.00055	<0.0005	0.00056	0.00034	<0.00051	0.00182	0.00018	<0.00019	0.0007	0.00018	0.0008	0.00151
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.05	0.056	0.058	0.007	0.009	0.008	<0.003	0.013	0.007	0.006	0.02	0.012
Potassium (dissolved)	mg/L	--	--	1.56	1.47	1.94	1.94	1.48	4.16	2.46	1.92	2.56	1.83	1.58	1.63	1.71
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	222	258	244	225	268	212	254	223	257	297	283	230	259
Ammonia-N	mg/L	--	--	0.153	<0.036	<0.545	<0.688	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	1.24	1.86	1.79	1.82	2	3	1	2	3	3	5	4	7
Conductivity	uS/cm	--	--	516	570	537	492	510	392	479	490	517	542	549	458	519
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1.3	2	<2.44	<2.28	<1	3	2	1	<3	2	3	3	2
Hardness	mg/L	80-100 (OG)	--	165	207	186	188	170	146	210	188	270	274	284	205	272
Nitrate (as N)	mg/L	10	2.6	0.11	0.078	0.147	0.152	0.09	0.08	0.08	0.13	0.06	0.11	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<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
Orthophosphate	mg/L	--	--	0.0097	0.0061	0.0343	0.0337	0.06	0.05	<0.03	0.06	<0.03	<0.03	<0.03	<0.03	0.06
pH	s.u.	6.5-8.5 (OG)	--	8.17	8.1	7.82	7.92	7.7	8.26	8.05	8.13	8.35	8.18	8.1	8	8.25
Phenolics (total)	mg/L	--	--	<0.001	<0.0051	<0.0032	<0.0049	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	55.7	50.2	50.9	50.8	53	28	30	33	26	22	14	22	11
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<1.5	0.87	<0.68	<0.94	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	428	327	635	635	509	483	559	560	619	672	582	688	554
pH, field	s.u.	6.5-8.5 (OG)	--	6.6	7.44	7.72	7.72	8.41	7.42	7.72	7.64	7.34	7.2	7.12	8.19	7.12
Temperature, field	Deg C	15 (AO)	--	10.3	7.87	10.13	10.13	8.65	8.34	14.3	9.29	7.98	9.5	14.1	3.87	11.85

Notes:

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(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW5	MW5	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6
Sample ID:				MW5	Field Duplicate	GW-WARD3-041117-014	GW-WARD3-112317-008	GW-WARD3-051818-003	GW-WARD3-110418-004	GW-WARD3-19-014	GW-WARD3-19-002	GW-WARD3-19-010	MW6	GW-WARD 3-012	GW-WARD 3-014	GW-WARD 3-014
Sample Date:				11/7/2023	11/7/2023 Duplicate	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.003	0.002	0.0199	<0.0154	0.014	0.0123	0.009	0.031	0.012	0.01	<0.008	-	0.008
Boron (dissolved)	mg/L	5	1.5	0.092	0.089	0.339	0.357	0.352	0.361	-	0.425	0.369	0.38	0.326	-	0.434
Calcium (dissolved)	mg/L	--	--	54.9	54.5	14.2	15.4	14.7	15.1	14.4	18	16.2	14.9	17.2	13.9	16.5
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.007	0.014	0.019	0.016	0.017	0.012	<0.009	0.034	0.018	0.01	<0.007	0.017	0.008
Magnesium (dissolved)	mg/L	--	--	17.3	17.2	5.81	6.53	6.06	6.26	5.76	6.16	6.23	5.76	6.29	5.42	5.98
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00221	0.00252	0.00061	0.00073	0.001	0.00069	0.00029	0.00088	0.00041	0.00043	<0.00018	0.00022	0.00027
Phosphorus (dissolved)	mg/L	--	--	0.009	0.012	<0.05	<0.05	<0.05	<0.05	<0.003	0.008	<0.003	<0.003	0.005	<0.003	0.009
Potassium (dissolved)	mg/L	--	--	1.78	1.96	0.594	0.616	0.604	0.638	0.529	0.644	0.615	0.54	0.646	0.531	0.601
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	237	260	151	140	139	137	172	165	132	136	131	150	137
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.02	<0.165	<0.086	<0.093	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	3	3	0.83	0.78	0.83	0.87	2	1	<1	1	1	<1	<1
Conductivity	uS/cm	--	--	505	500	278	277	270	255	274	275	263	276	272	264	277
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	2	1.3	1.1	1.9	<1.65	2	1	1	1	<2	<1	<1
Hardness	mg/L	80-100 (OG)	--	208	207	59	65	62	63	59.6	70.4	66.1	60.8	68.8	56.9	65.9
Nitrate (as N)	mg/L	10	2.6	0.07	0.07	0.072	0.029	0.041	0.04	<0.06	<0.06	0.07	0.1	0.09	0.09	0.08
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.16	0.1	0.0075	0.0039	0.005	0.0031	0.06	0.1	<0.03	<0.03	<0.03	0.04	0.04
pH	s.u.	6.5-8.5 (OG)	--	8.13	8.09	8.3	8.27	8.22	8.14	7.8	8.11	8.27	8.32	8.07	8.23	8.22
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.0024	<0.001	0.0314	<0.0035	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	32	32	7.83	7.71	7.98	8.84	8	12	16	7	8	8	9
Total kjeldahl nitrogen (TKN)	mg/L	--	--	0.8	<5	<0.15	<0.19	<0.15	<0.15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	479	479	314	296	181	345	353	344	333	324	338	306	332
pH, field	s.u.	6.5-8.5 (OG)	--	8.16	8.16	8.03	6.44	7.36	7.58	7.9	7.57	8.09	7.78	7.35	7.66	7.34
Temperature, field	Deg C	15 (AO)	--	10.58	10.58	8.1	8.4	8.04	9.42	8.28	6.52	11.8	9.12	8.1	8.1	10.9

Notes:

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(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW6	MW6	MW6	MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7
Sample ID:				GW-WARD3-12/2/22-10	MW6	MW6	GW-WARD3-041117-004	GW-WARD3-041117-006	GW-WARD3-112317-003	GW-WARD3-051818-007	GW-WARD3-110418-010	GW-WARD3-19-004	GW-WARD3-19-003	GW-WARD3-19-007	MW7	GW-WARD 3-003
Sample Date:				12/2/2022	5/19/2023	11/7/2023	4/11/2017	4/11/2017 Duplicate	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.121	0.017	0.019	<0.005	<0.005	<0.005	<0.005	<0.005	0.001	0.002	0.002	0.002	<0.009
Boron (dissolved)	mg/L	5	1.5	0.31	0.32	0.358	0.329	0.329	0.378	0.283	0.326	-	0.384	0.356	0.359	0.345
Calcium (dissolved)	mg/L	--	--	17.3	14.9	14.4	30	29.2	30.3	63.3	47	41.8	41.3	34.3	35.1	41
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.194	0.025	0.02	<0.01	<0.01	<0.01	**0.833**	0.091	**0.39**	**0.361**	**0.873**	0.021	**0.805**
Magnesium (dissolved)	mg/L	--	--	6.23	5.95	5.94	17.9	17.4	18.5	33.5	27.7	22.2	21.3	19.4	17.8	19.9
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00658	0.00055	0.00163	<0.0005	<0.0005	<0.0005	**0.129**	**0.0595**	**0.131**	0.0146	**0.13**	0.00198	**0.144**
Phosphorus (dissolved)	mg/L	--	--	0.021	0.004	0.01	<0.05	<0.05	<0.05	<0.05	0.055	0.041	0.051	0.126	0.069	0.108
Potassium (dissolved)	mg/L	--	--	0.661	0.652	0.584	1.1	1.08	1.24	1.45	1.54	1.19	1.56	1.56	1.64	1.56
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	140	236	139	208	207	216	313	260	258	237	220	209	217
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.02	<0.02	0.129	<0.13	<0.924	<0.1	<0.1	0.3	<0.1	0.1
Chloride	mg/L	250 (AO)	126	<1	8	7	4.91	4.96	3.38	16.5	11.4	8	6	4	4	4
Conductivity	uS/cm	--	--	278	263	269	476	477	475	643	536	541	479	458	472	476
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1	<1	1	1.1	1.2	1.5	2.9	<3.04	2	2	2	2	<3
Hardness	mg/L	80-100 (OG)	--	68.9	61.6	60.5	149	144	152	296	231	196	191	166	161	184
Nitrate (as N)	mg/L	10	2.6	0.08	0.08	0.11	0.132	0.14	0.047	<0.02	<0.02	<0.06	0.28	<0.06	0.18	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	0.98	0.16	0.0164	0.0151	0.0266	<0.003	0.0323	<0.03	<0.03	<0.03	0.06	0.03
pH	s.u.	6.5-8.5 (OG)	--	8	8.24	8	8.22	8.23	8.12	7.9	7.67	8.18	7.94	8.08	8.21	8.28
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.0011	<0.0014	<0.001	<0.0091	<0.0061	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	9	<2	29	39.2	39.6	38.6	32	32.4	33	30	28	32	34
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<5	<0.15	<0.15	0.36	0.46	<1.22	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	294	261	272	439	439	400	371	687	685	582	5.49	533	592
pH, field	s.u.	6.5-8.5 (OG)	--	7.84	8.35	8.48	8.03	8.03	6.45	7.23	7.43	7.86	7.23	7.49	7.47	7.13
Temperature, field	Deg C	15 (AO)	--	7.73	11.14	9.73	7.5	7.5	8.3	7.47	8.87	7.53	7.33	11.1	8.62	7.23

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW7	MW7	MW7	MW7	MW7	MW7	MW8	MW8	MW8	MW8	MW8	MW8	MW8
Sample ID:				GW-WARD 3-006	GW-WARD 3-008	GW-WARD3-12/2/22-13	GW-WARD3-12/2/22-14	MW7	MW7	GW-WARD3-041117-008	GW-WARD3-112317-001	GW-WARD3-051818-004	GW-WARD3-19-007	GW-WARD3-19-001	GW-WARD3-19-008	GW-WARD3-19-004
Sample Date:				12/12/2021	6/28/2022	12/2/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	5/21/2019	12/7/2019	12/7/2019	8/11/2020
							Duplicate								Duplicate	
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	-	0.004	0.004	0.004	0.005	0.005	<0.005	<0.005	<0.005	0.002	0.001	0.002	0.002
Boron (dissolved)	mg/L	5	1.5	-	0.422	0.36	0.353	0.062	0.396	0.447	0.454	0.455	-	0.523	0.533	0.445
Calcium (dissolved)	mg/L	--	--	32	34.8	31.9	32.6	75.9	29.2	22.1	22.2	22.6	22.9	25	25.5	23.8
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.02	**0.979**	0.065	0.052	0.012	0.042	<0.01	<0.01	<0.01	<0.007	<0.007	<0.007	0.01
Magnesium (dissolved)	mg/L	--	--	18.4	19	17.9	17.6	19	18.3	13.8	14.9	14.3	13.5	13.9	14.1	14.6
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00052	**0.0966**	0.0082	0.00873	0.00165	**0.0657**	<0.0005	0.00099	<0.0005	0.00074	0.00092	<0.00054	0.00081
Phosphorus (dissolved)	mg/L	--	--	0.061	0.131	0.33	0.354	0.013	2.06	<0.05	<0.05	<0.05	0.009	0.017	0.012	0.003
Potassium (dissolved)	mg/L	--	--	1.48	1.23	2.03	2.02	1.71	3.32	0.947	1.08	0.974	0.917	1.04	1.05	1
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	213	217	217	219	217	292	190	177	174	185	177	178	184
Ammonia-N	mg/L	--	--	<0.1	0.1	0.1	0.1	0.2	17.8	0.095	0.057	<0.027	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	4	5	4	4	6	6	1.21	1.18	1.24	2	1	1	<1
Conductivity	uS/cm	--	--	450	468	469	469	479	600	439	435	409	440	416	429	415
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1	4	2	2	2	**13**	<1	<1	<1	2	1	2	1
Hardness	mg/L	80-100 (OG)	--	156	165	153	154	268	149	112	117	115	113	120	122	119
Nitrate (as N)	mg/L	10	2.6	0.2	<0.06	0.13	0.13	0.14	<0.06	0.079	<0.02	0.094	0.08	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.04	0.05	0.14	0.13	0.04	1.3	0.0083	0.0046	0.0078	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.18	8.25	8.04	8.05	8.31	7.95	8.27	8.27	8.21	8.23	8.22	8.18	8.26
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	0.002	0.26	<0.0016	<0.001	<0.0098	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	37	37	36	37	32	5	42.5	41.4	42.7	48	43	43	42
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	19.6	<0.15	0.36	<0.15	<0.5	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	459	528	503	503	457	710	449	448	252	448	502	502	519
pH, field	s.u.	6.5-8.5 (OG)	--	7.35	7.36	7.66	7.66	7.94	7.59	8.44	6.46	7.67	8.38	7.4	7.4	7.65
Temperature, field	Deg C	15 (AO)	--	7.8	11.9	6.71	6.71	13	7.56	8.1	10.2	8.33	8.3	8.7	8.7	14.1

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.

(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW9	MW9	MW9	MW9	MW9	MW9
Sample ID:				**MW8**	**GW-WARD 3-002**	**GW-WARD 3-001**	**GW-WARD 3-011**	**GW-WARD3-12/2/22-09**	**MW8**	**MW8**	**GW-WARD3-041117-007**	**GW-WARD3-112317-002**	**GW-WARD3-051818-005**	**GW-WARD3-19-001**	**GW-WARD3-19-005**	**GW-WARD3-19-003**
Sample Date:				**11/29/2020**	**12/12/2021**	**12/12/2021 Duplicate**	**6/28/2022**	**12/2/2022**	**5/19/2023**	**11/7/2023**	**4/11/2017**	**11/23/2017**	**5/18/2018**	**5/21/2019**	**12/7/2019**	**8/11/2020**
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.002	-	-	0.001	0.004	0.012	0.006	0.0111	<0.0365	0.0265	0.018	0.039	0.038
Boron (dissolved)	mg/L	5	1.5	0.457	-	-	0.499	0.39	0.297	0.475	0.43	0.415	0.435	-	0.51	0.43
Calcium (dissolved)	mg/L	--	--	22.2	20.2	19.8	25.2	24.2	27.4	20	24.8	24.4	26.9	26.2	29.2	26.6
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.007	0.007	<0.007	<0.007	0.011	0.018	<0.007	<0.01	0.05	0.036	<0.014	0.038	0.046
Magnesium (dissolved)	mg/L	--	--	13.2	11.8	11.6	14.3	13.7	11.4	12.7	12.7	14.1	13.7	13.3	13.5	13.7
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00038	0.00253	0.00235	0.00379	0.0135	0.00127	0.00281	0.00169	0.00448	0.00378	0.00118	0.00308	0.00421
Phosphorus (dissolved)	mg/L	--	--	<0.003	0.094	0.089	0.034	0.021	<0.003	0.308	<0.05	<0.05	<0.05	0.042	0.025	0.025
Potassium (dissolved)	mg/L	--	--	0.902	8.11	7.98	1.11	1.44	0.813	1.08	0.917	0.936	0.909	0.925	0.993	0.97
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	171	153	165	179	160	186	180	179	182	165	175	168	174
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.123	<0.031	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	2	2	2	1	1	<1	4	0.74	0.79	0.8	1	<1	<1
Conductivity	uS/cm	--	--	431	368	363	426	375	441	431	441	435	411	441	423	413
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	<1	<1	<1	<1	3	3	1.1	<1	<1	2	1	1
Hardness	mg/L	80-100 (OG)	--	110	98.7	97.1	122	117	115	102	114	119	124	120	128	123
Nitrate (as N)	mg/L	10	2.6	<0.06	0.98	0.98	0.08	0.32	0.11	0.12	0.073	0.027	0.077	0.09	<0.06	0.13
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	0.04	0.0189	0.0122	0.0155	<0.03	0.05	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.22	8.23	8.22	8.22	8.02	8.33	8.1	8.27	8.28	8.22	8.24	8.17	8.24
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0016	<0.001	<0.0077	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	42	41	41	48	40	44	42	43	49.1	54.8	60	55	52
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.15	0.47	0.26	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	534	476	476	412	384	410	514	456	424	255	444	494	489
pH, field	s.u.	6.5-8.5 (OG)	--	7.7	7.29	7.29	7.91	7.83	8.26	8.04	8.42	6.51	7.7	8.29	7.48	7.16
Temperature, field	Deg C	15 (AO)	--	8.57	8.9	8.9	12.5	8.57	13.61	8.59	8.2	10.4	8.54	8.57	9.55	12.6

Notes:

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(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW10	MW10	MW10	MW10	MW10	MW10
Sample ID:				**MW9**	**DUP**	**GW-WARD 3-003**	**GW-WARD 3-010**	**GW-WARD 3-012**	**GW-WARD3-12/2/22-11**	**MW9**	**GW-WARD3-041117-003**	**GW-WARD3-112317-004**	**GW-WARD3-051818-009**	**GW-WARD3-110418-005**	**GW-WARD3-19-005**	**GW-WARD3-19-007**
Sample Date:				**11/29/2020**	**11/29/2020 Duplicate**	**12/12/2021**	**6/28/2022**	**6/28/2022 Duplicate**	**12/2/2022**	**11/7/2023**	**4/11/2017**	**11/23/2017**	**5/18/2018**	**11/4/2018**	**5/21/2019**	**12/7/2019**
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.016	0.018	-	0.015	0.011	0.157	0.016	<0.005	<0.0153	0.0406	0.0915	0.019	0.062
Boron (dissolved)	mg/L	5	1.5	0.419	0.426	-	0.519	0.461	0.396	0.456	0.257	0.272	0.267	0.283	-	0.328
Calcium (dissolved)	mg/L	--	--	25.4	24.7	22.6	28.3	28.4	26.5	23.8	31.4	31.6	31.1	33.6	32.8	37.1
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.014	0.012	0.025	0.014	0.015	0.216	0.053	<0.01	0.015	0.039	0.106	<0.018	0.033
Magnesium (dissolved)	mg/L	--	--	12.7	12.3	11.9	14.2	14.4	14.1	12.8	21.9	23.3	22.8	23.8	21	22.4
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00104	0.0013	0.00213	0.00108	0.00108	0.0116	0.0205	0.00054	0.00236	0.00697	0.0109	0.00146	0.00237
Phosphorus (dissolved)	mg/L	--	--	0.015	0.017	0.051	0.024	0.025	0.053	0.509	<0.05	<0.05	<0.05	<0.05	0.006	0.016
Potassium (dissolved)	mg/L	--	--	0.866	0.851	0.882	0.926	0.911	1.06	0.912	1.09	1.2	1.08	1.25	1.02	1.32
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	161	165	170	170	170	175	174	245	234	235	225	237	225
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.02	<0.076	<0.02	<0.109	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	1	1	<1	<1	<1	<1	1	<0.5	0.53	0.57	0.59	1	<1
Conductivity	uS/cm	--	--	430	425	407	426	427	421	436	476	480	460	429	478	474
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	1	<1	1	<1	2	2	<1	<1	<1	<1.2	<1	1
Hardness	mg/L	80-100 (OG)	--	116	112	105	129	130	124	112	169	175	172	182	168	185
Nitrate (as N)	mg/L	10	2.6	0.17	0.19	0.24	0.1	0.1	<0.06	0.08	0.034	0.143	0.052	0.101	0.06	0.11
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.04	0.04	<0.03	0.05	0.04	<0.03	0.03	0.0053	0.0531	0.0041	0.0147	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.39	8.33	8.28	8.16	8.18	8.08	7.88	8.2	8.26	8.2	8.12	8.21	8.24
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0013	<0.001	<0.0065	<0.0019	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	52	51	57	56	58	49	54	19	23	23.9	24.4	30	24
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.15	<0.15	<0.15	<0.15	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	498	498	448	410	410	435	512	439	404	281	561	447	647
pH, field	s.u.	6.5-8.5 (OG)	--	7.83	7.83	7.45	7.8	7.8	7.79	8.09	7.91	6.51	7.42	7.49	7.82	7.52
Temperature, field	Deg C	15 (AO)	--	7.87	7.87	9.5	12.3	12.3	8.37	8.24	7.3	9.7	7.3	10.34	7.57	7.65

Notes:

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(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW10	MW10	MW10	MW10	MW10	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11
Sample ID:				GW-WARD3-19-008	MW10	GW-WARD 3-004	GW-WARD 3-009	GW-WARD 3-007	GW-WARD3-041117-013	GW-WARD3-112317-014	GW-WARD3-051818-014	GW-WARD3-110418-008	GW-WARD3-19-009	GW-WARD3-19-013	GW-WARD3-19-012	MW11
Sample Date:				8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.069	0.079	0.081	-	0.033	<0.005	<0.0057	<0.005	<0.05	0.003	0.052	0.023	0.02
Boron (dissolved)	mg/L	5	1.5	0.264	0.309	0.279	-	0.322	0.295	0.333	0.332	0.45	-	0.407	0.31	0.374
Calcium (dissolved)	mg/L	--	--	35.3	36.3	38.6	33.2	36.3	55.8	46.4	46.9	114	45.1	44.5	46.3	43.1
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.084	0.053	0.066	0.031	0.121	<0.01	0.016	0.012	0.28	<0.007	0.023	0.024	0.013
Magnesium (dissolved)	mg/L	--	--	23.6	21.5	22.7	22.4	24.2	27.5	25.6	24.1	54.7	22.6	21.8	23.1	19.7
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00614	0.00583	0.0072	0.00495	**0.157**	0.00054	0.00164	0.0029	**0.0965**	0.001	0.00508	0.00327	0.00307
Phosphorus (dissolved)	mg/L	--	--	0.013	0.019	0.033	0.026	0.085	<0.05	0.141	0.082	0.51	0.063	0.149	0.08	0.028
Potassium (dissolved)	mg/L	--	--	1.23	1.5	1.3	1.2	1.3	1.23	3.21	1.78	10.1	1.32	2.75	1.99	1.45
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	231	241	226	235	230	258	248	239	499	245	217	234	208
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	0.3	<0.02	<0.316	<0.029	4.8	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	<1	1	<1	<1	<1	5.14	3.73	3.37	20	3	2	2	3
Conductivity	uS/cm	--	--	452	471	468	450	473	730	657	645	948	648	589	589	583
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1	<1	<2	<1	<1	2.4	1.8	2.1	3.72	1	2	2	1
Hardness	mg/L	80-100 (OG)	--	185	179	190	175	190	253	221	216	510	206	201	211	189
Nitrate (as N)	mg/L	10	2.6	<0.06	0.14	0.1	0.13	<0.06	0.049	0.023	0.111	0.054	0.08	0.08	0.09	0.09
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	0.011	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	<0.03	0.04	0.0038	0.005	0.0139	0.099	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.16	8.36	8.35	8.26	8.24	8.1	8.22	8.15	7.25	8.17	8.17	8.16	8.12
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	0.017	<0.0022	<0.001	<0.0041	<0.01	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	25	22	28	27	32	127	107	105	71.2	99	93	99	91
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.15	<0.63	0.17	10.3	<0.5	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	569	524	536	510	464	696	546	392	721	612	714	680	686
pH, field	s.u.	6.5-8.5 (OG)	--	7.68	7.67	7.21	7.59	7.42	7.46	6.44	7.22	7.31	7.73	7.87	7.16	7.13
Temperature, field	Deg C	15 (AO)	--	13.2	9.27	7.3	8.6	12.2	7.6	9.9	7.67	9.55	7.78	8.29	11.3	8.89

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW12	MW12	MW12	MW12	MW12	MW12
Sample ID:				GW-WARD 3-008	GW-WARD 3-009	GW-WARD 3-011	GW-WARD 3-005	GW-WARD3-12/2/22-01	MW11	MW11	GW-WARD3-041117-010	GW-WARD3-112317-012	GW-WARD3-051818-010	GW-WARD3-110418-006	GW-WARD3-19-010	GW-WARD3-19-011
Sample Date:				5/12/2021	5/12/2021 Duplicate	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	<0.005	<0.005	-	0.016	0.096	0.314	0.16	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Boron (dissolved)	mg/L	5	1.5	0.319	0.29	-	0.358	0.327	0.3	0.357	0.128	0.116	0.186	0.042	-	0.075
Calcium (dissolved)	mg/L	--	--	51.6	51.9	41.6	48.4	43.3	55.1	43.5	125	131	157	93.4	117	121
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.007	<0.007	0.01	0.021	0.101	**0.432**	0.22	**0.454**	**3.99**	**17.3**	0.144	**2.71**	0.047
Magnesium (dissolved)	mg/L	--	--	23.7	23.2	22	24.3	20.7	22.9	22.3	29.1	31.2	34	20.4	23.4	22.7
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00097	0.00099	0.00216	0.00229	0.0158	0.02143	0.0171	**0.159**	**0.141**	**0.237**	0.0296	**0.177**	**0.16**
Phosphorus (dissolved)	mg/L	--	--	0.016	0.017	0.109	0.095	0.21	0.079	0.122	<0.05	<0.05	<0.05	<0.05	<0.003	<0.003
Potassium (dissolved)	mg/L	--	--	1.21	1.2	2.08	1.92	1.57	1.26	1.61	7.87	6.6	7.95	2.86	5.64	4.17
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	223	228	222	231	221	235	222	557	583	515	295	447	365
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	4.41	3.54	3.51	<0.727	3.3	1.2
Chloride	mg/L	250 (AO)	126	2	3	3	3	3	3	4	4.7	4.99	4.36	1.27	3	2
Conductivity	uS/cm	--	--	613	613	559	620	587	626	602	1020	1060	967	539	800	658
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<2	<2	2	1	2	1	4	4.5	4.8	**6.5**	3.96	4	3
Hardness	mg/L	80-100 (OG)	--	227	225	194	221	193	232	200	431	455	533	317	390	396
Nitrate (as N)	mg/L	10	2.6	0.1	0.1	0.21	0.09	0.06	0.08	0.15	0.029	0.131	0.022	0.888	<0.06	0.36
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	<0.03	0.18	<0.03	0.2	<0.003	<0.003	<0.003	<0.003	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.19	8.21	8.24	8.17	8.1	8.29	8.08	7.45	7.68	7.29	7.32	7.22	7.95
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0036	0.0013	<0.0063	<0.0039	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	96	100	96	96	90	90	89	12	9.01	14.4	14	8	7
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.8	5.36	4.92	4.57	<1.05	2.8	1.1
Field Parameters																
Conductivity, field	uS/cm	--	--	718	718	1010	539	602	575	666	968	682	609	649	1290	797
pH, field	s.u.	6.5-8.5 (OG)	--	6.85	6.85	6.46	7.28	7.81	7.88	7.34	6.87	6.45	6.62	7.14	7.06	7.6
Temperature, field	Deg C	15 (AO)	--	8.1	8.1	7.9	13.5	8.57	10.33	10.53	7.1	8.7	7.24	10	6.92	7.53

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW12	MW12	MW12	MW12	MW12	MW12	MW12	MW12	MW13	MW13	MW13	MW13	MW13
Sample ID:				GW-Ward3-19-011	MW12	GW-WARD 3-010	GW-WARD 3-012	GW-WARD 3-003	GW-WARD3-12/2/22-04	MW12	MW12	GW-WARD3-041117-011	GW-WARD3-112317-013	GW-WARD3-051818-011	GW-WARD3-110418-003	GW-WARD3-19-013
Sample Date:				8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	<0.001	<0.001	<0.001	-	<0.001	<0.001	0.001	<0.001	0.0099	<0.0051	<0.005	0.0081	0.082
Boron (dissolved)	mg/L	5	1.5	0.095	0.047	0.085	-	0.124	0.071	0.081	0.069	0.016	0.015	0.02	0.02	-
Calcium (dissolved)	mg/L	--	--	116	93	152	107	129	113	182	135	60.2	59.7	57.8	56.7	68.8
Iron (dissolved)	mg/L	0.30 (AO)	0.17	**1.52**	0.071	**11.1**	**0.752**	**3.21**	**3.66**	**14.7**	**9.91**	<0.01	<0.01	0.022	<0.01	0.062
Magnesium (dissolved)	mg/L	--	--	22.5	18.2	28.1	24.1	29.5	24.7	37.1	29.9	18.3	18.7	20.8	20.6	20.1
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	**0.109**	0.0484	**0.188**	**0.102**	**0.166**	**0.205**	**0.299**	**0.21**	<0.0005	0.00088	0.00388	0.0014	0.00654
Phosphorus (dissolved)	mg/L	--	--	<0.003	<0.003	<0.003	<0.003	<0.003	0.008	<0.003	<0.003	<0.05	<0.05	<0.05	<0.05	<0.003
Potassium (dissolved)	mg/L	--	--	3.98	2.51	6.25	4.51	5.55	3.72	5.22	3.74	0.385	0.391	0.386	0.434	0.426
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	394	285	422	354	445	387	606	500	250	249	234	235	383
Ammonia-N	mg/L	--	--	2	0.3	2.6	1.4	2.3	1.1	2.5	2	0.156	<0.145	<0.065	<0.184	<0.1
Chloride	mg/L	250 (AO)	126	1	2	3	2	3	3	5	4	<0.5	<0.5	0.52	0.52	1
Conductivity	uS/cm	--	--	684	580	775	642	793	704	1090	933	441	453	410	407	453
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	3	2	<3	2	3	3	4	3	<1	<1	1.1	<2.01	1
Hardness	mg/L	80-100 (OG)	--	382	307	495	365	443	385	607	461	226	226	230	226	254
Nitrate (as N)	mg/L	10	2.6	0.29	0.98	<0.06	0.91	<0.06	0.31	<0.06	<0.06	0.024	<0.02	0.021	0.027	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.003	<0.003	<0.003	<0.003	0.05
pH	s.u.	6.5-8.5 (OG)	--	7.43	7.63	8.03	7.63	7.96	7.82	8.1	7.79	8.06	8.1	8.01	7.64	7.68
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0017	0.0011	<0.0028	<0.0045	<0.002
Sulfate	mg/L	500 (AO)	269	9	18	9	9	14	11	24	18	5.26	6.25	7.95	6.93	7
Total kjeldahl nitrogen (TKN)	mg/L	--	--	2.4	<0.5	2.6	1.4	2.8	0.9	2.7	2.5	0.77	<1.6	0.18	<0.51	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	719	630	949	718	771	741	1000	928	413	378	273	491	456
pH, field	s.u.	6.5-8.5 (OG)	--	6.99	7	6.46	6.8	6.36	6.64	6.78	7.18	7.68	6.5	7.03	6.91	7.63
Temperature, field	Deg C	15 (AO)	--	13.4	9.28	7.7	8.9	11.6	8.04	10.72	10.92	6.3	9.5	6.98	9.77	7.32

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
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(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW14	MW14	MW14	MW14
Sample ID:				GW-WARD3-19-014	GW-WARD3-19-014	MW13	GW-WARD 3-011	GW-WARD 3-013	GW-WARD 3-013	GW-WARD3-12/2/22-02	MW13	MW13	GW-WARD3-041117-012	GW-WARD3-112317-010	GW-WARD3-112317-011	GW-WARD3-051818-012
Sample Date:				12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	11/23/2017 Duplicate	5/18/2018
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.064	0.061	0.134	0.041	-	0.051	0.002	0.011	0.005	<0.005	<0.0203	<0.0227	0.009
Boron (dissolved)	mg/L	5	1.5	<0.016	0.043	0.018	<0.025	-	0.028	0.039	0.016	0.014	0.097	0.233	0.222	0.073
Calcium (dissolved)	mg/L	--	--	69.9	68.5	66.4	65.7	51.7	62.7	66	72.4	65.6	167	190	182	129
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.043	0.079	0.114	0.046	0.019	0.059	<0.007	0.017	0.023	**0.343**	**24.4**	**24.8**	**5.19**
Magnesium (dissolved)	mg/L	--	--	17.1	20.9	16.7	18.5	16.1	21	17.7	18.9	18	21.7	24.8	25.4	17.4
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00814	0.00538	0.00714	0.0076	0.00251	0.0051	0.00009	0.00235	0.00286	**1.38**	**1.41**	**1.43**	**1.38**
Phosphorus (dissolved)	mg/L	--	--	0.033	0.009	<0.003	0.005	<0.003	0.011	0.003	<0.003	0.003	<0.05	<0.05	<0.05	<0.05
Potassium (dissolved)	mg/L	--	--	0.501	0.535	0.311	0.44	0.332	0.402	0.352	0.344	0.223	5.76	8.24	8.24	4.55
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	380	257	247	220	311	232	244	226	241	515	577	588	365
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	3.73	9.88	7.13	2.62
Chloride	mg/L	250 (AO)	126	<1	<1	1	<1	<1	<1	<1	<1	2	1.96	4.1	3.98	1.13
Conductivity	uS/cm	--	--	412	421	423	416	407	418	443	418	457	1070	1070	1060	672
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1	1	<1	<1	<1	<1	2	1	1	**5.1**	**7**	**7.4**	4.1
Hardness	mg/L	80-100 (OG)	--	245	257	234	240	195	243	238	259	238	507	578	559	393
Nitrate (as N)	mg/L	10	2.6	<0.06	<0.06	0.13	<0.06	<0.06	0.06	0.08	<0.06	0.07	2.46	<0.02	<0.02	0.035
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.043	<0.01	<0.01	<0.01
Orthophosphate	mg/L	--	--	<0.03	<0.03	0.11	<0.03	0.05	<0.03	<0.03	0.05	0.12	<0.003	<0.003	<0.003	<0.003
pH	s.u.	6.5-8.5 (OG)	--	8.14	7.95	8.05	8.23	8.08	8.22	8.04	8.13	7.94	7.23	7.22	7.31	7.35
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.0032	<0.001	0.0048	<0.004
Sulfate	mg/L	500 (AO)	269	5	7	5	6	6	8	6	6	7	72.2	1.93	2.17	11.6
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<5	4.94	10.9	11.4	4.52
Field Parameters																
Conductivity, field	uS/cm	--	--	496	497	439	502	499	575	473	418	467	1060	1150	1150	614
pH, field	s.u.	6.5-8.5 (OG)	--	7.23	7.24	7.15	6.88	7.22	6.83	7.47	7.8	7.91	6.71	6.41	6.41	6.54
Temperature, field	Deg C	15 (AO)	--	6.98	12.3	8.95	7.6	7.5	11.3	8.69	10.87	10.52	5.3	9.6	9.6	6.2

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
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(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14
Sample ID:				GW-WARD3-051818-013	GW-WARD3-110418-002	GW-WARD3-19-006	GW-WARD3-19-012	GW-WARD3-19-012	GW-WARD3-19-009	GW-WARD3-19-015	MW14	GW-WARD 3-007	GW-WARD 3-010	GW-WARD 3-004	GW-WARD3-12/2/22-12	MW14
Sample Date:				5/18/2018	11/4/2018	5/21/2019	5/21/2019	12/7/2019	8/11/2020	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]	Duplicate			Duplicate			Duplicate						
Metals																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.0083	0.012	0.002	0.002	0.009	0.008	0.005	0.005	<0.011	-	0.003	0.015	0.002
Boron (dissolved)	mg/L	5	1.5	0.072	0.189	-	-	0.283	0.177	0.175	0.221	0.265	-	0.266	0.264	0.319
Calcium (dissolved)	mg/L	--	--	128	164	114	115	236	180	184	190	239	188	197	238	36.5
Iron (dissolved)	mg/L	0.30 (AO)	0.17	5.15	15.3	0.347	0.359	26.5	20.3	19.3	16.3	39.6	22.6	4.26	32.8	0.763
Magnesium (dissolved)	mg/L	--	--	17.6	20.5	11.4	11.6	25.3	29.1	29.5	24.9	29.3	28	28.1	31.5	17
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	1.36	1.41	1.05	1.07	1.73	0.916	0.948	1.62	1.68	0.702	1.38	2.08	0.05598
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.05	<0.003	<0.003	0.015	<0.003	<0.003	<0.003	0.008	0.025	0.004	0.026	0.137
Potassium (dissolved)	mg/L	--	--	4.45	6.53	1.85	1.89	7.44	6.15	6.08	7.23	9.62	7.7	7.05	7.36	1.28
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	371	532	564	467	984	459	531	675	453	629	371	705	452
Ammonia-N	mg/L	--	--	2.63	6.33	1	1	5.2	6.3	6.2	8.4	4.6	7.8	2.3	5.8	3.2
Chloride	mg/L	250 (AO)	126	1.15	2.84	2	2	10	2	2	8	4	6	2	14	2
Conductivity	uS/cm	--	--	681	996	834	765	1260	856	836	1230	890	1040	711	1280	929
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	6.1	9.26	4	4	9	5	5	7	<4	7	6	9	4
Hardness	mg/L	80-100 (OG)	--	391	494	331	334	695	570	582	576	717	586	607	725	161
Nitrate (as N)	mg/L	10	2.6	0.043	0.549	<0.06	<0.06	<0.06	0.43	0.43	0.36	0.62	0.53	0.49	<0.06	0.23
Nitrite (as N)	mg/L	1	0.3	0.013	<0.01	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	0.03	<0.03	<0.03	<0.3	<0.03
Orthophosphate	mg/L	--	--	<0.003	<0.003	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	7.45	6.61	7.01	7.17	6.96	7.17	7.01	6.91	7.84	7.11	7.77	7.28	7.95
Phenolics (total)	mg/L	--	--	<0.0031	<0.01	<0.002	<0.002	0.005	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002
Sulfate	mg/L	500 (AO)	269	12.2	7.82	21	20	11	18	18	20	39	51	27	59	78
Total kjeldahl nitrogen (TKN)	mg/L	--	--	4.16	7.94	0.8	0.9	8.1	7	7.3	9	5.9	8.1	2.6	7.3	3.3
Field Parameters																
Conductivity, field	uS/cm	--	--	614	985	1470	1470	1240	971	971	1190	950	1030	660	1280	752
pH, field	s.u.	6.5-8.5 (OG)	--	6.54	6.36	7.09	7.09	7.31	6.57	6.57	6.31	6.43	6.48	6.8	6.46	6.71
Temperature, field	Deg C	15 (AO)	--	6.2	10.19	6.48	6.48	7.38	12.9	12.9	8.98	7.2	8.6	11.9	8.92	9.49

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW14	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:				MW14	GW-WARD3-041117-015	GW-WARD3-112317-015	GW-WARD3-051818-015	GW-WARD3-110418-013	GW-WARD3-19-011	GW-WARD3-19-015	GW-WARD3-19-013	FB	GW-WARD 3-013	GW-WARD 3-015	GW-WARD3-12/2/22-03	Field Blank
Sample Date:				11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	6/28/2022	12/2/2022	5/19/2023
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]		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																
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.006	<0.005	0.016	<0.005	<0.005	<0.001	<0.001	0.042	0.003	0.004	0.004	0.035	0.015
Boron (dissolved)	mg/L	5	1.5	0.165	<0.01	<0.01	<0.01	<0.01	-	0.009	0.038	<0.002	0.01	0.014	0.027	<0.002
Calcium (dissolved)	mg/L	--	--	181	<0.05	0.121	0.107	<0.05	0.02	0.01	0.3	0.07	0.1	0.05	0.01	<0.01
Iron (dissolved)	mg/L	0.30 (AO)	0.17	**14.4**	<0.01	<0.01	<0.01	<0.01	0.011	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Magnesium (dissolved)	mg/L	--	--	24.3	<0.05	<0.05	<0.05	<0.05	0.004	0.013	0.053	0.008	0.009	0.002	0.003	0.001
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	**1.54**	<0.0005	<0.0005	<0.0005	<0.0005	0.00004	0.00012	0.00019	0.00014	0.00013	0.00021	0.00006	<0.00001
Phosphorus (dissolved)	mg/L	--	--	0.004	<0.05	<0.05	<0.05	<0.05	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium (dissolved)	mg/L	--	--	4.95	<0.05	<0.05	<0.05	<0.05	<0.009	0.012	0.039	<0.009	<0.009	<0.009	<0.009	<0.009
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	608	<10	<10	<10	<10	<2	<2	3	5	9	<2	2	2
Ammonia-N	mg/L	--	--	5.6	<0.02	0.331	0.034	0.375	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	7	<0.5	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<1	<1	<1
Conductivity	uS/cm	--	--	1120	<3	3.2	<3	<3	<2	<2	3	<2	22	2	3	3
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	**6**	<1	<1	<1	0.61	<1	<1	<1	<1	1	<1	<1	<1
Hardness	mg/L	80-100 (OG)	--	552	<10	<10	<10	<10	0.06	0.08	0.98	0.2	0.28	0.13	<0.05	<0.05
Nitrate (as N)	mg/L	10	2.6	<0.06	<0.02	<0.02	<0.02	<0.02	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.003	<0.003	<0.003	<0.003	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	7.56	6.17	6.81	6.6	5.85	5.63	6	7.58	6.8	7.08	6.18	5.96	6.24
Phenolics (total)	mg/L	--	--	<0.002	0.0013	<0.001	0.0047	0.0023	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	12	<0.3	<0.3	<0.3	<0.3	<2	<2	<2	<2	<2	<2	<2	<2
Total kjeldahl nitrogen (TKN)	mg/L	--	--	6.8	<0.15	0.35	<0.15	0.42	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	--	987	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5 (OG)	--	6.83	-	-	-	-	-	-	-	-	-	-	-	-
Temperature, field	Deg C	15 (AO)	--	10.59	-	-	-	-	-	-	-	-	-	-	-	-

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Table 4.5

General Chemistry And Dissolved Metals
Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				**Field Blank**
Sample ID:				**Field Blank**
Sample Date:				**11/7/2023**
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]	**Field Blank**
Metals				
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.013
Boron (dissolved)	mg/L	5	1.5	<0.002
Calcium (dissolved)	mg/L	--	--	0.05
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.007
Magnesium (dissolved)	mg/L	--	--	0.002
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00004
Phosphorus (dissolved)	mg/L	--	--	<0.003
Potassium (dissolved)	mg/L	--	--	<0.009
General Chemistry				
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	2
Ammonia-N	mg/L	--	--	<0.1
Chloride	mg/L	250 (AO)	126	<1
Conductivity	uS/cm	--	--	2
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1
Hardness	mg/L	80-100 (OG)	--	0.14
Nitrate (as N)	mg/L	10	2.6	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03
Orthophosphate	mg/L	--	--	<0.03
pH	s.u.	6.5-8.5 (OG)	--	6.55
Phenolics (total)	mg/L	--	--	<0.002
Sulfate	mg/L	500 (AO)	269	<2
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<5
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.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Table 4.6

General Chemistry And Total Metals
Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW2	SW2	SW2	SW2	SW2	SW2
Sample ID:			SW-WARD3-19-004	SW-WARD3-19-003	SW1	SW-WARD 3-001	SW-WARD 3-002	SW-WARD3-12/2/22-04	SW-Ward3-001	SW1	SW-WARD3-19-003	SW-WARD3-19-002	SW2	SW-WARD 3-002	SW-WARD 3-008	SW-WARD3-12/2/22-10
Sample Date:			5/21/2019	12/7/2019	11/29/2020	5/12/2021	12/12/2021	12/2/2022	5/19/2023	11/7/2023	5/21/2019	12/7/2019	11/29/2020	5/12/2021	12/12/2021	12/2/2022
Parameters	**Units**	**PWQO[1]**														
Metals																
Aluminum	mg/L	0.075 (a)	0.044	0.054	0.037	**0.119**	**0.208**	**0.083**	0.022	**0.111**	0.058	**0.081**	0.069	0.006	**0.157**	**0.404**
Boron	mg/L	0.2	0.067	0.032	0.078	0.095	0.039	0.083	**0.204**	0.032	0.162	0.122	0.189	0.176	0.065	0.128
Calcium	mg/L	--	88	80.9	104	137	69.4	110	133	102	102	90.9	119	114	69.6	112
Iron	mg/L	0.3	0.288	0.128	0.114	0.227	0.284	**0.565**	**3.22**	**1.26**	**1.98**	**0.71**	**1.06**	**1.85**	**0.696**	**2.62**
Magnesium	mg/L	--	16	16.3	21.5	22.2	18.1	26.7	25.8	28.5	22.2	22.6	27.8	27.4	19.1	26.6
Manganese	mg/L	--	0.077	0.0138	0.0421	0.0373	0.0244	0.084	0.44	0.238	0.228	0.0954	0.179	0.212	0.0812	0.298
Phosphorus	mg/L	0.03 (e)	0.02	0.01	0.024	0.022	0.021	0.025	0.03	**0.066**	0.015	0.009	0.018	0.008	0.018	**0.049**
Potassium	mg/L	-	2.22	1.74	1.92	2.51	1.63	4.22	6.76	2.48	6.81	5.99	6.6	7.1	2.69	5.43
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	--	293	285	318	328	239	316	402	344	378	332	370	391	285	322
Ammonia-N	mg/L	--	<0.1	0.1	<0.1	<0.1	0.2	0.7	3.4	0.2	2	1.5	1	2.1	0.5	1.1
Chloride	mg/L	--	2	2	3	4	3	14	9	9	3	4	4	4	3	8
Conductivity	uS/cm	--	521	506	607	595	409	620	754	671	667	616	720	714	469	607
Dissolved organic carbon (DOC)	mg/L	--	3	3	3	4	5	3	4	5	5	4	4	4	4	5
Hardness	mg/L	--	286	269	349	432	248	386	437	372	347	320	411	397	252	390
Nitrate (as N)	mg/L	--	0.36	0.22	0.19	0.29	0.3	1.66	0.2	0.06	0.32	0.43	0.34	0.32	0.27	1.25
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03
pH	s.u.	6.5-8.5	8.15	8.14	8.03	7.99	7.72	7.78	7.64	8	8.05	8.15	8.02	8.19	7.67	7.94
Phenolics (total)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sulfate	mg/L	--	4	13	6	3	5	14	6	9	3	11	8	2	7	17
Total kjeldahl nitrogen (TKN)	mg/L	--	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	3.5	0.8	1.7	1.4	0.7	2.6	<0.5	1.2
Un-ionized ammonia	mg/L	0.02 (g)	<0.00088	0.00034	<0.00038	<0.00017	0.00076	0.00042	0.00684	0.00058	0.0191	0.00429	0.00375	0.00218	0.00036	0.0009
Field Parameters																
Conductivity, field	uS/cm	--	520	647	680	865	436	915	731	858	650	760	780	857	1380	877
Dissolved oxygen (DO), field	mg/L	<4 (f)	**0.09**	**2.86**	6.93	5.63	-	**1.46**	**2.87**	**0.00**	**0.09**	**3.08**	5.82	4.41	-	-
pH, field	s.u.	6.5-8.5	7.61	7.33	7.35	7	7.31	6.59	6.9	7.12	7.64	7.27	7.31	6.77	6.68	6.85
Temperature, field	Deg C	--	9.37	5.38	6.21	6.7	7.5	5.05	11.41	9.68	9.61	5.12	7.34	6.8	4.92	1.64

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

Table 4.6

General Chemistry And Total Metals
Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW2	SW2	SW3	SW3	SW3	SW3	SW3	SW4	SW4	SW4	SW4	SW4	SW4	SW4
Sample ID:			**SW-Ward3-002**	**SW2**	**SW3**	**SW-WARD 3-007**	**SW-WARD 3-004**	**SW-Ward3-003**	**SW3**	**SW-WARD3-19-001**	**SW-WARD3-19-004**	**SW-WARD3-19-001**	**SW4**	**SW-WARD 3-003**	**SW-WARD 3-001**	**SW-WARD3-12/2/22-07**
Sample Date:			**5/19/2023**	**11/7/2023**	**11/29/2020**	**5/12/2021**	**6/28/2022**	**5/19/2023**	**11/7/2023**	**5/21/2019**	**12/7/2019**	**8/11/2020**	**11/29/2020**	**12/12/2021**	**6/28/2022**	**12/2/2022**
Parameters	**Units**	**PWQO[1]**														
Metals																
Aluminum	mg/L	0.075 (a)	**0.248**	**0.118**	0.06	0.07	**0.106**	**0.113**	**0.559**	**0.164**	**0.188**	**1.26**	**0.376**	**0.197**	**0.995**	**0.982**
Boron	mg/L	0.2	**0.202**	0.112	0.034	0.021	0.043	0.174	0.199	0.076	0.066	0.086	0.08	0.058	0.078	0.072
Calcium	mg/L	--	125	116	105	94.8	122	119	133	56.7	80.2	46.7	72.8	69.2	22	71.8
Iron	mg/L	0.3	**1.57**	**0.836**	0.09	0.157	0.201	0.235	**1.28**	**0.432**	**0.309**	**2.36**	**0.824**	**0.599**	**1.36**	**2.6**
Magnesium	mg/L	--	28.9	27.7	29.5	28	36.2	27.6	34.9	16.3	24.6	24	21.6	20.6	17.9	21.2
Manganese	mg/L	--	0.187	0.206	0.0171	0.0212	0.0225	0.0941	0.708	0.0901	0.084	0.117	0.132	0.107	0.0608	0.288
Phosphorus	mg/L	0.03 (e)	**0.039**	0.013	**0.038**	0.024	**0.072**	0.017	**0.273**	**0.035**	**0.064**	**0.173**	**0.204**	**0.114**	**0.166**	**0.192**
Potassium	mg/L	-	8.1	5.57	2.33	1.59	3.61	7.77	13.7	3.83	9.18	4.7	10.9	6.85	1.33	8.92
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	--	383	371	298	299	326	391	431	203	266	174	231	239	104	232
Ammonia-N	mg/L	--	2.1	0.3	<0.1	<0.1	<0.1	0.3	2.3	<0.1	0.4	<0.1	<0.1	2.4	<0.1	2.1
Chloride	mg/L	--	6	6	17	19	27	18	28	9	20	15	17	14	11	20
Conductivity	uS/cm	--	707	707	669	636	730	736	922	394	538	360	505	471	249	470
Dissolved organic carbon (DOC)	mg/L	--	4	5	4	5	4	7	10	7	12	17	12	6	15	11
Hardness	mg/L	--	432	403	385	352	453	411	476	209	301	215	271	257	129	267
Nitrate (as N)	mg/L	--	0.81	0.75	2.77	2	3.78	1.04	0.67	<0.06	0.12	<0.06	<0.06	0.13	<0.06	<0.06
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	<0.03	<0.03	<0.03	<0.03	0.06	<0.03	<0.03	<0.03	0.03	<0.03	0.04	<0.03	0.04	0.03
pH	s.u.	6.5-8.5	8.04	8.18	8.22	8.03	8.3	8.27	8.21	8.34	8.24	8.12	**8.51**	8.19	**9.86**	8.04
Phenolics (total)	mg/L	0.001	<0.001	<0.001	<0.001	**0.002**	<0.001	<0.001	0.001	**0.003**	<0.005	**0.002**	**0.002**	<0.001	**0.003**	**0.002**
Sulfate	mg/L	--	3	5	19	17	54	22	48	4	14	4	6	5	<2	10
Total kjeldahl nitrogen (TKN)	mg/L	--	1.6	0.7	<0.5	<0.5	<0.5	0.7	3.4	<0.5	1.1	0.9	1.6	2.3	<0.5	3.4
Un-ionized ammonia	mg/L	0.02 (g)	0.00862	0.00145	<0.00085	<0.00046	<0.00199	0.00635	**0.02745**	<0.00318	0.00151	<0.00254	<0.00235	0.01781	<0.05699	0.01499
Field Parameters																
Conductivity, field	uS/cm	--	703	827	731	747	686	677	1110	379	682	401	560	477	223	509
Dissolved oxygen (DO), field	mg/L	<4 (f)	**1.25**	6.61	7.65	7.35	5.71	**3.11**	**3.33**	**0.1**	**1.74**	4.65	4.8	-	7.99	5.01
pH, field	s.u.	6.5-8.5	7.23	7.37	7.61	7.39	7.77	7.87	7.82	8.05	7.31	7.61	7.95	7.54	**9.38**	7.78
Temperature, field	Deg C	--	10.83	8.83	9.02	7.7	15.4	13.16	7.22	13.17	7.42	23.8	12.18	9.31	18.9	1.99

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

Table 4.6

General Chemistry And Total Metals
Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW4	SW4	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW7	SW7	SW7	SW7
Sample ID:			SW-Ward3-004	SW4	SW-WARD3-19-005	SW-WARD3-19-006	SW5	SW-WARD 3-008	SW-WARD 3-006	SW-WARD3-12/2/22-06	SW-Ward3-005	SW5	SW-WARD3-19-006	SW-WARD3-19-005	SW7	SW-WARD 3-009
Sample Date:			5/19/2023	11/7/2023	5/21/2019	12/7/2019	11/29/2020	5/12/2021	12/12/2021	12/2/2022	5/19/2023	11/7/2023	5/21/2019	12/7/2019	11/29/2020	5/12/2021
Parameters	**Units**	**PWQO[1]**														
Metals																
Aluminum	mg/L	0.075 (a)	**0.155**	**0.381**	**0.18**	**1.52**	**0.782**	0.005	0.014	**3.49**	0.011	**1.04**	0.006	**0.12**	0.019	0.01
Boron	mg/L	0.2	0.05	0.04	**0.233**	**0.231**	**0.319**	**0.379**	**0.472**	**0.352**	**0.212**	**0.332**	0.024	0.02	0.048	0.023
Calcium	mg/L	--	21.2	65.7	138	185	220	204	175	225	140	168	102	63	63.8	81.2
Iron	mg/L	0.3	**0.636**	**0.726**	**8.18**	**71.4**	**14.6**	**6.2**	**2.97**	**138**	**1.18**	**95.2**	**0.421**	**0.61**	0.084	0.153
Magnesium	mg/L	--	15.5	18.3	35.3	49.3	53	51.1	49.8	59.6	31.4	43.6	17.5	15.2	15.3	17.4
Manganese	mg/L	--	0.0363	0.0568	0.569	0.854	1.28	1.31	0.96	1.54	0.53	2.2	0.087	0.162	0.0677	0.0127
Phosphorus	mg/L	0.03 (e)	**0.146**	**0.066**	**0.049**	**0.276**	**0.094**	0.016	0.017	**0.591**	0.008	**0.292**	0.026	**0.095**	**0.041**	0.015
Potassium	mg/L	-	0.976	1.82	21.7	25.7	29.7	30.1	28.4	31.2	14.8	22.8	1.35	1.66	0.974	0.996
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	--	115	193	497	561	590	605	585	620	449	525	308	166	181	259
Ammonia-N	mg/L	--	<0.1	<0.1	4.7	6.1	3.1	7.8	6	7.8	3	6.6	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	--	<1	4	45	67	250	120	130	80	33	46	2	2	2	2
Conductivity	uS/cm	--	203	373	1030	1330	1950	1600	1460	1380	956	1180	540	391	403	478
Dissolved organic carbon (DOC)	mg/L	--	9	8	8	11	9	14	15	15	9	11	13	34	28	15
Hardness	mg/L	--	117	239	490	665	768	719	643	808	478	599	327	220	222	274
Nitrate (as N)	mg/L	--	<0.06	<0.06	0.58	0.14	<0.06	0.42	2.52	0.86	0.18	0.47	<0.06	<0.06	<0.06	0.12
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	<0.03	<0.03	<0.03	<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	8.32	8	7.85	7.77	7.54	8.11	7.34	7.75	7.92	8	8.06	6.85	7.63	7.95
Phenolics (total)	mg/L	0.001	<0.001	<0.001	**0.003**	<0.006	0.001	**0.002**	<0.001	**0.003**	**0.002**	<0.001	**0.004**	**0.025**	**0.002**	0.001
Sulfate	mg/L	--	<2	3	34	110	93	98	160	120	57	73	<2	52	22	2
Total kjeldahl nitrogen (TKN)	mg/L	--	<0.5	0.9	4.7	7.4	3.3	9.2	5.9	8.5	3.3	8.1	<0.5	0.8	<0.5	<0.5
Un-ionized ammonia	mg/L	0.02 (g)	<0.00439	<0.00138	**0.0347**	0.00788	0.00364	0.00811	**0.02058**	**0.02021**	**0.05849**	**0.02672**	<0.0003	<0.00053	<0.00019	<0.00019
Field Parameters																
Conductivity, field	uS/cm	--	225	482	950	1610	1740	1610	440	1710	540	1320	536	532	4590	592
Dissolved oxygen (DO), field	mg/L	<4 (f)	**1.86**	4.57	**1.03**	**2.1**	4.22	**3.9**	-	-	**0**	8.67	**0.1**	**1.92**	**3.07**	**2.46**
pH, field	s.u.	6.5-8.5	8.16	7.9	7.57	6.92	6.76	6.62	7.28	7.28	7.78	7.25	7.1	7.67	7.05	7
Temperature, field	Deg C	--	14.23	6.75	8.37	5.24	8.64	11.2	7.09	3.62	14.79	10.06	10.56	1.41	6.55	7.7

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.
(e)	No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(g)	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.
(h)	Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
-	Parameter not analyzed / no information
--	No guideline.
<	Parameter detected below the laboratory method detection limit
NM	Not Measured.
36.0	Parameter exceeds the PWQO.

Table 4.6

General Chemistry And Total Metals
Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW7	SW7	SW7	SW7	SW8	SW8	SW9	SW9	SW10	SW10	SW10	SW10	SW11	SW11
Sample ID:			**SW-WARD 3-009**	**SW-WARD3-12/2/22-09**	**SW-Ward3-006**	**SW7**	**SW-WARD 3-004**	**SW-WARD 3-004**	**SW-WARD 3-005**	**SW-WARD 3-001**	**SW-WARD 3-006**	**SW-WARD 3-007**	**SW-WARD 3-003**	**SW-WARD3-12/2/22-05**	**SW-WARD 3-003**	**SW-WARD 3-005**
Sample Date:			**12/12/2021**	**12/2/2022**	**5/19/2023**	**11/7/2023**	**5/12/2021**	**12/12/2021**	**5/12/2021**	**12/12/2021**	**5/12/2021**	**12/12/2021**	**6/28/2022**	**12/2/2022**	**5/12/2021**	**12/12/2021**
Parameters	**Units**	**PWQO[1]**														
Metals																
Aluminum	mg/L	0.075 (a)	0.037	**0.091**	0.012	0.046	**0.144**	**0.113**	0.046	**0.126**	0.073	**13.4**	**0.141**	**0.092**	0.013	0.021
Boron	mg/L	0.2	0.021	**0.211**	**0.35**	**0.26**	0.018	0.02	0.154	0.064	0.065	**0.555**	0.118	0.069	0.186	**0.233**
Calcium	mg/L	--	73.6	73.3	235	98.4	88.1	58	112	74	101	57.3	122	90.4	129	120
Iron	mg/L	0.3	**0.312**	0.281	**0.824**	**1.37**	0.268	0.213	**0.401**	**0.308**	0.154	**11**	0.277	0.133	0.078	0.129
Magnesium	mg/L	--	16.7	13.5	36.6	17.6	19.5	14.4	27.6	19.8	26.8	19.5	32.5	25	29.3	30.8
Manganese	mg/L	--	0.066	0.0919	0.598	0.377	0.0401	0.0284	0.0465	0.0672	0.0353	0.338	0.0886	0.0199	0.186	0.193
Phosphorus	mg/L	0.03 (e)	**0.034**	**0.034**	**0.157**	**0.063**	**0.124**	**0.037**	0.013	0.016	**0.031**	**0.8**	**0.047**	**0.032**	<0.003	0.008
Potassium	mg/L	-	0.535	4.76	23.9	9.28	2.6	1.31	5.69	2.76	3.42	7.28	6.34	4.66	10.9	13.4
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	--	215	155	672	295	278	198	355	249	313	165	337	300	383	400
Ammonia-N	mg/L	--	<0.1	<0.1	5.2	0.1	<0.1	<0.1	<0.1	0.3	0.2	0.1	<0.1	0.6	1.1	1.7
Chloride	mg/L	--	1	8	31	6	8	6	5	4	22	11	33	26	42	44
Conductivity	uS/cm	--	375	339	1310	597	530	354	655	469	679	337	752	660	887	838
Dissolved organic carbon (DOC)	mg/L	--	11	22	18	26	11	6	4	6	6	6	6	6	8	9
Hardness	mg/L	--	253	238	736	318	300	204	393	266	363	224	439	329	443	427
Nitrate (as N)	mg/L	--	0.16	0.13	<0.06	<0.06	<0.06	<0.06	1.16	0.34	1.65	0.99	2.34	1.52	0.78	1.2
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	<0.03	<0.03	0.22	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.14	0.04	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5	7.5	7.45	7.87	7.93	8.34	7.61	8.34	8	8.25	7.66	8.28	8.14	8.2	8.09
Phenolics (total)	mg/L	0.001	<0.001	**0.006**	**0.002**	**0.005**	<0.001	<0.001	**0.002**	<0.001	**0.002**	<0.001	**0.002**	<0.001	<0.001	<0.001
Sulfate	mg/L	--	<2	57	56	31	<2	7	3	6	21	13	45	31	42	59
Total kjeldahl nitrogen (TKN)	mg/L	--	<0.5	0.5	5.9	1.3	1.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.2	1.3	1.7
Un-ionized ammonia	mg/L	0.02 (g)	<0.00012	<0.00004	**0.02157**	0.00064	<0.00034	<0.0003	<0.00025	0.00156	0.00081	0.00055	<0.00175	0.00036	0.0025	0.00697
Field Parameters																
Conductivity, field	uS/cm	--	478	671	1200	617	643	399	784	470	787	410	777	678	950	750
Dissolved oxygen (DO), field	mg/L	<4 (f)	-	**0**	**3.12**	**0.31**	**3.79**	-	4.49	-	7.11	-	7.37	**2.24**	**3.65**	-
pH, field	s.u.	6.5-8.5	6.91	6.54	7.2	7.48	7.28	7.28	7.17	7.37	7.35	7.43	7.69	6.62	7	7.34
Temperature, field	Deg C	--	4.81	2.73	11.85	9.22	6.8	5.23	6.4	9.76	7.2	8.79	16.1	4.34	10	7.6

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

Table 4.6

General Chemistry And Total Metals
Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW11	SW11	SW11
Sample ID:			SW-WARD 3-002	SW-Ward3-008	SW11
Sample Date:			6/28/2022	5/19/2023	11/7/2023
Parameters	**Units**	**PWQO[1]**			
Metals					
Aluminum	mg/L	0.075 (a)	**0.886**	0.015	0.04
Boron	mg/L	0.2	0.183	0.179	**0.249**
Calcium	mg/L	--	128	134	135
Iron	mg/L	0.3	**1.36**	0.159	**0.317**
Magnesium	mg/L	--	28.4	29.1	35.1
Manganese	mg/L	--	0.344	0.239	0.225
Phosphorus	mg/L	0.03 (e)	**0.088**	0.004	0.005
Potassium	mg/L	-	9.55	12.2	16.5
General Chemistry					
Alkalinity, total (as CaCO3)	mg/L	--	376	389	456
Ammonia-N	mg/L	--	<0.1	1.8	4.2
Chloride	mg/L	--	39	30	35
Conductivity	uS/cm	--	783	812	1010
Dissolved organic carbon (DOC)	mg/L	--	8	7	10
Hardness	mg/L	--	437	455	481
Nitrate (as N)	mg/L	--	1.01	0.62	0.56
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	0.03	<0.03	<0.03
pH	s.u.	6.5-8.5	8.23	8.2	8.18
Phenolics (total)	mg/L	0.001	<0.001	0.001	<0.001
Sulfate	mg/L	--	32	49	60
Total kjeldahl nitrogen (TKN)	mg/L	--	<0.5	2.2	4.8
Un-ionized ammonia	mg/L	0.02 (g)	<0.00151	**0.02978**	**0.05584**
Field Parameters					
Conductivity, field	uS/cm	--	778	885	1240
Dissolved oxygen (DO), field	mg/L	<4 (f)	5.89	**3.4**	5.59
pH, field	s.u.	6.5-8.5	7.64	7.83	7.85
Temperature, field	Deg C	--	15.6	11.12	7.72

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.
(e)	No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(g)	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.
(h)	Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
-	Parameter not analyzed / no information
--	No guideline.
<	Parameter detected below the laboratory method detection limit
NM	Not Measured.
36.0	Parameter exceeds the PWQO.

Appendices

Appendix A

Environmental Compliance Approval

Ministry of the Environment
Ontario

Provisional Certificate No.
A 272001

PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE

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

Township of Bruce
R.R. #3
Tiverton, Ontario
N0G 2T0

for the use and operation of a 1.0 hectare landfilling site within an total site area of 20.5 hectares.

all in accordance with the following plans and specifications:

1. Application and supporting information forms dated September 15, 1971.
2. Plan of operation adopted by the Township of Bruce as submitted under covering letter from C. Ellis to W. Page dated November 13, 1979.

Located:

E. ½ Lot 17, Concession 2
Township of Bruce
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 and non-hazardous solid industrial (limited to miscellaneous debris from agriculture such as wire, stumps and scrap metal) wastes.

and subject to the following conditions:

1. No waste other than segregated brush, lumber and clean wood is to be burned at the site.
2. Access to the burning area by the public and other unauthorized personnel is prohibited when burning is being carried out.
3. No burning is to be carried out unless supervision is being provided by the operating authority.
4. Provisional Certificate of Approval No. A 272001 dated September 4, 1980 is revoked and replaced by this Provisional Certificate of Approval No. A 272001 dated September 22, 1986.

Ministry of the Environment
Ontario

NOTICE

TO: Township of Bruce
R.R. #3
Tiverton, Ontario
N0G 2T0

You are hereby notified that Provisional Certificate of Approval No. A 272001 has been issued to you subject to the conditions outlined therein.

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

1. The reason for condition 1, is that the burning of wastes other than segregated brush, lumber and clean wood results in unacceptable emissions of air contaminants and may present a hazard to the health of nearby persons or may create a nuisance.

2. The reason for conditions 2 and 3 is that restricted access to the burning area and adequate supervision are required to ensure that burning is carried out in an acceptable manner under the proper conditions and only suitable types of waste are burned. The use and operation of the site without these conditions may create a nuisance or may result in a hazard to the health or safety of any person.

3. The reason for condition 4 is that the Provisional Certificate of Approval dated September 4, 1980 does not contain an expiry date and it is necessary to clarify that the site is to be used and operated in accordance with the Provisional Certificate of Approval dated September 22, 1986.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board.

This Notice should be served upon:

The Secretary
Environmental Appeal Board
1 St. Clair Avenue West
5th Floor
Toronto, Ontario M4V 1K7

AND

The Director
Section 38, E.P.A.
Ministry of the Environment
135 St. Clair Ave. W.,
Toronto, Ontario M4V 1P5

Dated at Toronto this 22nd day of September, 1986.

Director,
Section 38, E.P.A.,
Ministry of the Environment.

VVI 6 1

APPROVALS BRANCH
3rd Floor
Tel. No. (416) 440-3544
Fax No. (416) 440-6973

February 19, 1998

Ms. R. Trelford
Deputy Clerk-Treasurer
The Township of Bruce
R.R. #3
Tiverton, Ontario
N0G 2T0

Dear Ms. Trelford:

Re: Notice of Amendment for a Plan of Operation at the Township of Bruce Waste Site
Certificate of Approval No. A 272001

Please find enclosed a Notice of Amendment to the Certificate of Approval for the Township of Bruce Waste Disposal Site. The Notice attaches Schedule "A" which references a plan of operation for the waste disposal site. The Notice also adds a condition which prohibits the disposal of waste within one metre of the seasonal high elevation of the groundwater table.

Should you have any further questions, please contact Mr. J. Robert Bruce of this office at (416) 440-3526.

Yours truly,

A. Dominski, P. Eng., Manager
Waste Section

JRB/st
Encl.

cc: District Manager, MOE Barrie District Office
B. Hutchison, MOE Owen Sound Area Office
K. Arnold Spivey, Maitland Engineering Services Ltd.

The Township of Bruce
R.R. #3
Tiverton, Ontario
N0G 2T0

You are hereby notified that Provisional Certificate of Approval No. A 272001 dated September 22, 1986, and amended December 16, 1992, and February 22, 1995, issued to you, The Township of Bruce, are being amended as follows:

The following condition is hereby added:

7. Waste emplacement shall not take place below an elevation which is the lower of the ground surface or one metre above the seasonal high point for the underlying ground water table.

Schedule "A" is added:

SCHEDULE "A"

This Schedule "A" forms part of the Provisional Certificate of Approval No. A272001 dated September 22, 1986.

1. A May 1993 report entitled "Plan of Development and Operation, Township of Bruce Waste Disposal Site, Township of Bruce, County of Bruce" prepared by Maitland Engineering Services Ltd.

2. A December 15, 1997, letter from Mr. A. Dominski of the Ministry of the Environment, Approvals Branch, addressed to Ms. R. Trelford of the Township of Bruce.

The reasons for these amendments are:

1. The reason for the addition of Condition 7 is to prevent the placement of waste below the groundwater table and thereby protect the environment.

2. The reason for the addition of Schedule "A" is to provide a plan for the orderly development and safe operation of the landfill site.

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

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

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

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

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

This Notice must be served upon:

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

<u>AND</u>

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

DATED AT TORONTO this 19th *day of* February, 1998.

THIS IS A TRUE COPY OF
THE ORIGINAL CERTIFICATE
SIGNED BY: A. Dominski, P. Eng.

MAILED ON: Feb. 23/98

BY: _____

JRB/st
cc: District Manager, Barrie

Ministry of the Environment
Environmental Assessment and
Approvals Branch
Floor 12A
2 St Clair Ave W
Toronto ON M4V 1L5
Fax: (416)314-8452
Telephone: (416) 314-8102

Ministère de l'Environnement
Direction des évaluations et des
autorisations environnementales
Étage 12A
2 av St Clair O
Toronto ON M4V 1L5
Télécopieur: (416)314-8452
Téléphone : (416) 314-8102

Ontario

February 17, 2003

Jim O'Rourke, Public Works Manager
The Corporation of the Municipality of Kincardine
Municipal Administration Centre
1475 Concession 5, R.R. #5
Kincardine, Ontario
Canada
N2Z 2X6

Dear Jim O'Rourke:

Re: Notification of Change of Name
MOE Reference Number 1609-5JUQLK

The Ministry of the Environment (the "Ministry") acknowledges receipt of your letter dated November 05, 2002 requesting a change in company name:

FROM: The Township of Bruce

TO: The Corporation of the Municipality of Kincardine

By this letter, the Ministry advises you that your notification of change in company name has been registered in our records for the following Certificate(s) of Approval:

Certificate(s) of Approval for Waste Disposal Sites, Section 27,EPA:

A272001

The Ministry will not be providing you with an amended certificate(s) to reflect the change in company name. Therefore, this letter must be appended to its corresponding Certificate(s) of Approval. The name change will be included in any future amended Certificate(s) of Approval.

If you have any questions regarding the above, please contact me at the above phone number.

Yours truly,

Rachel Krisak
Application Processor

cc: District Manager, MOE Barrie
Area Supervisor, MOE Owen Sound

Appendix B

Stratigraphic and Instrumentation Logs

RECORD OF TEST HOLE 1

Depth m	DESCRIPTION	Sample	Strat.	Water	pipe	REMARKS
	Organic Topsoil					Bentonite seal
1	medium brown ~~silty~~ SAND some wet and with traces of gravel	0.6 to 1.2m				
2						cuttings
		2.4 to 3.0m				PVC Sch 40 pipe
3						
3.3		3.0 to 3.6m				
4	clayey SILT with traces of sand occ. gravel					sandpacked screen 3.6 - 4.2m
5						hole cuttings backfill
						End of TEST HOLE 5.2m
6						
7						
8						

RECORD OF TEST HOLE 2

Depth m	DESCRIPTION	Sample	Strat.	Water	Pipe	REMARKS
1	Medium brown SAND with traces of gravel and silt	0.6 to 1.2m				Bentonite seal
2						
2.2		1.8 to 2.4m				cuttings
3	grey clayey SILT with traces of sand occ. gravel					PVC Sch 40 pipe
4						screen 3.5 - 4.1m sandpacked
5						hole cutting backfill
						End of TEST HOLE 5.2m
6						N.B. pipe installed in excavated area
7						1.5m sand
8						

RECORD OF TEST HOLE 3

Depth m	DESCRIPTION	Sample	Strat.	Water	Pipe	REMARKS
1	Medium brown SAND with traces of gravel and silt	0.6 to 1.2m				Bentonite seal
1.4		1.5 to 2.0m				PVC Sch 40 pipe
2						
3	grey clayey SILT with traces of sand occ. gravel					hole cuttings
4						
5						
6						screen 5.5 - 6.1m; sandpacked; hole cutting backfill
7						End of TEST HOLE 6.7m
8						

RECORD OF TEST HOLE 4

Depth m	DESCRIPTION	Sample	Strat.	Water	Pipe	REMARKS
0.8	sand and garbage fill	0 to 0.6m; 1.2 to 1.8m				Bentonite seal
1.4	medium brown SAND with traces of gravel and silt					
						PVC Sch 40 pipe
						cuttings
	grey clayey SILT with traces of sand occ. gravel					
						screen 4.9 - 5.5m
						sandpacked
6						hole cutting backfill
						End of TEST HOLE 6.1m
7						
8						

RECORD OF TEST HOLE 5

Depth m	DESCRIPTION	Sample	Strat.	Water	Pipe	REMARKS
0.5	Medium brown sand with traces of gravel and silt	0 to 0.6m				Bentonite seal
1		0.6 to 1.2m				PVC Sch 40 pipe
2	grey clayey SILT with traces of sand occ. gravel					
3						cuttings
4						
5						screen 4.9 - 5.5m
						sandpacked
6						hole cuttings backfill
						End of TEST HOLE 6.1m
7						N.B. pipe installed in excavated area
8						1.8m

RECORD OF TEST HOLE 6

Depth m	DESCRIPTION	Sample	Strat.	Water	Pipe	REMARKS
0.2	TOPSOIL					Bentonite seal
	medium brown SAND with traces of gravel and silt	0 to 0.6m				
0.9	coarse SAND and gravel	0.6 to 1.2m				
1.1	grey clayey SILT with traces of sand occ. gravel	1.2 to 1.8m				PVC Sch 40 pipe
						cuttings
		7.6 to 8.2m				screen 7.0 - 7.6m
						sandpacked
						hole cuttings backfill
8						End of TEST HOLE 8.2m

RECORD OF TEST HOLE 7

Depth m	DESCRIPTION	Sample	Strat.	Water	Pipe	REMARKS
0.3	TOPSOIL	0 to 0.6m				Bentonite seal
1.5	medium brown silty SAND with traces of gravel	0.6 to 1.2m 1.2 to 1.8m				
8	grey clayey SILT with traces of sand occ. gravel	3.0 to 3.6m 7.6 to 8.2m				PVC Sch 40 pipe cuttings screen 7.0 - 7.6m sandpacked hole cuttings backfill End of TEST HOLE 8.2m

1
2
3
4
5
6
7
8

RECORD OF TEST HOLE 9

Depth m	DESCRIPTION	Sample	Strat.	Water	Pipe	REMARKS
0.3	TOPSOIL	0 to 0.6m				Bentonite seal
1	grey clayey SILT with traces of sand occ.gravel	0.6 to 1.2m				
2						
3		3.0 to 3.6m				PVC Sch 40 pipe
4						cuttings
5						
6						
7		7.6 to 8.2m				screen 7.0 - 7.6m; sandpacked
8						hole cuttings backfill; End of TEST HOLE 8.2m

PROJECT: 921-3073-1

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE 8

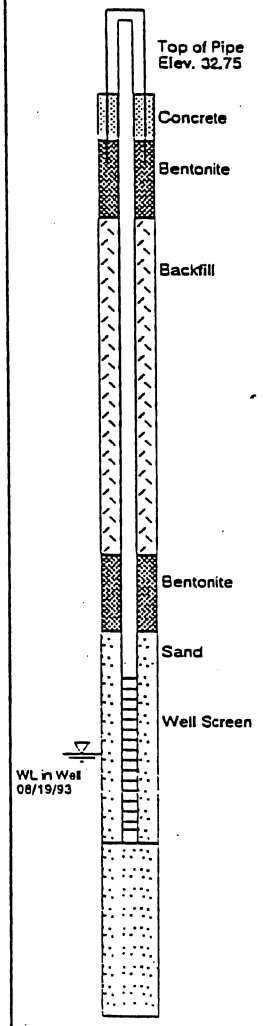
BORI[illegible]TE: JULY 7, 1993.

SAMP[illegible]AMMER, 63.5kg; DROP, 760mm

SHEET 1 OF 1

DATUM: LOCAL

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3m	⊕ / O	ADDITIONAL LAB. TESTING	MONITORING INSTALLATIONS GROUNDWATER AND ENVIRONMENTAL OBSERVATIONS
-1										OW8-93
0		GROUND SURFACE		32.02 0.00						
1	POWER AUGER (HOLLOW STEM)	REFER TO TH#8 FOR STRATIGRAPHY								
2										
3										
4										
5										
6										
7										
8										
9				22.88						
		END OF BOREHOLE		9.14						
10										
11										
12										
13										
14										



WATER LEVEL MEASURED IN WELL AT ELEV. 25.48, AUG. 19, 1993.

DATA INPUT W Fletcher

DEPTH SCALE

1 : 75

Golder Associates

LOGGED:

CHECKED:

PROJECT: 921-3073-1

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE 10

BORIN TE: JULY 7, 1993.

SAMPL 'AMMER, 63.5kg; DROP, 760mm

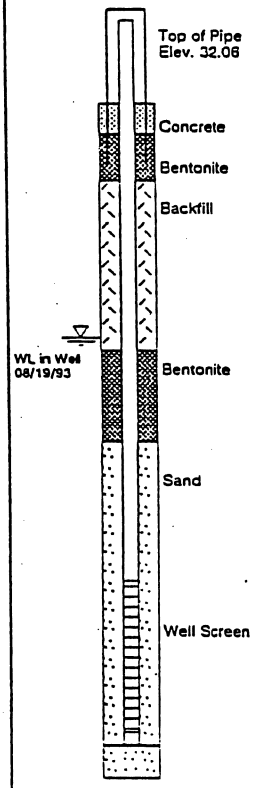
SHEET 1 OF 1

DATUM: LOCAL

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		GROUND SURFACE		31.24				
0	POWER AUGER (HOLLOW STEM)	TOPSOIL		0.00 / 30.94				
				0.30				
1		Mottled brown and grey becoming brown CLAYEY SILT (TILL)			1	50 DO	15	
					2	50 DO	24	
2				28.80				
				2.44				
3					3	50 DO	16	
4		Grey CLAYEY SILT (TILL)						
5					4	50 DO	7	
6					5	50 DO	7	
				24.53				
7		END OF BOREHOLE		6.71				

MONITORING INSTALLATIONS GROUNDWATER AND ENVIRONMENTAL OBSERVATIONS

OW10-93



WATER LEVEL MEASURED IN WELL AT ELEV. 28.95, AUG. 19, 1993.

DATA INPUT: V. Fletcher

DEPTH SCALE

1 : 75

Golder Associates

LOGGED: J.P.M.

CHECKED:

PROJECT: 921-3073-1

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE 11

BORING DATE: JULY 7, 1993.

SAMPLING: HAMMER, 63.5kg; DROP, 760mm

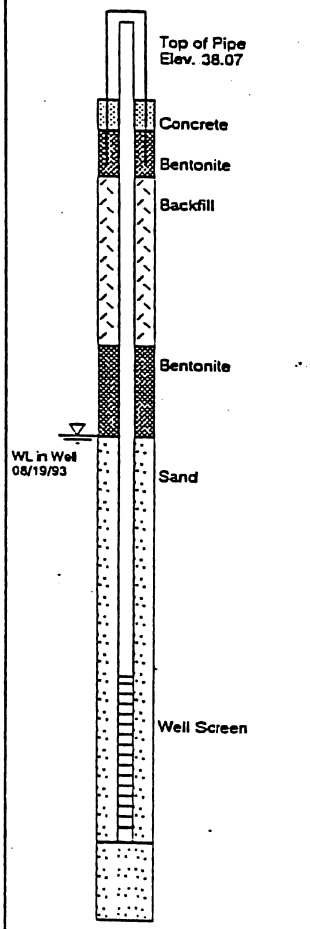
SHEET 1 OF 1

DATUM: LOCAL

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		GROUND SURFACE		37.30				
0	POWER AUGER (HOLLOW STEM)	Brown CLAYEY SILT some sand		0.00				
1				35.93	1	50 DO	8	
		Brown CLAYEY SILT (TILL)		1.37				
				35.47	2	50 DO	15	
2		Grey CLAYEY SILT (TILL)		1.83				
3					3	50 DO	17	
4					4	50 DO	14	
5					5	50 DO	16	
6								
7					6	50 DO	19	
8				29.15				
		END OF BOREHOLE		8.15				

MONITORING INSTALLATIONS
GROUNDWATER AND
ENVIRONMENTAL OBSERVATIONS

OW11-93



WATER LEVEL MEASURED IN WELL AT ELEV. 33.98, AUG. 19, 1993.

DATA INPUT W Fletcher

DEPTH SCALE

Golder Associates

LOGGED: J.P.M.

PROJECT: 921-3073-1

LOCATION: REFER TO LOCATION PLAN

RECORD OF BOREHOLE 12

BORIN .TE: JULY 7, 1993.

SAMPL AMMER, 63.5kg; DROP, 760mm

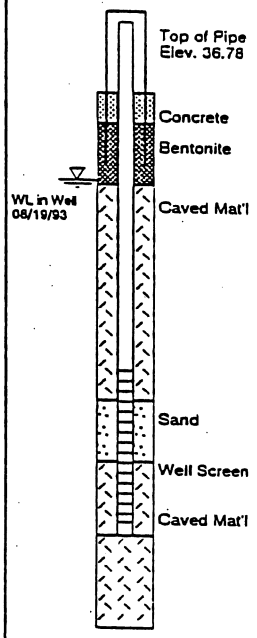
SHEET 1 OF 1

DATUM: LOCAL

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	⊕ / o	ADDITIONAL LAB. TESTING
-1									
0		GROUND SURFACE		36.08					
	POWER AUGER (HOLLOW STEM)	TOPSOIL		0.00 / 35.78					
		SAND AND GRAVEL, local cobbles		0.30	1	50 DO	26		
1									
2				33.95	2	50 DO	21		
		Brown fine to medium SAND trace to some silt		2.13					
3					3	50 DO	14		
4				31.20					
5		CLAYEY SILT		4.88 / 30.90	4	50 DO	19		
		END OF BOREHOLE		5.18					
6									
7									
8									
9									
10									
11									
12									
13									
14									

MONITORING INSTALLATIONS
GROUNDWATER AND
ENVIRONMENTAL OBSERVATIONS

OW12-93



WATER LEVEL MEASURED IN WELL AT ELEV. 35.23, AUG. 19, 1993.

DATA INPUT W. Fletcher

DEPTH SCALE

1 : 75

Golder Associates

LOGGED: J.P.M.

CHECKED:

LOG OF BOREHOLE LW1 Deep

ENCL. No.: 1

PROJECT No.:	SW1306043	ELEVATION:	100.00 m
CLIENT:	Municipality of Kincardine	DATUM:	Local
PROJECT NAME:	Overburden Observation Wells	METHOD:	Direct Push / Hollow Stem Auger
LOCATION:	Ward 3 Waste Disposal Site, Kincardine, ON	DIAMETER:	200 mm
DATE:	4 July 2006	LOGGED BY:	L.C., AMEC

SYMBOL	STRATIGRAPHIC DESCRIPTION	WELL DATA	ELEVATION (m)	DEPTH (m)	SAMPLES No.	SAMPLES TYPE	SAMPLES % REC.	SAMPLES N-VALUE	LAB DATA SOIL VAPOURS ppm	LAB DATA PL %	LAB DATA NMC %	LAB DATA LL %	LAB DATA UNIT WT kN/m3	LAB DATA FIELD VANE kPa	REMARKS
	Black 99.7 250mm Sandy TOPSOIL		100												
	brown Poorly-Graded SAND and GRAVEL trace silt occasional shale pieces	dry	99	1	1	CS	60								
	98				2	CS	100								
	brown Fine SAND trace gravel, silt	wet	98	2											
	97.6 grey Fine SAND	saturated	97	3	3	CS	68								Well details: LW1 Deep constructed with 5.1cm ID PVC. Gas Probe constructed with 3.8cm ID PVC. 15cm round x 1.5m long steel well cover at surface set approximately 0.95m above grade. LW1 Deep well pumped dry after approximately 30 litres.
	96 grey Silty CLAY embedded sand and gravel	apl	96	4	4	CS	100								
		wtpl	95	5											
			94	6	5	CS	100								
			93	7											
			92	8	6	CS	80								
			91	9											
	90		90		7	CS	87								Water measured

GEO-ENV-I/M SW1306043.GPJ SARNIA.GDT 7/11/06

VERTICAL SCALE: 1:50

CHECKED BY: R.K.

amec

LOG OF BOREHOLE LW1 Deep

ENCL. No.: 2

PROJECT No.:	SW1306043	ELEVATION:	100.00 m
CLIENT:	Municipality of Kincardine	DATUM:	Local
PROJECT NAME:	Overburden Observation Wells	METHOD:	Direct Push / Hollow Stem Auger
LOCATION:	Ward 3 Waste Disposal Site, Kincardine, ON	DIAMETER:	200 mm
DATE:	4 July 2006	LOGGED BY:	L.C., AMEC

SYMBOL	STRATIGRAPHIC DESCRIPTION	WELL DATA	ELEVATION (m)	DEPTH (m)	SAMPLES No.	SAMPLES TYPE	SAMPLES % REC.	SAMPLES N-VALUE	LAB DATA SOIL VAPOURS ppm	PL %	NMC %	LL %	UNIT WT kN/m3	FIELD VANE kPa	REMARKS
	grey Silty CLAY embedded sand and gravel wtpl		90												at 9.8m depth at completion of well installation.
			89	11	8	CS	100								
			88	12	9	CS	100								
			87	13											
			86	14	10	CS	90								
			85	15											
	84.8 END OF BOREHOLE		84	16											
			83	17											
			82	18											
			81	19											
			80												

GEO-ENV-I/M SW1306043.GPJ SARNIA.GDT 7/11/06

VERTICAL SCALE: 1:50

CHECKED BY: R.K.

amec

LOG OF BOREHOLE LW1 Shallow

ENCL. No.: 3

PROJECT No.:	SW1306043	ELEVATION:	100.00 m
CLIENT:	Municipality of Kincardine	DATUM:	Local
PROJECT NAME:	Overburden Observation Wells	METHOD:	Hollow Stem Auger
LOCATION:	Ward 3 Waste Disposal Site, Kincardine, ON	DIAMETER:	200 mm
DATE:	5 July 2006	LOGGED BY:	L.C., AMEC

SYMBOL	STRATIGRAPHIC DESCRIPTION	WELL DATA	ELEVATION (m)	DEPTH (m)	SAMPLES No.	SAMPLES TYPE	SAMPLES % REC.	SAMPLES N-VALUE	LAB DATA SOIL VAPOURS ppm	LAB DATA PL %	LAB DATA NMC %	LAB DATA LL %	LAB DATA UNIT WT kN/m3	LAB DATA FIELD VANE kPa	REMARKS
	Black 250mm Sandy TOPSOIL 99.7		100	0											
	brown Poorly-Graded SAND and GRAVEL dry trace silt occasional shale pieces		99	1											Lithology inferred from LW1 Deep.
	98 brown Fine SAND wet trace gravel, silt 97.6		98	2											
	grey Fine SAND saturated		97	3											Water measured at 2.4m depth at completion of well installation. Well details: LW1 Shallow constructed with 5.1cm ID PVC. 10cm square x 1.5m long steel well cover at surface set approximately 0.95m above grade. LW1 Shallow well pumped dry after approximately 20 litres.
	96 grey Silty CLAY apl embedded sand and gravel 95.4		96	4											
	END OF BOREHOLE		95	5											
			94	6											
			93	7											
			92	8											
			91	9											
			90												

GEO-ENV-I/M SW1306043.GPJ SARNIA.GDT 7/11/06

VERTICAL SCALE: 1:50

CHECKED BY: R.K.

amec

LOG OF BOREHOLE LW2

ENCL. No.: 4

PROJECT No.:	SW1306043	ELEVATION:	100.00 m
CLIENT:	Municipality of Kincardine	DATUM:	Local
PROJECT NAME:	Overburden Observation Wells	METHOD:	Direct Push / Hollow Stem Auger
LOCATION:	Ward 3 Waste Disposal Site, Kincardine, ON	DIAMETER:	200 mm
DATE:	5 July 2006	LOGGED BY:	L.C., AMEC

SYMBOL	STRATIGRAPHIC DESCRIPTION	WELL DATA	ELEVATION (m)	DEPTH (m)	SAMPLES: No.	TYPE	% REC.	N-VALUE	LAB DATA: SOIL VAPOURS ppm	PL %	NMC %	LL %	UNIT WT kN/m3	FIELD VANE kPa	REMARKS
dark brown	250mm Sandy TOPSOIL		100	0	1	CS	100								
99.7															
brown	Silty CLAY embedded sand and gravel	wtpl	99	1											
grey		apl			2	CS	100								
			98	2											
			97	3	3	CS	100								Well details: LW2 constructed with 5.1cm ID PVC. Gas Probe constructed with 3.8cm ID PVC. 15cm round x 1.5m long steel well cover at surface set approximately 0.95m above grade. LW2 well dry at completion.
	(soft wet vertical fissures from 3.8m to 4.6m depth)	wtpl	96	4	4	CS	100								
			95	5											
			94	6	5	CS	100								
			93	7											
			92	8	6	CS	100								
90.9			91	9											Borehole remained open and dry at completion.
	END OF BOREHOLE		90												

GEO-ENV-I/M SW1306043.GPJ SARNIA.GDT 7/11/06

VERTICAL SCALE: 1:50

CHECKED BY: R.K.

amec

LOG OF BOREHOLE MW13

ENCL. No.: 5

PROJECT No.:	SW1306043	ELEVATION:	100.00 m
CLIENT:	Municipality of Kincardine	DATUM:	Local
PROJECT NAME:	Overburden Observation Wells	METHOD:	Direct Push / Hollow Stem Auger
LOCATION:	Ward 3 Waste Disposal Site, Kincardine, ON	DIAMETER:	200 mm
DATE:	5 July 2006	LOGGED BY:	L.C., AMEC

SYMBOL	STRATIGRAPHIC DESCRIPTION		WELL DATA	ELEVATION (m)	DEPTH (m)	SAMPLES No.	SAMPLES TYPE	SAMPLES % REC.	SAMPLES N-VALUE	LAB DATA SOIL VAPOURS ppm	LAB DATA PL %	LAB DATA NMC %	LAB DATA LL %	LAB DATA UNIT WT kN/m3	LAB DATA FIELD VANE kPa	REMARKS
	Black 99.8	200mm Sandy TOPSOIL		100												
	brown 99.5	Fine SAND some silt, roots	dry													
	brown 98.9	CLAYEY SILT / SILTY CLAY layered thin silt lenses, trace roots	dtpl	99	1	1	CS	90								
	brown 98.4	Clayey SILT heavily weathered, fissured thin silt and clay lenses	wtpl													
	grey 98.1	Poorly-Graded SAND and GRAVEL some silt	saturated	98	2	2	CS	100								Water measured at 1.7m depth at completion of well installation.
	grey 96.7	Fine SAND trace silt, gravel	saturated													
	grey 95.4	Silty CLAY embedded sand and gravel several thin silt lenses	apl	97	3	3	CS	100								Well details: MW13 constructed with 3.8cm ID PVC. 10cm square x 1.5m long steel well cover at surface set approximately 0.95m above grade. MW13 well pumped dry after approximately 20 litres.
		END OF BOREHOLE		96	4											
				95	5											
				94	6											
				93	7											
				92	8											
				91	9											
				90												

GEO-ENV-I/M SW1306043.GPJ SARNIA.GDT 7/11/06

VERTICAL SCALE: 1:50

CHECKED BY: R.K.

amec

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: Municipality of Kincardine - Ward 3
HOLE DESIGNATION: MW14
PROJECT NUMBER: 004074-32
DATE COMPLETED: October 9, 2013
CLIENT: Municipality of Kincardine
DRILLING METHOD: 4 1/4" HSA
LOCATION: Former Bruce Township Landfill - Ward 3
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 273.51 TOP OF RISER 273.39 GROUND SURFACE 272.52						
0	LOAMY TOPSOIL, sandy topsoil, with silt, dark brown, dry; high organic content	272.45	CONCRETE				
	SP - SAND, trace silt, loose, medium grained sand, light brown, dry to moist			1		46	4
0.5							
1.0	ML - SANDY SILT, sandy to with sand, with gravel, stiff, fine grained sand, fine to medium grained gravel, no plasticity, brown, dry	271.46		2		54	12
			3/8" BENTONITE GRAVEL				
1.5	- increase sand content: SAND AND SILT at 1.52m BGS		50 mm dia SCH 40 PVC RISER PIPE				
				3		25	6
2.0	- grey, moist to wet at 2.29m BGS						
2.5	- 5 cm seam of greenish coloured, medium to coarse grained sand with silt at 2.59m BGS			4		54	14
	- wet 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 3
PROJECT NUMBER: 004074-32
CLIENT: Municipality of Kincardine
LOCATION: Former Bruce Township Landfill - Ward 3
DRILLING SUBCONTRACTOR: Noll Drilling Inc.

HOLE DESIGNATION: MW14
DATE COMPLETED: October 9, 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
	- trace gravel at 3.05m BGS		#1 SILICA SANDPACK 50 mm dia SCH 40 PVC SCREEN	5		67	23
3.5							
4.0	CI/ML - CLAYEY SILT (TILL), trace gravel, stiff to very stiff, moderate plasticity, fine grained gravel, grey, saturated with little available water	268.56		6		75	13
4.5							
5.0				7		83	10
	END OF BOREHOLE @ 5.18m BGS	267.34					
5.5	A complete geodetic survey of the Ward 3 Landfil has not been completed. The reference elevations provided on this log have been adjusted to a common assumed relative elevation. Reference Elevation = 39.01m						

WELL DETAILS
Screened interval:
269.48 to 267.95m
3.05 to 4.57m BGS
Length: 1.52m
Diameter: 51mm
Slot Size: 10
Material: SCH. 40 PVC
Seal:
272.22 to 270.08m
0.30 to 2.44m BGS
Material: BENTONITE GRAVEL
Sand Pack:
270.08 to 267.95m
2.44 to 4.57m BGS
Material: #1 SILICA SANDPACK

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE

OVERBURDEN LOG 004074-32 2013 STRATIGRAPHIC LOGS -WARD3.GPJ CRA_CORP.GDT 4/17/14

Appendix C

MECP Correspondence

4074-30

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Ontario

December 7, 2011

Mr. Jim O'Rourke
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Dear Mr. O'Rourke,

RE: 2010 Annual Monitoring Report, Kincardine Ward 3 Landfill Site

We have received the report titled "2010 Annual Monitoring Report, Kincardine Ward 3 Landfill Site, Municipality of Kincardine Ontario", prepared by Conestoga-Rovers & Associates and dated April 2011. The report was forwarded to our technical support section for their review. Comments from our regional surface water specialist are provided below.

The report concludes that the landfill is having a minor influence on some of the downstream surface water station locations. After reviewing the data, our surface water reviewer agrees that this is generally correct.

Future reports should to illustrate trend through time graphics for chloride, conductivity, dissolved organic carbon and hardness, for all surface water monitoring sites.

It is recommended that surface water historical data for each monitoring station be displayed on one page if possible, which will facilitate easier review. This may be possible with a panoramic view Table display.

Figure 1.1 should be checked to ensure it correctly shows the location of the landfill.

The report recommends that SW6 be removed from the monitoring program. In my letter dated May 17, 2010 we provided comment on this recommendation. SW6 is located on the south side of Concession Road 2/3, west of the landfill access road. The MOE agrees that SW6 can be removed from the monitoring program. However, the location of SW6 should remain on the map figures and the historical surface water data associated with SW6 continue with each annual report.

We will forward comments from our groundwater group once they have completed their review of the 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 C2 610

cc. Jack Colonnello, MOE, London
Jim Bromley, MOE, Owen Sound
Jim Yardley, Conestoga-Rovers, Waterloo

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Ontario

June 12, 2012

Mr. Jim O'Rourke
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Dear Mr. O'Rourke,

RE: 2011 Annual Monitoring Report, Kincardine Ward 3 landfill site

We have received the report titled "2011 Annual Monitoring Report, Kincardine Ward 3 Landfill Site", prepared by Conestoga-Rovers & Associates and dated April 2012. The 2011 report, as in previous reports, concludes that the landfill is having a minor influence on some of the downstream surface water station locations, notably SW2 and SW5. Our regional surface water specialist reviewed the 2011 annual report with respect to the surface water assessment and after reviewing the data, concurs with this conclusion.

Note that the Monitoring and Screening Checklists (Appendix H) should be signed off by the Competent Environmental Practitioner (CEP) report.

We will forward comments from our groundwater group once they have completed their review of the report. 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

File Storage Number: SI BR KB C2 610

cc. Jack Colonnello, MOE, London
Jim Bromley, MOE, Owen Sound
Jim Yardley, Conestoga-Rovers, Waterloo

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

October 10, 2012 Reference No. 004074

Mr. Ian Mitchell, P. Eng.
District Engineer
Ministry of the Environment
Owen Sound District Office
101 17th Street East, 3rd Floor
Owen Sound, ON N4K 0A5

Dear Mr. Mitchell:

Re: Winter Closure of Kincardine Ward 3 Landfill Site
ECA No. A272001

The Municipality of Kincardine (Municipality) has decided to temporarily close the Kincardine Ward 3 Landfill Site (Ward 3 Landfill) for the period of mid-October 2012 to mid-May 2013. The closure of the Ward 3 Landfill Site for the 7-month period will allow the effective disposal of the municipal waste generated in the northern portion of the Municipality during the low waste generation periods of the year. The winter closure of the Ward 3 Landfill Site is part of the overall streamlining of the Municipality's waste disposal operations.

With the recent improvements to the Kincardine Waste Management Centre (KWMC) and the Kincardine Ward 1 Landfill closure, the KWMC is the main waste disposal operation for the Municipality. The Ward 3 Landfill Site during the summer receives waste for 11.5 hours per week (Tuesday: noon to 8 p.m., Saturday: 8 a.m. to 11:30 a.m.) and during the winter period for 6.5 hours (Tuesday: 1 p.m. to 4 p.m., Saturday: 8 a.m. to 11:30 a.m.). The amount of waste received during the winter period at the Ward 3 Landfill is minimal. The winter closure will allow staff to be transferred to the KWMC for the winter period.

The following summarizes the work that will be completed by the Municipality with regard to the winter closure of the Ward 3 Landfill Site:

1. Signage will be posted indicating that the Site is closed for the winter and that all waste should be taken to the KWMC for disposal. The location and hours for the KWMC will be posted as well.
2. Once the Site has been closed for the winter, the waste disposal area will be graded to provide positive drainage and interim cover will be applied. Interim cover will be at least 0.3 metres thick and no exposed waste will be visible after placement of the interim cover.
3. During the winter closure period, municipal staff will conduct regular inspections of the landfill to ensure that waste has not been placed at the Site entrance and that the interim

cover has not been eroded. Any waste that is placed at the Site entrance will be removed and taken to the KWMC for disposal. Erosion areas will be repaired as required.

Should you have any questions, please do not hesitate to contact Mr. Gagan Sandhu, Kincardine Public Works Manager (519-396-3468 X120) or myself regarding this matter.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

James R. Yardley, P.Eng.

JY/lp/4

cc: Gagan Sandhu, Municipality of Kincardine

4074

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Ontario

August 11, 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 3 Landfill

Further to my letter dated July 7, 2014 with ministry surface water comments regarding the 2013 Annual Monitoring Report for the Kincardine Ward 3 Landfill Site, our regional hydrogeologist reviewed the 2013 report and provides the following comments:

1. The MOECC comments on the results of the groundwater monitoring program for the years 2010 to 2012 were adequately addressed in section 3.5 of the 2013 report. In response to MOECC request to address the non-compliance at MW12, a new monitor (MW14) was installed in October 2013. This monitor was included in the 2013 monitoring event.

2. The water level measurements collected in 2013 show that the shallow groundwater direction is generally to the north and consistent with the historical observations. With incorporation of MW14 in the water level measurements, the shallow groundwater flow show developing of a weak radial pattern at the southeast corner of the site.

3. The water quality in the downgradient monitors is reportedly consistent with the historical results with exception at monitor MW7. Minor impacts are observed at MW7 with slightly elevated chloride, alkalinity, and hardness. The concentration of chloride in 2013 is above the historical levels. The cause of this is unknown, as such this monitor should be closely monitored.

4. Leachate impacts continued to be noticed in the southern boundary monitor MW12 as well as in the newly installed monitor MW14. The Reasonable Use Guideline (RUG) assessment indicates exceedances for iron, manganese and DOC in the southern boundary monitors MW12 and MW14. A minor exceedance for DOC is noted in the eastern boundary monitor MW2.

5. To address the non-compliance issue at the southern boundary, the consultant recommended continuation of collecting more water quality data from the newly installed monitor MW14 to confirm whether the impact noticed at MW12 is related to the landfill or not. If the additional water quality confirmed impacts similar to those noticed in MW12, the consultant recommended taking further actions to determine the extent of leachate impact to groundwater in the adjacent property. This approach is reasonable and acceptable.

6. The water quality results for samples collected from the two private bedrock wells (PW-2 and PW-3) continue to show no landfill impact. The consultant recommended removing these wells from the monitoring program based on their location relative to the landfill and the thick aquitard overlaying the bedrock aquifer. In addition the recent and historical water quality results did not show evidence of landfill-related impacts. We concur with this recommendation.

7. A hydrogeological cross-section is included in Appendix B. The direction of this section is not show in the site plan and seems to be mistakenly labeled as East-West instead of South-North. This section should be reviewed and updated to include the new monitor (MW14) and the leachate monitors LW1-S & D.

We agree with the reports' conclusions that the site has no measurable impacts to the shallow groundwater with the exception of the noted impact in the southern boundary. We concur with the reports' recommendations to continue the existing groundwater monitoring program.

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 C2 610

cc. Jim Bromley, MOE, Owen Sound
Jim Yardley, Conestoga-Rovers, Waterloo
Husein Awad, MOE, London

4074-30

Rec'd CRA

JUL 11 2014

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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 3 Landfill

We have received a copy of the report titled "2013 Annual Monitoring Report, Kincardine Ward 3 Landfill Site", prepared by Conestoga-Rovers & Associates, dated April 2014. The report was forwarded to our technical support section for their review.

Our Regional Surface Water Evaluator reviewed the report and concurs with the consultant that there appears to be a slight landfill related impact at SW3 and SW5 associated primarily with marginally elevated chlorides (Section 5.2 and page 30). Surface water results for all sites remain within historical norms (Figures 6 and Table 4.6). The impact should be considered minor and no action is required at this time. Section 9.0 (Recommendations) makes no recommendations with respect to modifying the surface water monitoring program.

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 C2 610

cc. Jim Bromley, MOE, Owen Sound
Jim Yardley, Conestoga-Rovers, Waterloo
Hugh Geurts, MOE, London

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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 Waste Management Centre

We have received a copy of the report titled "2015 Annual Monitoring Report, Kincardine Waste Management Centre, Kincardine, Ontario", 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 ministry concurs with the report's conclusion that the landfill site and the discharges from its two groundwater interceptor trenches and two storm ponds are not having an impact on the North Penetangore River (SW1, SW2 and SW3) or on the tributary (SW4) down gradient of the wetland area south of the Phase 2 area. Upward trends in chemical variables are not evident at these sampling locations. Some mild on-site impact is evident at SW5 closer to the waste footprint. On page 34 the table of trigger levels includes incorrect Provincial Water Quality Objective (PWQO) entries for total phenolics (4-AAP test) and total phosphorus. The PWQO's are 0.001 mg/L for phenolics and 0.03 mg/L for phosphorus in watercourses. Overall the ministry has no concerns or recommendations other than continued monitoring and reporting as noted in the annual report.

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

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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 3 Landfill

We have received a copy of the report titled "2015 Annual Report, Kincardine Ward 3 Landfill Site", 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:

Generally the ministry concurs with the report that off-site impact is minimal as assessed as monitoring location SW3. The concentrations of several indicator variables over time at on-site locations SW1, SW2, SW3 and SW5 are showing an increasing trend albeit slight in most cases. Since this trend is occurring even at the "background" location SW1, the consultant should speak to the adequacy of SW1 as a "background" location in the next annual report. SW1, SW2 and SW5 showed the highest-ever concentrations of iron in 2015 although we agree that the iron result for SW5 (125 mg/L) may be an anomaly. While the leachate is generally characterized as "weak", it is iron-rich as shown by the monitoring data for leachate well LW1-S. SW2 has shown elevated ammonia for many years with Provincial Water Quality Objectives (PWQO) exceedances in 2014 but ammonia has been relatively low over time at SW1. SW2 also shows elevated phenolics since 2014. SW3 and SW5 continue to show elevated chloride compared to other locations although not to a level of concern.

Some of the time series graphs do not present any monitoring data for 2013 but the tabulated data show that 2013 chemistry results are available in many cases. The graphs need to be checked so that all the data are plotted. For example the iron concentration of 6.74 mg/L at SW3 in October 2013 is missing from the graph but its presence would influence any conclusions drawn from the graph about the trend over time.

Ministry of the Environment, Conservation & Parks

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Ontario

February 23, 2021

Mr. Adam Weishar
Municipality of Kincardine
1475 Concession 5
RR # 5
Kincardine, ON, N2Z 2X6

Via email: aweishar@kincardine.net

Dear Mr. Weishar:

Re: 2019 Annual Monitoring Report, Kincardine Ward 3 Landfill Site
MOE File SI BR KB C2 610

We have received a copy of the report titled "2019 Annual Monitoring Report, Kincardine Ward 3 Landfill Site, Municipality of Kincardine, Ontario", prepared by GHD Limited, dated April 30, 2020. 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 identifies two surface water sampling locations that appear to be showing evidence that landfill leachate is accessing surface water. These stations are identified as SW3 and SW5.

With respect to leachate influence at SW3, page 15 of the report states that "Water quality at SW3 shows less indication of landfill-related water quality influence as compared to upstream drainage swale monitoring location SW5, and more indication of landfill-related water quality influence as compared to the upstream intermittent creek location SW2 indicating that landfill-related impacts are contributed to the waterbody by the swale."

Specific to SW5, page 15 of the report states that "Analytical results from the spring event indicated that concentrations of many parameters are elevated above background. The elevated indicator parameters are interpreted to be the result of landfilling."

Section 6.2 page 18 shows that there were PWQO exceedances at SW3 and SW5 which were similar. According to the report, SW3 exceedances were: aluminium (spring), iron, phosphorous, phenolics (fall), and field DO (spring), whereas SW5 exceedances were: aluminium, boron, iron, phosphorous, phenolics, un-ionized ammonia (spring) and field DO.

Further, the report identifies that these results are similar to historical surface water sampling results.

The consultant also identified on Page 19 that SW2 and SW5 both have landfill related elevated results.

Under the conclusions section, Section 8.10 on page 20 states that "Surface water quality flowing offsite is similar to background water quality and shows no indications of landfill-related water quality influences."

Our surface water specialist disagrees with this conclusion since earlier in the report the consultant identified that they observed landfill-related water quality influences at SW2, SW5 and SW3, with SW3 being a mixture of both the swale and the intermittent creek. Further, it is our surface water reviewer's opinion that having sampling station SW3 located at the confluence of the two receivers does not allow for a conclusive statement such as what the consultant has concluded.

We provide the following recommendations:

Mapping-

There is a minor editing error which will need to be corrected. In the report on Figures 2.3 and 2.4, the flow direction identified by the arrows are reversed. It has been identified in the report that the upstream station is listed as SW1 so the flow direction in Figs 2.3 and 2.4 erroneously shows SW1 as the furthest downstream station and this needs to be corrected.

Proposed sampling station modifications-

As mentioned above, our surface water specialist is concerned that leachate impacted surface water has been found at stations SW3 and SW5 and we are unsure whether this material is flowing offsite. In order to further investigate this area, we recommend that the proponent add a few new SW sampling stations.

Suggested additional stations are as follows:

1. The proponent should add a new station between SW5 and SW3 on the drainage swale, further northwest and downstream from SW5 at a point 5-10 m upstream of the confluence of the drainage swale and the intermittent creek.

   As noted previously, since SW5 appears to have some landfill related impacts, a new station located downstream in the drainage swale may be able to determine whether the leachate related concentrations found at SW5 are being attenuated prior to reaching the confluence with the intermittent creek.

2. Further, as previously mentioned, our surface water specialist believes SW3 may not be providing accurate "downstream" concentrations since it is located at the confluence of both the intermittent creek and drainage swale. By sampling at this mixing location, it is

unclear as to whether the elevated leachate related concentrations are coming from the drainage swale or the intermittent creek (or possibly both), so it likely won't provide accurate downstream results for either system.

In order to remedy this, we recommend altering the location of SW3 to be further upstream in the intermittent creek outside of the influence of the drainage swale (likely somewhere in the range of 5-10 m upstream) so that it will represent a true approximation of the downstream intermittent creek since SW2 is showing possible leachate influence.

3. In addition to the above two changes, we would recommend that the proponent establish an additional station downstream of the confluence of the drainage swale and the intermittent creek.

   Once established, the consultant can use the new SW3 location to identify the conditions in the intermittent creek prior to the confluence, the additional drainage swale sample can be used to identify any inputs from the drainage swale and the new monitoring station downstream of the confluence can demonstrate "downstream" conditions post mixing and prior to the surface water flowing offsite.

It is ultimately the intent of these additional stations to clarify whether the landfill-impacted surface water is accessing the intermittent creek which ultimately flows offsite.

These additional stations should be considered for the 2021 sampling plan and a summary of these additional locations be provided in the 2021 annual monitoring report.

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. Ryan Smith, MECP, London
Jim Yardley, GHD, Waterloo, jim.yardley@ghd.com
Lisa Hines, MECP, Owen Sound

Appendix D

QA/QC Data Verification Table

Appendix D

QA/QC Data Verification Table
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:		MW3	MW3		MW5	MW5		Field Blank	Field Blank
Sample ID:		MW3	Field Duplicate	RPD	MW5	Field Duplicate	RPD	Field Blank	Field Blank
Sample Date:		5/19/2023	5/19/2023 Duplicate		11/7/2023	11/7/2023 Duplicate		5/19/2023 Field Blank	11/7/2023 Field Blank
Parameters	**Units**								
Metals									
Aluminum (dissolved)	mg/L	0.009	0.013	36%	0.003	0.002	40%	0.015	0.013
Barium (dissolved)	mg/L	-	-		-	-		-	-
Boron (dissolved)	mg/L	0.099	0.317	105%	0.092	0.089	3%	<0.002	<0.002
Calcium (dissolved)	mg/L	171	25.7	148%	54.9	54.5	1%	<0.01	0.05
Iron (dissolved)	mg/L	1.87	0.027	194%	<0.007	0.014	nm	<0.007	<0.007
Magnesium (dissolved)	mg/L	18.4	11.9	43%	17.3	17.2	1%	0.001	0.002
Manganese (dissolved)	mg/L	1.13	0.00117	200%	0.00221	0.00252	13%	<0.00001	0.00004
Phosphorus (dissolved)	mg/L	<0.003	0.004	nm	0.009	0.012	29%	<0.003	<0.003
Potassium (dissolved)	mg/L	3.75	0.734	135%	1.78	1.96	10%	<0.009	<0.009
Sodium (dissolved)	mg/L	-	-		-	-		-	-
General Chemistry									
Alkalinity, total (as CaCO3)	mg/L	160	156	3%	237	260	9%	2	2
Ammonia-N	mg/L	<0.1	<0.1	0%	<0.1	<0.1	0%	<0.1	<0.1
Chloride	mg/L	<1	<1	0%	3	3	0%	<1	<1
Conductivity	µS/cm	396	392	1%	505	500	1%	3	2
Dissolved organic carbon (DOC)	mg/L	<1	<1	0%	2	2	0%	<1	<1
Hardness	mg/L	502	113	127%	208	207	0%	<0.05	0.14
Nitrate (as N)	mg/L	0.14	0.14	0%	0.07	0.07	0%	<0.06	<0.06
Nitrite (as N)	mg/L	<0.03	<0.03	0%	<0.03	<0.03	0%	<0.03	<0.03
Orthophosphate	mg/L	<0.03	<0.03	0%	0.16	0.1	46%	<0.03	<0.03
pH	s.u.	8.3	8.3	0%	8.13	8.09	0%	6.24	6.55
Phenolics (total)	mg/L	<0.002	<0.002	0%	<0.002	<0.002	0%	<0.002	<0.002
Sulfate	mg/L	47	47	0%	32	32	0%	<2	<2
Total kjeldahl nitrogen (TKN)	mg/L	<0.5	<0.5	0%	0.8	<5	nm	<0.5	<5
Field Parameters									
Conductivity, field	µS/cm	365000	-	-	479000	479000	-	-	-
pH, field	s.u.	8.25	-	-	8.16	8.16	-	-	-
Temperature, field	Deg C	11.64	-	-	10.58	10.58	-	-	-
								-	-

Notes:

RPD - Relative Percent Difference

Appendix E

Historical Water Quality and Elevation Data

Appendix E.1

Historical Results 1987 to 2009

Appendix E.1

Groundwater Elevations
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	1-Jul-87	1-Mar-89	1-Mar-98	1-Dec-90	1-Jun-91	1-May-92	1-Jun-93	1-Aug-93	1-Nov-93
MW1	36.37	32.77	34.21	34.21	33.79	33	33.8	33.57	32.64	33.41
MW2	36.91	34.95	35.64	35.64	35.59	35.01	35.46	35.25	34.62	35.11
MW3	36.80	31.99	34.97	34.97	35.84	35.12	35.49	35.4	34.99	35.28
MW5	37.41	32.13	36.15	36.15	35.95	35.41	35.99	35.77	35.06	35.23
MW6	36.29	31.09	34.5	34.5	34.44	34.09	34.24	34.1	-	34.05
MW7	32.52	31.4	31.81	31.81	31.23	-	30.65	-	-	30.65
MW8	32.75	29.17	31.89	31.89	31.78	30.91	31.64	-	25.48	30.23
MW9	32.16	24.12	29.94	29.94	29.9	29.53	29.7	29.56	28.62	29.79
MW10	32.06	-	-	-	-	-	-	-	28.95	30.38
MW11	38.07	-	-	-	-	-	-	-	33.98	35.2
MW12	36.78	-	-	-	-	-	-	-	35.23	35.71
MW13	38.18	-	-	-	-	-	-	-	-	-
PW2	-	-	-	-	-	-	-	-	-	-
PW3	-	-	-	-	-	-	-	-	-	-
LW1-S	38.66	-	-	-	-	-	-	-	-	-
LW1-D	38.65	-	-	-	-	-	-	-	-	-
LW2	35.21	-	-	-	-	-	-	-	-	-

Notes:

mAMSL - metres above mean sea level.
mbtor - metres below top of riser pipe.
- No information/not surveyed.
Survey information taken from an assumed elevation. A geodetic survey has not been completed at the Ward III Site. All measurements are relative to a chosen elevation and measured in metres.

Appendix E.1

Groundwater Elevations
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	1-Jun-94	1-Sep-94	1-Apr-95	1-Oct-95	1-May-96	1-Oct-96	1-Apr-97	1-Oct-97	1-Apr-98
MW1	36.37	33.51	32.87	33.56	32.68	33.74	33.34	33.84	32.75	33.82
MW2	36.91	35.29	34.74	35.49	34.57	35.57	35.09	35.58	34.59	35.48
MW3	36.80	35.51	35.05	35.38	34.87	35.66	35.24	35.56	34.87	35.46
MW5	37.41	35.86	35.17	35.89	35.11	36.05	35.38	36.04	35.14	35.74
MW6	36.29	34.21	33.96	34.19	33.98	34.29	34.13	34.31	33.85	34.26
MW7	32.52	31.17	31.06	31.57	30.82	31.47	31.34	31.81	30.56	31.66
MW8	32.75	30.86	30.72	30.95	30.65	30.99	31.15	30.83	30.33	31.03
MW9	32.16	29.69	29.49	29.62	29.44	29.68	29.82	29.78	28.9	29.56
MW10	32.06	30.47	30.2	30.44	29.7	30.47	30.52	30.49	29.58	30.41
MW11	38.07	35.95	35.31	36.01	35.39	36.22	35.91	36.3	35.15	35.96
MW12	36.78	36	35.4	36.03	35.93	36.03	35.83	36.06	35.13	36.03
MW13	38.18	-	-	-	-	-	-	-	-	-
PW2	-	-	-	-	-	-	-	-	-	-
PW3	-	-	-	-	-	-	-	-	-	-
LW1-S	38.66	-	-	-	-	-	-	-	-	-
LW1-D	38.65	-	-	-	-	-	-	-	-	-
LW2	35.21	-	-	-	-	-	-	-	-	-

Notes:

mAMSL - metres above mean sea level.
mbtor - metres below top of riser pipe.
- No information/not surveyed.
Survey information taken from an assumed elevation. A geodetic survey has not been completed at the Ward III Site. All measurements are relative to a chosen elevation and measured in metres.

Appendix D

Groundwater Elevations
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	1-Oct-98	1-Apr-99	1-Oct-99	1-May-00	1-Oct-00	1-May-01	1-Oct-01	1-Apr-02	1-Oct-02
MW1	36.37	32.41	33.15	32.43	33.26	33	34.12	33.79	34.01	32.39
MW2	36.91	34.26	35.24	34.34	35.31	34.89	36.04	35.19	35.65	34.28
MW3	36.80	34.4	35.31	34.64	35.48	35.18	36.03	35.46	35.62	34.31
MW5	37.41	34.8	35.64	34.8	35.81	35.08	35.84	35.47	35.84	34.66
MW6	36.29	33.23	34.01	33.39	34.05	33.95	34.14	33.83	34.15	32.95
MW7	32.52	29.03	31.4	30.15	31.54	31.56	31.67	31.3	32.08	29.33
MW8	32.75	29.09	30.21	29.35	30.44	30.77	30.94	30.35	30.84	29.05
MW9	32.16	26.68	27.7	28.06	29.51	29.59	29.66	29.06	29.55	25.75
MW10	32.06	26.9	30.09	28.68	30.32	30.24	30.42	30.06	30.46	26.87
MW11	38.07	34.19	35.07	34.32	35.67	35.51	36.11	35.27	36.14	34.67
MW12	36.78	34.78	35.93	34.88	35.98	35.52	36.04	35.94	36	33.8
MW13	38.18	-	-	-	-	-	-	-	-	-
PW2	-	-	-	-	-	-	-	-	-	-
PW3	-	-	-	-	-	-	-	-	-	-
LW1-S	38.66	-	-	-	-	-	-	-	-	-
LW1-D	38.65	-	-	-	-	-	-	-	-	-
LW2	35.21	-	-	-	-	-	-	-	-	-

Notes:

mAMSL - metres above mean sea level.
mbtor - metres below top of riser pipe.
- No information/not surveyed.
Survey information taken from an assumed elevation. A geodetic survey has not been completed at the Ward III Site. All measurements are relative to a chosen elevation and measured in metres.

Appendix D

Groundwater Elevations
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	22-Apr-03	19-Nov-03	1-Jun-04	10-Nov-04	18-Jul-05	9-Nov-05	9-May-06	30-Nov-06	10-Jun-07
MW1	36.37	33.73	33.49	33.71	32.87	31.96	32.95	33.38	33.47	33.17
MW2	36.91	35.58	35.11	35.2	34.49	34.22	34.64	35.34	35.12	34.82
MW3	36.80	35.3	34.85	35.02	34.33	34.45	34.3	35.27	34.8	34.78
MW5	37.41	35.79	35.24	35.26	34.71	34.69	34.76	35.53	35.25	35.47
MW6	36.29	33.85	-	-	-	-	-	33.96	33.74	33.36
MW7	32.52	31.72	31.05	31.34	-	-	29.99	31.55	31.79	31.54
MW8	32.75	30.43	30.4	30.25	30.09	29.72	29.32	30.47	30.79	30.15
MW9	32.16	28.33	29.3	29.05	28.75	28.77	25.73	29.32	29.76	28.94
MW10	32.06	30.06	30.05	30.12	29.25	29.52	28.03	30.3	30.42	30.38
MW11	38.07	35.11	35.59	35.86	34.61	36.07	33.46	36.31	35.77	35.63
MW12	36.78	36.08	35.96	35.99	35.33	33.75	35.46	35.95	35.98	35.82
MW13	38.18	-	-	-	-	-	-	-	36.19	35.56
PW2	-	-	-	-	-	-	-	-	-	-
PW3	-	-	-	-	-	-	-	-	-	-
LW1-S	38.66	-	-	-	-	-	-	-	35.94	35.49
LW1-D	38.65	-	-	-	-	-	-	-	34.32	35.07
LW2	35.21	-	-	-	-	-	-	-	33.26	33.24

Notes:

mAMSL - metres above mean sea level.
mbtor - metres below top of riser pipe.
- No information/not surveyed.
Survey information taken from an assumed elevation. A geodetic survey has not been completed at the Ward III Site. All measurements are relative to a chosen elevation and measured in metres.

Appendix D

Groundwater Elevations
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	14-Oct-07	31-Jul-08	5-Dec-08	30-Apr-09	20-Nov-09
MW1	36.37	32.34	33.18	33.74	33.95	33.07
MW2	36.91	34.2	35.14	35.51	35.60	34.79
MW3	36.80	34.23	35.2	35.22	35.40	34.74
MW5	37.41	34.51	35.55	35.74	35.90	34.90
MW6	36.29	32.67	33.09	34.3	34.18	33.50
MW7	32.52	29.5	31.55	31.75	31.40	30.80
MW8	32.75	28.8	30.54	30.71	30.81	29.99
MW9	32.16	27.77	29.51	30.25	29.98	30.00
MW10	32.06	27.36	30.46	30.55	30.47	29.97
MW11	38.07	33.23	36.09	36.28	36.46	34.65
MW12	36.78	34.79	35.9	36.02	36.05	35.46
MW13	38.18	34.75	35.88	36.27	36.46	35.28
PW2	-	-	-	-	-	-
PW3	-	-	-	-	-	-
LW1-S	38.66	34.89	35.71	36.13	36.24	35.35
LW1-D	38.65	34.62	35.32	35.69	35.65	35.03
LW2	35.21	31.55	33.69	33.61	33.43	33.33

Notes:

mAMSL - metres above mean sea level.
mbtor - metres below top of riser pipe.
- No information/not surveyed.
Survey information taken from an assumed elevation. A geodetic survey has not been completed at the Ward III Site. All measurements are relative to a chosen elevation and measured in metres.

Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MW1 16-Apr-02	MW1 29-Oct-02	MW1 22-Apr-03	MW1 25-Nov-03	MW1 25-Nov-03	MW1 2-Jun-04	MW1 2-Jun-04	MW1 18-Nov-04	MW1 18-Nov-04	MW1 20-Jul-05	MW1 16-Nov-05	MW1 9-May-06	MW1 14-Jun-07
Alkalinity	30 - 500	OG	421	302	332	278	278	334	337	317	314	309	274	399	432
Aluminum	0.1	OG	ND(0.01)	0.011	ND(0.005)	0.027	0.028	ND	-	ND	ND	0.008	ND	ND(0.01)	ND
Barium	1	MAC	0.097	0.078	0.074	0.072	0.072	0.075	-	0.08	0.079	-	-	-	-
Boron	5	MAC	0.41	0.36	0.301	0.31	0.313	0.296	-	0.344	0.343	0.26	0.29	0.282	0.36
Cadmium	0.005	MAC	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND	ND	ND	-	ND	ND	-	ND	-	-
Calcium	-	-	125	93.5	93.4	94.7	94.1	110	-	95.1	94.7	92	86	91.1	120
Chloride	250	AO	34	36	35	33.9	34.3	41	40.4	33.7	32.2	3	25	24	35
Chromium	0.05	MAC	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	ND	ND	-	ND	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	1	AO	ND(0.002)	ND(0.002)	0.0012	0.001	0.0009	0.0012	-	0.0007	0.0017	-	ND	-	-
Dissolved Organic Carbon (DOC)	5	AO	2.4	0.8	1.5	1.6	1.6	2.1	1.7	2	1.9	0.8	1.6	1.4	3.2
Hardness	80 - 100	OG	**567**	**399**	**437**	**394**	**390**	**465**	**463**	**405**	**404**	**347**	**380**	**421**	**540**
Iron	0.3	AO	ND(0.03)	ND(0.03)	ND(0.03)	ND	ND	ND	-	ND	ND	0.12	ND	ND(0.01)	ND
Lead	0.01	MAC	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	ND	ND	-	ND	ND	-	ND	-	-
Magnesium	-	-	62	40.2	49.5	38.1	37.6	46.4	-	40.5	40.6	42	40	47	60
Manganese	0.05	AO	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	ND	ND	ND	0.009	ND(0.001)	ND
Ammonia	-	-	ND(0.05)	ND(0.05)	ND(0.05)	ND	ND	ND	ND	ND	ND	0.06	ND	0.2	ND
Nitrite	1	MAC	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND	ND	ND	ND(0.06)	ND
Nitrate	10	MAC	0.59	0.38	ND(0.1)	0.4	0.4	0.3	0.3	0.2	0.2	ND	0.4	0.88	0.5
Potassium	-	-	9.3	4.5	9.8	4.6	4.5	5	-	4.4	4.5	4.2	6.4	8.08	8.8
Silica	-	-	3.93	4.41	3.34	9.1	9	-	-	8.8	9	-	-	-	-
Sodium	200	AO	30.8	31.4	24	30	29.6	31.3	-	30.4	30.6	31	26	26.4	32
Sulphate	500	AO	155	139	119	-	-	142	139	-	-	13.2	90	98	108
Total Kjeldahl Nitrogen (TKN)	-	-	0.28	0.09	0.48	0.17	0.17	0.28	0.31	0.41	0.39	-	0.2	-	-
Total Phenolics	-	-	-	-	-	-	-	ND	ND	-	-	0.001	ND	ND(0.002)	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	ND(0.005)	0.005	ND(0.005)	0.065	0.064	0.019	-	ND	ND	-	ND	-	-
Laboratory Conductivity (µmhos/cm)	-	-	1060	840	857	720	-	865	855	870	-	-	629	-	1040
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	7.64	7.7	7.34	-	-	8.2	-	8.1
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MW1 27-Oct-07	MW1 31-Jul-08	MW1 6-Dec-08	MW1 30-Apr-09	MW1 20-Nov-09
Alkalinity	30 - 500	OG	339	384	**538**	**511**	444
Aluminum	0.1	OG	ND	ND	ND	ND(0.010)	ND(0.010)
Barium	1	MAC	-	-	-	-	-
Boron	5	MAC	0.39	0.32	0.44	0.473	0.427
Cadmium	0.005	MAC	-	-	-	-	-
Calcium	-	-	-	100	140	149	102
Chloride	250	AO	34	38	26	24.2	24.7
Chromium	0.05	MAC	-	-	-	-	-
Cobalt	-	-	-	ND	ND	-	-
Copper	1	AO	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	1.2	1.4	1.8	2.0	1.6
Hardness	80 - 100	OG	**460**	**480**	**650**	**671**	**505**
Iron	0.3	AO	ND	ND	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	-	-	-	-
Magnesium	-	-	51	55	77	72.8	60.8
Manganese	0.05	AO	ND	-	ND	ND(0.0010)	**0.116**
Ammonia	-	-	ND	ND	0.08	ND(0.050)	ND(0.050)
Nitrite	1	MAC	ND	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	ND	0.9	0.7	0.93	0.15
Potassium	-	-	7	11	15	11.8	8.9
Silica	-	-	-	-	-	-	-
Sodium	200	AO	32	33	29	-	-
Sulphate	500	AO	108	105	149	106	103
Total Kjeldahl Nitrogen (TKN)	-	-	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	ND	ND	ND	0.0018	0.001
Phosphorus (Dissolved)	-	-	-	-	-	-	0.0
Phosphate (ortho)	-	-	-	-	-	0.0044	0
Zinc	5	AO	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	887	-	1210	1160	982
Laboratory pH (Std. Units)	6.5 - 8.5	OG	8.1	-	7.9	7.78	7.9
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	7.29	7.25
Field Conductivity (µmhos/cm)	-	-	-	-	-	1110	987
Field Temperature (°C)	15	AO	-	-	-	7.8	10.2

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards
(ODWS), August 2000, revised January 2001 and June 2003, where a
(2) Maximum Acceptable Boundary Concentration as calculated based on t
ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, Mc

Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW2 16-Apr-02	MW2 29-Oct-02	MW2 22-Apr-03	MW2 25-Nov-03	MW2 2-Jun-04	MW2 18-Nov-04	MW2 20-Jul-05	MW2 16-Nov-05	MW2 9-May-06	MW2 28-Dec-06	MW2 14-Jun-07	MW2 27-Oct-07
Alkalinity	30 - 500	OG	-	**512**	428	496	416	398	398	433	398	378	342	403	363
Aluminum	0.1	OG	-	ND(0.01)	ND(0.01)	ND(0.005)	0.006	0.006	ND	ND	ND	0.53	ND(0.01)	ND	ND
Barium	1	MAC	-	0.044	0.037	0.036	0.035	0.035	0.038	-	-	-	-	-	-
Boron	5	MAC	1.5	0.18	0.21	0.172	0.194	0.185	0.181	0.17	0.18	0.156	0.178	0.17	0.21
Cadmium	0.005	MAC	-	ND(0.0001)	0.0001	ND(0.0001)	ND	0.0002	0.0005	-	ND	-	-	-	-
Calcium	-	-	-	116	89.6	106	88	88.6	88.3	87	90	108	71.4	82	84
Chloride	250	AO	126	19	15	17	15	17.1	14	14.1	16	13	12	14	15
Chromium	0.05	MAC	-	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	ND	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	1	AO	0.5	0.003	0.003	0.002	0.0032	0.0034	0.0027	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	**5.9**	4.5	4.7	4.5	3.8	**6.6**	3.9	4	3.7	4.9	3.8	3.6
Hardness	80 - 100	OG	-	**498**	**392**	**469**	**386**	**393**	**388**	**391**	**400**	**462**	**330**	**370**	**390**
Iron	0.3	AO	0.17	ND(0.03)	ND(0.03)	ND(0.03)	ND	ND	ND	ND	ND	**0.92**	ND(0.01)	ND	-
Lead	0.01	MAC	-	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	0.0005	ND	-	ND	-	-	-	-
Magnesium	-	-	-	50.5	40.8	49.6	40.5	41.8	40.5	41	44	46.4	37	40	44
Manganese	0.05	AO	0.03	**0.114**	**0.11**	**0.087**	ND	ND	0.007	ND	0.02	**0.147**	ND(0.001)	ND	**0.12**
Ammonia	-	-	-	0.07	ND(0.05)	0.07	ND	ND	ND	0.12	ND	0.1	0.2	0.07	0.1
Nitrite	1	MAC	0.3	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND(0.06)	ND(0.06)	ND	ND
Nitrate	10	MAC	2.6	ND(0.1)	ND(0.1)	ND(0.1)	0.2	ND	ND	0.8	ND	0.11	0.11	ND	0.3
Potassium	-	-	-	1.3	1.3	1.1	1.3	1.4	1.3	1.3	1.4	1.35	1.26	1.4	1.6
Silica	-	-	-	7.34	7.7	7.92	15.9	-	14.8	-	-	-	-	-	-
Sodium	200	AO	121	23.2	25.4	23.1	24.1	24.5	23.8	27	25	23.1	24.3	27	28
Sulphate	500	AO	269	16	17	15	-	14.3	-	14.4	14	14	13	15	18
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.64	0.43	0.74	0.46	0.64	1.33	-	0.4	-	ND(0.5)	-	-
Total Phenolics	-	-	-	-	-	-	-	ND	-	0.85	ND	ND(0.002)	ND(0.002)	ND	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	-	ND(0.005)	ND(0.005)	ND(0.005)	0.011	0.025	0.008	-	ND	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	936	762	896	860	706	740	-	666	-	-	766	707
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	7.7	7.73	-	8.26	-	-	8.1	8.2
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
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Bold Parameter exceeds the ODWS
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Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW2 31-Jul-08	MW2 6-Dec-08	MW2 30-Apr-09	MW2 20-Nov-09
Alkalinity	30 - 500	OG	-	364	367	378	378
Aluminum	0.1	OG	-	ND	ND	ND(0.010)	ND(0.010)
Barium	1	MAC	-	-	-	-	-
Boron	5	MAC	1.5	0.18	0.18	0.184	0.184
Cadmium	0.005	MAC	-	-	-	-	-
Calcium	-	-	-	79	72	86.5	74.3
Chloride	250	AO	126	12	12	11.6	10.6
Chromium	0.05	MAC	-	-	-	-	-
Cobalt	-	-	-	ND	ND	-	-
Copper	1	AO	0.5	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	3	3.6	3.2	2.9
Hardness	80 - 100	OG	-	**360**	**340**	**356**	**344**
Iron	0.3	AO	0.17	ND	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	-	-	-	-
Magnesium	-	-	-	40	38	33.9	38.5
Manganese	0.05	AO	0.03	-	ND	ND(0.0010)	0.0019
Ammonia	-	-	-	0.05	ND	0.083	ND(0.050)
Nitrite	1	MAC	0.3	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	2.6	ND	0.2	0.13	ND(0.10)
Potassium	-	-	-	3.1	1.8	1.2	1.3
Silica	-	-	-	-	-	-	-
Sodium	200	AO	121	30	27	-	-
Sulphate	500	AO	269	14	15	14.3	13.3
Total Kjeldahl Nitrogen (TKN)	-	-	-	-	-	0.44	ND(0.15)
Total Phenolics	-	-	-	ND	ND	0.0052	1
Phosphorus (Dissolved)	-	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	-	0.0055	0.0111
Zinc	5	AO	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	-	698	720	692
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	8.1	8.05	8.03
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	7.61	7.58
Field Conductivity (µmhos/cm)	-	-	-	-	-	547	663
Field Temperature (°C)	15	AO	-	-	-	8.9	8.5

Notes:

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Appendix D

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General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MW3 16-Apr-02	MW3 29-Oct-02	MW3 22-Apr-03	MW3 25-Nov-03	MW3 2-Jun-04	MW3 10-Nov-04	MW3 10-Nov-04	MW3 20-Jul-05	MW3 16-Nov-05	MW3 9-May-06	MW3 28-Dec-06	MW3 14-Jun-07	MW3 27-Oct-07
Alkalinity	30 - 500	OG	195	215	225	225	171	208	208	165	215	199	197	216	208
Aluminum	0.1	OG	ND(0.01)	ND(0.01)	ND(0.005)	ND	0.008	ND	ND	0.006	ND	ND(0.01)	ND(0.01)	0.008	ND
Barium	1	MAC	0.028	0.031	0.031	0.035	0.022	0.03	0.031	-	-	-	-	-	-
Boron	5	MAC	0.16	0.27	0.242	0.228	0.119	0.217	0.207	0.23	0.23	0.198	0.224	0.21	0.25
Cadmium	0.005	MAC	0.0001	ND(0.0001)	ND(0.0001)	ND	0.0002	ND	ND	-	ND	-	-	-	37
Calcium	-	-	37.8	35.2	41.1	42.5	37.5	38.5	37.6	38	40	36.2	35.6	42	-
Chloride	250	AO	1	2	2	0.8	4.3	3.6	3.5	ND	1	1.3	1.5	3	3
Chromium	0.05	MAC	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	ND	-	ND	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	1	AO	ND(0.002)	ND(0.002)	0.0016	0.0009	0.002	0.0006	0.0006	-	ND	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	1	0.5	1.7	1.5	1.8	0.9	1	0.8	0.9	1.3	1	1.1	0.8
Hardness	80 - 100	OG	**167**	**159**	**192**	**191**	**145**	**176**	**176**	**190**	**180**	**162**	**160**	**180**	**170**
Iron	0.3	AO	ND(0.03)	ND(0.03)	ND(0.03)	ND	ND	ND	ND	ND	ND	<0.01	<0.01	ND	ND
Lead	0.01	MAC	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	ND	ND	ND	-	ND	-	-	-	-
Magnesium	-	-	17.7	17.3	21.7	20.6	12.5	18	17.1	19	20	17.5	17.3	19	20
Manganese	0.05	AO	0.039	ND(0.005)	ND(0.005)	ND	ND	ND	ND	ND	0.011	0.006	ND(0.001)	0.008	0.002
Ammonia	-	-	ND(0.05)	ND(0.05)	ND(0.05)	ND	ND	0.04	0.03	0.05	0.24	0.2	0.4	ND	ND
Nitrite	1	MAC	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND	ND(0.06)	0.06	ND	ND
Nitrate	10	MAC	ND(0.1)	ND(0.1)	ND(0.1)	ND	ND	0.2	0.2	19.7	ND	0.12	0.25	0.1	ND
Potassium	-	-	1.1	1.1	1	1.1	1.1	1	0.9	1	1.2	1.29	1.01	1	1.2
Silica	-	-	3.38	3.62	4.44	9	-	-	-	-	-	-	-	-	-
Sodium	200	AO	23.7	36.4	34.5	33.5	18.9	33.6	33.2	38	39	34.4	32.4	36	39
Sulphate	500	AO	23	38	44	-	31.2	-	-	40.7	45	51	30	29	28
Total Kjeldahl Nitrogen (TKN)	-	-	0.19	0.19	0.57	0.34	0.8	0.32	0.31	-	0.4	-	ND(0.5)	-	-
Total Phenolics	-	-	-	-	-	-	ND	-	-	0.232	ND	0.002	0.002	ND	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	ND(0.005)	ND(0.005)	ND(0.005)	ND	0.031	ND	ND	-	ND	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	390	435	467	550	363	460	-	-	404	-	-	464	447
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	7.85	8.08	-	-	8.25	-	-	8.3	8.3
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MW3 31-Jul-08	MW3 6-Dec-08	MW3 30-Apr-09	MW3 20-Nov-09
Alkalinity	30 - 500	OG	159	173	116	191
Aluminum	0.1	OG	ND	ND	ND(0.010)	0.027
Barium	1	MAC	-	-	-	-
Boron	5	MAC	0.18	0.18	0.093	0.235
Cadmium	0.005	MAC	-	-	-	-
Calcium	-	-	-	31	27.4	38.9
Chloride	250	AO	4	4	3.3	ND(2.0)
Chromium	0.05	MAC	-	-	-	-
Cobalt	-	-	ND	ND	-	-
Copper	1	AO	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	1.8	1.6	2.5	1.1
Hardness	80 - 100	OG	**140**	**130**	**101**	**165**
Iron	0.3	AO	ND	ND	<0.050	<0.050
Lead	0.01	MAC	-	-	-	-
Magnesium	-	-	15	13	7.95	16.5
Manganese	0.05	AO	ND	ND	ND(0.0010)	0.0061
Ammonia	-	-	ND	ND	0.052	ND(0.050)
Nitrite	1	MAC	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	0.3	0.4	0.27	ND(0.10)
Potassium	-	-	3.2	3.5	2.6	1.1
Silica	-	-	-	-	-	-
Sodium	200	AO	36	31	-	-
Sulphate	500	AO	23	28	14.0	25.4
Total Kjeldahl Nitrogen (TKN)	-	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	ND	ND	ND(0.0010)	ND(0.0010)
Phosphorus (Dissolved)	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	0.0105	0.0064
Zinc	5	AO	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	382	260	400
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	8.1	8.10	8.25
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	7.88	7.95
Field Conductivity (µmhos/cm)	-	-	-	-	293	436
Field Temperature (°C)	15	AO	-	-	7.8	9.6

Notes:

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OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
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Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MW5 16-Apr-02	MW5 29-Oct-02	MW5 22-Apr-03	MW5 22-Apr-03	MW5 25-Nov-03	MW5 2-Jun-06	MW5 10-Nov-04	MW5 20-Jul-05	MW5 16-Nov-05	MW5 9-May-06	MW5 28-Dec-06	MW5 14-Jun-07	MW5 27-Oct-07	MW5 31-Jul-08
Alkalinity	30 - 500	OG	210	230	239	238	206	206	210	212	205	205	350	199	199	190
Aluminum	0.1	OG	ND(0.01)	ND(0.01)	ND(0.005)	ND(0.005)	ND	0.005	0.006	0.006	ND	ND(0.01)	ND(0.01)	ND	ND	ND
Barium	1	MAC	0.039	0.044	0.039	0.039	0.38	0.038	0.036	-	-	-	-	-	-	-
Boron	5	MAC	0.26	0.28	0.192	0.209	0.301	0.269	0.262	0.27	0.26	0.233	0.302	0.25	0.31	0.27
Cadmium	0.005	MAC	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND(0.0001)	0.0002	ND	ND	-	ND	-	-	-	-	-
Calcium	-	-	44.8	50.2	54.9	51.6	41.4	46.9	40.7	43	44	37.8	36.4	40	39	39
Chloride	250	AO	1	2	2	2	0.8	1.9	1.6	1	2	1	0.9	2	2	2
Chromium	0.05	MAC	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	ND	-	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Copper	1	AO	ND(0.002)	ND(0.002)	0.0008	0.001	0.0011	0.0011	ND	-	0.003	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	0.5	0.5	0.9	0.8	1	0.7	0.7	0.5	0.6	ND(1)	1.5	0.8	0.6	0.3
Hardness	80 - 100	OG	**205**	**221**	**249**	**236**	**188**	**211**	**187**	**193**	**200**	**175**	**170**	**190**	**190**	**190**
Iron	0.3	AO	ND(0.03)	ND(0.03)	ND(0.03)	ND(0.03)	ND	ND	ND	ND	ND	ND(0.01)	ND(0.01)	ND	ND	ND
Lead	0.01	MAC	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	ND	ND	-	ND	-	-	-	-	-
Magnesium	-	-	22.5	23.3	27.1	25.9	20.5	22.9	20.3	23	21	19.6	19.3	21	23	21
Manganese	0.05	AO	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	ND	ND	ND(0.001)	0.002	0.004	ND	ND
Ammonia	-	-	ND(0.05)	ND(0.05)	ND(0.05)	ND(0.05)	ND	0.12	0.04	0.08	ND	0.1	0.3	0.05	ND	ND
Nitrite	1	MAC	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND(0.06)	ND(0.06)	ND	ND	ND
Nitrate	10	MAC	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND	ND	ND	0.2	ND	0.14	0.12	ND	0.1	ND
Potassium	-	-	1.2	1.3	1.1	1	1.3	1.3	1.1	1.1	1.3	1.44	1.19	1.1	1.4	2.5
Silica	-	-	3.23	3.82	3.93	3.76	7.7	-	-	-	-	-	-	-	-	-
Sodium	200	AO	43.5	41.5	38.2	39.1	45.6	47.1	44.1	47	51	45.9	46.7	46	49	52
Sulphate	500	AO	82	92	68	81	-	98	-	91.6	88	86	84	84	82	83
Total Kjeldahl Nitrogen (TKN)	-	-	0.13	0.06	0.46	0.38	0.22	0.11	0.24	-	0.1	-	ND(0.5)	-	-	-
Total Phenolics	-	-	-	-	-	-	-	ND	-	0.049	ND	ND(0.002)	ND(0.002)	ND	ND	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	ND(0.005)	ND(0.005)	0.014	0.006	0.006	0.019	ND	-	ND	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	546	549	569	577	630	526	530	-	465	-	-	549	540	-
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	7.96	7.56	-	8.16	-	-	8.2	8.3	-
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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Historic Water Quality Data
Kincardine Ward 3 Landfill Site
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Parameter (mg/L)	MOE ODWS (1)		MW5 31-Jul-08	MW5 30-Apr-09	MW5 20-Nov-09
Alkalinity	30 - 500	OG	198	195	202
Aluminum	0.1	OG	ND	ND(0.010)	ND(0.010)
Barium	1	MAC	-	-	-
Boron	5	MAC	0.3	0.272	0.308
Cadmium	0.005	MAC	-	-	-
Calcium	-	-	37	43.8	42
Chloride	250	AO	3	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	-	-	-
Cobalt	-	-	ND	-	-
Copper	1	AO	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	0.6	ND(1.0)	ND(1.0)
Hardness	80 - 100	OG	**170**	**196**	**196**
Iron	0.3	AO	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	-	-
Magnesium	-	-	19	21.1	22.2
Manganese	0.05	AO	ND	0.0012	0.0012
Ammonia	-	-	0.07	ND(0.050)	ND(0.050)
Nitrite	1	MAC	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	0.1	0.10	0.13
Potassium	-	-	1.4	1.2	1.3
Silica	-	-	-	-	-
Sodium	200	AO	49	-	-
Sulphate	500	AO	85	89.8	81.1
Total Kjeldahl Nitrogen (TKN)	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	ND	ND(0.0010)	ND(0.0010)
Phosphorus (Dissolved)	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	0.0044	0.0061
Zinc	5	AO	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	531	535	519
Laboratory pH (Std. Units)	6.5 - 8.5	OG	8.1	8.20	8.29
Field pH (Std. Units)	6.5 - 8.5	OG	-	8.02	7.97
Field Conductivity (µmhos/cm)	-	-	-	462	536
Field Temperature (°C)	15	AO	-	8.8	10.6

Notes:

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General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MW6 16-Apr-02	MW6 29-Oct-02	MW6 22-Apr-03	MW6 9-May-06	MW6 28-Dec-06	MW6 14-Jun-07	MW6 27-Oct-07	MW6 31-Jul-08	MW6 6-Dec-08	MW6 30-Apr-09	MW6 20-Nov-09
Alkalinity	30 - 500	OG	138	145	176	244	129	146	143	138	138	137	147
Aluminum	0.1	OG	2.91	ND(0.01)	0.56	ND(0.01)	0.01	ND	0.016	0.008	ND	ND(0.010)	0.032
Barium	1	MAC	0.266	0.012	0.016	-	-	-	-	-	-	-	-
Boron	5	MAC	0.42	0.34	0.362	0.336	0.373	0.34	0.39	0.37	0.36	0.463	0.341
Cadmium	0.005	MAC	ND(0.0001)	ND(0.0001)	ND(0.0001)	-	-	-	-	-	-	-	-
Calcium	-	-	18.9	16.1	22.5	15.3	15	150	16	15	15	16.8	18.7
Chloride	250	AO	1	2	2	1	1	3	3	1	2	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	ND(0.005)	ND(0.005)	ND(0.005)	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	ND	ND	-	-
Copper	1	AO	0.004	0.004	0.009	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	1.1	1	1.3	ND(1)	1.5	1.8	1.3	1.6	1.2	1.2	2.3
Hardness	80 - 100	OG	81.9	69.9	95.1	66.2	66.2	66	71	69	69	70	76
Iron	0.3	AO	**1.85**	ND(0.03)	**0.57**	ND(0.01)	ND(0.01)	ND	ND	ND	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	0.0007	ND(0.0005)	0.0007	-	-	-	-	-	-	-	-
Magnesium	-	-	8.44	16.1	9.44	6.78	6.97	6.8	7.5	7.4	75	6.88	7.07
Manganese	0.05	AO	0.024	ND(0.005)	0.019	0.002	ND(0.001)	ND	0.013	ND	ND	ND(0.0010)	0.0045
Ammonia	-	-	ND(0.05)	ND(0.05)	0.05	0.1	ND(0.1)	0.06	ND	0.19	ND	0.055	ND(0.050)
Nitrite	1	MAC	ND(0.02)	ND(0.02)	ND(0.02)	ND(0.06)	ND(0.06)	ND	ND	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	ND(0.1)	ND(0.1)	ND(0.1)	0.21	0.42	0.1	0.3	0.1	0.2	0.11	0.14
Potassium	-	-	1.9	ND(1)	0.8	0.99	0.67	7.1	0.76	2.2	0.97	ND(1.0)	ND(1.0)
Silica	-	-	10.2	3.42	5.1	-	-	-	-	-	-	-	-
Sodium	200	AO	38.2	36	37.6	42.6	40.8	39	43	47	45	-	-
Sulphate	500	AO	11	14	16	16	15	13	13	-	11	10.9	9.5
Total Kjeldahl Nitrogen (TKN)	-	-	0.47	0.15	1.78	-	ND(0.5)	-	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	-	-	ND(0.002)	ND(0.002)	ND	ND	-	ND	0.0059	ND(0.0010)
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	0.0078	0.0112
Zinc	5	AO	0.034	ND(0.005)	0.027	-	-	-	-	-	-	-	-
Laboratory CoNDuctivity (µmhos/cm)	-	-	270	272	286	-	-	316	305	-	284	280	279
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	8.2	8.3	-	8.1	8.36	8.31
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	7.97	7.97
Field CoNDuctivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	269	337
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	8.5	8.8

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water StaNDards (ODWS), August 2000, revised January 2001 aND June 2003, where applicable.
(2) Maximum Acceptable BouNDary Concentration as calculated based on the ODWS guidelines for AO, IMAC aND MAC parameters.
OG - Operation Guideline (water treatment aND distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
1.85 Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MW7 16-Apr-02	MW7 29-Oct-02	MW7 22-Apr-03	MW7 25-Nov-03	MW7 25-Nov-03	MW7 16-Nov-05	MW7 9-May-06	MW7 14-Jun-07	MW7 27-Oct-07	MW7 31-Jul-08	MW7 31-Jul-08 Duplicate	MW7 6-Dec-08	MW7 30-Apr-09	MW7 20-Nov-09
Alkalinity	30 - 500	OG	179	217	213	208	219	210	198	222	219	205	193	193	272	240
Aluminum	0.1	OG	0.328	ND(0.01)	ND(0.005)	0.058	0.015	ND	ND(0.01)	ND	ND	ND	ND	ND	ND(0.010)	0.061
Barium	1	MAC	0.204	0.03	0.029	0.034	0.027	-	-	-	-	-	-	-	-	-
Boron	5	MAC	0.27	0.4	0.406	0.406	0.327	0.38	0.35	0.35	0.38	0.33	0.28	0.28	0.301	0.364
Cadmium	0.005	MAC	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND(0.0001)	0.0001	ND	-	-	-	-	-	-	-	-
Calcium	-	-	33.5	28	30.3	37.3	35.4	30	28.3	33	32	32	30	30	63.8	38.4
Chloride	250	AO	2	3	4	2.3	6.2	4	2.6	3	4	3	4	4	4.7	2.6
Chromium	0.05	MAC	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-
Copper	1	AO	0.002	ND(0.002)	0.001	0.001	0.0026	0.001	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3	1.2	1.6	1.7	2.1	7.5	1.2	1.5	1.4	1.7	2	2	2.5	1.8
Hardness	80 - 100	OG	**152**	**143**	**160**	**174**	**163**	**160**	**150**	**170**	**180**	**170**	**160**	**160**	**278**	**196**
Iron	0.3	AO	0.19	ND(0.03)	ND(0.03)	ND	ND	ND	ND(0.01)	ND	ND	ND	ND	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	0.0006	ND	-	-	-	-	-	-	-	-
Magnesium	-	-	16.6	17.7	20.6	19.5	18.1	21	19.2	20	23	22	19	19	28.9	24.4
Manganese	0.05	AO	ND(0.005)	ND(0.005)	ND(0.005)	ND	0.01	0.003	ND(0.001)	ND	ND	ND	ND	ND	ND(0.0010)	0.0034
Ammonia	-	-	0.05	0.05	ND(0.05)	ND	0.11	0.1	0.1	ND	ND	ND	ND	ND	0.066	ND(0.050)
Nitrite	1	MAC	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	0.02	ND(0.06)	ND	ND	ND	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	ND(0.1)	0.27	0.72	0.5	0.4	0.2	0.28	0.1	0.2	0.1	0.5	0.5	ND(0.10)	ND(0.10)
Potassium	-	-	1.6	1.2	1.1	1.4	1.8	1.3	1.59	1.1	1.3	2.9	1.6	1.6	1.3	1.3
Silica	-	-	3.27	3.53	3.95	8	-	-	-	-	-	-	-	-	-	-
Sodium	200	AO	27.5	49.2	47.4	49.8	42	55	51.7	47	54	54	42	42	-	-
Sulphate	500	AO	31	44	54	-	48.6	57	53	49	47	45	40	40	37.5	41.1
Total Kjeldahl Nitrogen (TKN)	-	-	0.23	0.28	0.58	0.17	0.32	1.7	-	-	-	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	-	-	-	ND	ND	0.003	ND	ND	ND	ND	ND	ND(0.0010)	ND(0.0010)
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0066	0.0092
Zinc	5	AO	0.033	ND(0.005)	ND(0.005)	0.134	0.045	ND	-	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	388	456	483	550	479	444	-	514	511	-	448	448	575	507
Laboratory pH (Std. Units)	6.5 - 8.5	OG	0	0	0	0	7.85	8.05	-	8.2	8.3	-	8.1	8.1	8.02	8.15
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	7.58	7.82
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500	563
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	9	8.8

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix D

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW8 16-Apr-02	MW8 29-Oct-02	MW8 22-Apr-03	MW8 25-Nov-03	MW8 25-Nov-03	MW8 10-Nov-04	MW8 20-Jul-05	MW8 16-Nov-05	MW8 9-May-06	MW8 14-Jun-07	MW8 27-Oct-07	MW8 31-Jul-08
Alkalinity	30 - 500	OG	-	196	197	201	189	192	192	207	195	180	188	186	186
Aluminum	0.1	OG	-	ND(0.01)	ND(0.01)	ND(0.005)	ND	0.006	ND	0.008	0.069	ND(0.01)	ND	0.011	ND
Barium	1	MAC	-	0.035	0.034	0.033	0.033	0.032	0.031	-	-	-	-	-	-
Boron	5	MAC	1.5	0.48	0.47	0.511	0.48	0.475	0.453	0.43	0.4	0.422	0.46	0.49	0.46
Cadmium	0.005	MAC	-	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND	ND	ND	-	ND	-	-	-	-
Calcium	-	-	-	27	26.6	27.2	26.5	29.6	25.7	29	28	24.1	25	24	24
Chloride	250	AO	126	1	2	2	1.4	2.6	2.3	2	2	1.4	2	2	ND
Chromium	0.05	MAC	-	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	ND	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND
Copper	1	AO	0.5	ND(0.002)	ND(0.002)	0.0006	0.0009	0.0009	0.0005	-	ND	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	0.8	0.8	0.9	1.7	1	0.7	0.7	0.8	ND(1)	4	0.8	0.6
Hardness	80 - 100	OG	-	**140**	**136**	**144**	**135**	**149**	**136**	**140**	**140**	**125**	**140**	**130**	**130**
Iron	0.3	AO	0.17	0.04	ND(0.03)	ND(0.03)	ND	ND	ND	ND	ND	ND(0.01)	ND	ND	ND
Lead	0.01	MAC	-	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	ND	ND	-	ND	-	-	-	-
Magnesium	-	-	-	17.7	17	18.5	16.6	18.3	16	18	18	15.8	18	18	17
Manganese	0.05	AO	0.03	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	ND	0.006	ND(0.001)	ND	0.007	**0.18**
Ammonia	-	-	-	ND(0.05)	ND(0.05)	ND(0.05)	ND	ND	ND	0.05	ND	0.1	ND	ND	0.13
Nitrite	1	MAC	0.3	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND(0.06)	ND	ND	ND
Nitrate	10	MAC	2.6	ND(0.1)	ND(0.1)	ND(0.1)	ND	0.3	ND	ND	ND	0.75	ND	ND	0.03
Potassium	-	-	-	1.2	1.1	1	1.2	1.3	1.1	1.2	1.4	1.45	1.1	1.3	2.6
Silica	-	-	-	3.63	3.48	3.96	7.8	-	-	-	-	-	-	-	-
Sodium	200	AO	121	55.4	54	56.4	55	57.6	55.1	60	64	55.3	61	58	62
Sulphate	500	AO	269	52	69	69	-	72.5	-	66.8	61	59	61	54	49
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.11	0.31	0.51	0.64	0.09	0.18	-	0.2	-	-	-	-
Total Phenolics	-	-	-	-	-	-	-	ND	-	0.001	ND	0.003	ND	ND	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	-	0.058	ND(0.005)	0.006	ND	0.02	ND	-	ND	-	-	-	-
Laboratory CoNDuctivity (µmhos/cm)	-	-	-	487	464	496	520	478	490	-	428	-	481	466	-
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	8.08	7.94	-	8.25	-	8.2	8.3	-
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-
Field CoNDuctivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water StaNDards (ODWS), August 2000, revised January 2001 aND June 2003, where applicable.
(2) Maximum Acceptable BouNDary Concentration as calculated based on the ODWS guidelines for AO, IMAC aND MAC parameters.
OG - Operation Guideline (water treatment aND distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
0.18 Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW8 6-Dec-08	MW8 30-Apr-09	MW8 30-Apr-09 Duplicate	MW8 20-Nov-09
Alkalinity	30 - 500	OG	-	184	186	185	192
Aluminum	0.1	OG	-	ND	ND(0.010)	ND(0.010)	ND(0.010)
Barium	1	MAC	-	-	-	-	-
Boron	5	MAC	1.5	0.46	0.543	0.564	0.472
Cadmium	0.005	MAC	-	-	-	-	-
Calcium	-	-	-	29	25.9	26.4	25.7
Chloride	250	AO	126	2	ND(2.0)	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	-	-	-	-	-
Cobalt	-	-	-	ND	-	-	-
Copper	1	AO	0.5	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	0.7	1.2	ND(1.0)	ND(1.0)
Hardness	80 - 100	OG	-	**150**	**128**	**131**	**134**
Iron	0.3	AO	0.17	ND	ND(0.050)	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	-	-	-	-
Magnesium	-	-	-	19	15.3	15.7	17.0
Manganese	0.05	AO	0.03	ND	ND(0.0010)	ND(0.0010	ND(0.0010
Ammonia	-	-	-	ND	0.088	0.092	ND(0.050)
Nitrite	1	MAC	0.3	ND	ND(0.10)	ND(0.10)	ND(0.10)
Nitrate	10	MAC	2.6	0.2	ND(0.10)	ND(0.10)	0.12
Potassium	-	-	-	2.3	1.0	1.1	1.2
Silica	-	-	-	-	-	-	-
Sodium	200	AO	121	52	-	-	-
Sulphate	500	AO	269	50	52.4	52.0	47.9
Total Kjeldahl Nitrogen (TKN)	-	-	-	-	ND(0.15)	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	-	ND(0.0010)	ND(0.0010	ND(0.0010
Phosphorus (Dissolved)	-	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	0.0091	0.0218	0.01
Zinc	5	AO	-	-	-	-	-
Laboratory CoNDuctivity (µmhos/cm)	-	-	-	454	449	449	441
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	8.1	8.24	8.27	8.32
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	8.04		7.99
Field CoNDuctivity (µmhos/cm)	-	-	-	-	387		469
Field Temperature (°C)	15	AO	-	-	8.7		10.0

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water StaNDards (ODWS), August 2000, revised January 2001 aND June 2003, where applicable.
(2) Maximum Acceptable BouNDary Concentration as calculated based on the ODWS guidelines for AO, IMAC aND MAC parameters.
OG - Operation Guideline (water treatment aND distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Bold Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW9 16-Apr-02	MW9 22-Apr-03	MW9 25-Nov-03	MW9 2-Jun-04	MW9 10-Nov-04	MW9 20-Jul-05
Alkalinity	30 - 500	OG	-	181	219	198	191	192	201
Aluminum	0.1	OG	-	ND(0.01)	0.011	ND	ND	0.011	0.005
Barium	1	MAC	-	0.032	0.05	0.043	0.037	0.036	-
Boron	5	MAC	1.5	0.47	0.524	0.485	0.456	0.44	0.43
Cadmium	0.005	MAC	-	ND(0.0001)	ND(0.0001)	0.0003	0.0001	0.0002	-
Calcium	-	-	-	29.3	49.7	39.7	39.8	33.4	37
Chloride	250	AO	126	1	2	0.8	2.3	1.4	1
Chromium	0.05	MAC	-	ND(0.005)	ND(0.005)	ND	ND	ND	-
Cobalt	-	-	-	-	-	-	-	-	-
Copper	1	AO	0.5	ND(0.002)	0.0019	0.0014	0.0013	0.0007	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	1.1	1	0.9	1	0.8	0.9
Hardness	80 - 100	OG	-	**144**	**245**	**189**	**187**	**157**	**161**
Iron	0.3	AO	0.17	ND(0.03)	ND(0.03)	ND	ND	ND	0.19
Lead	0.01	MAC	-	ND(0.0005)	ND(0.0005)	ND	ND	ND	-
Magnesium	-	-	-	17.3	29.3	21.9	21.3	18.6	21
Manganese	0.05	AO	0.03	ND(0.005)	ND(0.005)	ND	0.005	ND	ND
Ammonia	-	-	-	ND(0.05)	ND(0.05)	0.04	ND	ND	0.06
Nitrite	1	MAC	0.3	ND(0.02)	ND(0.02)	ND	ND	ND	ND
Nitrate	10	MAC	2.6	ND(0.1)	ND(0.1)	ND	ND	ND	ND
Potassium	-	-	-	1.1	1.4	1.3	1.4	1.1	1.1
Silica	-	-	-	3.17	3.61	6.9	-	-	-
Sodium	200	AO	121	54.4	65.5	59.6	60.7	57.6	62
Sulphate	500	AO	269	65	174	-	126	-	100
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.23	0.47	0.12	0.15	0.06	-
Total Phenolics	-	-	-	-	-	-	ND	-	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-
Zinc	5	AO	-	ND(0.005)	ND(0.005)	ND	0.018	ND	-
Laboratory Conductivity (µmhos/cm)	-	-	-	493	722	660	560	530	-
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	8.03	7.99	-
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW9 16-Nov-05	MW9 9-May-06	MW9 14-Jun-07	MW9 27-Oct-07	MW9 31-Jul-08	MW9 6-Dec-08
Alkalinity	30 - 500	OG	-	193	200	190	186	180	181
Aluminum	0.1	OG	-	ND	ND(0.01)	ND	ND	ND	ND
Barium	1	MAC	-	-	-	-	-	-	-
Boron	5	MAC	1.5	0.43	0.411	0.44	-	0.44	0.42
Cadmium	0.005	MAC	-	ND	-	-	-	-	-
Calcium	-	-	-	34	31.3	31	31	-	26
Chloride	250	AO	126	1	0.9	3	2	ND	2
Chromium	0.05	MAC	-	ND	-	-	-	-	-
Cobalt	-	-	-	-	-	-	-	ND	ND
Copper	1	AO	0.5	0.003	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	1.6	ND(1)	1.5	1.1	0.6	0.8
Hardness	80 - 100	OG	-	**170**	**151**	**150**	**150**	**150**	**130**
Iron	0.3	AO	0.17	ND	ND(0.01)	ND	ND	ND	ND
Lead	0.01	MAC	-	ND	-	-	-	-	-
Magnesium	-	-	-	21	17.7	19	19	18	16
Manganese	0.05	AO	0.03	0.005	ND(0.001)	0.021	0.022	0.004	ND
Ammonia	-	-	-	ND	0.2	0.07	ND	0.07	ND
Nitrite	1	MAC	0.3	ND	ND(0.06)	ND	ND	ND	ND
Nitrate	10	MAC	2.6	0.4	0.09	ND	ND	ND	ND
Potassium	-	-	-	1.4	1.62	1.2	1.2	2.8	1.3
Silica	-	-	-	-	-	-	-	-	-
Sodium	200	AO	121	63	57.9	61	63	63	59
Sulphate	500	AO	269	105	90	81	72	77	75
Total Kjeldahl Nitrogen (TKN)	-	-	-	3	-	-	-	-	-
Total Phenolics	-	-	-	ND	ND(0.002)	ND	ND	ND	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-
Zinc	5	AO	-	ND	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	477	-	523	505	-	486
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	8.32	-	8.2	8.4	-	8.2
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
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Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW9 30-Apr-09	MW9 20-Nov-09
Alkalinity	30 - 500	OG	-	180	187
Aluminum	0.1	OG	-	ND(0.010)	0.014
Barium	1	MAC	-	-	-
Boron	5	MAC	1.5	0.541	0.447
Cadmium	0.005	MAC	-	-	-
Calcium	-	-	-	33.1	31.6
Chloride	250	AO	126	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	-	-	-
Cobalt	-	-	-	-	-
Copper	1	AO	0.5	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	1.4	1.4
Hardness	80 - 100	OG	-	**152**	**147**
Iron	0.3	AO	0.17	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	-	-
Magnesium	-	-	-	16.8	16.5
Manganese	0.05	AO	0.03	0.0011	0.0070
Ammonia	-	-	-	0.089	0.056
Nitrite	1	MAC	0.3	ND(0.10)	ND(0.10)
Nitrate	10	MAC	2.6	ND(0.10)	ND(0.10)
Potassium	-	-	-	1.1	1.1
Silica	-	-	-	-	-
Sodium	200	AO	121	-	-
Sulphate	500	AO	269	75.9	66.1
Total Kjeldahl Nitrogen (TKN)	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	ND(0.0010)	ND(0.0010)
Phosphorus (Dissolved)	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	0.0101	0.0087
Zinc	5	AO	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	486	463
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	8.10	8.27
Field pH (Std. Units)	6.5 - 8.5	OG	-	8.08	8.02
Field Conductivity (µmhos/cm)	-	-	-	422	491
Field Temperature (°C)	15	AO	-	8.9	10.3

Notes:

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OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
bold Parameter exceeds the ODWS
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Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW10 16-Apr-02	MW10 29-Oct-02	MW10 22-Apr-03	MW10 25-Nov-03	MW10 1-Jun-04	MW10 10-Nov-04	MW10 20-Jul-05	MW10 9-May-06	MW10 14-Jun-07	MW10 27-Oct-07	MW10 31-Jul-08	MW10 6-Dec-08	MW10 30-Apr-09	MW10 20-Nov-09
Alkalinity	30 - 500	OG	-	254	256	263	249	250	250	267	235	256	241	245	249	243	255
Aluminum	0.1	OG	-	ND(0.01)	ND(0.01)	ND(0.005)	ND	0.005	ND	0.011	ND(0.01)	ND	ND	ND	ND	ND(0.010)	0.014
Barium	1	MAC	-	0.041	0.041	0.04	0.043	0.041	0.041	-	-	-	-	-	-	-	-
Boron	5	MAC	1.5	0.31	0.32	0.311	0.321	0.281	0.287	0.27	0.261	0.28	0.29	0.29	0.29	0.349	0.306
Cadmium	0.005	MAC	-	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND	ND	ND	-	-	-	-	-	-	-	-
Calcium	-	-	-	39.1	37.1	41.5	40.2	44.2	37.8	42	35.5	35	37	38	35	43.2	37.1
Chloride	250	AO	126	1	2	2	0.7	1.1	1.4	1	0.8	3	2	ND	2	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	-	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-
Copper	1	AO	0.5	ND(0.002)	ND(0.002)	0.0006	0.0006	0.0009	ND	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	0.8	0.5	0.8	1.4	0.7	0.7	0.7	ND(1)	1	0.8	0.4	1	1.1	1.2
Hardness	80 - 100	OG	-	**213**	**202**	**231**	**215**	**234**	**216**	**218**	**193**	**190**	**210**	**210**	**200**	**222**	**207**
Iron	0.3	AO	0.17	ND(0.03)	ND(0.03)	ND(0.03)	ND	ND	ND	ND	ND(0.01)	ND	ND	ND	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	ND	ND	-	-	-	-	-	-	-	-
Magnesium	-	-	-	28.1	26.5	30.9	27.8	30.1	26	29	25.3	26	28	28	27	27.8	27.7
Manganese	0.05	AO	0.03	ND(0.005)	ND(0.005)	ND(0.005)	ND	0.009	0.011	ND	ND(0.001)	ND	ND	ND	ND	ND(0.0010)	0.0046
Ammonia	-	-	-	ND(0.05)	ND(0.05)	ND(0.05)	ND	0.08	0.03	ND	0.2	ND	ND	ND	ND	0.08	ND(0.050)
Nitrite	1	MAC	0.3	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND(0.06)	ND	ND	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	2.6	ND(0.1)	ND(0.1)	ND(0.1)	0.4	ND	ND	0.9	0.07	ND	ND	ND	ND	ND(0.10)	ND(0.10)
Potassium	-	-	-	1.3	1.3	1.2	1.4	1.5	1.2	1.5	1.53	1.1	1.4	1.6	1.4	1.2	1.3
Silica	-	-	-	4.08	4.2	4.27	8.9	-	-	-	-	-	-	-	-	-	-
Sodium	200	AO	121	41	40.4	42.2	41.5	42.4	39.6	44	41.5	42	46	44	44	-	-
Sulphate	500	AO	269	43	51	67	-	64	-	53.1	41	40	34	46	43	46.1	38.9
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.17	0.11	0.51	0.22	0.24	0.1	-	-	-	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	-	-	-	-	ND	-	ND	ND(0.002)	ND	ND	ND	ND	ND(0.0010)	ND(0.0010)
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0052	0.007
Zinc	5	AO	-	ND(0.005)	ND(0.005)	ND(0.005)	ND	0.009	ND	-	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	544	526	580	630	542	550	-	-	535	513	-	540	532	511
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	7.9	7.66	-	-	8.4	8.3	-	8.1	8.20	8.18
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-	7.87	7.81
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	471	543
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	8.9	9.7

Notes:

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ND Parameter detected below the laboratory method detection limit.
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Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW11 16-Apr-02	MW11 29-Oct-02	MW11 22-Apr-03	MW11 25-Nov-03	MW11 1-Jun-04	MW11 10-Nov-04	MW11 20-Jul-05	MW11 16-Nov-05	MW11 9-May-06	MW11 28-Dec-06	MW11 14-Jun-07	MW11 27-Oct-07
Alkalinity	30 - 500	OG	-	208	212	211	203	198	206	207	199	184	188	199	190
Aluminum	0.1	OG	-	ND(0.01)	ND(0.01)	ND(0.005)	ND	0.007	ND	0.008	ND	ND(0.01)	ND(0.01)	ND	ND
Barium	1	MAC	-	0.036	0.034	0.031	0.034	0.03	0.032	-	-	-	-	-	-
Boron	5	MAC	1.5	0.44	0.41	0.457	0.434	0.417	0.384	0.35	0.36	0.372	0.423	0.41	0.41
Cadmium	0.005	MAC	-	ND(0.0001)	ND(0.0001)	ND(0.0001)	0.0001	ND	ND	-	ND	-	-	-	-
Calcium	-	-	-	36.3	36.5	34.1	36.1	36.1	33.7	32	33	28.8	26.7	31	28
Chloride	250	AO	126	1	2	2	1.1	2.6	2	ND	2	1.1	1.1	2	3
Chromium	0.05	MAC	-	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	ND	-	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	1	AO	0.5	ND(0.002)	ND(0.002)	0.0006	ND	0.0006	ND	-	0.001	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	1.3	1	1.2	1.4	1.3	1.2	0.9	1.1	1.2	ND(1)	1.1	1.1
Hardness	80 - 100	OG	-	**171**	**169**	**164**	**167**	**165**	**165**	**156**	**160**	**135**	**127**	**150**	**140**
Iron	0.3	AO	0.17	ND(0.03)	ND(0.03)	ND(0.03)	ND	ND	ND	0.13	ND	ND(0.01)	ND(0.01)	ND	ND
Lead	0.01	MAC	-	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	ND	ND	-	ND	-	-	-	-
Magnesium	-	-	-	19.6	18.8	19.1	18.5	18.1	16.7	16	18	15.4	14.6	18	17
Manganese	0.05	AO	0.03	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	ND	ND	0.002	0.007	0.012	ND
Ammonia	-	-	-	ND(0.05)	ND(0.05)	ND(0.05)	ND	0.11	ND	ND	ND	ND(0.1)	ND(0.1)	0.05	ND
Nitrite	1	MAC	0.3	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND(0.06)	ND(0.02)	ND	ND
Nitrate	10	MAC	2.6	ND(0.1)	ND(0.1)	ND(0.1)	ND	ND	ND	2.1	ND	ND(0.05)	0.12	0.1	ND
Potassium	-	-	-	1.1	1.1	0.9	1.1	1.2	0.9	0.9	1.2	1.46	0.99	1.3	1.1
Silica	-	-	-	3.84	3.51	4.2	8	-	-	-	-	-	-	-	-
Sodium	200	AO	121	50.8	47.9	51.6	50.3	51.5	3.33	47	57	49.2	46.3	54	49
Sulphate	500	AO	269	61	74	70	-	69.7	-	63.4	61	49	47	45	41
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.15	0.39	0.55	0.28	0.47	0.08	-	0.3	-	ND(0.5)	-	-
Total Phenolics	-	-	-	-	-	-	-	ND	-	0.001	ND	ND(0.002)	ND(0.002)	ND	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	-	ND(0.005)	ND(0.005)	ND(0.005)	ND	0.019	ND	-	ND	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	517	504	515	580	482	510	-	412	-	-	462	448
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	8.06	8.04	-	8.35	-	-	8.4	8.3
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

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(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW11 31-Jul-08	MW11 6-Dec-08	MW11 30-Apr-09	MW11 20-Nov-09
Alkalinity	30 - 500	OG	-	187	186	186	185
Aluminum	0.1	OG	-	ND	ND	ND(0.010)	0.018
Barium	1	MAC	-	-	-	-	-
Boron	5	MAC	1.5	0.39	0.38	0.496	0.423
Cadmium	0.005	MAC	-	-	-	-	-
Calcium	-	-	-	29	25	30.0	26.5
Chloride	250	AO	126	2	2	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	-	-	-	-	-
Cobalt	-	-	-	ND	ND	-	-
Copper	1	AO	0.5	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	0.8	1	1.4	2.5
Hardness	80 - 100	OG	-	**140**	**120**	**136**	**128**
Iron	0.3	AO	0.17	ND	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	-	-	-	-
Magnesium	-	-	-	17	15	14.8	15.1
Manganese	0.05	AO	0.03	0.005	ND	ND(0.0010	0.0053
Ammonia	-	-	-	ND	ND	0.165	0.06
Nitrite	1	MAC	0.3	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	2.6	ND	0.1	ND(0.10)	ND(0.10)
Potassium	-	-	-	2.6	1	ND(1.0)	ND(1.0)
Silica	-	-	-	-	-	-	-
Sodium	200	AO	121	53	49	-	-
Sulphate	500	AO	269	43	39	37.5	34.3
Total Kjeldahl Nitrogen (TKN)	-	-	-	-	-	0.211	ND(0.15)
Total Phenolics	-	-	-	ND	ND	ND(0.0010	ND(0.0010
Phosphorus (Dissolved)	-	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	-	0.0074	0.007
Zinc	5	AO	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	-	428	411	407
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	8.1	8.23	8.26
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	7.97	7.77
Field Conductivity (µmhos/cm)	-	-	-	-	-	767	460
Field Temperature (°C)	15	AO	-	-	-	8.2	9.8

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Bold Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW12 16-Apr-02	MW12 29-Oct-02	MW12 22-Apr-03	MW12 22-Apr-03	MW12 25-Nov-03	MW12 1-Jun-04	MW12 10-Nov-04	MW12 20-Jul-05	MW12 16-Nov-05	MW12 9-May-06	MW12 28-Dec-06	MW12 14-Jun-07
Alkalinity	30 - 500	OG	-	**867**	**842**	**851**	**832**	**764**	**826**	**846**	**898**	**831**	**781**	**762**	**860**
Aluminum	0.1	OG	-	ND(0.01)	ND(0.01)	ND(0.005)	ND(0.005)	ND	0.009	ND	0.01	0.011	ND(0.01)	ND(0.01)	0.006
Barium	1	MAC	-	0.138	0.172	0.137	0.144	0.202	0.256	0.236	0.38	-	-	-	-
Boron	5	MAC	1.5	0.53	0.48	0.498	0.498	0.44	0.496	0.461	-	0.44	0.374	0.462	0.44
Cadmium	0.005	MAC	-	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND	ND	ND	-	0.0017	-	-	-
Calcium	-	-	-	176	170	165	166	168	226	184	200	190	192	197	210
Chloride	250	AO	126	20	18	19	18	16.9	59.4	33.8	39.5	38	34	31	37
Chromium	0.05	MAC	-	ND(0.005)	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-	ND	-	-	-
Cobalt	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	1	AO	0.5	ND(0.002)	ND(0.002)	0.0006	ND(0.0005)	0.0006	0.0009	ND	-	0.001	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	**14.1**	**11.7**	**10.9**	**10.1**	**10.7**	**15.4**	**14**	**14.4**	**13.1**	**34.4**	**14.2**	**13.3**
Hardness	80 - 100	OG	-	**767**	**688**	**702**	**700**	**667**	**832**	**700**	**754**	**700**	**724**	**719**	**750**
Iron	0.3	AO	0.17	0.04	**4.76**	**2.13**	**5.75**	**23.9**	**32**	**28.5**	**17**	**25**	**27**	**22.4**	**30**
Lead	0.01	MAC	-	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	ND	ND	-	ND	-	-	-
Magnesium	-	-	-	79.5	64	70.5	69.4	59.9	64.7	54	57	55	59.4	55	53
Manganese	0.05	AO	0.03	**0.065**	**0.073**	**0.063**	**0.069**	**0.085**	**0.121**	**0.109**	**0.12**	**0.11**	**0.122**	**0.126**	**0.16**
Ammonia	-	-	-	10.1	13	13.1	13.1	ND	15.9	16	19.6	16.3	14.1	12.9	18.2
Nitrite	1	MAC	0.3	0.02	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND(0.06)	ND(0.06)	ND
Nitrate	10	MAC	2.6	ND(0.1)	ND(0.1)	ND(0.1)	ND(0.1)	ND	ND	ND	ND	ND	ND(0.05)	0.28	ND
Potassium	-	-	-	18	19.3	17.6	17.4	18.2	23.7	19.7	22	24	22.4	19.6	23
Silica	-	-	-	12.6	12	13.4	13.4	27.8	-	-	-	-	-	-	-
Sodium	200	AO	121	25.9	21.7	22.2	21.7	17.2	24.4	22.6	31	31	29.5	27.5	31
Sulphate	500	AO	269	8	3	5	4	-	2.2	-	3	8	1.4	0.9	4
Total Kjeldahl Nitrogen (TKN)	-	-	-	11.6	13.7	13.8	13.6	13.6	18.7	22	-	21	-	12.9	-
Total Phenolics	-	-	-	-	-	-	-	-	0.002	-	0.013	ND	ND(0.002)	0.003	ND
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate (ortho)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	-	ND(0.005)	ND(0.005)	ND(0.005)	0.006	ND	0.015	ND	-	ND	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	1490	1380	1410	1390	1580	1420	1530	-	1340	-	-	1550
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	6.72	6.77	-	7.85	-	-	7.7
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Bold Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW12 27-Oct-07	MW12 31-Jul-08	MW12 6-Dec-08	MW12 30-Apr-09	MW12 20-Nov-09	MW12 20-Nov-09 Duplicate
Alkalinity	30 - 500	OG	-	**815**	**757**	**750**	**697**	**604**	**620**
Aluminum	0.1	OG	-	0.059	ND	ND	ND(0.10)	ND(0.10)	ND(0.50)
Barium	1	MAC	-	-	-	-	-	-	-
Boron	5	MAC	1.5	0.52	0.38	0.33	ND(0.50)	ND(0.50)	ND(0.50)
Cadmium	0.005	MAC	-	-	-	-	-	-	-
Calcium	-	-	-	21	190	150	220	162	164
Chloride	250	AO	126	27	23	22	18.5	10.5	9.8
Chromium	0.05	MAC	-	-	-	-	-	-	-
Cobalt	-	-	-	-	0.016	0.0093	-	-	-
Copper	1	AO	0.5	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	**13.5**	**9.5**	**11**	**10.7**	**7.2**	**7.8**
Hardness	80 - 100	OG	-	**770**	**710**	**570**	**750**	**566**	**573**
Iron	0.3	AO	0.17	**28**	**24**	**2.9**	**25.9**	**19.3**	**20.0**
Lead	0.01	MAC	-	-	-	-	-	-	-
Magnesium	-	-	-	62	55	45	48.5	38.9	39.8
Manganese	0.05	AO	0.03	**0.15**	**0.17**	**0.13**	**0.218**	**0.211**	**0.217**
Ammonia	-	-	-	20.3	17	16	12.3	11.1	11.4
Nitrite	1	MAC	0.3	ND	ND	ND	ND(0.10)	ND(0.10)	ND(0.10)
Nitrate	10	MAC	2.6	ND	ND	0.1	ND(0.10)	ND(0.10)	ND(0.10)
Potassium	-	-	-	27	24	21	20	18	18
Silica	-	-	-	-	-	-	-	-	-
Sodium	200	AO	121	30	27	25	-	-	-
Sulphate	500	AO	269	8	7	3	13.9	28.3	28.2
Total Kjeldahl Nitrogen (TKN)	-	-	-	-	-	-	12.3	11.5	12.0
Total Phenolics	-	-	-	ND	ND	ND	0.0036	0.004	0.006
Phosphorus (Dissolved)	-	-	-	-	-	-	-	ND(0.50)	ND(0.50)
Phosphate (ortho)	-	-	-	-	-	-	0.0043	0.0035	0.0035
Zinc	5	AO	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	1490	-	1360	1320	1150	1160
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	7.9	-	7.5	7.13	7.22	7.2
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	6.5	6.79	6.79
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	1350	1040	1040
Field Temperature (°C)	15	AO	-	-	-	-	7.8	10.0	10.0

Notes:

All concentrations in mg/L unless otherwise noted.
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OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Bold Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	MW13 28-Dec-06	MW13 14-Jun-07	MW13 27-Oct-07	MW13 31-Jul-08	MW13 6-Dec-08	MW13 30-Apr-09	MW13 20-Nov-09
Alkalinity	30 - 500	OG	-	211	228	220	216	218	220	222
Aluminum	0.1	OG	-	0.02	0.011	0.013	0.011	0.006	ND(0.010)	ND(0.010)
Barium	1	MAC	-	-	-	-	-	-	-	-
Boron	5	MAC	1.5	0.056	0.029	0.061	0.032	0.026	ND(0.050)	ND(0.050)
Cadmium	0.005	MAC	-	-	-	-	-	-	-	-
Calcium	-	-	-	57.6	61	57	62	58	69.0	61.5
Chloride	250	AO	126	1.2	2	2	2	1	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	ND	ND	-	-
Copper	1	AO	0.5	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3.05	4.6	1.6	3	1.7	1.7	1.7	2.3
Hardness	80 - 100	OG	-	**222**	**230**	**230**	**240**	**220**	**252**	**233**
Iron	0.3	AO	0.17	**0.64**	ND	ND	ND	ND	ND(0.050)	ND(0.050)
Lead	0.01	MAC	-	-	-	-	-	-	-	-
Magnesium	-	-	-	18.9	20	22	21	18	19.4	19.3
Manganese	0.05	AO	0.03	0.044	0.024	0.035	0.024	0.004	0.0018	0.0043
Ammonia	-	-	-	ND(0.1)	ND	ND	0.09	0.08	0.125	ND(0.050)
Nitrite	1	MAC	0.3	ND(0.06)	ND	ND	ND	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	2.6	0.81	ND	ND	ND	ND	ND(0.10)	ND(0.10)
Potassium	-	-	-	1.09	0.83	1.4	0.88	2.5	ND(1.0)	ND(1.0)
Silica	-	-	-	-	-	-	-	-	-	-
Sodium	200	AO	121	6.61	4.9	9.5	5.7	7.2	-	-
Sulphate	500	AO	269	15	13	18	12	12	10.6	9.6
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.9	-	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	ND(0.002)	ND	ND	ND	ND	ND(0.0010)	0.004
Phosphorus (Dissolved)	-	-	-	-	-	-	-	-	-	ND(0.050)
Phosphate (ortho)	-	-	-	-	-	-	-	-	0.0035	0.0041
Zinc	5	AO	-	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	-	443	433	-	418	401	415
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	8.2	8.3	-	8.1	8.04	8.06
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	7.7	7.61
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	367	439
Field Temperature (°C)	15	AO	-	-	-	-	-	-	8.0	9.6

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Bold Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Groundwater Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	Field Blank 30-Apr-09	Field Blank 20-Nov-09
Alkalinity	30 - 500	OG	-	ND(10)	ND(10)
Aluminum	0.1	OG	-	ND(0.010)	ND(0.010)
Boron	5	MAC	1.3	ND(0.050)	ND(0.050)
Calcium	-	-	-	ND(0.50)	ND(0.50)
Chloride	250	AO	126	ND(2.0)	ND(2.0)
Dissolved Organic Carbon (DOC)	5	AO	3	ND(1.0)	ND(1.0)
Hardness	80 - 100	OG	-	ND(10)	ND(10)
Iron	0.3	AO	0.26	ND(0.050)	ND(0.050)
Magnesium	-	-	-	ND(0.50)	ND(0.50)
Manganese	0.05	AO	0.027	ND(0.0010)	ND(0.0010)
Ammonia	-	-	-	ND(0.050)	ND(0.050)
Nitrite	1	MAC	0.29	ND(0.10)	ND(0.10)
Nitrate	10	MAC	3.25	ND(0.10)	ND(0.10)
Nitrate and Nitrite as N	-	-	-	ND(0.2)	ND(0.2)
Potassium	-	-	-	ND(1.0)	ND(1.0)
Sulphate	500	AO	262	ND(2.0)	ND(2.0)
Total Kjeldahl Nitrogen (TKN)	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	ND(0.0010)	ND(0.0010)
Phosphorus (Dissolved)	-	-	-	ND(0.0030)	ND(0.0030)
Phosphate (ortho)	-	-	-	ND(0.050)	ND(0.0030)
Laboratory Conductivity (µmhos/cm)	-	-	-	5.04	1.86
Laboratory pH (Std. Units)	-	-	-	7.09	6.79
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available
ND Parameter detected below the laboratory method detection limit.
Parameter exceeds the ODWS
Analytical data collected prior to 2009 was provided by Pryde, Schropp, McComb Inc.

Appendix E.1

Leachate Well Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine - Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	LW1-S 28-Dec-06	LW1-S 14-Jun-07	LW1-S 27-Oct-07	LW1-S 31-Jul-08	LW1-S 06-Dec-08	LW1-S 30-Apr-09	LW1-S 20-Nov-09
Alkalinity	30 - 500	OG	-	**502**	452	**560**	354	347	212	341
Aluminum	0.1	OG	-	ND(0.01)	0.009	0.006	0.015	ND	2.82	4.91
Barium	1	MAC	-	-	-	-	-	-	-	-
Boron	5	MAC	1.3	0.193	0.14	0.19	0.24	0.097	ND(0.50)	ND(0.50)
Cadmium	0.005	MAC	-	-	-	-	-	-	-	-
Calcium	-	-	-	129	120	170	150	91	107	170
Chloride	250	AO	126	14	9	25	7	7	ND(2.0)	3.5
Chromium	0.05	MAC	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	0.0023	0.0013	-	-
Copper	1	AO	0.5	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3	3.8	3.5	**5.9**	3.1	3	2.2	2.2
Hardness	80 - 100	OG	-	**500**	**460**	**630**	**1100**	**340**	**372**	**606**
Iron	0.3	AO	0.26	**7.96**	**7.1**	**12**	**2.5**	**0.78**	**10.7**	**20.7**
Magnesium	-	-	-	43.5	38	48	170	27	25.5	43.9
Manganese	0.05	AO	0.027	**0.278**	**0.44**	**0.98**	**0.58**	**0.45**	**0.406**	**0.746**
Ammonia	-	-	-	1.8	0.65	1.66	0.54	0.32	0.203	0.158
Nitrite	1	MAC	0.29	ND(0.06)	ND	ND	ND	0.01	ND(0.10)	ND(0.10)
Nitrate	10	MAC	3.25	ND(0.05)	ND	ND	ND	ND	ND(0.10)	ND(0.10)
Potassium	-	-	-	7.51	6.1	11	21	6.6	ND(0.50)	ND(10)
Silica	-	-	-	-	-	-	-	-	-	-
Sodium	200	AO	-	17.7	15	17	66	13	-	-
Sulphate	500	AO	262	4.1	9	13	11	-	6.7	7.1
Total Kjeldahl Nitrogen (TKN)	-	-	-	2.2	-	-	-	-	0.362	0.164
Total Phenolics	-	-	-	ND(0.002)	ND	ND	ND	-	ND(0.0010)	ND(0.0010)
Phosphate (ortho)	-	-	-	-	-	-	-	-	ND(0.0030)	0.0032
Phosphorus	-	-	-	-	-	-	-	-	ND(0.50)	ND(0.50)
Zinc	5	AO	-	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm	-	-	-	-	826	1060	-	653	406	593
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	8.1	8	-	7.9	7.97	7.88
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	7.31	7.3
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	373	597
Field Temperature (°C)	15	AO	-	-	-	-	-	-	7.2	10.6

Notes:

All concentrations in mg/L unless otherwise noted.
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(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available.
ND - Parameter detected below the laboratory method detection limit
Parameter exceeds ODWS
Analytical data collected prior to April 2009 was taken from
Ward 3, 2008 Annual Monitoring Report written by Pryde, Schropp, McComb Inc.

Appendix E.1

LEACHATE WELL ANALYTICAL RESULTS
GENERAL CHEMISTRY AND DISSOLVED METALS
HISTORIC WATER QUALITY DATA
KINCARDINE - WARD 3 LANDFILL SITE
MUNICIPALITY OF KINCARDINE, ONTARIO

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	LW1-D 28-Dec-06	LW1-D 14-Jun-07	LW1-D 27-Oct-07	LW1-D 31-Jul-08	LW1-D 06-Dec-08	LW1-D 30-Apr-09	LW1-D 20-Nov-09
Alkalinity	30 - 500	OG	-	253	250	229	213	210	209	212
Aluminum	0.1	OG	-	0.02	0.007	0.006	0.015	0.005	**2.55**	**1.46**
Barium	1	MAC	-	-	-	-	-	-	-	-
Boron	5	MAC	1.3	0.498	0.48	0.53	0.47	0.47	ND(0.50)	0.467
Cadmium	0.005	MAC	-	-	-	-	-	-	-	-
Calcium	-	-	-	29.2	26	25	21	20	107	29.2
Chloride	250	AO	126	7.7	8	6	4	4	3.4	2.8
Chromium	0.05	MAC	-	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	ND	ND	-	-
Copper	1	AO	0.5	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3	**6.7**	**5.1**	4.6	2.8	3.2	4.2	4.4
Hardness	80 - 100	OG	-	**131**	**120**	**110**	97	85	**128**	**117**
Iron	0.3	AO	0.26	0.18	ND	ND	ND	ND	10.7	2.04
Magnesium	-	-	-	14.1	12	12	11	8.5	25.5	10.8
Manganese	0.05	AO	0.027	0.026	**0.053**	**0.052**	**0.051**	**0.059**	**0.406**	**0.114**
Ammonia	-	-	-	0.1	0.05	ND	0.33	0.11	0.057	ND(0.050)
Nitrite	1	MAC	0.29	0.1	ND	ND	0.02	ND	ND(0.10)	ND(0.10)
Nitrate	10	MAC	3.25	0.59	0.1	ND	0.1	0.1	0.12	0.11
Potassium	-	-	-	3.35	2.5	2.7	3.8	2.2	ND(10)	2
Silica	-	-	-	-	-	-	-	-	-	-
Sodium	200	AO	-	80.7	88	89	92	80	-	-
Sulphate	500	AO	262	49	46	50	54	45	43.2	39.5
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.7	-	-	-	-	ND(0.15)	ND(0.15)
Total Phenolics	-	-	-	ND(0.002)	ND	ND	ND	ND	ND(0.0010)	ND(0.0010)
Phosphate (ortho)	-	-	-	-	-	-	-	-	0.0062	0.0095
Phosphorus	-	-	-	-	-	-	-	-	ND(0.50)	0.086
Zinc	5	AO	-	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm	-	-	-	-	586	550	-	490	478	460
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	8.3	8.3	-	8.1	8.29	8.28
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	7.76	7.78
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	411	499
Field Temperature (°C)	15	AO	-	-	-	-	-	-	9.3	10.6

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available.
ND - Parameter detected below the laboratory method detection limit
Parameter exceeds ODWS
Analytical data collected prior to April 2009 was taken from
Ward 3, 2008 Annual Monitoring Report written by Pryde, Schropp, McComb Inc.

Appendix E.1

Leachate Well Analytical Results
General Chemistry and Dissolved Metals
Historic Water Quality Data
Kincardine - Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	LW2 14-Jun-07	LW2 27-Oct-07	LW2 31-Jul-08	LW2 06-Dec-08	LW2 30-Apr-09	LW2 20-Nov-09
Alkalinity	30 - 500	OG	-	253	250	229	213	159	158
Aluminum	0.1	OG	-	0.02	0.007	0.006	0.015	0.57	**1.48**
Barium	1	MAC	-	-	-	-	-	-	-
Boron	5	MAC	1.3	0.498	0.48	0.53	0.47	0.529	0.449
Cadmium	0.005	MAC	-	-	-	-	-	-	-
Calcium	-	-	-	29.2	26	25	21	32.4	38.7
Chloride	250	AO	126	7.7	8	6	4	ND(2.0)	ND(2.0)
Chromium	0.05	MAC	-	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-	ND	-	-
Copper	1	AO	0.5	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3	**6.7**	**5.1**	4.6	2.8	3.6	3.6
Hardness	80 - 100	OG	-	**131**	**120**	**110**	97	**144**	**169**
Iron	0.3	AO	0.26	0.18	ND	ND	ND	**1.05**	**2.07**
Magnesium	-	-	-	14.1	12	12	11	15.4	17.6
Manganese	0.05	AO	0.027	0.026	**0.053**	**0.052**	**0.051**	**0.0942**	**0.0801**
Ammonia	-	-	-	0.1	0.05	ND	0.33	0.08	ND(0.050)
Nitrite	1	MAC	0.29	0.1	ND	ND	0.02	ND(0.10)	ND(0.10)
Nitrate	10	MAC	3.25	0.59	0.1	ND	0.1	ND(0.10)	ND(0.10)
Potassium	-	-	-	3.35	2.5	2.7	3.8	1.2	1.6
Silica	-	-	-	-	-	-	-	-	-
Sodium	200	AO	-	80.7	88	89	92	-	-
Sulphate	500	AO	262	49	46	50	54	56.1	49.9
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.7	-	-	-	0.22	ND(0.15)
Total Phenolics	-	-	-	ND(0.002)	ND	ND	ND	ND(0.0010)	0.002
Phosphate (ortho)	-	-	-	-	-	-	-	0.0099	0.0116
Phosphorus	-	-	-	-	-	-	-	0.053	0.102
Zinc	5	AO	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm	-	-	-	-	586	550	-	405	393
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	8.3	8.3	-	8.21	8.24
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	8.01	7.87
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	370	429
Field Temperature (°C)	15	AO	-	-	-	-	-	8.9	10.1

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information available.
ND - Parameter detected below the laboratory method detection limit
[ ] Parameter exceeds ODWS
Analytical data collected prior to April 2009 was taken from
Ward 3, 2008 Annual Monitoring Report written by Pryde, Schropp, McComb Inc.

Appendix E.1

General Chemistry and Total Metals
Residential Well Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					PW2	PW2	PW2	PW2	PW2	PW2	PW2	PW3	PW3	PW3	PW3	PW3	PW3	PW3
Sample ID:					CRA-4074-02-WARD3-(	W-WARD3-1110-0(	W-WARD3-0511-0(	W-WARD3-1011-0(	W-WARD3-0412-0(	W-WARD3-1012-0(	W-WARD3-0513-0(	W-WARD3-1110-0(	W-WARD3-0511-0(	W-WARD3-1011-0(	W-WARD3-0412-0(	W-WARD3-1012-0(	W-WARD3-0513-0(	W-WARD3-1013-001
Sample Date:					5/12/2010	11/29/2010	5/24/2011	11/22/2011	4/23/2012	11/26/2012	5/16/2013	11/29/2010	5/24/2011	11/21/2011	4/24/2012	11/26/2012	5/13/2013	10/21/2013
Parameters	**Units**	***ODWS*** [1]	***ODWS Source***	***MABC*** [2]														
Metals																		
Aluminum	mg/L	-	-	-	<0.010	<0.010	0.309	<0.010	<0.01	<0.010	<0.010	<0.010	0.298	<0.010	<0.01	0.013	<0.010	<0.10
Boron	mg/L	5	IMAC	1.5	0.336	0.308	0.336	0.304	0.265	0.318	0.320	0.296	0.362	0.285	0.280	0.312	0.328	0.35
Calcium	mg/L	-	-	-	15.4	16.4	15.4	16.7	21.8	14.8	17.2	25.1	27.4	26.1	13.6	24.3	26.4	31.8
Iron	mg/L	0.3	AO	0.17	**0.555**	**0.351**	0.240	0.273	**0.656**	**0.546**	**0.343**	0.114	0.206	0.206	**0.345**	0.207	0.192	**7.61**
Magnesium	mg/L	-	-	-	8.33	8.52	8.53	7.32	11.5	7.97	9.09	13.8	14.1	11.1	7.11	13.1	14.3	13.1
Manganese	mg/L	0.05	AO	0.03	0.0165	0.0119	0.0113	0.0103	0.0045	0.0157	0.0151	0.0040	0.0057	0.0050	0.0144	0.0050	0.0047	<0.010
Phosphorus	mg/L	-	-	-	0.095	0.054	0.096	0.077	<0.05	0.12	0.106	<0.050	<0.05	<0.050	0.086	<0.10	<0.050	<0.50
Potassium	mg/L	-	-	-	1.2	1.2	1.2	1.3	1.1	1.2	1.3	1.2	1.3	1.3	1.1	1.2	1.3	<10
General Chemistry																		
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	157	153	153	156	126	165	183	121	127	121	155	122	122	132
Ammonia-N	mg/L	-	-	-	0.575	0.546	0.645	0.446	0.209	0.737	0.727	0.222	0.264	0.154	0.519	0.225	0.270	0.313
Chloride	mg/L	250	AO	126	2.7	2.9	2.8	2.9	5.8	3.0	2.8	5.5	5.5	5.5	3.1	5.7	5.6	5.8
Conductivity	µS/cm	-	-	-	339	343	341	315	489	279	312	490	487	432	336	364	403	491
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	1.2	2.2	2.6	2.9	1.6	1.7	2.3	2.1	2.2	2.5	2.0	1.8	2.0	2.1
Hardness	mg/L	80-100	OG	-	73	76	74	72	102	70	80	119	127	111	63	115	125	134
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	<0.1	<0.10	0.11	<0.10	<0.10	<0.10	<0.1	<0.10	0.13	<0.10	<0.10	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	0.0365	0.0382	0.0493	0.0474	0.0055	0.0427	0.0406	0.0045	0.0053	0.0054	0.0480	0.0047	0.0056	0.0064
pH, lab	s.u.	-	-	-	8.27	8.17	8.33	8.28	8.12	8.14	8.36	8.22	8.23	8.21	8.21	8.09	8.24	8.20
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	0.0050	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	<0.001	<0.0010	<0.001	<0.0010	<0.0010	<0.0010
Sulfate	mg/L	500	AO	269	16.8	16.8	19.3	19.8	111	18.7	16.8	110	112	110	17.8	114	111	108
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.93	0.90	0.93	0.73	0.31	1.02	0.94	0.40	0.292	0.217	0.94	0.43	<0.57	0.37
Field Parameters																		
Conductivity, field	µS/cm	-	-	-	441	254	411	368	352	277	321	370	572	557	466	376	457	464
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	2.04	4.92	-	-	-	-	3.59	5.99	-
pH, field	s.u.	6.5-8.5	OG	-	8.35	7.25	7.60	8.38	8.46	7.44	7.34	7.72	8.55	8.34	8.10	7.23	8.22	8.69
Temperature, field	Deg C	15	AO	-	8.2	11.9	11.7	10.7	8.6	9.1	11.5	9.8	11.3	9.1	7.9	9.2	8.4	10.5

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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 E.1

Residential Well Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	PW-2 16-Apr-02	PW-2 22-Apr-03	PW-2 25-Nov-03	PW-2 18-Nov-04	PW-2 20-Jul-05	PW-2 16-Nov-05	PW-2 09-May-06	PW-2 28-Dec-06	PW-2 14-Jun-07	PW-2 27-Oct-07	PW-2 31-Jul-08	PW-2 30-Apr-09	PW-2 20-Nov-09
															No Access	
Alkalinity	30 - 500	OG	-	93	94	93	97	99.4	94	87	86	94	93	94	-	165
Arsenic	0.025	IMAC	0.0066	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	1	MAC	0.32	0.011	0.011	0.011	0.012	-	-	-	-	-	-	-	-	-
Boron	5	MAC	1.3	0.32	0.322	0.312	0.322	0.28	0.29	0.285	0.312	0.3	0.31	0.35	-	0.339
Cadmium	0.005	MAC	0.0013	ND(0.0001)	ND(0.0001)	ND	ND	-	ND	-	-	-	-	-	-	-
Calcium	-	-	-	70.7	69.5	70.5	71.9	80	74	68	68.3	75	75	78	-	16.1
Chloride	250	AO	126	6	6	6.7	7.2	7	6	6.1	6.4	7	7	7	-	3
Chromium	0.05	MAC	0.014	ND(0.005)	ND(0.005)	ND	ND	-	ND	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	1	AO	0.50	ND(0.002)	ND(0.0005)	0.0031	0.0049	-	0.002	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3	0.8	0.9	1.3	1	0.9	0.9	1.4	ND(1)	1	1	**32.2**	-	3.2
Hardness	80 - 100	OG	-	**350**	**353**	**343**	**348**	**377**	**380**	**343**	**346**	**370**	**390**	**390**	-	76
Iron	0.3	AO	0.26	0.06	**0.38**	0.2	**0.37**	**0.39**	**0.45**	**0.33**	**0.36**	**0.41**	**0.42**	0.11	-	0.24
Lead	0.01	MAC	0.004	ND(0.0005)	ND(0.0005)	ND	0.0007	-	ND	-	-	-	-	-	-	-
Magnesium	-	-	-	42.2	43.7	40.6	40.8	47	47	42.2	42.5	45	49	47	-	8.58
Manganese	0.05	AO	0.027	ND(0.005)	ND(0.005)	ND	ND	ND	ND	0.002	0.002	ND	ND	ND	-	0.0152
Mercury	0.001	MAC	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia	-	-	-	0.14	0.11	ND	0.12	ND	0.13	0.2	0.2	0.17	0.12	ND	-	0.778
Nitrite	1	MAC	0.29	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND(0.06)	ND(0.06)	ND	ND	ND	-	ND(0.10)
Nitrate	10	MAC	3.25	ND(0.1)	ND(0.1)	ND	ND	-	ND	ND(0.05)	ND(0.05)	ND	ND	ND	-	ND(0.10)
Potassium	-	-	-	2.4	2.1	2.3	2.4	2.5	2.7	2.75	2.61	2.6	2.8	2.4	-	1.2
Sodium	200	AO	102	41.7	44	42.6	44.3	47	49	44.4	44.4	48	45	51	-	-
Sulphate	500	AO	262	297	346	-	-	382	317	330	340	304	326	310	-	17.6
Total Dissolved Solids (TDS)	500	AO	385	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.16	0.51	0.19	0.21	-	0.3	-	ND(0.05)	-	-	-	-	1.16
Total Phenolics	-	-	-	-	-	-	-	ND	ND	ND(0.002)	ND(0.002)	ND	ND	ND	-	ND(0.0010)
Total Phosphorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.073
Turbidity (NTU)	5	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	2.5	ND(0.005)	0.25	0.012	0.039	-	0.009	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm	-	-	-	870	842	950	870	-	730	-	-	878	879	-	-	341
Laboratory pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	7.91	-	8.07	-	-	8.0	8.1	-	-	8.42
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-	8.11
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	441
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	9.9

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water
August 2000, revised January 2001 and
June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based
on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed / no information
ND - Parameter detected below the laboratory method detection limit
Parameter exceeds ODWS
2002-2008 data has been provided by Pryde, Schropp, McComb Inc. in the Ward 3 2008 Annual Monitoring Report

Appendix E.1

Residential Well Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	PW-3 16-Apr-02	PW-3 29-Oct-02	PW-3 22-Apr-03	PW-3 25-Nov-03	PW-3 02-Jun-04	PW-3 02-Jun-04	PW-3 18-Nov-04	PW-3 20-Jul-05	PW-3 16-Nov-05	PW-3 09-May-06	PW-3 28-Dec-06	PW-3 14-Jun-07	PW-3 27-Oct-07	PW-3 31-Jul-08
Alkalinity	30 - 500	OG	-	156	159	163	176	159	160	156	171	160	149	147	160	155	157
Arsenic	0.025	IMAC	0.0066	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	1	MAC	0.32	0.046	0.049	0.039	0.049	0.042	0.043	0.059	-	-	-	-	-	-	-
Boron	5	MAC	1.3	0.35	0.34	0.347	0.345	0.311	0.31	0.343	0.32	0.33	0.304	0.342	0.34	-	0.33
Cadmium	0.005	MAC	0.0013	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND	ND	ND	ND	-	ND	-	-	-	-	-
Calcium	-	-	-	15	15.3	14.4	15.5	14.5	14.5	16.1	16	16	13.9	14.4	16	17	16
Chloride	250	AO	126	3	3	3	3.5	3.7	3.7	3.6	4	2	3.1	3.2	3	3	3
Chromium	0.05	MAC	0.014	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	ND	-	ND	-	-	-	-	-
Chemical Oxygen Demand (COD)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	1	AO	0.50	ND(0.002)	ND(0.002)	0.0019	0.0008	0.0075	0.0076	0.0022	-	ND	-	-	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3	1.3	1.5	1.4	1.7	5.1	**5.7**	1.7	1.6	1.6	1.8	1.1	1.6	1.9	1.4
Hardness	80 - 100	OG	-	72.7	73.7	67.8	72	72	72	78	74.3	77	66.2	70.6	79	83	80
Iron	0.3	AO	0.26	0.07	0.27	0.27	0.22	0.22	0.21	ND	0.23	**0.53**	**0.81**	**0.36**	**0.41**	ND	**0.47**
Lead	0.01	MAC	0.004	ND(0.0005)	ND(0.0005)	ND(0.0005)	ND	0.0013	0.0012	ND	-	ND	-	-	-	-	-
Magnesium	-	-	-	8.55	8.62	7.74	8.15	7.9	7.78	9.14	8.9	8.9	7.68	8.4	93	9.9	9.5
Manganese	0.05	AO	0.027	0.008	0.009	0.011	0.008	0.015	0.015	0.008	0.007	0.013	0.014	0.012	0.014	0.013	0.012
Mercury	0.001	MAC	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonia	-	-	-	0.8	0.72	0.71	ND	0.68	0.65	0.5	0.78	0.79	1	1	0.88	0.53	0.79
Nitrite	1	MAC	0.29	ND(0.02)	ND(0.02)	ND(0.02)	ND	ND	ND	ND	ND	ND	ND(0.06)	ND(0.06)	ND	ND	ND
Nitrate	10	MAC	3.25	ND(0.1)	ND(0.1)	ND(0.1)	ND	ND	ND	ND	ND	ND	ND(0.05)	ND(0.05)	ND	ND	ND
Potassium	-	-	-	1.2	1.2	0.9	1.3	1.2	1.2	1.3	1.1	1.3	1.29	1.26	1.4	1.3	1.4
Sodium	200	AO	102	47.2	48.6	48.9	48.4	45.3	44.3	48.7	49	56	48.3	48.8	56	60	56
Sulphate	500	AO	262	24	25	22	-	22.3	22.3	-	21.5	20	17	21	19	21	23
Total Dissolved Solids (TDS)	500	AO	385	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen (TKN)	-	-	-	0.81	0.82	1.17	0.9	0.81	0.83	0.8	-	0.9	-	1.3	-	-	-
Total Phenolics	-	-	-	0	0	0	0	0.015	0.015	-	ND	ND	0.003	ND(0.002)	ND	ND	ND
Total Phosphorus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity (NTU)	5	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	5	AO	2.5	0.032	0.114	0.114	0.099	0.294	0.295	0.068	-	0.12	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)				352	329	339	360	325	324	350	-	302	-	-	359	347	-
Laboratory pH (Std. Units)				-	-	-	-	8.2	8.19	8.27	-	8.3	-	-	8.3	8.2	-
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water
August 2000, revised January 2001 and
June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based
on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed
< - Parameter detected below the laboratory method detection limit
nd - Parameter detected below the laboratory method detection limit
bold Parameter exceeds ODWS
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Appendix E.1

Residential Well Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE ODWS (1)		MABC (2)	PW-3 06-Dec-08	PW-3 30-Apr-09	PW-3 20-Nov-09
					No Access	No Access
Alkalinity	30 - 500	OG	-	158	-	-
Arsenic	0.025	IMAC	0.0066	-	-	-
Barium	1	MAC	0.32	-	-	-
Boron	5	MAC	1.3	0.33	-	-
Cadmium	0.005	MAC	0.0013	-	-	-
Calcium	-	-	-	15	-	-
Chloride	250	AO	126	3	-	-
Chromium	0.05	MAC	0.014	-	-	-
Chemical Oxygen Demand (COD)	-	-	-	-	-	-
Copper	1	AO	0.50	-	-	-
Dissolved Organic Carbon (DOC)	5	AO	3	1.8	-	-
Hardness	80 - 100	OG	-	75	-	-
Iron	0.3	AO	0.26	0.18	-	-
Lead	0.01	MAC	0.004	-	-	-
Magnesium	-	-	-	9	-	-
Manganese	0.05	AO	0.027	0.016	-	-
Mercury	0.001	MAC	0.0003	-	-	-
Ammonia	-	-	-	0.88	-	-
Nitrite	1	MAC	0.29	ND	-	-
Nitrate	10	MAC	3.25	ND	-	-
Potassium	-	-	-	1.3	-	-
Sodium	200	AO	102	56	-	-
Sulphate	500	AO	262	18	-	-
Total Dissolved Solids (TDS)	500	AO	385	-	-	-
Total Kjeldahl Nitrogen (TKN)	-	-	-	-	-	-
Total Phenolics	-	-	-	ND	-	-
Total Phosphorus	-	-	-	-	-	-
Turbidity (NTU)	5	AO	-	-	-	-
Zinc	5	AO	2.5	-	-	-
Laboratory Conductivity (µmhos/cm)				346	-	-
Laboratory pH (Std. Units)				8.2	-	-
Field pH (Std. Units)	6.5 - 8.5	OG	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-
Field Temperature (°C)	15	AO	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.
(1) Ministry of the Environment (MOE), Ontario Drinking Water
August 2000, revised January 2001 and
June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based
on the ODWS guidelines for AO, IMAC and MAC parameters.
OG - Operation Guideline (water treatment and distribution).
IMAC - Interim Maximum Acceptable Concentration (health related).
MAC - Maximum Acceptable Concentration (health related).
AO - Aesthetic Objective (non-health related, i.e. colour, taste, smell).
- Parameter not analyzed
< - Parameter detected below the laboratory method detection limit
nd - Parameter detected below the laboratory method detection limit
Parameter exceeds ODWS
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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-1 16-Apr-02	SW-1 22-Apr-03	SW-1 19-Nov-03	SW-1 19-Nov-03	SW-1 2-Jun-04	SW-1 18-Nov-04	SW-1 18-Nov-04
Alkalinity	-	179	166	200	198	229	285	286
Aluminum	(a)	0.01	**0.372**	**0.431**	**0.42**	0.015	0.007	0.012
Beryllium	(h)	ND(0.001)	ND(0.001)	ND	ND	ND	ND	ND
Boron	0.2	0.02	0.014	0.019	0.019	0.016	0.015	0.015
Cadmium	0.0002	ND(0.0001)	ND(0.0001)	ND	ND	ND	0.0001	ND
Calcium	-	45.6	47.9	52.7	53.2	61	86.9	84.9
Chloride	-	5	9	6.9	-	6.3	15.7	15.6
Chromium	0.0089 (b)	ND(0.005)	ND(0.005)	ND	ND	ND	ND	ND
Cobalt	0.0009	**0.002**	0.0002	0.0002	0.0002	0.0003	0.0001	0.0001
Copper	0.005	0.002	0.0027	0.0013	0.0012	0.0014	0.0025	0.0023
Dissolved Organic Carbon (DOC)	-	7.6	8.5	7.8	7.7	9.4	10.1	10.5
Hardness	-	172	178	208	208	236	356	356
Iron	0.3	0.04	**0.32**	**0.41**	**0.4**	0.16	0.03	0.04
Lead	(c)	ND(0.0005)	ND(0.0005)	ND	ND	0.0005	ND	ND
Magnesium	-	14.1	14.2	15.3	15.3	17.4	22.4	21.8
Manganese	-	-	-	0.022	0.022	0.023	0.021	0.021
Molybdenum	0.04	ND(0.002)	ND(0.001)	ND	ND	ND	ND	ND
Nickel	0.025	ND(0.002)	ND(0.001)	0.001	ND	0.002	0.001	ND
Nitrite	-	ND(0.02)	ND(0.02)	ND	-	ND	ND	ND
Nitrate	-	ND(0.1)	0.68	0.3	-	0.2	ND	ND
Potassium	-	-	-	-	-	-	-	-
Silver	0.0001	ND(0.0001)	ND(0.0001)	ND	ND	ND	ND	ND
Sodium	-	-	-	-	-	-	-	-
Sulphate	-	7	15	-	-	4	-	-
TKN	-	-	-	0.55	0.56	0.92	0.81	0.85
Total Phenolics	0.001	ND(2)	ND(2)	ND	ND	ND	ND	ND
Phosphorus (Ortho)	-	0.01	ND(0.01)	0	0	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	**0.055**	0.028	**0.067**	**0.067**	**0.115**	**0.036**	**0.034**
Turbidity (NTU)	-	5.11	8.59	8.9	9.1	-	1.9	1.9
Vanadium	0.006	ND(0.002)	0.0014	0.0014	0.0013	0.0014	0.001	0.0011
Zinc	0.02 - 0.03 (g)	ND(0.005)	0.007	ND	ND	0.015	0.009	0.009
Laboratory Conductivity (µmhos/cm)	-	346	357	420	-	400	620	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-	-	7.92	7.72	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

- Parameter not analyzed / no information

ND - Parameter detected below the laboratory method detection limit

Bold Parameter exceeds ODWS

2002-2008 data has been provided by Pryde, Schropp, McComb Inc. in the Ward 3 2008 Annual Monitoring Report

Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-1 20-Jul-05	SW-1 16-Nov-05	SW-1 9-May-06	SW-1 28-Dec-06	SW-1 14-Jun-07	SW-1 31-Jul-08
Alkalinity	-	283	152	287	234	417	339
Aluminum	(a)	**0.82**	**0.35**	**0.22**	0.03	**0.29**	**0.14**
Beryllium	(h)	-	ND	-	-	-	-
Boron	0.2	0.03	0.016	0.044	0.023	0.093	0.024
Cadmium	0.0002	-	ND	-	-	-	-
Calcium	-	72	56	76.8	67.2	100	100
Chloride	-	4	6	5.4	8.7	19	15
Chromium	0.0089 (b)	-	ND	-	-	-	-
Cobalt	0.0009	-	ND	-	-	-	0.0005
Copper	0.005	-	0.005	-	-	-	-
Dissolved Organic Carbon (DOC)	-	14.9	10.9	7.7	5.7	14.5	15.2
Hardness	-	238	220	273	253	380	360
Iron	0.3	**2.6**	0.28	**1.14**	0.04	**2.2**	**0.89**
Lead	(c)	-	0.0005	-	-	-	-
Magnesium	-	16	18	19.7	20.8	28	30
Manganese	-	0.72	0.006	0.213	0.004	0.78	0.092
Molybdenum	0.04	-	ND	-	-	-	-
Nickel	0.025	-	0.001	-	-	-	-
Nitrite	-	ND	0.02	ND(0.06)	ND(0.06)	ND	0.18
Nitrate	-	ND	0.4	1.71	ND(0.05)	ND	ND
Potassium	-	-	-	-	-	11	3.6
Silver	0.0001	-	ND	-	-	-	-
Sodium	-	-	-	-	-	86	6.5
Sulphate	-	3	39	6.9	7.4	3	ND
TKN	-	-	0.9	-	0.5	-	-
Total Phenolics	0.001	**0.003**	ND	0.001	ND(0.001)	0.001	ND
Phosphorus (Ortho)	-	-	-	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	**0.55**	**0.1**	0.07	ND(0.01)	**0.16**	**0.15**
Turbidity (NTU)	-	-	-	-	-	-	-
Vanadium	0.006	-	0.003	-	-	-	-
Zinc	0.02 - 0.03 (g)	-	ND	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	328	-	-	793	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	8.1	-	-	8.2	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

- Parameter not analyzed / no information

ND - Parameter detected below the laboratory method detection limit

Bold Parameter exceeds ODWS

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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-1 6-Dec-08	SW-1 30-Apr-09	SW-1 20-Nov-09
				Dry
Alkalinity	-	222	198	-
Aluminum	(a)	**0.21**	**1.14**	-
Beryllium	(h)	-	-	-
Boron	0.2	ND	ND(0.050)	-
Cadmium	0.0002	-	-	-
Calcium	-	59	59.2	-
Chloride	-	3	5.6	-
Chromium	0.0089 (b)	-	-	-
Cobalt	0.0009	ND	-	-
Copper	0.005	-	-	-
Dissolved Organic Carbon (DOC)	-	5.8	12.5	-
Hardness	-	200	229	-
Iron	0.3	**0.32**	**1.78**	-
Lead	(c)	-	-	-
Magnesium	-	19	19.8	-
Manganese	-	0.041	0.0854	-
Molybdenum	0.04	-	-	-
Nickel	0.025	-	-	-
Nitrite	-	ND	ND(0.10)	-
Nitrate	-	ND	ND(0.10)	-
Potassium	-	1.6	3.4	-
Silver	0.0001	-	-	-
Sodium	-	1.8	-	-
Sulphate	-	ND	2.0	-
TKN	-	-	1.11	-
Total Phenolics	0.001	ND	**0.0013**	-
Phosphorus (Ortho)	-	-	0.0154	-
Total Phosphorus	0.01 - 0.03 (e)	**0.048**	**0.133**	-
Turbidity (NTU)	-	-	-	-
Vanadium	0.006	-	-	-
Zinc	0.02 - 0.03 (g)	-	-	-
Laboratory Conductivity (µmhos/cm)	-	416	359	-
Laboratory pH (Std. Units)	6.5 - 8.5	7.9	8.10	-
Field pH (Std. Units)	6.5 - 8.5	-	7.67	-
Field Conductivity (µmhos/cm)	-	-	332	-
Field Temperature (°C)	-	-	14.4	-
Field Dissolved Oxygen	(f)	-	7.88	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

- Parameter not analyzed / no information

ND - Parameter detected below the laboratory method detection limit

Bold Parameter exceeds ODWS

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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-2 16-Apr-02	SW-2 22-Apr-03	SW-2 19-Nov-03	SW-2 02-Jun-04	SW-2 18-Nov-04	SW-2 09-May-06	SW-2 28-Dec-06
Alkalinity	-	186	171	195	247	348	354	254
Aluminum	(a)	0.01	**0.289**	**0.413**	0.008	0.007	0.01	0.04
Beryllium	(h)	ND(0.001)	ND(0.001)	ND	ND	ND	-	-
Boron	0.2	0.03	0.02	0.017	0.044	0.151	0.19	0.032
Cadmium	0.0002	ND(0.0001)	ND(0.0001)	ND	ND	ND	-	-
Calcium	-	48.6	47.6	52.2	65.8	95.8	88.1	70.1
Chloride	-	5	9	6.4	12	18	8.5	8.2
Chromium	0.0089 (b)	ND(0.005)	ND(0.005)	ND	ND	ND	-	-
Cobalt	0.0009	0.002	0.002	0.0002	0.0003	0.0003	-	-
Copper	0.005	0.002	0.0026	0.0013	0.0013	0.0019	-	-
Dissolved Organic Carbon (DOC)	-	7.2	8	8.3	8.7	9.3	7.5	5.3
Hardness	-	187	178	208	253	390	341	265
Iron	0.3	0.06	0.26	**0.43**	0.19	0.05	**1.03**	0.26
Lead	(c)	ND(0.0005)	ND(0.0005)	ND	ND	ND	-	-
Magnesium	-	16	14.3	15.9	19.6	31.3	29.4	21.7
Manganese	-	-	-	0.013	0.059	0.092	0.242	0.039
Molybdenum	0.04	ND(0.002)	ND(0.001)	ND	ND	ND	-	-
Nickel	0.025	ND(0.002)	ND(0.001)	ND	0.002	0.001	-	-
Nitrite	-	0.03	ND(0.02)	ND	0.2	ND	0.12	ND(0.06)
Nitrate	-	0.11	0.63	0.4	0.7	0.6	1.26	0.13
Potassium	-	-	-	-	-	-	-	-
Silver	0.0001	ND(0.0001)	ND(0.0001)	ND	ND	ND	-	-
Sodium	-	-	-	-	-	-	-	-
Sulphate	-	7	17	-	4.4	-	6.4	7.7
TKN	-	-	-	0.59	1.31	3.55	-	0.9
Total Phenolics	0.001	ND(2)	ND(2)	ND	ND	ND	ND(0.001)	0.001
Phosphorus (Ortho)	-	ND(0.01)	ND(0.01)	-	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	**0.049**	0.028	**0.055**	**0.088**	0.011	0.01	0.01
Turbidity (NTU)	-	4.19	7.81	10.1	-	1.2	-	-
Vanadium	0.006	ND(0.002)	0.0012	0.0014	0.0008	ND	-	-
Zinc	0.02 - 0.03 (g)	ND(0.005)	0.006	0.005	ND	0.009	-	-
Laboratory Conductivity (µmhos/cm)	-	366	360	410	479	730	-	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-	7.93	7.61	-	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

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Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-2 14-Jun-07	SW-2 06-Dec-08	SW-2 30-Apr-09	SW-2 20-Nov-09
Alkalinity	-	689	272	312	165
Aluminum	(a)	**0.16**	**0.14**	**0.076**	ND(0.010)
Beryllium	(h)	-	-	-	-
Boron	0.2	**0.59**	0.038	0.142	**0.339**
Cadmium	0.0002	-	-	-	-
Calcium	-	150	75	98.5	16.1
Chloride	-	26	3	4.1	3
Chromium	0.0089 (b)	-	-	-	-
Cobalt	0.0009	-	ND	-	-
Copper	0.005	-	-	-	-
Dissolved Organic Carbon (DOC)	-	12.4	5	6.1	3.2
Hardness	-	540	250	352	76
Iron	0.3	**1.5**	**0.75**	**1.59**	0.24
Lead	(c)	-	-	-	-
Magnesium	-	59	23	25.7	8.58
Manganese	-	0.97	0.12	0.146	0.0152
Molybdenum	0.04	-	-	-	-
Nickel	0.025	-	-	-	-
Nitrite	-	0.65	ND	ND(0.10)	ND(0.10)
Nitrate	-	0.5	0.2	0.41	ND(0.10)
Potassium	-	34	3.4	6.3	1.2
Silver	0.0001	-	-	-	-
Sodium	-	25	3.1	-	-
Sulphate	-	5	5	7.0	17.6
TKN	-	-	-	1.91	1.16
Total Phenolics	0.001	ND	ND	ND(0.0010)	ND(0.0010)
Phosphorus (Ortho)	-	-	-	ND(0.0030)	0.0447
Total Phosphorus	0.01 - 0.03 (e)	**0.036**	**0.034**	**0.0370**	**0.073**
Turbidity (NTU)	-	-	-	-	-
Vanadium	0.006	-	-	-	-
Zinc	0.02 - 0.03 (g)	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	1260	514	575	341
Laboratory pH (Std. Units)	6.5 - 8.5	8.1	8	8.01	8.42
Field pH (Std. Units)	6.5 - 8.5	-	-	7.44	7.42
Field Conductivity (µmhos/cm)	-	-	-	504	925
Field Temperature (°C)	-	-	-	13.5	7.3
Field Dissolved Oxygen	(f)	-	-	6.87	5.63

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

- Parameter not analyzed / no information

ND - Parameter detected below the laboratory method detection limit

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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-3 16-Apr-02	SW-3 29-Oct-02	SW-3 22-Apr-03	SW-3 19-Nov-03	SW-3 02-Jun-04	SW-3 18-Nov-04	SW-3 20-Jul-05
Alkalinity	-	198	384	180	196	254	361	345
Aluminum	(a)	0.01	**7.45**	**0.302**	**0.674**	0.021	**0.163**	**6**
Beryllium	(h)	ND(0.001)	ND(0.001)	ND(0.001)	ND	ND	ND	-
Boron	0.2	0.03	0.09	0.026	0.02	0.05	0.132	0.12
Cadmium	0.0002	ND(0.0001)	0.0011	ND(0.0001)	ND	ND	ND	-
Calcium	-	49.8	129	51.3	51.7	69.1	105	210
Chloride	-	6	38	9	6.7	10.8	25.2	33.4
Chromium	0.0089 (b)	ND(0.005)	0.011	ND(0.005)	ND	ND	ND	-
Cobalt	0.0009	0.002	0.004	0.0002	0.0003	0.002	0.0006	-
Copper	0.005	0.002	0.014	0.0024	0.0017	0.0018	0.002	-
Dissolved Organic Carbon (DOC)	-	7.7	6.3	8.4	8.7	8.6	8.8	7.4
Hardness	-	192	484	189	207	260	409	334
Iron	0.3	ND(0.03)	**6.43**	0.25	**0.61**	0.15	0.24	**11**
Lead	(c)	ND(0.0005)	0.0048	ND(0.0005)	0.0005	0.0006	ND	-
Magnesium	-	16.4	39.4	14.9	15.5	20.4	31.1	48
Manganese	-	-	-	-	0.021	0.039	0.028	1.9
Molybdenum	0.04	ND(0.002)	ND(0.002)	ND(0.001)	ND	ND	ND	-
Nickel	0.025	ND(0.002)	0.014	ND(0.001)	0.001	0.002	0.003	-
Nitrite	-	0.02	ND(0.02)	ND(0.02)	ND	ND	ND	ND
Nitrate	-	0.21	ND(0.1)	0.74	0.3	0.9	1	1.9
Potassium	-	-	-	-	-	-	-	-
Silver	0.0001	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND	ND	ND	-
Sodium	-	-	-	-	-	-	-	-
Sulphate	-	9	58	20	-	7.7	-	67.4
TKN	-	-	-	-	0.55	0.76	0.67	-
Total Phenolics	0.001	ND(2)	ND(2)	ND(2)	ND	ND	ND	-
Phosphorus (Ortho)	-	ND(0.01)	ND(0.01)	ND(0.01)	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	**0.041**	**0.126**	**0.041**	**0.077**	**0.064**	0.027	**0.26**
Turbidity (NTU)	-	4.22	14.8	7.62	17	-	2	-
Vanadium	0.006	ND(0.002)	0.011	0.011	0.0017	0.0018	0.0009	-
Zinc	0.02 - 0.03 (g)	ND(0.005)	**0.046**	ND(0.005)	0.007	0.009	ND	-
Laboratory Conductivity (µmhos/cm)	-	396	819	383	400	483	770	ND
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-	-	8.07	7.83	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); PWQO for Cr (VI) is 0.001 mg/L.

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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-3 16-Nov-05	SW-3 09-May-06	SW-3 28-Dec-06	SW-3 14-Jun-07	SW-3 27-Oct-07	SW-3 31-Aug-08
Alkalinity	-	353	296	263	366	278	356
Aluminum	(a)	0.036	ND(0.01)	0.03	0.057	0.074	**0.63**
Beryllium	(h)	ND	-	-	-	-	-
Boron	0.2	0.12	0.112	0.051	0.12	0.11	0.19
Cadmium	0.0002	ND	-	-	-	-	-
Calcium	-	130	91.2	77	110	97	130
Chloride	-	29	20	9.9	25	28	30
Chromium	0.0089 (b)	ND	-	-	-	-	-
Cobalt	0.0009	0.0012	-	-	-	ND	0.0011
Copper	0.005	0.002	-	-	-	-	-
Dissolved Organic Carbon (DOC)	-	6.2	7	6.5	8.6	8.1	8.3
Hardness	-	460	334	287	390	320	400
Iron	0.3	ND	0.02	0.09	0.13	0.26	**1.4**
Lead	(c)	ND	-	-	-	-	-
Magnesium	-	35	25.8	23	27	29	36
Manganese	-	0.023	0.017	0.025	0.052	0.054	0.21
Molybdenum	0.04	ND	-	-	-	-	-
Nickel	0.025	0.005	-	-	-	-	-
Nitrite	-	ND	ND(0.06)	ND(0.06)	0.02	ND	ND
Nitrate	-	0.2	1.37	0.5	0.4	1.4	0.8
Potassium	-	-	-	-	8.5	8.8	13
Silver	0.0001	ND	-	-	-	-	-
Sodium	-	-	-	-	15	18	23
Sulphate	-	75	38	13	33	71	53
TKN	-	0.7	-	0.9	-	-	-
Total Phenolics	0.001	ND	ND(0.001)	**0.002**	ND	ND	ND
Phosphorus (Ortho)	-	-	-	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	0.012	ND(0.01)	ND(0.01)	**0.081**	**0.042**	**0.074**
Turbidity (NTU)	-	-	-	-	-	-	-
Vanadium	0.006	ND	-	-	-	-	-
Zinc	0.02 - 0.03 (g)	ND	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	709	-	-	770	721	-
Laboratory pH (Std. Units)	6.5 - 8.5	8.24	-	-	8.3	8	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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.

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(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.

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Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-3 06-Dec-08	SW-3 30-Apr-09	SW-3 20-Nov-09
Alkalinity	-	294	300	376
Aluminum	(a)	**0.89**	0.051	0.016
Beryllium	(h)	-	-	-
Boron	0.2	0.077	0.124	**0.215**
Cadmium	0.0002	-	-	-
Calcium	-	93	86.5	101
Chloride	-	8	4.2	11.8
Chromium	0.0089 (b)	-	-	-
Cobalt	0.0009	0.0008	-	-
Copper	0.005	-	-	-
Dissolved Organic Carbon (DOC)	-	5.8	6.5	-
Hardness	-	280	317	395
Iron	0.3	**1.3**	**0.821**	0.06
Lead	(c)	-	-	-
Magnesium	-	28	24.6	34.5
Manganese	-	0.16	0.173	0.0223
Molybdenum	0.04	-	-	-
Nickel	0.025	-	-	-
Nitrite	-	ND	ND(0.10)	ND(0.10)
Nitrate	-	0.4	0.73	0.75
Potassium	-	6	5.8	8.7
Silver	0.0001	-	-	-
Sodium	-	8.1	-	-
Sulphate	-	20	7.9	42.2
TKN	-	-	1.01	ND(0.15)
Total Phenolics	0.001	ND	ND(0.0010)	**0.002**
Phosphorus (Ortho)	-	-	ND(0.0030)	0.0032
Total Phosphorus	0.01 - 0.03 (e)	**0.06**	0.0275	ND(0.050)
Turbidity (NTU)	-	-	-	-
Vanadium	0.006	-	-	-
Zinc	0.02 - 0.03 (g)	-	-	-
Laboratory Conductivity (µmhos/cm)	-	590	564	741
Laboratory pH (Std. Units)	6.5 - 8.5	8.1	8.15	8.19
Field pH (Std. Units)	6.5 - 8.5	-	7.69	7.69
Field Conductivity (µmhos/cm)	-	-	490	776
Field Temperature (°C)	-	-	13.6	7.4
Field Dissolved Oxygen	(f)	-	7.06	5.87

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Historic Water Quality Data
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Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-4 16-Apr-02	SW-4 29-Oct-02	SW-4 22-Apr-03	SW-4 19-Nov-03	SW-4 02-Jun-04	SW-4 18-Nov-04	SW-4 20-Jul-05
Alkalinity	-	179	198	196	298	250	209	224
Aluminum	(a)	ND(0.01)	**1.16**	**0.077**	**0.187**	0.022	0.007	**3.1**
Beryllium	(h)	ND(0.001)	ND(0.001)	ND(0.001)	ND	ND	ND	-
Boron	0.2	0.03	0.08	0.053	0.078	0.067	0.062	0.11
Cadmium	0.0002	ND(0.0001)	0.0002	ND(0.0001)	ND	ND	ND	-
Calcium	-	44.3	63	54.8	85	67.4	52.9	78
Chloride	-	5	29	4	10.4	7.4	8.7	10.7
Chromium	0.0089 (b)	ND(0.005)	ND(0.005)	ND(0.005)	ND	ND	ND	-
Cobalt	0.0009	0.002	0.001	ND(0.0001)	0.0001	0.0001	0.0001	-
Copper	0.005	ND(0.002)	0.008	0.0016	0.0031	0.0014	0.0019	-
Dissolved Organic Carbon (DOC)	-	5.5	24.3	8.3	9.7	9.9	16.9	25.1
Hardness	-	165	244	195	325	253	228	221
Iron	0.3	ND(0.03)	**1.57**	0.09	0.11	0.13	0.1	**6.6**
Lead	(c)	ND(0.0005)	0.0022	ND(0.0005)	ND	0.0006	ND	-
Magnesium	-	13.2	21.1	14.2	22.3	20	16.5	28
Manganese	-	-	-	-	0.013	0.022	0.005	0.53
Molybdenum	0.04	ND(0.002)	0.002	ND(0.001)	ND	ND	ND	-
Nickel	0.025	ND(0.002)	0.003	ND(0.001)	ND	0.001	ND	-
Nitrite	-	ND(0.02)	0.02	ND(0.02)	ND	ND	ND	ND
Nitrate	-	ND(0.1)	0.23	ND(0.1)	ND	ND	ND	2.7
Potassium	-	-	-	-	-	-	-	-
Silver	0.0001	ND(0.0001)	ND(0.0001)	ND(0.0001)	ND	ND	ND	-
Sodium	-	-	-	-	-	-	-	-
Sulphate	-	9	58	22	-	7.5	-	39
TKN	-	ND(0.1)	-	-	0.66	0.95	1.75	-
Total Phenolics	0.001	ND(2)	ND(2)	ND(2)	ND	0.001	ND	**0.003**
Phosphorus (Ortho)	-	ND(0.01)	ND(0.01)	ND(0.01)	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	0.025	0.273	0.045	0.072	0.049	0.048	0.98
Turbidity (NTU)	-	2.18	50.1	4.19	18.3	-	3.9	-
Vanadium	0.006	ND(0.002)	0.003	0.0008	0.0006	ND	0.0006	-
Zinc	0.02 - 0.03 (g)	ND(0.005)	0.009	ND(0.005)	ND	0.023	0.025	-
Laboratory Conductivity (µmhos/cm)	-	332	545	397	640	466	410	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-	-	8.11	8.15	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

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(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

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Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-4 16-Nov-05	SW-4 09-May-06	SW-4 14-Jun-07	SW-4 27-Oct-07	SW-4 31-Aug-08	SW-4 06-Dec-08	SW-4 30-Apr-09	SW-4 20-Nov-09
Alkalinity	-	140	137	152	154	192	370	266	302
Aluminum	(a)	0.06	**0.21**	**0.085**	**0.96**	0.059	**2.1**	0.042	**0.378**
Beryllium	(h)	ND	-	-	-	-	-	-	-
Boron	0.2	0.055	0.082	0.064	0.11	0.089	0.03	0.064	0.064
Cadmium	0.0002	ND	-	-	-	-	-	-	-
Calcium	-	50	30.2	26	46	45	140	84.2	73.3
Chloride	-	9	1.4	2	24	4	2	7.5	10
Chromium	0.0089 (b)	ND	-	-	-	-	-	-	-
Cobalt	0.0009	ND	-	-	0.0007	ND	0.0024	-	-
Copper	0.005	0.004	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	-	13.4	8.3	12.3	30.5	16	19	9.8	-
Hardness	-	210	147	140	160	180	330	299	299
Iron	0.3	0.13	0.24	0.29	**2.5**	**1.7**	**78**	0.183	**0.91**
Lead	(c)	0.0006	-	-	-	-	-	-	-
Magnesium	-	16	17.5	20	22	25	24	21.5	28.1
Manganese	-	0.015	0.01	0.011	0.17	0.081	0.91	0.0141	0.101
Molybdenum	0.04	0.002	-	-	-	-	-	-	-
Nickel	0.025	ND	-	-	-	-	-	-	-
Nitrite	-	0.01	ND(0.06)	ND	0.02	ND	ND	ND(0.10)	ND(0.10)
Nitrate	-	ND	ND(0.05)	ND	0.1	ND	ND	ND(0.10)	ND(0.10)
Potassium	-	-	-	1.2	34	3.3	0.89	6.9	15.3
Silver	0.0001	ND	-	-	-	-	-	-	-
Sodium	-	-	-	4	8.6	5.2	2.9	-	-
Sulphate	-	64	9.3	ND	39	ND	5	7.9	10.1
TKN	-	1.8	-	-	-	-	-	0.75	2.7
Total Phenolics	0.001	ND	ND(0.001)	ND	ND	ND	ND	ND(0.0010)	**0.006**
Phosphorus (Ortho)	-	-	-	-	-	-	-	ND(0.0030)	0.0061
Total Phosphorus	0.01 - 0.03 (e)	0.152	0.04	0.029	0.63	0.046	0.87	0.0485	0.338
Turbidity (NTU)	-	-	-	-	-	-	-	-	-
Vanadium	0.006	0.001	-	-	-	-	-	-	-
Zinc	0.02 - 0.03 (g)	ND	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	366	-	285	455	-	675	508	561
Laboratory pH (Std. Units)	6.5 - 8.5	8.07	-	8.3	8.3	-	7.8	8.25	8.13
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	7.90	7.59
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	442	609
Field Temperature (°C)	-	-	-	-	-	-	-	14.5	6.6
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	7.73	7.19

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

- Parameter not analyzed / no information

ND - Parameter detected below the laboratory method detection limit

Bold Parameter exceeds ODWS

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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-5 16-Apr-02	SW-5 29-Oct-02	SW-5 22-Apr-03	SW-5 19-Nov-03	SW-5 02-Jun-04	SW-5 18-Nov-04	SW-5 20-Jul-05
Alkalinity	-	328	458	350	445	367	474	427
Aluminum	(a)	ND(0.01)	0.016	0.035	0.009	ND(0.01)	0.015	0.015
Beryllium	(h)	ND(0.001)	ND(0.001)	ND	ND	-	-	-
Boron	0.2	0.02	0.02	**0.363**	0.019	0.008	0.011	0.013
Cadmium	0.0002	ND(0.0001)	ND(0.0001)	0.0001	ND	-	-	-
Calcium	-	84.7	73.5	174	92.8	73.1	96	88
Chloride	-	3	3	35.7	6.3	2.2	2	ND
Chromium	0.0089 (b)	ND(0.005)	ND(0.005)	ND	ND	-	-	-
Cobalt	0.0009	0.002	0.0001	0.0008	0.0003	-	-	ND
Copper	0.005	ND(0.002)	0.0021	0.0044	0.0013	-	-	-
Dissolved Organic Carbon (DOC)	-	10.1	14.4	16.6	13	9.8	19	20
Hardness	-	297	251	667	303	257	330	290
Iron	0.3	0.2	0.08	ND	0.28	0.15	0.25	0.26
Lead	(c)	ND(0.0005)	ND(0.0005)	ND	0.0005	-	-	-
Magnesium	-	20.8	16.4	44.1	19.7	18	22	20
Manganese	-	-	-	0.227	0.214	0.054	0.069	0.086
Molybdenum	0.04	ND(0.002)	ND(0.001)	ND	ND	-	-	-
Nickel	0.025	ND(0.002)	ND(0.001)	0.005	0.002	-	-	-
Nitrite	-	ND(0.02)	ND(0.02)	ND	ND	ND(0.06)	ND	ND
Nitrate	-	ND(0.1)	ND(0.1)	0.7	ND	ND(0.05)	ND	ND
Potassium	-	-	-	-	-	-	0.35	0.99
Silver	0.0001	ND(0.0001)	ND(0.0001)	ND	ND	-	-	-
Sodium	-	-	-	-	-	-	1.8	1.5
Sulphate	-	13	48	-	1.6	2.6	ND	ND
TKN	-	-	-	10.3	1.69	ND(0.5)	-	-
Total Phenolics	0.001	ND(2)	ND(2)	ND	ND	0.001	ND	ND
Phosphorus (Ortho)	-	ND(0.01)	ND(0.01)	-	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	0.028	0.021	0.017	0.029	0.02	0.031	0.05
Turbidity (NTU)	-	1.37	0.49	7.9	-	-	-	-
Vanadium	0.006	ND(0.002)	ND(0.0005)	ND	ND	-	-	-
Zinc	0.02 - 0.03 (g)	ND(0.005)	0.006	0.01	0.008	-	-	-
Laboratory Conductivity (µmhos/cm)	-	556	420	1360	541	-	586	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-	7.6	-	8	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

- Parameter not analyzed / no information

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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-5 16-Nov-05	SW-5 28-Dec-06	SW-5 14-Jun-07	SW-5 27-Oct-07	SW-5 31-Jul-08	SW-5 06-Dec-08	SW-5 30-Apr-09	SW-5 20-Nov-09
									Dry
Alkalinity	-	499	373	381	401	350	381	355	-
Aluminum	(a)	0.059	0.013	-	0.019	0.012	0.014	0.011	-
Beryllium	(h)	-	-	-	-	-	-	-	-
Boron	0.2	ND	0.161	-	0.19	**0.21**	0.19	0.174	-
Cadmium	0.0002	-	-	-	-	-	-	-	-
Calcium	-	59	109	-	140	130	120	109	-
Chloride	-	3	9.4	-	38	32	25	17.9	-
Chromium	0.0089 (b)	-	-	-	-	-	-	-	-
Cobalt	0.0009	ND	-	-	0.0027	0.0007	0.9	-	-
Copper	0.005	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (DOC)	-	19	13.7	-	8.8	7.1	8.5	8.2	-
Hardness	-	190	359	-	480	380	370	384	-
Iron	0.3	0.23	**1.74**	-	**0.79**	0.1	ND	0.143	-
Lead	(c)	-	-	-	-	-	-	-	-
Magnesium	-	16	21.3	-	39	35	35	26.8	-
Manganese	-	0.065	0.275	-	1.2	0.087	0.22	0.181	-
Molybdenum	0.04	-	-	-	-	-	-	-	-
Nickel	0.025	-	-	-	-	-	-	-	-
Nitrite	-	ND	ND(0.10)	-	0.02	ND	0.03	ND(0.10)	-
Nitrate	-	0.3	ND(0.10)	-	3.2	0.7	0.8	0.71	-
Potassium	-	0.7	10.5	-	12	14	14	11.8	-
Silver	0.0001	-	-	-	-	-	-	-	-
Sodium	-	1.2	-	-	27	25	22	-	-
Sulphate	-	ND	2.8	-	87	63	59	32.1	-
TKN	-	-	5.29	-	-	-	-	1.50	-
Total Phenolics	0.001	**0.002**	**0.0011**	-	ND	ND	ND	ND(0.0010)	-
Phosphorus (Ortho)	-	-	ND(0.0030)	-	-	-	-	ND(0.0030)	-
Total Phosphorus	0.01 - 0.03 (e)	0.14	0.0182	-	0.002	0.009	0.017	0.0285	-
Turbidity (NTU)	-	-	-	-	-	-	-	-	-
Vanadium	0.006	-	-	-	-	-	-	-	-
Zinc	0.02 - 0.03 (g)	-	-	-	-	-	-	-	-
Laboratory Conductivity (µmhos/cm)	-	387	670	-	989	-	868	744	-
Laboratory pH (Std. Units)	6.5 - 8.5	7.7	7.77	-	8.1	-	8	7.91	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	7.31	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	561	-
Field Temperature (°C)	-	-	-	-	-	-	-	8.71	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	5.00	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

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(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

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Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-6 16-Apr-02	SW-6 22-Apr-03	SW-6 19-Nov-03	SW-6 02-Jun-04	SW-6 18-Nov-04	SW-6 28-Dec-06
Alkalinity	-	219	192	211	184	282	218
Aluminum	(a)	ND(0.01)	**0.082**	**0.602**	0.035	ND	**0.12**
Beryllium	(h)	ND(0.001)	ND(0.001)	ND	ND	ND	-
Boron	0.2	0.02	0.016	0.009	0.015	0.01	0.005
Cadmium	0.0002	ND(0.0001)	ND(0.0001)	ND	ND	ND	-
Calcium	-	57.5	58.2	61	58.4	78.4	70.7
Chloride	-	3	6	16.4	3.7	22.4	30
Chromium	0.0089 (b)	ND(0.005)	ND(0.005)	ND	ND	ND	-
Cobalt	0.0009	0.002	ND(0.0001)	0.0003	0.0002	ND	-
Copper	0.005	ND(0.002)	0.0026	0.0012	0.0026	0.0017	-
Dissolved Organic Carbon (DOC)	-	5.9	6.1	5.5	24.5	9.8	4.2
Hardness	-	216	208	225	191	298	245
Iron	0.3	ND(0.03)	0.07	**0.55**	0.11	0.04	0.12
Lead	(c)	ND(0.0005)	ND(0.0005)	ND	0.0007	ND	-
Magnesium	-	17.7	15.2	13.4	13	17.1	16.6
Manganese	-	-	-	0.014	0.013	0.019	0.019
Molybdenum	0.04	ND(0.002)	ND(0.001)	ND	ND	ND	-
Nickel	0.025	ND(0.002)	ND(0.001)	ND	0.003	ND	-
Nitrite	-	ND(0.02)	ND(0.02)	ND	ND	ND	ND(0.06)
Nitrate	-	ND(0.1)	1.59	0.2	ND	ND	0.2
Potassium	-	-	-	-	-	-	-
Silver	0.0001	ND(0.0001)	ND(0.0001)	ND	ND	ND	-
Sodium	-	-	-	-	-	-	-
Sulphate	-	11	21	-	6.2	-	9.5
TKN	-	-	-	0.49	1.91	0.97	ND(0.5)
Total Phenolics	0.001	ND(2)	ND(2)	ND	ND	ND	0.001
Phosphorus (Ortho)	-	ND(0.01)	ND(0.01)	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	0.031	0.023	0.05	0.625	0.062	0.01
Turbidity (NTU)	-	1.5	1.97	23	-	1.2	-
Vanadium	0.006	ND(0.002)	0.0008	0.0011	ND	ND	-
Zinc	0.02 - 0.03 (g)	ND(0.005)	ND(0.005)	0.007	0.007	0.008	-
Laboratory Conductivity (µmhos/cm)	-	427	404	440	331	580	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-	8	7.61	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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.

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

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Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-6 27-Oct-07	SW-6 30-Apr-09	SW-6 20-Nov-09
Alkalinity	-	145	260	296
Aluminum	(a)	**3.1**	0.010	0.021
Beryllium	(h)	-	-	-
Boron	0.2	0.014	ND(0.050)	ND(0.050)
Cadmium	0.0002	-	-	-
Calcium	-	63	91.5	91.2
Chloride	-	44	8.7	38.7
Chromium	0.0089 (b)	-	-	-
Cobalt	0.0009	0.0016	-	-
Copper	0.005	-	-	-
Dissolved Organic Carbon (DOC)	-	8.8	11.2	-
Hardness	-	150	320	317
Iron	0.3	**3.4**	**0.385**	0.083
Lead	(c)	-	-	-
Magnesium	-	13	22.1	21.7
Manganese	-	0.11	0.0554	0.353
Molybdenum	0.04	-	-	-
Nickel	0.025	-	-	-
Nitrite	-	ND	ND(0.10)	ND(0.10)
Nitrate	-	ND	ND(0.10)	ND(0.10)
Potassium	-	3.4	3.0	3.2
Silver	0.0001	-	-	-
Sodium	-	39	-	-
Sulphate	-	10	5.0	10.4
TKN	-	-	0.87	0.19
Total Phenolics	0.001	ND	ND(0.0010)	**0.002**
Phosphorus (Ortho)	-	-	0.0096	0.0261
Total Phosphorus	0.01 - 0.03 (e)	0.08	0.0668	0.157
Turbidity (NTU)	-	-	-	-
Vanadium	0.006	-	-	-
Zinc	0.02 - 0.03 (g)	-	-	-
Laboratory Conductivity (µmhos/cm)	-	433	500	653
Laboratory pH (Std. Units)	6.5 - 8.5	8.3	7.94	7.91
Field pH (Std. Units)	6.5 - 8.5	-	7.39	7.39
Field Conductivity (µmhos/cm)	-	-	440	697
Field Temperature (°C)	-	-	14.6	6.5
Field Dissolved Oxygen	(f)	-	2.5	7.35

Notes:

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(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.

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Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-7 16-Apr-02	SW-7 22-Apr-03	SW-7 19-Nov-03	SW-7 02-Jun-04	SW-7 28-Dec-06	SW-7 14-Jun-07	SW-7 31-Jul-08
Alkalinity	-	304	185	667	298	251	327	266
Aluminum	(a)	ND(0.01)	0.016	0.035	0.009	ND(0.01)	0.015	0.015
Beryllium	(h)	ND(0.001)	ND(0.001)	ND	ND	-	-	-
Boron	0.2	0.02	0.02	**0.363**	0.019	0.008	0.011	0.013
Cadmium	0.0002	ND(0.0001)	ND(0.0001)	0.0001	ND	-	-	-
Calcium	-	84.7	73.5	174	92.8	73.1	96	88
Chloride	-	3	3	35.7	6.3	2.2	2	ND
Chromium	0.0089 (b)	ND(0.005)	ND(0.005)	ND	ND	-	-	-
Cobalt	0.0009	0.002	0.0001	0.0008	0.0003	-	-	ND
Copper	0.005	ND(0.002)	0.0021	0.0044	0.0013	-	-	-
Dissolved Organic Carbon (DOC)	-	10.1	14.4	16.6	13	9.8	19	20
Hardness	-	297	251	667	303	257	330	290
Iron	0.3	0.2	0.08	ND	0.28	0.15	0.25	0.26
Lead	(c)	ND(0.0005)	ND(0.0005)	ND	0.0005	-	-	-
Magnesium	-	20.8	16.4	44.1	19.7	18	22	20
Manganese	-	-	-	0.227	0.214	0.054	0.069	0.086
Molybdenum	0.04	ND(0.002)	ND(0.001)	ND	ND	-	-	-
Nickel	0.025	ND(0.002)	ND(0.001)	0.005	0.002	-	-	-
Nitrite	-	ND(0.02)	ND(0.02)	ND	ND	ND(0.06)	ND	ND
Nitrate	-	ND(0.1)	ND(0.1)	0.7	ND	ND(0.05)	ND	ND
Potassium	-	-	-	-	-	-	0.35	0.99
Silver	0.0001	ND(0.0001)	ND(0.0001)	ND	ND	-	-	-
Sodium	-	-	-	-	-	-	1.8	1.5
Sulphate	-	13	48	-	1.6	2.6	ND	ND
TKN	-	-	-	10.3	1.69	ND(0.5)	-	-
Total Phenolics	0.001	ND(2)	ND(2)	ND	ND	0.001	ND	ND
Phosphorus (Ortho)	-	ND(0.01)	ND(0.01)	-	-	-	-	-
Total Phosphorus	0.01 - 0.03 (e)	0.028	0.021	0.017	0.029	0.02	0.031	0.05
Turbidity (NTU)	-	1.37	0.49	7.9	-	-	-	-
Vanadium	0.006	ND(0.002)	ND(0.0005)	ND	ND	-	-	-
Zinc	0.02 - 0.03 (g)	ND(0.005)	0.006	0.01	0.008	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	-
Field pH (Std. Units)	6.5 - 8.5	-	-	-	-	-	-	-
Field Conductivity (µmhos/cm)	-	-	-	-	-	-	-	-
Field Temperature (°C)	-	-	-	-	-	-	-	-
Field Dissolved Oxygen	(f)	-	-	-	-	-	-	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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. For hardness <75 mg/L the PWQO is 11 µg/L, for hardness > 75 mg/L the PWQO is 1100 µg/L.

- Parameter not analyzed / no information

ND - Parameter detected below the laboratory method detection limit

bold Parameter exceeds ODWS

2002-2008 data has been provided by Pryde, Schropp, McComb Inc. in the Ward 3 2008 Annual Monitoring Report

Appendix E.1

Surface Water Analytical Results
General Chemistry and Total Metals
Historic Water Quality Data
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Parameter (mg/L)	MOE PWQO (1)	SW-7 06-Dec-08	SW-7 30-Apr-09	SW-7 20-Nov-09
				Dry
Alkalinity	-	201	362	-
Aluminum	(a)	0.059	0.013	-
Beryllium	(h)	-	-	-
Boron	0.2	ND	0.161	-
Cadmium	0.0002	-	-	-
Calcium	-	59	109	-
Chloride	-	3	9.4	-
Chromium	0.0089 (b)	-	-	-
Cobalt	0.0009	ND	-	-
Copper	0.005	-	-	-
Dissolved Organic Carbon (DOC)	-	19	13.7	-
Hardness	-	190	359	-
Iron	0.3	0.23	**1.74**	-
Lead	(c)	-	-	-
Magnesium	-	16	21.3	-
Manganese	-	0.065	0.275	-
Molybdenum	0.04	-	-	-
Nickel	0.025	-	-	-
Nitrite	-	ND	ND(0.10)	-
Nitrate	-	0.3	ND(0.10)	-
Potassium	-	0.7	10.5	-
Silver	0.0001	-	-	-
Sodium	-	1.2	-	-
Sulphate	-	ND	2.8	-
TKN	-	-	5.29	-
Total Phenolics	0.001	**0.002**	0.0011	-
Phosphorus (Ortho)	-	-	ND(0.0030)	-
Total Phosphorus	0.01 - 0.03 (e)	0.14	0.0182	-
Turbidity (NTU)	-	-	-	-
Vanadium	0.006	-	-	-
Zinc	0.02 - 0.03 (g)	-	-	-
Laboratory Conductivity (µmhos/cm)	-	-	-	-
Laboratory pH (Std. Units)	6.5 - 8.5	-	-	-
Field pH (Std. Units)	6.5 - 8.5	-	6.76	-
Field Conductivity (µmhos/cm)	-	-	1690	-
Field Temperature (°C)	-	-	13.0	-
Field Dissolved Oxygen	(f)	-	0.00	-

Notes:

All concentrations in mg/L unless otherwise noted.

(1) Ministry of Environment (MOE), Provincial Water 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); 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. For hardness <75 mg/L the PWQO is 11 µg/L, for hardness > 75 mg/L the PWQO is 1100 µg/L.

- Parameter not analyzed / no information

ND - Parameter detected below the laboratory method detection limit

bold Parameter exceeds ODWS

2002-2008 data has been provided by Pryde, Schropp, McComb Inc. in the Ward 3 2008 Annual Monitoring Report

Appendix E.2

Historical Records 2010 to 2017

Table 4.4

General Chemistry and Total Metals
Leachate Well Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:		**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**
Sample Date:		**5/12/2010**	**11/29/2010**	**5/25/2011**	**11/22/2011**	**4/22/2012**	**11/26/2012**	**5/13/2013**	**10/21/2013**
Parameters	**Units**								
Metals									
Aluminum	mg/L	0.465	0.359	0.838	0.871	0.422	2.02	0.37	0.842
Boron	mg/L	0.483	0.408	<0.05	0.449	0.373	<0.50	0.53	0.453
Calcium	mg/L	18.2	17.4	92.6	18	16.1	131	16.6	19.9
Iron	mg/L	0.46	0.458	25.4	1	0.561	15.4	<0.50	0.835
Magnesium	mg/L	7.65	7.19	21.5	5.89	5.51	23.6	7.2	5.85
Manganese	mg/L	0.0482	0.0763	0.408	0.096	0.0676	0.708	0.069	0.0622
Phosphorus	mg/L	<0.050	<0.050	0.083	<0.050	<0.05	<1.0	<0.50	<0.050
Potassium	mg/L	1.6	1.5	4.2	1.5	1.2	<10	<10	1.4
General Chemistry									
Alkalinity, total (as CaCO3)	mg/L	190	174	272	175	179	425	172	187
Ammonia-N	mg/L	<0.050	<0.050	0.157	0.073	<0.05	0.074	<0.050	<0.050
Chloride	mg/L	2	2.1	<40	2.1	2.4	8.8	2.2	2.1
Conductivity	µS/cm	427	435	514	380	398	456	338	390
Dissolved organic carbon (DOC)	mg/L	1.8	3.1	1.9	2.3	2.2	2.8	2.9	2.3
Hardness	mg/L	77	73	320	69	63	424	71	74
Nitrate (as N)	mg/L	0.1	<0.10	<2	<0.10	<0.1	<0.10	<0.10	<0.10
Nitrite (as N)	mg/L	<0.10	<0.10	<2	<0.10	<0.1	<0.10	<0.10	<0.10
Orthophosphate	mg/L	<0.0030	0.0277	<0.003	0.0054	0.0042	<0.0030	0.0046	0.0037
pH, lab	s.u.	8.26	8.3	7.88	8.17	8.24	7.67	8.3	8.28
Phenolics (total)	mg/L	<0.0010	<0.0010	<0.001	<0.0010	<0.001	<0.0010	0.005	0.0014
Sulfate	mg/L	35.8	35.9	<40	30.4	30.2	11.5	27.2	24.6
Total kjeldahl nitrogen (TKN)	mg/L	0.26	0.17	0.204	<0.15	<0.15	<0.15	<0.18	0.17
Field Parameters									
Conductivity, field	µS/cm	408	328	430	402	393	325	383	377
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	3.91	-
pH, field	s.u.	8.16	7.01	7.42	8.08	7.57	6.92	7.73	8.04
Temperature, field	Deg C	8.3	9.61	9.4	9.5	9.4	9.9	8.5	10.1

Notes:

- \- Parameter not analyzed / no information available
- < Parameter detected below the laboratory MDL.
- NM Not Measured.

Table 4.4

General Chemistry and Total Metals
Leachate Well Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:		**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1D**	**LW1S**
Sample Date:		**6/15/2014**	**10/30/2014**	**6/8/2015**	**11/16/2015**	**4/26/2016**	**11/04/2016**	**4/11/2017**	**11/23/2017**	**5/12/2010**
Parameters	**Units**									
Metals										
Aluminum	mg/L	0.771	0.673	0.62	1.11	1.07	0.94	0.64	0.844	1.33
Boron	mg/L	0.414	0.435	0.44	0.431	0.45	0.502	0.46	0.42	<0.50
Calcium	mg/L	19.4	19.7	17.3	16.2	20.3	17.3	16.3	22.9	113
Iron	mg/L	0.812	0.729	0.71	0.987	1.01	0.815	0.72	0.96	37.8
Magnesium	mg/L	5.87	5.69	7	6.2	8.49	6.94	6.90	9.38	27.4
Manganese	mg/L	0.0761	0.0737	0.101	0.0804	0.0814	0.0694	0.0541	0.0777	0.43
Phosphorus	mg/L	<0.050	<0.050	<0.50	<0.050	<0.50	<0.050	<0.50	<0.50	<0.50
Potassium	mg/L	1.2	1.2	<10	1.4	1.41	1.33	1.25	1.20	<10
General Chemistry										
Alkalinity, total (as CaCO3)	mg/L	175	174	172	180	175	184	180	177	338
Ammonia-N	mg/L	<0.050	<0.050	0.182	<0.050	0.021	<0.020	<0.020	0.224	0.204
Chloride	mg/L	2.1	<2.0	2.11	<10	2.04	2.04	2.08	2.06	<2.0
Conductivity	µS/cm	371	382	377	377	371	370	369	359	594
Dissolved organic carbon (DOC)	mg/L	1.6	1.3	1.7	2	2.9	1.5	1.5	1.4	<1.0
Hardness	mg/L	73	73	72	66	86	72	69	96	394
Nitrate (as N)	mg/L	<0.10	<0.10	0.091	<0.40	0.083	0.081	0.065	0.073	<0.10
Nitrite (as N)	mg/L	<0.10	<0.10	<0.010	<0.20	<0.010	<0.010	<0.010	<0.010	<0.10
Orthophosphate	mg/L	<0.0030	0.0043	<0.0030	0.0031	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
pH, lab	s.u.	8.34	8.18	8.42	8.34	8.3	8.07	8.31	8.29	7.74
Phenolics (total)	mg/L	0.0034	0.001	0.0142	0.0199	<0.0010	0.0021	0.0011	<0.0010	<0.0010
Sulfate	mg/L	23.8	22.3	21.8	23	19.1	20.3	17.6	17.4	7.4
Total kjeldahl nitrogen (TKN)	mg/L	0.16	0.15	0.34	<0.15	<0.15	<0.15	<0.15	0.32	0.55
Field Parameters										
Conductivity, field	µS/cm	502	383	332	302	347	381	351	327	507
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-
pH, field	s.u.	8	7.95	7.05	8.3	7.77	7.93	7.75	6.51	7.54
Temperature, field	Deg C	10.2	9.7	9.9	11.3	8.8	9.8	9.0	9.5	7.6

Notes:

-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory MDL.
NM	Not Measured.

Table 4.4

General Chemistry and Total Metals
Leachate Well Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:		**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW1S**
Sample Date:		**11/29/2010**	**5/25/2011**	**11/22/2011**	**4/22/2012**	**11/26/2012**	**5/13/2013**	**10/21/2013**	**6/15/2014**	**10/30/2014**
Parameters	**Units**									
Metals										
Aluminum	mg/L	1.52	0.418	1.76	1.24	0.54	0.7	5.57	3.3	3.71
Boron	mg/L	<0.50	0.455	<0.50	<0.5	0.61	<0.10	<0.10	<0.050	<0.050
Calcium	mg/L	119	19	125	90.6	23.8	108	118	110	130
Iron	mg/L	9.64	0.443	12.3	73.9	0.68	14.7	19	22.4	15
Magnesium	mg/L	32	6.86	28.9	18.8	12	24.9	24.5	23.2	27.8
Manganese	mg/L	0.396	0.029	0.463	0.596	0.053	0.608	0.52	0.675	0.564
Phosphorus	mg/L	<0.50	<0.05	<0.50	<0.5	<1.0	<0.50	<0.50	0.124	0.161
Potassium	mg/L	<10	1.4	<10	<10	<10	<10	<10	4.8	6
General Chemistry										
Alkalinity, total (as CaCO3)	mg/L	316	182	356	256	152	303	307	304	315
Ammonia-N	mg/L	0.139	<0.05	0.102	0.201	<0.050	0.212	<0.129	0.108	0.119
Chloride	mg/L	<2.0	<40	7.1	13.1	<2.0	8	6.7	3.9	3.8
Conductivity	µS/cm	599	414	649	557	277	437	570	539	574
Dissolved organic carbon (DOC)	mg/L	1.8	3.8	2.7	1.6	1.8	1.6	2.2	<1.0	<1.0
Hardness	mg/L	428	76	432	304	109	373	396	370	440
Nitrate (as N)	mg/L	<0.10	<2	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	mg/L	<0.10	<2	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Orthophosphate	mg/L	<0.0030	0.0038	0.0038	<0.003	0.0105	0.0038	<0.0030	<0.0030	0.0031
pH, lab	s.u.	7.9	8.24	7.69	7.83	8.14	7.85	7.78	7.74	7.64
Phenolics (total)	mg/L	<0.0010	<0.001	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	0.0033	0.001
Sulfate	mg/L	7.9	<40	6.4	17.8	44.6	10.7	8.8	6.2	6.4
Total kjeldahl nitrogen (TKN)	mg/L	<0.15	<0.15	<0.15	0.28	0.16	<0.33	0.25	0.32	0.23
Field Parameters										
Conductivity, field	µS/cm	438	490	501	544	535	587	489	716	484
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	1.58	-	-	-
pH, field	s.u.	6.77	7.11	7.59	7.76	6.42	7.15	7.54	7.66	7.55
Temperature, field	Deg C	10.1	8.7	10.4	7.7	10.5	6.8	12.6	9.7	11.4

Notes:

- \- Parameter not analyzed / no information available
- < Parameter detected below the laboratory MDL.
- NM Not Measured.

Table 4.4

General Chemistry and Total Metals
Leachate Well Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:		**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW1S**	**LW2**	**LW2**	**LW2**
Sample Date:		**6/8/2015**	**11/16/2015**	**4/26/2016**	**11/04/2016**	**4/11/2017**	**11/23/2017**	**5/12/2010**	**11/29/2010**	**5/25/2011**
Parameters	**Units**									
Metals										
Aluminum	mg/L	2.46	3.99	5.94	11.2	6.61	6.04	1.06	0.718	0.804
Boron	mg/L	<0.10	<0.050	<0.10	<0.10	<0.10	<0.10	0.419	0.376	0.438
Calcium	mg/L	132	145	123	265	157	152	32.5	29.6	33.3
Iron	mg/L	29.1	16.2	29.1	30.2	57.2	21.4	1.13	1.15	1.33
Magnesium	mg/L	27.5	28.2	30	67.2	37.1	33.6	14.7	14.2	15
Manganese	mg/L	0.791	0.643	0.7	1.06	1.17	0.753	0.0607	0.0445	0.0547
Phosphorus	mg/L	<0.50	0.189	<0.50	<0.50	<0.50	<0.50	0.09	0.071	0.103
Potassium	mg/L	<10	5.9	5.51	11.3	5.71	5.85	1.4	1.3	1.2
General Chemistry										
Alkalinity, total (as CaCO3)	mg/L	306	325	276	494	269	359	154	152	157
Ammonia-N	mg/L	0.331	0.106	0.216	0.182	0.290	0.315	<0.050	<0.050	<0.05
Chloride	mg/L	12.9	<10	15.8	16.1	26.6	10.9	<2.0	<2.0	<40
Conductivity	µS/cm	601	592	558	952	589	660	383	385	373
Dissolved organic carbon (DOC)	mg/L	1.7	3.6	3.4	2.5	1.5	2.1	1.6	1.8	2.7
Hardness	mg/L	444	478	432	939	546	517	142	132	145
Nitrate (as N)	mg/L	0.036	1.71	0.022	<0.020	<0.020	<0.020	<0.10	<0.10	<2
Nitrite (as N)	mg/L	<0.010	<0.20	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<2
Orthophosphate	mg/L	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	0.0107	0.0132	0.0112
pH, lab	s.u.	7.95	7.88	7.95	6.96	7.82	7.96	8.18	8.22	8.22
Phenolics (total)	mg/L	0.0143	0.0116	0.0026	0.0023	0.0019	<0.0010	<0.0010	<0.0010	0.002
Sulfate	mg/L	7.44	7.4	6.55	7.95	11.8	6.25	47.6	45.8	40.5
Total kjeldahl nitrogen (TKN)	mg/L	0.41	0.17	<1.5	0.61	0.45	<1.5	0.18	<0.15	<0.15
Field Parameters										
Conductivity, field	µS/cm	500	431	525	797	559	548	480	297	406
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.52	7.61	7.31	7.14	7.44	6.58	7.87	7.17	7.55
Temperature, field	Deg C	9.5	13	6.4	11.9	7.0	10.2	8	9.4	9.1

Notes:

- `-` Parameter not analyzed / no information available
- `<` Parameter detected below the laboratory MDL.
- NM Not Measured.

Table 4.4

General Chemistry and Total Metals
Leachate Well Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:		**LW2**	**LW2**	**LW2**	**LW2**	**LW2**	**LW2**	**LW2**	**LW2**	**LW2**
Sample Date:		**11/22/2011**	**4/22/2012**	**11/26/2012**	**5/13/2013**	**10/21/2013**	**6/15/2014**	**10/30/2014**	**6/8/2015**	**11/16/2015**
Parameters	**Units**									
Metals										
Aluminum	mg/L	0.21	0.173	0.84	0.19	0.164	0.17	0.65	0.7	1.31
Boron	mg/L	0.395	0.322	0.65	0.45	0.357	0.373	0.404	0.395	0.381
Calcium	mg/L	25	20.4	16.2	23.8	30.9	31.6	35.4	26	29
Iron	mg/L	0.34	0.279	0.81	<0.50	0.255	0.321	0.865	1.14	1.46
Magnesium	mg/L	10.8	9.62	6.5	12.6	10.4	9.8	11.5	11.7	12.7
Manganese	mg/L	0.0174	0.0375	0.084	0.044	0.0273	0.0466	0.0631	0.058	0.0731
Phosphorus	mg/L	<0.050	<0.05	<1.0	<0.50	<0.050	<0.050	<0.050	0.056	0.065
Potassium	mg/L	<1.0	<1	<10	<10	<1.0	<1.0	1	1.1	1.3
General Chemistry										
Alkalinity, total (as CaCO3)	mg/L	146	157	173	152	159	154	157	157	150
Ammonia-N	mg/L	<0.050	<0.05	0.077	<0.050	<0.050	0.062	<0.050	<0.050	<0.050
Chloride	mg/L	<2.0	<2	2.1	<2.0	<2.0	<2.0	<2.0	1.26	1.28
Conductivity	µS/cm	341	364	303	315	373	368	376	369	372
Dissolved organic carbon (DOC)	mg/L	2.6	2	2.1	2.2	2.6	1.4	1.1	3.4	3.5
Hardness	mg/L	107	91	67	111	120	119	136	113	125
Nitrate (as N)	mg/L	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	0.027	0.033
Nitrite (as N)	mg/L	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010
Orthophosphate	mg/L	0.0131	0.0113	0.0034	0.013	0.011	0.0083	0.0128	0.0093	0.0131
pH, lab	s.u.	8.14	8.1	8.11	8.24	8.24	8.2	8.15	8.32	8.31
Phenolics (total)	mg/L	0.001	<0.001	<0.0010	<0.0010	<0.0010	0.0065	0.001	0.0127	0.0073
Sulfate	mg/L	44.6	45.3	29.2	45	44.4	45.7	44.2	46.3	44.5
Total kjeldahl nitrogen (TKN)	mg/L	<0.15	<0.15	0.17	<0.15	<0.15	0.17	<0.15	0.21	<0.15
Field Parameters										
Conductivity, field	µS/cm	368	367	294	361	360	482	374	359	294
Dissolved oxygen (DO), field	mg/L	-	-	-	2.23	-	-	-	-	-
pH, field	s.u.	7.97	7.85	7.19	7.83	8.31	8.55	7.94	6.28	8.05
Temperature, field	Deg C	10.3	8.8	10.5	7.3	13.2	10.4	11.8	9.9	13

Notes:

- - Parameter not analyzed / no information available
- < Parameter detected below the laboratory MDL.
- NM Not Measured.

Table 4.4

General Chemistry and Total Metals
Leachate Well Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:		**LW2**	**LW2**
Sample Date:		**4/26/2016**	**11/03/2016**
Parameters	**Units**		
Metals			
Aluminum	mg/L	0.3	0.194
Boron	mg/L	0.43	0.447
Calcium	mg/L	24.1	22
Iron	mg/L	<0.50	0.241
Magnesium	mg/L	12	10.8
Manganese	mg/L	0.0383	0.0221
Phosphorus	mg/L	<0.50	<0.050
Potassium	mg/L	0.99	0.857
General Chemistry			
Alkalinity, total (as CaCO3)	mg/L	155	153
Ammonia-N	mg/L	<0.020	<0.020
Chloride	mg/L	1.22	1.25
Conductivity	µS/cm	373	373
Dissolved organic carbon (DOC)	mg/L	3.4	2.4
Hardness	mg/L	110	99
Nitrate (as N)	mg/L	0.031	0.027
Nitrite (as N)	mg/L	<0.010	<0.010
Orthophosphate	mg/L	0.0101	0.0108
pH, lab	s.u.	8.25	8.09
Phenolics (total)	mg/L	0.002	0.0026
Sulfate	mg/L	43.8	43.9
Total kjeldahl nitrogen (TKN)	mg/L	<0.15	<0.15
Field Parameters			
Conductivity, field	µS/cm	344	362
Dissolved oxygen (DO), field	mg/L	-	-
pH, field	s.u.	8.05	8.24
Temperature, field	Deg C	7.6	13.7

Notes:

-	Parameter not analyzed / no information available
<	Parameter detected below the laboratory MDL.
NM	Not Measured.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:						MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1
Sample ID:						CRA-4074-02-WARD3-50	GW-WARD3-1110-006	GW-WARD3-1110-007	GW-WARD3-0511-009	GW-WARD3-0511-010	GW-WARD3-1013-001	GW-WARD3-DD-061514-003	GW-WARD3-103014-004	GW-WARD3-8/6/15-003
Sample Date:						5/12/2010	11/29/2010	11/29/2010 Duplicate	5/25/2011	5/25/2011 Duplicate	10/21/2013	6/15/2014	10/30/2014	6/8/2015
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**	**Median Background 2012-2017**									
Metals														
Aluminum (dissolved)	mg/L	-	-	-	0.01	0.033	<0.010	0.013	<0.01	0.034	<0.010	<0.010	<0.010	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.31	0.386	0.463	0.449	0.461	0.465	0.38	0.375	0.469	0.408
Calcium (dissolved)	mg/L	-	-	-	39.0	112	132	130	133	139	122	125	126	139
Iron (dissolved)	mg/L	0.3	AO	0.17	0.05	<0.050	<0.050	<0.050	<0.05	<0.05	0.236	**0.41**	**0.966**	**0.911**
Magnesium (dissolved)	mg/L	-	-	-	15.7	60.3	<0.050	67.4	77.4	68.9	67.5	67.4	65.1	64.8
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.00203	0.0011	<0.0010	0.0019	<0.001	0.0047	**0.216**	**0.309**	**0.315**	**0.168**
Phosphorus (dissolved)	mg/L	-	-	-	0.05	<0.050	<0.050	<0.050	<0.05	<0.05	<0.050	<0.050	1.1	0.074
Potassium (dissolved)	mg/L	-	-	-	1.11	10.6	12	11.9	12.3	12.5	10	9.9	12.1	10
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	197	481	484	478	554	548	559	577	622	534
Ammonia-N	mg/L	-	-	-	0.05	<0.050	<0.050	<0.050	<0.05	<0.05	<0.119	<0.050	17.1	0.326
Chloride	mg/L	250	AO	126	2.0	24.5	23.5	23.6	21	21.7	19.4	15.4	18	17.1
Conductivity	µS/cm	-	-	-	442	1050	1080	1080	1140	1140	1130	1120	1230	1130
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	1.4	1.4	1.7	2.6	3.4	3.2	2.6	1.5	**118**	2.8
Hardness	mg/L	80-100	OG	-	158.8	529	610	603	651	630	584	590	581	615
Nitrate (as N)	mg/L	10	MAC	2.6	0.09	0.35	0.91	0.89	0.85	0.78	<0.10	<0.10	<0.50	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	0.051	<0.10	<0.10	<0.10	<0.1	<0.1	<0.10	<0.10	<0.50	0.142
Orthophosphate	mg/L	-	-	-	0.0057	0.0037	0.0038	0.0039	0.0037	0.0036	<0.0030	<0.0030	1.32	<0.0030
pH, lab	s.u.	-	-	-	8.16	7.84	7.84	7.86	7.86	7.84	7.59	7.58	7.08	7.63
Phenolics (total)	mg/L	-	-	-	0.00153	<0.0010	<0.0010	0.001	<0.001	0.001	<0.0010	0.0028	1.23	0.0014
Sulfate	mg/L	500	AO	269	45.0	99.1	83.2	83.9	79.4	79.1	80.9	84	24	78.6
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.18	0.26	0.18	0.24	<0.15	<0.15	0.72	0.32	26.6	2.79
Field Parameters														
Conductivity, field	µS/cm	-	-	-	426	704	1000	1000	1150	-	946	1510	1150	904
Dissolved oxygen (DO), field	mg/L	-	-	-	3.84	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.75	7.76	6.69	6.69	7.02	-	7.51	7.85	7.56	5.78
Temperature, field	Deg C	15	AO	-	9.2	7.5	9.6	9.6	9.6	-	12.9	-	12	9.3

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW1	MW1	MW1	MW1	MW1	MW2	MW2	MW2	MW2	MW2	MW2
Sample ID:					GW-WARD3-161115-003	GW-WARD3-042616-002	GW-WARD3-110316-003	GW-WARD3-041117-005	GW-WARD3-112317-005	CRA-4074-02-WARD3-51	GW-WARD3-1110-009	GW-WARD3-0511-007	GW-WARD3-1011-007	GW-WARD3-0412-007	GW-WARD3-1012-007
Sample Date:					11/16/2015	4/26/2016	11/3/2016	4/11/2017	11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012	11/26/2012
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	0.0052	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.010	0.017	0.042	0.028	0.037
Boron (dissolved)	mg/L	5	IMAC	1.5	0.413	0.424	0.47	0.358	0.410	0.161	0.163	0.154	0.177	0.159	0.163
Calcium (dissolved)	mg/L	-	-	-	123	133	132	129	123	69.4	79	82.9	82.6	82.8	74
Iron (dissolved)	mg/L	0.3	AO	0.17	**0.989**	**0.92**	0.101	0.138	**0.641**	<0.050	<0.050	<0.05	0.059	<0.05	<0.050
Magnesium (dissolved)	mg/L	-	-	-	60.6	63.3	60.9	55.8	55.0	35.6	36.9	36	33.4	36.2	31
Manganese (dissolved)	mg/L	0.05	AO	0.03	**0.207**	**0.133**	**0.177**	**0.0526**	**0.119**	<0.0010	0.0057	0.003	0.0097	0.0082	0.0051
Phosphorus (dissolved)	mg/L	-	-	-	0.738	<0.050	0.758	<0.050	0.065	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050
Potassium (dissolved)	mg/L	-	-	-	11.2	9.94	10.8	8.10	8.66	1.2	1.2	1.2	1.6	1.5	1.1
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	617	561	557	510	456	379	363	391	352	366	354
Ammonia-N	mg/L	-	-	-	7.39	0.527	6.08	0.293	0.722	<0.050	<0.050	<0.05	<0.050	0.078	<0.050
Chloride	mg/L	250	AO	126	19.2	15	20.4	26.3	21.8	10.4	10	10.5	9.7	9.9	9.3
Conductivity	µS/cm	-	-	-	1130	1140	1140	1080	1030	681	673	692	643	668	424
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	**6.9**	4.8	4.7	1.7	1.8	2.8	2.7	4	3.1	1.1	3.3
Hardness	mg/L	80-100	OG	-	557	593	579	552	534	320	349	355	344	356	312
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.020	<0.10	0.041	<0.020	<0.10	<0.10	<0.1	<0.10	0.1	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	<0.050	<0.010	<0.050	<0.010	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10
Orthophosphate	mg/L	-	-	-	0.109	<0.0030	-	<0.0030	<0.0030	0.0049	0.0042	0.004	0.0063	0.006	0.0046
pH, lab	s.u.	-	-	-	7.72	7.53	7.05	7.86	7.89	7.99	8.11	7.99	8.02	8.08	7.97
Phenolics (total)	mg/L	-	-	-	0.235	0.0022	0.0563	0.0012	<0.0010	<0.0010	<0.0010	<0.001	<0.0010	<0.001	<0.0010
Sulfate	mg/L	500	AO	269	8.9	63.1	36.6	71.3	68.9	12.7	12.6	13.4	12.5	14.4	13.5
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	9.35	2.37	14.1	1.45	3.4	0.35	0.27	<0.15	<0.15	0.27	0.45
Field Parameters															
Conductivity, field	µS/cm	-	-	-	853	1100	1770	967	1000	559	5000	675	431	638	509
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.46	7.35	7.36	7.27	6.40	7.95	6.92	7.3	7.97	7.55	6.81
Temperature, field	Deg C	15	AO	-	13.1	7.1	12.8	8.0	10.7	7.6	8.9	9.9	8.5	7.7	8.1

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW2
Sample ID:					GW-WARD3-0513-007	GW-WARD3-1013-003	GW-WARD3-DD-061514-004	GW-WARD3-103014-005	GW-WARD3-8/6/15-004	GW-WARD3-161115-009	GW-WARD3-042616-010	GW-WARD3-110316-004	GW-WARD3-041117-009	GW-WARD3-112317-006
Sample Date:					5/13/2013	10/21/2013	6/15/2014	10/30/2014	6/8/2015	11/16/2015	4/26/2016	11/3/2016	4/11/2017	11/23/2017
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**										
Metals														
Aluminum (dissolved)	mg/L	-	-	-	0.019	0.027	0.058	0.034	0.03	0.118	0.0276	0.0591	0.0786	0.0294
Boron (dissolved)	mg/L	5	IMAC	1.5	0.16	0.17	0.15	0.166	0.165	0.172	0.162	0.177	0.161	0.165
Calcium (dissolved)	mg/L	-	-	-	82.1	78.8	68.2	68.4	73.2	72.5	67.9	69.4	70.1	68.9
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.050	<0.050	<0.050	0.074	0.024	0.058	0.049	0.023
Magnesium (dissolved)	mg/L	-	-	-	38.1	34.4	35.4	34.3	35.7	34.3	35	36.5	32.4	34.6
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.0056	0.0094	0.0061	0.0087	0.0089	0.0156	0.00901	0.00975	0.0120	0.00762
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	1.3	1.2	1.1	1.1	1.3	1.24	1.24	1.2	1.14	1.20
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	356	364	333	336	348	356	366	365	355	347
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	0.069	0.042	<0.020	0.039	<0.020
Chloride	mg/L	250	AO	126	9.8	9.4	9.3	8.9	9.26	8.9	8.81	8.48	8.39	7.82
Conductivity	µS/cm	-	-	-	626	659	622	644	651	658	668	662	647	637
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	3	2.6	2.5	2.4	2.8	4.6	4.8	3.2	2.2	2.1
Hardness	mg/L	80-100	OG	-	362	338	316	312	330	322	314	323	308	315
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	0.11	<0.10	<0.10	0.062	0.035	0.116	0.07	0.052	0.052
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	-	-	0.0048	0.0215	<0.0030	0.0081	<0.0030	<0.0030	<0.0030	-	0.0032	0.0045
pH, lab	s.u.	-	-	-	8.14	8.01	8	7.6	8.13	7.98	8.07	7.61	8.06	8.16
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	0.0013	<0.0010	0.0056	0.0145	0.0038	0.0027	0.0017	<0.0010
Sulfate	mg/L	500	AO	269	13.7	12.9	13.8	13.4	14	13.6	12.8	13	12.6	12.5
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.28	0.23	0.43	0.26	0.3	0.31	0.22	0.33	0.24	0.22
Field Parameters														
Conductivity, field	µS/cm	-	-	-	632	622	697	658	510	427	442	655	596	544
Dissolved oxygen (DO), field	mg/L	-	-	-	4.02	-	-	6.56	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.39	7.79	8.37	7.81	6.26	8.1	7.48	7.85	8.04	6.52
Temperature, field	Deg C	15	AO	-	7.6	11.8	-	10.8	10.4	11.1	6.7	11.7	7.3	9.4

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3
Sample ID:					CRA-4074-02-WARD3-52	GW-WARD3-1110-014	GW-WARD3-0511-004	GW-WARD3-1011-010	GW-WARD3-0412-010	GW-WARD3-1012-010	GW-WARD3-0513-009	GW-WARD3-1013-002	GW-WARD3-DD-061514-007	GW-WARD3-103014-009	GW-WARD3-8/6/15-008
Sample Date:					5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012	11/26/2012	5/13/2013	10/21/2013	6/15/2014	10/30/2014	6/8/2015
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	0.016	<0.010	0.015	<0.010	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.219	0.23	0.086	0.245	0.234	0.234	0.24	0.267	0.256	0.29	0.276
Calcium (dissolved)	mg/L	-	-	-	32.9	33.2	32.4	44.1	42.5	35.6	42.1	40	42	40.1	32.7
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium (dissolved)	mg/L	-	-	-	16.3	17.4	10.3	15.8	16	13.4	16.1	14.6	16.5	14.9	15.9
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.0010	<0.0010	<0.001	0.0012	<0.001	<0.0010	<0.0010	<0.0010	0.0013	0.0011	<0.0010
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	<1.0	<1.0	3.1	1	<1.0	<1.0	1	1.3	<1.0	<1.0	1
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	202	198	150	200	193	195	190	191	196	187	177
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	<0.05	<0.050	0.055	<0.050	<0.050	<0.058	<0.050	0.088	0.09
Chloride	mg/L	250	AO	126	<2.0	<2.0	<2	<2.0	<2.0	<2.0	<2.0	2	2.2	2.1	2.11
Conductivity	µS/cm	-	-	-	415	423	298	381	415	310	353	430	416	421	429
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	1.1	3.7	<1.0	<1.0	<1.0	<1.0	2.7	<1.0	<1.0	1.1
Hardness	mg/L	80-100	OG	-	149	154	123	175	172	144	172	160	173	162	147
Nitrate (as N)	mg/L	10	MAC	2.6	0.11	<0.10	0.19	<0.10	0.15	<0.10	0.1	0.11	<0.10	<0.10	0.095
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010
Orthophosphate	mg/L	-	-	-	0.0052	0.0055	0.0122	0.0069	0.0057	<0.0030	0.0061	0.0101	0.004	0.0064	0.0048
pH, lab	s.u.	-	-	-	8.17	8.29	8.06	8.18	8.15	8.13	8.29	8.16	8.28	8.11	8.33
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	<0.001	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	0.0018	0.0045	0.0103
Sulfate	mg/L	500	AO	269	26.4	28.1	14.2	26.8	32.4	34.1	37	35.3	40.3	37.1	42.8
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	<0.15	<0.15	<0.15	0.17	0.19	<0.15	<0.15	<0.15	0.29	0.23
Field Parameters															
Conductivity, field	µS/cm	-	-	-	386	314	414	431	409	319	398	405	713	413	367
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	4.46	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	8.23	7.75	7.5	7.97	7.73	7.21	7.77	7.88	8.39	7.84	7.3
Temperature, field	Deg C	15	AO	-	7.5	8.2	8.4	8.5	8.1	8.8	6.6	11.1	-	9.9	10

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW3	MW3	MW3	MW3	MW3	MW5	MW5	MW5	MW5	MW5
Sample ID:					GW-WARD3-161115-001	GW-WARD3-042616-007	GW-WARD3-110416-006	GW-WARD3-041117-001	GW-WARD3-112317-009	CRA-4074-02-WARD3-53	GW-WARD3-1110-002	GW-WARD3-0511-006	GW-WARD3-1011-008	GW-WARD3-0412-008
Sample Date:					11/16/2015	4/26/2016	11/4/2016	4/11/2017	11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**										
Metals														
Aluminum (dissolved)	mg/L	-	-	-	<0.0050	<0.0050	0.0127	<0.0050	0.0076	0.022	<0.010	<0.01	<0.010	<0.01
Boron (dissolved)	mg/L	5	IMAC	1.5	0.273	0.276	0.317	0.268	0.301	0.253	0.27	0.237	0.258	0.218
Calcium (dissolved)	mg/L	-	-	-	29.9	28.6	29.6	29.9	29.9	38.2	38.5	44.7	54.5	52.3
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.010	<0.010	0.018	<0.010	0.013	<0.050	<0.050	<0.05	<0.050	<0.05
Magnesium (dissolved)	mg/L	-	-	-	14.2	14.2	14.8	13.9	14.6	19.7	20.5	21.6	19.7	21.2
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.00050	<0.00050	0.00247	<0.00050	0.00264	<0.0010	<0.0010	0.0012	0.0083	<0.001
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	<0.050	<0.05
Potassium (dissolved)	mg/L	-	-	-	0.87	0.895	1.25	0.870	1.25	1.1	1.2	1.2	1.2	1.5
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	186	187	184	184	186	211	201	215	208	220
Ammonia-N	mg/L	-	-	-	<0.050	<0.020	0.074	<0.020	0.046	<0.050	<0.050	<0.05	<0.050	<0.05
Chloride	mg/L	250	AO	126	1.97	1.77	1.64	1.62	1.42	<2.0	<2.0	<2.0	<2.0	<2.0
Conductivity	µS/cm	-	-	-	421	422	416	427	407	514	529	556	535	583
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	2.6	3.4	<1.0	<1.0	<1.0	1.8	1.4	1.5	2.3	<1
Hardness	mg/L	80-100	OG	-	133	130	135	132	135	177	180	201	217	218
Nitrate (as N)	mg/L	10	MAC	2.6	0.06	0.09	0.055	0.076	0.072	0.14	<0.10	<0.1	<0.10	0.13
Nitrite (as N)	mg/L	1	MAC	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1
Orthophosphate	mg/L	-	-	-	0.0047	0.0055	-	0.0051	0.0063	0.0045	0.0058	0.0052	0.0049	0.0059
pH, lab	s.u.	-	-	-	8.24	8.17	8.01	8.22	8.25	8.18	8.18	8.22	8.14	8.11
Phenolics (total)	mg/L	-	-	-	0.0028	<0.0010	0.0028	0.0011	<0.0010	<0.0010	<0.0010	<0.001	<0.0010	<0.001
Sulfate	mg/L	500	AO	269	39.9	39.9	39.7	38.4	38.7	83.2	79.5	91.9	82.1	93.1
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
Field Parameters														
Conductivity, field	µS/cm	-	-	-	340	390	394	398	357	693	382	555	576	749
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	8.4	8	8.3	8.14	6.59	7.87	7.18	7.55	8.12	7.73
Temperature, field	Deg C	15	AO	-	11.6	6.6	9	7.7	8.6	7.6	9.6	10.7	9.9	8.2

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5
Sample ID:					GW-WARD3-1012-008	GW-WARD3-0513-006	GW-WARD3-1013-004	GW-WARD3-DD-061514-005	GW-WARD3-103014-003	GW-WARD3-8/6/15-007	GW-WARD3-161115-002	GW-WARD3-042616-005	GW-WARD3-110416-005	GW-WARD3-041117-002
Sample Date:					11/26/2012	5/13/2013	10/21/2013	6/15/2014	10/30/2014	6/8/2015	11/16/2015	4/26/2016	11/4/2016	4/11/2017
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**										
Metals														
Aluminum (dissolved)	mg/L	-	-	-	0.011	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050
Boron (dissolved)	mg/L	5	IMAC	1.5	0.25	0.2	0.221	0.224	0.244	0.221	0.244	0.2	0.238	0.129
Calcium (dissolved)	mg/L	-	-	-	49.9	57	52	53.9	52	40.7	40.7	36	40.5	35.2
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Magnesium (dissolved)	mg/L	-	-	-	18.9	23	20.1	21.5	20.3	20.9	20.3	18.8	20.2	13.2
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.002	<0.0010	<0.0010	<0.0010	0.002	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	0.096	<0.050	0.054	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	1.1	1.4	1.6	1.1	1.4	1.3	1.39	1.33	1.25	1.88
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	213	219	224	227	234	230	240	223	240	208
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	<0.119	<0.050	<0.050	<0.050	0.058	<0.020	0.063	<0.020
Chloride	mg/L	250	AO	126	<2.0	<2.0	<2.0	<2.0	<2.0	1.55	1.57	1.41	1.31	1.11
Conductivity	µS/cm	-	-	-	385	562	578	579	568	561	563	538	550	463
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	<1.0	1.5	<1.0	<1.0	1.1	3.6	3.2	1.2	2.0
Hardness	mg/L	80-100	OG	-	202	237	213	223	214	188	185	167	185	142
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	0.22	0.1	<0.10	0.144	0.257	0.125	0.114	0.092
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	-	-	0.0048	0.0056	0.0502	0.0042	0.0279	0.0096	0.037	0.0076	-	0.0077
pH, lab	s.u.	-	-	-	8.09	8.26	8.15	8.2	7.89	8.32	8.21	8.22	7.84	8.25
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	0.0051	0.0076	0.0175	0.0051	0.002	0.0012
Sulfate	mg/L	500	AO	269	85.3	95.1	87.5	86.3	73.2	75.9	69.9	62.7	63.7	35.8
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	<0.20	<0.15	0.39	0.69	0.47	0.2	<0.15	<0.15	<0.15
Field Parameters														
Conductivity, field	µS/cm	-	-	-	411	540	517	523	547	454	429	499	505	431
Dissolved oxygen (DO), field	mg/L	-	-	-	-	4.16	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.08	7.85	8.12	8.39	8.11	6.7	8.25	7.82	8.19	8.19
Temperature, field	Deg C	15	AO	-	10	9.1	13.3	-	11.7	11.3	12.8	7	13.7	7.5

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW5	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6
Sample ID:					GW-WARD3-112317-007	CRA-4074-02-WARD3-54	GW-WARD3-1110-010	GW-WARD3-0511-005	GW-WARD3-1011-009	GW-WARD3-0412-009	GW-WARD3-1012-009	GW-WARD3-0513-008	GW-WARD3-1013-005	GW-WARD3-DD-061514-006	GW-WARD3-103014-008
Sample Date:					11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012	11/26/2012	5/13/2013	10/21/2013	6/15/2014	10/30/2014
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	<0.0050	0.027	<0.010	0.02	0.018	0.014	0.013	0.013	0.013	0.012	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.194	0.358	0.334	0.357	0.341	0.32	0.302	0.342	0.352	0.332	0.363
Calcium (dissolved)	mg/L	-	-	-	36.0	16.6	14.4	15.3	20	19.4	17.9	19.8	19.5	19.3	19.7
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.010	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium (dissolved)	mg/L	-	-	-	18.2	6.9	6.71	6.56	6.28	6.35	5.82	6.78	6.45	6.76	6.23
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.00066	0.0027	<0.0010	0.0028	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	1.56	<1.0	<1.0	<1	<1.0	<1	<1.0	<1.0	<1.0	<1.0	<1.0
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	222	140	138	141	143	149	139	145	141	140	141
Ammonia-N	mg/L	-	-	-	0.153	<0.050	0.065	0.104	<0.050	<0.05	<0.050	<0.050	<0.051	<0.050	0.057
Chloride	mg/L	250	AO	126	1.24	<2.0	<2.0	<2	<2.0	<2	<2.0	<2.0	<2.0	<2.0	<2.0
Conductivity	µS/cm	-	-	-	516	262	266	262	250	268	221	245	274	269	279
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	1.3	1.2	1.4	1.6	1.3	2.7	<1.0	<1.0	1.6	1.1	<1.0
Hardness	mg/L	80-100	OG	-	165	70	64	65	76	75	69	77	75	76	75
Nitrate (as N)	mg/L	10	MAC	2.6	0.110	<0.10	<0.10	<0.1	<0.10	0.1	<0.10	<0.10	0.13	<0.10	0.14
Nitrite (as N)	mg/L	1	MAC	0.3	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	0.0097	0.0066	0.0074	0.0077	0.0089	0.0084	0.0064	0.0081	0.0085	0.0064	0.0102
pH, lab	s.u.	-	-	-	8.17	8.29	8.3	8.28	8.24	8.05	8.18	8.36	8.17	8.38	8.22
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.001	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	0.0014	<0.0010
Sulfate	mg/L	500	AO	269	55.7	8.1	7.3	7.1	7.2	10.6	8.3	7.6	7.6	8.8	8.4
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<1.5	<0.15	<0.15	<0.15	<0.15	<0.15	0.19	<0.15	0.16	1.85	0.18
Field Parameters															
Conductivity, field	µS/cm	-	-	-	428	1308	223	293	346	300	221	310	314	358	299
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	5.8	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	6.60	8.26	7.15	7.76	8.01	7.85	7.33	7.52	8.24	8.52	8.16
Temperature, field	Deg C	15	AO	-	10.3	7.7	8.1	8.4	6.5	8.6	8.8	6.8	10.6	-	9.8

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW6	MW6	MW6	MW6	MW6	MW6	MW7	MW7	MW7	MW7	MW7
Sample ID:					GW-WARD3-8/6/15-014	GW-WARD3-161115-007	GW-WARD3-042616-014	GW-WARD3-110416-012	GW-WARD3-041117-014	GW-WARD3-112317-008	CRA-4074-02-WARD3-55	GW-WARD3-1110-008	GW-WARD3-0511-011	GW-WARD3-1011-006	GW-WARD3-0412-006
Sample Date:					6/8/2015	11/16/2015	4/26/2016	11/4/2016	4/11/2017	11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	<0.010	0.006	0.0168	0.0135	0.0199	0.0154	0.026	0.065	<0.01	<0.010	<0.01
Boron (dissolved)	mg/L	5	IMAC	1.5	0.347	0.37	0.351	0.366	0.339	0.357	0.32	0.345	0.275	0.345	0.339
Calcium (dissolved)	mg/L	-	-	-	14.9	15.6	13.4	14.9	14.2	15.4	37.6	45.8	50.6	47.5	43
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.010	0.014	0.013	0.019	0.016	<0.050	<0.050	<0.05	<0.050	<0.05
Magnesium (dissolved)	mg/L	-	-	-	6.31	6.23	6.13	6.44	5.81	6.53	21.8	20.8	26.8	20.9	19.7
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.0010	<0.00050	<0.00050	0.00084	0.00061	0.00073	0.0013	0.0175	0.0017	0.0016	0.0012
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	0.058	<0.05
Potassium (dissolved)	mg/L	-	-	-	<1.0	0.63	0.665	0.603	0.594	0.616	1.2	1.3	1.3	1.5	1.2
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	146	138	143	142	151	140	221	222	243	216	219
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	0.024	0.035	<0.020	0.165	<0.050	0.112	<0.05	<0.050	<0.05
Chloride	mg/L	250	AO	126	0.89	0.88	0.84	0.78	0.83	0.78	3.5	2.4	9.9	5.2	3.4
Conductivity	µS/cm	-	-	-	272	279	276	278	278	277	497	490	552	435	489
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	1	2.7	2.6	<1.0	1.3	1.1	1.7	2.4	3.3	3.1	1.4
Hardness	mg/L	80-100	OG	-	63	65	59	64	59	65	184	200	237	205	188
Nitrate (as N)	mg/L	10	MAC	2.6	0.079	0.169	0.114	0.093	0.072	0.029	0.13	<0.10	<0.1	0.18	0.11
Nitrite (as N)	mg/L	1	MAC	0.3	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1
Orthophosphate	mg/L	-	-	-	0.0075	0.0205	0.0064	-	0.0075	0.0039	0.0067	0.0084	0.0084	0.0446	0.0114
pH, lab	s.u.	-	-	-	8.38	8.33	8.3	8.06	8.30	8.27	8.13	8.15	8.07	8.06	8.08
Phenolics (total)	mg/L	-	-	-	0.003	0.0119	0.0024	0.0041	0.0024	<0.0010	<0.0010	<0.0010	<0.001	<0.0010	<0.001
Sulfate	mg/L	500	AO	269	9.63	9.38	8.61	9.85	7.83	7.71	52.4	46	47.8	42.9	44
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	0.19	0.17	0.28	<0.15	<0.15	<0.15
Field Parameters															
Conductivity, field	µS/cm	-	-	-	232	216	269	267	314	296	211	362	546	487	473
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.46	7.65	8.13	8.35	8.03	6.44	8.26	7.2	7.36	8.14	7.66
Temperature, field	Deg C	15	AO	-	8.7	11.5	7.2	10.3	8.1	8.4	6.4	6.6	7.9	6.7	7.6

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7
Sample ID:					GW-WARD3-1012-006	GW-WARD3-0513-005	GW-WARD3-1013-010	GW-WARD3-DD-061514-001	GW-WARD3-103014-006	GW-WARD3-8/6/15-005	GW-WARD3-161115-004	GW-WARD3-042616-003	GW-WARD3-110316-001	GW-WARD3-041117-004
Sample Date:					11/26/2012	5/13/2013	10/21/2013	6/15/2014	10/30/2014	6/8/2015	11/16/2015	4/26/2016	11/3/2016	4/11/2017
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**										
Metals														
Aluminum (dissolved)	mg/L	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050
Boron (dissolved)	mg/L	5	IMAC	1.5	0.336	0.272	0.307	0.22	0.375	0.355	0.358	0.364	0.413	0.329
Calcium (dissolved)	mg/L	-	-	-	40.9	59.8	44.8	40.1	41.5	35.8	31	30.4	30.7	30.0
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.050	<0.050	0.233	<0.050	0.013	<0.010	<0.010	<0.010
Magnesium (dissolved)	mg/L	-	-	-	17.8	27.4	19.9	19.6	18.9	21	19.6	18.9	19.9	17.9
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.0010	<0.0010	0.0012	<0.0010	**0.21**	<0.0010	0.00566	<0.00050	0.00072	<0.00050
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	0.101	<0.050	0.057	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	1.4	1.4	1.2	1.5	1.2	1.2	1.25	1.14	1.13	1.10
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	226	225	226	209	215	229	222	223	221	208
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	0.259	<0.050	<0.050	<0.020	0.028	<0.020
Chloride	mg/L	250	AO	126	2.7	19.4	11.4	5.4	4.2	6.74	4.95	5.49	4.11	4.91
Conductivity	µS/cm	-	-	-	350	539	526	484	481	508	489	489	488	476
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	1.5	2.2	2.1	1.9	1.7	1.5	3.4	3.5	2.1	1.1
Hardness	mg/L	80-100	OG	-	176	262	194	181	181	176	158	154	158	149
Nitrate (as N)	mg/L	10	MAC	2.6	0.21	<0.10	0.19	0.18	<0.10	0.168	0.107	0.147	0.206	0.132
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	-	-	0.0244	0.0101	0.0387	0.0164	0.0639	0.02	0.0456	0.0163	-	0.0164
pH, lab	s.u.	-	-	-	7.95	8.07	8.01	8.13	7.86	8.29	8.18	8.15	7.61	8.22
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0171	0.0092	0.0024	0.0032	0.0011
Sulfate	mg/L	500	AO	269	43.6	44.8	41.8	39.1	38.4	45	40.9	41.3	39.7	39.2
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.23	<0.19	0.19	0.39	0.32	0.24	0.17	<0.15	0.22	<0.15
Field Parameters														
Conductivity, field	µS/cm	-	-	-	382	461	487	697	464	416	379	458	468	439
Dissolved oxygen (DO), field	mg/L	-	-	-	-	3.79	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.06	7.59	7.9	8.2	7.99	6.32	8.16	7.8	7.31	8.03
Temperature, field	Deg C	15	AO	-	8.2	6.4	10.3	-	10	8.2	11.3	6.1	10.5	7.5

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW7	MW7	MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8
Sample ID:					GW-WARD3-041117-006	GW-WARD3-112317-003	CRA-4074-02-WARD3-56	GW-WARD3-1110-013	GW-WARD3-0511-014	GW-WARD3-1011-001	GW-WARD3-0412-001	GW-WARD3-0412-002	GW-WARD3-1012-001	GW-WARD3-0513-001	GW-WARD3-0513-002
Sample Date:					4/11/2017	11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012	4/22/2012	11/26/2012	5/13/2013	5/13/2013
Parameters	Units	ODWS[1]	ODWS Source	MABC[2]	Duplicate							Duplicate			Duplicate
Metals															
Aluminum (dissolved)	mg/L	-	-	-	<0.0050	<0.0050	0.033	<0.010	0.017	0.013	0.025	<0.01	0.014	<0.010	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.329	0.378	0.445	0.435	0.44	0.44	0.41	0.4	0.385	0.408	0.416
Calcium (dissolved)	mg/L	-	-	-	29.2	30.3	28.6	22.8	24	34.7	33.5	31.3	33.5	32.7	33.2
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.010	<0.010	<0.050	<0.050	<0.05	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050
Magnesium (dissolved)	mg/L	-	-	-	17.4	18.5	15.4	16.1	15.5	14.4	14.9	14.3	14.6	15.5	15.6
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.00050	<0.00050	0.007	<0.0010	0.0017	0.002	0.0013	<0.001	<0.0010	<0.0010	<0.0010
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.05	<0.050	<0.05	<0.05	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	1.08	1.24	1.1	1.1	1.1	1.1	<1	<1	1.1	1.1	1.1
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	207	216	185	175	183	182	185	189	189	187	185
Ammonia-N	mg/L	-	-	-	<0.020	0.129	<0.050	<0.050	<0.05	0.06	<0.05	<0.05	<0.050	0.195	<0.050
Chloride	mg/L	250	AO	126	4.96	3.38	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Conductivity	µS/cm	-	-	-	477	475	432	434	428	383	421	422	333	402	388
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	1.2	1.5	<1.0	2	2.3	<1.0	<1	<1	<1.0	1	<1.0
Hardness	mg/L	80-100	OG	-	144	152	134	123	124	146	145	137	144	145	147
Nitrate (as N)	mg/L	10	MAC	2.6	0.140	0.047	<0.10	<0.10	<0.1	<0.10	0.33	0.1	<0.10	<0.10	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	<0.010	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1	<0.1	<0.10	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	0.0151	0.0266	0.0087	0.0094	0.008	0.0066	0.0095	0.0099	0.0074	0.0089	0.0086
pH, lab	s.u.	-	-	-	8.23	8.12	8.23	8.31	8.22	8.19	8.17	8.18	8.15	8.15	8.21
Phenolics (total)	mg/L	-	-	-	0.0014	<0.0010	<0.0010	<0.0010	0.002	<0.0010	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Sulfate	mg/L	500	AO	269	39.6	38.6	46.3	45.5	46	44.4	44.7	47	45.3	45.6	45
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	0.36	<0.15	<0.15	<0.15	<0.15	<0.15	0.39	<0.15	<0.21	<0.15
Field Parameters															
Conductivity, field	µS/cm	-	-	-	439	400	665	325	444	427	450	450	335	464	464
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	1.88	1.88
pH, field	s.u.	6.5-8.5	OG	-	8.03	6.45	8.52	7.18	7.53	8.22	7.67	7.67	7.28	7.29	7.29
Temperature, field	Deg C	15	AO	-	7.5	8.3	6.1	8.2	8.1	9.1	8.3	8.3	10.7	6.5	7.1

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8
Sample ID:					GW-WARD3-1013-012	GW-WARD3-1013-014	GW-WARD3-080414-001	GW-WARD3-103014-001	GW-WARD3-8/6/15-001	GW-WARD3-161115-010	GW-WARD3-161115-011	GW-WARD3-042616-009	GW-WARD3-041117-008	GW-WARD3-112317-001
Sample Date:					10/21/2013	10/21/2013	8/4/2014	10/30/2014	6/8/2015	11/16/2015	11/16/2015	4/26/2016	4/11/2017	11/23/2017
Parameters	Units	ODWS[1]	ODWS Source	MABC[2]		Duplicate					Duplicate			
Metals														
Aluminum (dissolved)	mg/L	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Boron (dissolved)	mg/L	5	IMAC	1.5	0.385	0.403	0.421	0.448	0.434	0.44	0.424	0.428	0.447	0.454
Calcium (dissolved)	mg/L	-	-	-	30.2	29.5	29.7	31.6	23.6	22.9	23	20.8	22.1	22.2
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010
Magnesium (dissolved)	mg/L	-	-	-	13.4	12.8	14.3	14.6	14.9	14.2	13.6	13.7	13.8	14.9
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.0010	0.0012	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	0.00099
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	1.1	0.955	0.96	0.958	0.947	1.08
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	173	190	187	189	189	202	187	183	190	177
Ammonia-N	mg/L	-	-	-	<0.050	<0.069	0.088	<0.050	<0.050	0.118	<0.050	0.081	0.095	0.057
Chloride	mg/L	250	AO	126	<2.0	<2.0	<2.0	<2.0	1.32	1.31	1.3	1.24	1.21	1.18
Conductivity	µS/cm	-	-	-	434	432	445	440	433	430	431	434	439	435
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	<1.0	<1.0	<1.0	<1.0	2.6	2.4	2.9	<1.0	<1.0
Hardness	mg/L	80-100	OG	-	130	126	133	139	120	116	114	108	112	117
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	<0.10	<0.10	0.064	0.034	0.036	0.083	0.079	<0.020
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	-	-	0.0096	0.009	0.0086	0.0119	0.0062	0.0093	0.01	0.0086	0.0083	0.0046
pH, lab	s.u.	-	-	-	8.32	8.21	8.33	8.13	8.26	8.32	8.32	8.2	8.27	8.27
Phenolics (total)	mg/L	-	-	-	0.0014	0.0012	0.0081	0.001	0.0049	0.0035	0.0036	0.0028	0.0016	<0.0010
Sulfate	mg/L	500	AO	269	43	42.9	44.5	42.8	47.8	46	45.3	43.6	42.5	41.4
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	<0.15	0.21	<0.15	0.2	<0.15	<0.15	<0.15	<0.15	0.36
Field Parameters														
Conductivity, field	µS/cm	-	-	-	411	411	529	453	356	356	356	412	449	448
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	8.59	8.59	7.18	8.1	7.83	7.8	7.8	7.31	8.44	6.46
Temperature, field	Deg C	15	AO	-	11.6	11.6	13.8	10.7	9.8	12	12	7.1	8.1	10.2

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW9
Sample ID:					CRA-4074-02-WARD3-57	GW-WARD3-1110-012	GW-WARD3-0511-013	GW-WARD3-1011-002	GW-WARD3-1011-003	GW-WARD3-0412-004	GW-WARD3-1012-002	GW-WARD3-1012-003	GW-WARD3-0513-003	GW-WARD3-1013-006	GW-WARD3-080414-002
Sample Date:					5/12/2010	11/29/2010	5/25/2011	11/22/2011	11/22/2011	4/22/2012	11/26/2012	11/26/2012	5/13/2013	10/21/2013	8/4/2014
Parameters	Units	ODWS[1]	ODWS Source	MABC[2]					Duplicate			Duplicate			
Metals															
Aluminum (dissolved)	mg/L	-	-	-	0.073	<0.010	0.051	<0.010	<0.010	0.029	<0.010	<0.010	<0.010	<0.010	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.445	0.409	0.422	0.429	0.435	0.4	0.339	0.367	0.409	0.439	0.414
Calcium (dissolved)	mg/L	-	-	-	26.2	26.2	34.1	39	38.2	36.2	37.2	35.7	36.8	34.8	32.3
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.05	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium (dissolved)	mg/L	-	-	-	16	16.2	15.3	14.2	14.1	14.4	14.2	14.1	14.7	13.8	13.5
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.0013	<0.0010	0.0052	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.05	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	1	1	1.1	<1.0	<1.0	<1	<1.0	<1.0	1	<1.0	<1.0
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	179	170	175	169	170	175	182	177	167	175	179
Ammonia-N	mg/L	-	-	-	<0.050	0.07	<0.05	<0.050	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	0.112
Chloride	mg/L	250	AO	126	<2.0	<2.0	<2.0	<2.0	<2.0	<2	<2.0	<2.0	<2.0	<2.0	<2.0
Conductivity	µS/cm	-	-	-	460	463	458	395	398	431	334	329	389	442	455
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	1.9	1.5	1	<1.0	<1	<1.0	<1.0	1.2	<1.0	<1.0
Hardness	mg/L	80-100	OG	-	131	132	148	156	153	150	152	147	152	144	137
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	<0.1	<0.10	<0.10	0.11	<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.1	<0.10	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	0.0099	0.0094	0.012	0.0108	0.0117	0.012	0.0108	0.0103	0.0133	0.0177	0.0131
pH, lab	s.u.	-	-	-	8.22	8.26	8.12	8.16	8.17	8.14	8.15	8.13	8.25	8.22	8.37
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	0.0013	0.0018
Sulfate	mg/L	500	AO	269	66.1	62.5	66	61.1	60.9	59.7	57.5	57.7	59.5	56.4	58.8
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	0.16	<0.15	<0.15	<0.15	<0.15	0.23	0.22	<0.15	<0.15	<0.15
Field Parameters															
Conductivity, field	µS/cm	-	-	-	435	339	466	433	-	438	340	340	434	415	433
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	2.83	-	-
pH, field	s.u.	6.5-8.5	OG	-	8.4	7.34	7.59	8.2	-	7.84	7.28	7.28	7.37	8.16	7.44
Temperature, field	Deg C	15	AO	-	7.6	9	8.6	10	-	8.3	10.7	10.7	7.1	11.9	12.9

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW9	MW9	MW9	MW9	MW9	MW9	MW10	MW10	MW10	MW10	MW10
Sample ID:					GW-WARD3-103014-002	GW-WARD3-8/6/15-002	GW-WARD3-161115-006	GW-WARD3-042616-001	GW-WARD3-041117-007	GW-WARD3-112317-002	CRA-4074-02-WARD3-58	GW-WARD3-1110-011	GW-WARD3-0511-012	GW-WARD3-1011-005	GW-WARD3-0412-005
Sample Date:					10/30/2014	6/8/2015	11/16/2015	4/26/2016	4/11/2017	11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	<0.010	<0.010	<0.0050	<0.0050	0.0111	0.0365	0.02	<0.010	0.06	<0.010	0.014
Boron (dissolved)	mg/L	5	IMAC	1.5	0.423	0.427	0.417	0.433	0.430	0.415	0.3	0.276	0.27	0.291	0.258
Calcium (dissolved)	mg/L	-	-	-	35.8	25.9	24.6	23	24.8	24.4	37	36	46.5	48.1	45.4
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.010	<0.010	<0.010	0.050	<0.050	<0.050	<0.05	<0.050	<0.05
Magnesium (dissolved)	mg/L	-	-	-	14.5	14	13.9	13.3	12.7	14.1	27.6	26	25.5	23.3	24
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.0010	<0.0010	<0.00050	<0.00050	0.00169	0.00448	0.0049	0.0041	0.0073	0.0064	<0.001
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	<0.050	<0.05
Potassium (dissolved)	mg/L	-	-	-	<1.0	<1.0	0.904	0.972	0.917	0.936	1.2	1.3	1.3	1.2	1.2
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	166	163	172	178	179	182	244	197	244	239	239
Ammonia-N	mg/L	-	-	-	0.16	0.058	<0.050	<0.020	<0.020	0.123	<0.050	<0.050	<0.05	<0.050	<0.05
Chloride	mg/L	250	AO	126	<2.0	0.86	0.91	0.89	0.74	0.79	<2.0	<2.0	<2	<2.0	<2
Conductivity	µS/cm	-	-	-	442	438	437	434	441	435	503	502	494	429	488
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	1	<1.0	1.8	3.1	1.1	<1.0	<1.0	1.9	1.6	<1.0	<1.0
Hardness	mg/L	80-100	OG	-	149	123	118	112	114	119	206	197	221	216	212
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	0.091	0.065	0.093	0.073	0.027	<0.10	<0.10	<0.1	<0.10	<0.1
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1
Orthophosphate	mg/L	-	-	-	0.0121	0.0124	0.0072	0.0136	0.0189	0.0122	0.0052	0.0059	0.006	0.0099	0.0068
pH, lab	s.u.	-	-	-	8.13	8.29	8.33	8.22	8.27	8.28	8.17	8.24	8.17	8.15	8.05
Phenolics (total)	mg/L	-	-	-	<0.0010	0.0085	0.0193	0.0058	0.0016	<0.0010	<0.0010	<0.0010	<0.001	<0.0010	<0.001
Sulfate	mg/L	500	AO	269	55.5	59.3	56.8	53.1	43.0	49.1	36.4	33.3	33.2	29.6	30.4
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.65	0.25	<0.15	<0.15	<0.15	0.47	<0.15	0.21	<0.15	<0.15	<0.15
Field Parameters															
Conductivity, field	µS/cm	-	-	-	429	349	363	409	456	424	453	449	503	469	472
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	8.22	7.93	7.73	7.2	8.42	6.51	8.27	7.22	7.43	8.11	7.66
Temperature, field	Deg C	15	AO	-	11.5	9.9	12.6	7.5	8.2	10.4	6.8	8.2	8.7	7.4	8.5

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10
Sample ID:					GW-WARD3-1012-005	GW-WARD3-0513-004	GW-WARD3-1013-009	GW-WARD3-DD-061514-002	GW-WARD3-103014-007	GW-WARD3-8/6/15-006	GW-WARD3-161115-005	GW-WARD3-042616-004	GW-WARD3-110316-002	GW-WARD3-041117-003
Sample Date:					11/26/2012	5/13/2013	10/21/2013	6/15/2014	10/30/2014	6/8/2015	11/16/2015	4/26/2016	11/3/2016	4/11/2017
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**										
Metals														
Aluminum (dissolved)	mg/L	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	<0.0050
Boron (dissolved)	mg/L	5	IMAC	1.5	0.253	0.267	0.298	0.263	0.301	0.276	0.291	0.284	0.299	0.257
Calcium (dissolved)	mg/L	-	-	-	42.8	46.5	43.2	43.5	42.6	34.4	32.6	30.4	32.6	31.4
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Magnesium (dissolved)	mg/L	-	-	-	22	25.4	22.2	24.1	23	23.4	23	23	24	21.9
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0006	<0.00050	0.00066	0.00054
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	1.1	1.3	1.1	1.1	1.1	1.2	1.14	1.16	1.14	1.09
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	258	238	250	249	242	228	241	248	249	245
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.02	0.056	<0.020
Chloride	mg/L	250	AO	126	<2.0	<2.0	<2.0	<2.0	<2.0	0.63	0.63	0.59	0.59	<0.50
Conductivity	µS/cm	-	-	-	347	406	483	491	482	476	475	477	479	476
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.1	3.00	<1.0	<1.0
Hardness	mg/L	80-100	OG	-	197	221	199	208	201	182	176	171	180	169
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	<0.10	<0.10	<0.10	0.03	<0.020	0.026	0.034	0.034
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	-	-	0.0058	0.0068	0.007	0.0042	0.0065	0.0043	0.0063	0.0043	-	0.0053
pH, lab	s.u.	-	-	-	8.07	8.15	8.17	8.18	8.11	8.32	8.31	8.17	7.97	8.20
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	0.0022	<0.0010	0.0072	0.0308	0.0098	0.0053	0.0013
Sulfate	mg/L	500	AO	269	27.5	28.1	26.3	27.9	25.9	27.6	26.8	25.8	24.1	19.0
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.18	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.19	0.17	<0.15
Field Parameters														
Conductivity, field	µS/cm	-	-	-	373	464	450	652	461	387	367	432	457	439
Dissolved oxygen (DO), field	mg/L	-	-	-	-	2.18	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.08	7.67	8.17	8.35	7.96	6.44	8.2	7.85	8.25	7.91
Temperature, field	Deg C	15	AO	-	9	6.9	11.8	-	10.8	9	12.2	6.8	12	7.3

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW10	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11
Sample ID:					GW-WARD3-112317-004	CRA-4074-02-WARD3-59	GW-WARD3-1110-001	GW-WARD3-0511-001	GW-WARD3-1011-013	GW-WARD3-0412-013	GW-WARD3-1012-013	GW-WARD3-0513-012	GW-WARD3-1013-007	GW-WARD3-DD-061514-012	GW-WARD3-103014-014
Sample Date:					11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012	11/26/2012	5/13/2013	10/21/2013	6/15/2014	10/30/2014
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	0.0153	0.033	0.014	0.021	<0.010	0.015	0.012	<0.010	<0.010	<0.010	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.272	0.387	0.372	0.368	0.37	0.34	0.339	0.278	0.36	0.331	0.371
Calcium (dissolved)	mg/L	-	-	-	31.6	27.6	33.5	31	37	40.4	40	47.3	42.3	42.6	41.1
Iron (dissolved)	mg/L	0.3	AO	0.17	0.015	<0.050	<0.050	<0.05	0.059	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050
Magnesium (dissolved)	mg/L	-	-	-	23.3	14.4	16.6	14.8	13.4	15.2	15.6	19.5	16.4	17.5	16.1
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.00236	0.0081	0.0062	0.0049	0.0032	0.0091	0.0028	0.0045	0.007	0.0033	**0.0698**
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	0.251	0.111	0.149	0.143	0.14	<0.050	<0.050	0.116	<0.050
Potassium (dissolved)	mg/L	-	-	-	1.20	1.2	1.9	1.2	2	1.9	3.2	1.1	<1.0	1.8	<1.0
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	234	185	184	187	187	193	217	209	210	205	186
Ammonia-N	mg/L	-	-	-	0.076	<0.050	<0.050	0.08	<0.050	<0.05	0.075	<0.050	<0.050	<0.050	<0.050
Chloride	mg/L	250	AO	126	0.53	<2.0	<2.0	<2	<2.0	<2	2.1	2.4	2.1	<2.0	<2.0
Conductivity	µS/cm	-	-	-	480	404	412	408	379	426	395	408	485	480	466
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	<1.0	2.4	2.3	1.9	1.4	1.6	1.8	1.9	1.5	<1.0
Hardness	mg/L	80-100	OG	-	175	128	152	138	148	164	164	198	173	178	169
Nitrate (as N)	mg/L	10	MAC	2.6	0.143	<0.10	0.11	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	0.1
Nitrite (as N)	mg/L	1	MAC	0.3	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	0.0531	0.0063	0.0124	0.0087	0.008	0.0073	0.0049	0.0065	0.0424	0.0051	0.0124
pH, lab	s.u.	-	-	-	8.26	8.21	8.1	8.09	8.21	8.08	8.06	8.18	8.2	8.15	8.03
Phenolics (total)	mg/L	-	-	-	<0.0010	<0.0010	<0.0010	<0.001	0.001	<0.001	<0.0010	<0.0010	<0.0010	0.0056	0.0023
Sulfate	mg/L	500	AO	269	23.0	32.3	33.8	33.2	35.5	41.3	54.1	62.3	55.1	53.9	49.1
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.23	<0.31	<0.15	0.26	<0.15
Field Parameters															
Conductivity, field	µS/cm	-	-	-	404	504	315	421	421	440	349	489	508	624	456
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	1.97	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	6.51	7.72	6.84	7.53	7.62	7.81	6.98	7.55	7.6	7.82	7.68
Temperature, field	Deg C	15	AO	-	9.7	7.5	9.6	8.5	9.3	7.8	9.7	6.6	10.3	-	9.7

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW12	MW12	MW12
Sample ID:					GW-WARD3-8/6/15-011	GW-WARD3-161115-014	GW-WARD3-042616-011	GW-WARD3-110416-008	GW-WARD3-110416-009	GW-WARD3-041117-013	GW-WARD3-112317-014	CRA-4074-02-WARD3-60	CRA-4074-02-WARD3-61	GW-WARD3-1110-003
Sample Date:					6/8/2015	11/16/2015	4/26/2016	11/4/2016	11/4/2016 Duplicate	4/11/2017	11/23/2017	5/12/2010	5/12/2010 Duplicate	11/29/2010
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**										
Metals														
Aluminum (dissolved)	mg/L	-	-	-	<0.010	0.0105	<0.0050	0.0096	0.0098	<0.0050	0.0057	<0.10	<0.10	<0.10
Boron (dissolved)	mg/L	5	IMAC	1.5	0.341	0.373	0.35	0.381	0.385	0.295	0.333	<0.50	<0.50	<0.50
Calcium (dissolved)	mg/L	-	-	-	32.9	31.4	29.1	31.6	30	55.8	46.4	167	163	150
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	0.015	<0.010	0.018	0.015	<0.010	0.016	**22**	**22**	**15.9**
Magnesium (dissolved)	mg/L	-	-	-	17.2	16	16.4	16.6	16.9	27.5	25.6	38	36.8	38.5
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.0010	0.00225	<0.00050	0.00431	0.00485	0.00054	0.00164	**0.219**	**0.217**	**0.175**
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	0.067	0.059	<0.050	0.141	<0.50	<0.50	<0.50
Potassium (dissolved)	mg/L	-	-	-	1	1.27	1.09	1.69	1.22	1.23	3.21	18	18	17
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	193	207	214	205	201	258	248	572	570	517
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	0.029	0.076	0.054	<0.020	0.316	4.84	4.95	4.46
Chloride	mg/L	250	AO	126	1.96	1.75	1.77	1.69	1.69	5.14	3.73	7.4	7.4	7.6
Conductivity	µS/cm	-	-	-	483	461	477	466	466	730	657	1070	1070	998
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	2.2	3.7	3.2	1.5	2	2.4	1.8	4.9	**5.3**	4.9
Hardness	mg/L	80-100	OG	-	153	144	140	147	145	253	221	575	559	532
Nitrate (as N)	mg/L	10	MAC	2.6	0.065	0.046	0.055	<0.020	<0.020	0.049	0.023	<0.10	<0.10	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	0.037	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	0.0033	0.0076	0.0063	-	-	0.0038	0.0050	0.0032	0.0038	0.0033
pH, lab	s.u.	-	-	-	8.24	8.22	8.18	7.94	7.94	8.10	8.22	7.24	7.18	7.39
Phenolics (total)	mg/L	-	-	-	0.0045	0.0078	0.0019	0.0035	0.0027	0.0022	<0.0010	0.002	0.003	<0.0010
Sulfate	mg/L	500	AO	269	53.4	48.3	49.6	48	47.8	127	107	28.3	28.1	17.2
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.22	0.41	<0.15	0.2	0.21	<0.15	0.63	9.44	10.3	7.9
Field Parameters														
Conductivity, field	µS/cm	-	-	-	411	373	360	455	455	696	546	671	671	940
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	6.89	7.92	7.17	7.71	7.71	7.46	6.44	7.19	7.19	6.21
Temperature, field	Deg C	15	AO	-	8.9	11.4	8.3	9.4	9.4	7.6	9.9	7.5	7.5	8.9

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW12	MW12	MW12	MW12	MW12	MW12	MW12	MW12	MW12	MW12	MW12
Sample ID:					GW-WARD3-0511-003	GW-WARD3-1011-012	GW-WARD3-0412-012	GW-WARD3-1012-012	GW-WARD3-0513-011	GW-WARD3-1013-011	GW-WARD3-DD-061514-009	GW-WARD3-103014-012	GW-WARD3-8/6/15-012	GW-WARD3-161115-012	GW-WARD3-042616-012
Sample Date:					5/25/2011	11/22/2011	4/22/2012	11/26/2012	5/13/2013	10/21/2013	6/15/2014	10/30/2014	6/8/2015	11/16/2015	4/26/2016
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	<0.01	<0.010	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.0050
Boron (dissolved)	mg/L	5	IMAC	1.5	0.167	0.168	0.209	0.236	0.216	0.142	0.196	0.077	0.135	0.063	0.127
Calcium (dissolved)	mg/L	-	-	-	138	145	200	155	187	137	171	108	144	100	127
Iron (dissolved)	mg/L	0.3	AO	0.17	**14.5**	**11.2**	**22.2**	**13.6**	**18.7**	**9.67**	**18.8**	**5.28**	**2.86**	**1.11**	**8.26**
Magnesium (dissolved)	mg/L	-	-	-	30.7	30.3	44.5	33.4	40.8	27.9	41.4	24.4	31.3	22.1	29
Manganese (dissolved)	mg/L	0.05	AO	0.03	**0.17**	**0.199**	**0.257**	**0.213**	**0.219**	**0.149**	**0.247**	**0.127**	**0.164**	**0.0876**	**0.155**
Phosphorus (dissolved)	mg/L	-	-	-	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	13.4	11.6	13.7	11.1	12.5	8.4	11.5	4.8	8.7	4.22	7.82
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	478	522	705	725	614	505	699	406	524	406	468
Ammonia-N	mg/L	-	-	-	4.4	2.84	3.24	4.9	4.39	3.66	7.21	1.62	3.72	1.41	4.77
Chloride	mg/L	250	AO	126	4.5	6.3	9.5	9.1	6.9	5.3	8.5	3.6	5.5	2.54	3.66
Conductivity	µS/cm	-	-	-	892	925	1260	1050	993	933	1180	763	1010	723	898
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	**11**	**5.9**	**6.9**	**7.3**	**9.5**	4.4	**6.9**	4.1	4.2	4.9	**6.8**
Hardness	mg/L	80-100	OG	-	470	487	683	525	634	457	598	369	489	342	436
Nitrate (as N)	mg/L	10	MAC	2.6	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	0.6	0.45	0.164	0.205
Nitrite (as N)	mg/L	1	MAC	0.3	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.050	<0.010	<0.010
Orthophosphate	mg/L	-	-	-	0.0037	0.0042	0.0045	<0.0030	0.0037	0.0032	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
pH, lab	s.u.	-	-	-	7.33	7.47	7.12	6.99	7.05	7.29	7.06	7.25	7.64	7.66	7.4
Phenolics (total)	mg/L	-	-	-	<0.001	0.001	0.0019	<0.0010	0.002	<0.0010	0.0035	0.0077	0.003	0.0081	0.0016
Sulfate	mg/L	500	AO	269	8.3	7.7	43	26.8	10.5	8.5	15.1	16	21.5	11.8	13.2
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	6.67	6	7.8	6.88	5.87	3.95	6.6	1.92	3.98	1.84	4.66
Field Parameters															
Conductivity, field	µS/cm	-	-	-	930	970	1370	973	1200	816	1570	725	734	479	794
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	1.49	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	6.73	7.07	6.42	6.02	6.56	7.02	7.28	7.03	5.98	7.55	6.93
Temperature, field	Deg C	15	AO	-	7.7	9.4	7.2	9.7	6.2	11.5	-	10.8	8.8	12.2	6.6

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW12	MW12	MW12	MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW13
Sample ID:					GW-WARD3-110416-010	GW-WARD3-041117-010	GW-WARD3-112317-012	CRA-4074-02-WARD3-62	GW-WARD3-1110-004	GW-WARD3-0511-002	GW-WARD3-1011-011	GW-WARD3-0412-011	GW-WARD3-1012-011	GW-WARD3-0513-010	GW-WARD3-1013-008
Sample Date:		ODWS[1]	ODWS Source	MABC[2]	11/4/2016	4/11/2017	11/23/2017	5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012	11/26/2012	5/13/2013	10/21/2013
Parameters	**Units**														
Metals															
Aluminum (dissolved)	mg/L	-	-	-	<0.0050	<0.0050	<0.0050	<0.010	<0.010	<0.01	<0.010	<0.01	<0.010	<0.010	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.119	0.128	0.116	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050
Calcium (dissolved)	mg/L	-	-	-	124	125	131	51.8	65.6	63.2	58.4	59.2	61.1	64	58.7
Iron (dissolved)	mg/L	0.3	AO	0.17	**4.75**	**0.454**	**3.99**	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050
Magnesium (dissolved)	mg/L	-	-	-	27.8	29.1	31.2	17.4	18.6	18.9	17.6	18.4	18.8	20.7	17.9
Manganese (dissolved)	mg/L	0.05	AO	0.03	**0.163**	**0.159**	**0.141**	0.002	<0.0010	0.0016	<0.0010	<0.001	<0.0010	<0.0010	0.0011
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050	0.073
Potassium (dissolved)	mg/L	-	-	-	6.51	7.87	6.60	<1.0	<1.0	<1	<1.0	<1	<1.0	<1.0	<1.0
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	487	557	583	234	224	231	230	227	263	228	233
Ammonia-N	mg/L	-	-	-	4	4.41	3.54	<0.050	0.063	0.059	0.086	0.072	<0.050	<0.050	<0.050
Chloride	mg/L	250	AO	126	3.48	4.70	4.99	<2.0	<2.0	<2	<2.0	<2	<2.0	<2.0	<2.0
Conductivity	µS/cm	-	-	-	863	1020	1060	401	411	410	375	405	306	346	438
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	3.7	4.5	4.8	<1.0	2	1.4	1	<1	1.1	2.1	1.5
Hardness	mg/L	80-100	OG	-	425	431	455	201	240	236	218	224	230	245	220
Nitrate (as N)	mg/L	10	MAC	2.6	0.095	0.029	0.131	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	<0.010	<0.010	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	-	<0.0030	<0.0030	0.0051	0.0031	0.0041	0.0044	0.0586	0.0134	0.0037	0.006
pH, lab	s.u.	-	-	-	6.87	7.45	7.68	8	8.05	8.03	8.07	7.97	7.8	8.16	8.01
Phenolics (total)	mg/L	-	-	-	0.0021	0.0036	0.0013	0.008	0.003	<0.001	<0.0010	<0.001	<0.0010	<0.0010	<0.0010
Sulfate	mg/L	500	AO	269	12.8	12.0	9.01	8.7	7.8	9.2	7.4	10.9	8.9	8.8	8.5
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	4.65	5.36	4.92	0.41	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.21
Field Parameters															
Conductivity, field	µS/cm	-	-	-	726	968	682	576	305	421	404	404	324	406	417
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	3.73	-
pH, field	s.u.	6.5-8.5	OG	-	7.11	6.87	6.45	7.4	7.11	7.28	7.95	7.49	6.87	7.6	7.72
Temperature, field	Deg C	15	AO	-	11	7.1	8.7	7.3	8.8	8.2	9	7.3	9.5	6.1	11

Notes:

(1) Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW14	MW14
Sample ID:					GW-WARD3-DD-061514-008	GW-WARD3-103014-013	GW-WARD3-8/6/15-013	GW-WARD3-161115-008	GW-WARD3-042616-013	GW-WARD3-110416-011	GW-WARD3-041117-011	GW-WARD3-112317-013	GW-WARD3-1013-013	GW-WARD3-DD-061514-010
Sample Date:					6/15/2014	10/30/2014	6/8/2015	11/16/2015	4/26/2016	11/4/2016	4/11/2017	11/23/2017	10/21/2013	6/15/2014
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**										
Metals														
Aluminum (dissolved)	mg/L	-	-	-	<0.010	<0.010	<0.010	<0.0050	<0.0050	<0.0050	0.0099	0.0051	<0.010	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	<0.050	<0.050	0.016	0.011	0.015	0.021	0.016	0.015	0.276	0.129
Calcium (dissolved)	mg/L	-	-	-	57.3	58	60.4	55.6	54.4	61.7	60.2	59.7	210	136
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010	<0.010	**10.4**	**5.95**
Magnesium (dissolved)	mg/L	-	-	-	19.6	18	18.5	16.7	18.2	20.1	18.3	18.7	35.0	22.6
Manganese (dissolved)	mg/L	0.05	AO	0.03	0.0036	<0.0010	0.0059	0.00117	0.00405	0.00754	<0.00050	0.00088	**1.41**	**1.22**
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	<1.0	<1.0	<1.0	0.312	0.408	0.742	0.385	0.391	11.3	8.7
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	237	232	224	224	230	231	250	249	776	519
Ammonia-N	mg/L	-	-	-	<0.050	<0.050	0.054	<0.050	0.052	0.075	0.156	0.145	7.70	8.08
Chloride	mg/L	250	AO	126	<2.0	<2.0	0.67	0.78	0.55	0.57	<0.50	<0.50	14.4	2.7
Conductivity	µS/cm	-	-	-	416	431	404	415	419	433	441	453	1320	924
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	<1.0	1.7	2.6	3.2	<1.0	<1.0	<1.0	**9.0**	**7.4**
Hardness	mg/L	80-100	OG	-	224	219	227	208	211	237	226	226	670	433
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	0.026	0.045	<0.020	0.676	0.024	<0.020	<0.10	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.010	<0.010	<0.010	0.032	<0.010	<0.010	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	<0.0030	0.003	<0.0030	<0.0030	<0.0030	-	<0.0030	<0.0030	0.0032	<0.0030
pH, lab	s.u.	-	-	-	8.02	7.86	8.16	8.11	8.06	7.59	8.06	8.10	6.85	6.99
Phenolics (total)	mg/L	-	-	-	0.0031	0.0011	0.003	0.0031	0.0013	0.0031	0.0017	0.0011	0.0018	0.0081
Sulfate	mg/L	500	AO	269	9.8	7.1	7.52	7.39	8.2	9.71	5.26	6.25	5.7	21.7
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	0.33	<0.15	<0.15	<0.15	<1.5	1.9	0.77	1.6	7.50	7.25
Field Parameters														
Conductivity, field	µS/cm	-	-	-	537	425	328	313	410	411	413	378	1310	1260
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	8.22	7.37	6.8	8.11	7.44	7.65	7.68	6.5	7.08	7.20
Temperature, field	Deg C	15	AO	-	-	10.3	8.9	11.7	5.8	10.5	6.3	9.5	10.9	-

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14
Sample ID:					GW-WARD3-1013-013	GW-WARD3-DD-061514-010	GW-WARD3-DD-061514-011	GW-WARD3-103014-010	GW-WARD3-103014-011	GW-WARD3-8/6/15-009	GW-WARD3-8/6/15-010	GW-WARD3-161115-013	GW-WARD3-042616-006	GW-WARD3-042616-008
Sample Date:					10/21/2013	6/15/2014	6/15/2014	10/30/2014	10/30/2014	6/8/2015	6/8/2015	11/16/2015	4/26/2016	4/26/2016
Parameters	Units	ODWS[1]	ODWS Source	MABC[2]			Duplicate		Duplicate		Duplicate			Duplicate
Metals														
Aluminum (dissolved)	mg/L	-	-	-	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0243	0.0069	0.0075
Boron (dissolved)	mg/L	5	IMAC	1.5	0.276	0.129	0.134	0.258	0.252	0.158	0.156	0.408	0.141	0.138
Calcium (dissolved)	mg/L	-	-	-	210	136	137	176	171	167	165	206	180	174
Iron (dissolved)	mg/L	0.3	AO	0.17	**10.4**	**5.95**	**6**	**17.2**	**17**	**17**	**17.5**	**34.1**	**9.86**	**9.93**
Magnesium (dissolved)	mg/L	-	-	-	35	22.6	22.5	21.7	21.3	21.1	21.4	28.6	22.2	22.5
Manganese (dissolved)	mg/L	0.05	AO	0.03	**1.41**	**1.22**	**1.22**	**1.62**	**1.61**	**1.1**	**1.13**	**1.26**	**0.938**	**0.955**
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	11.3	8.7	8.6	9.2	8.9	7.7	7.8	12.2	6.09	6.22
General Chemistry														
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	776	519	495	710	729	538	555	709	538	543
Ammonia-N	mg/L	-	-	-	7.7	8.08	7.97	8.27	8.17	8.84	8.91	13.5	6.1	6.31
Chloride	mg/L	250	AO	126	14.4	2.7	2.6	10.3	10.7	4.9	4.2	7.6	2.29	2.38
Conductivity	µS/cm	-	-	-	1320	924	905	1260	1280	1050	1050	1260	1000	1020
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	**9**	**7.4**	**6.8**	**9.6**	**12.1**	**6.5**	**7**	**10.6**	**8.6**	**9.4**
Hardness	mg/L	80-100	OG	-	670	433	436	528	516	504	500	632	541	527
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	<0.10	0.12	<0.10	<0.10	<0.10	0.042	<0.020	<0.020
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.10	<0.10	<0.10	<0.050	<0.050	<0.010	0.012	0.016
Orthophosphate	mg/L	-	-	-	0.0032	<0.0030	<0.0030	0.0036	0.0033	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
pH, lab	s.u.	-	-	-	6.85	6.99	6.99	6.69	6.68	7.14	7.12	7	7.06	7.06
Phenolics (total)	mg/L	-	-	-	0.0018	0.0081	0.0084	0.0157	0.0019	0.0036	0.0062	0.0049	0.0044	0.0029
Sulfate	mg/L	500	AO	269	5.7	21.7	21.3	<2.0	<2.0	17.5	16.2	0.96	27.9	28.2
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	7.5	7.25	7.45	10.3	9.14	9.04	8.85	14.8	12.1	9.9
Field Parameters														
Conductivity, field	µS/cm	-	-	-	1310	1260	1260	1200	1200	867	867	968	586	586
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	7.08	7.2	7.2	6.78	6.78	5.68	5.68	6.94	7.1	7.1
Temperature, field	Deg C	15	AO	-	10.9	-	-	10.4	10.4	9.3	9.3	11.8	4.8	4.8

Notes:

[1]	Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					MW14	MW14	MW14	MW14	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sample ID:					GW-WARD3-110416-007	GW-WARD3-041117-012	GW-WARD3-112317-010	GW-WARD3-112317-011	CRA-4074-02-WARD3-63	GW-WARD3-1110-005	GW-WARD3-0511-008	GW-WARD3-1011-004	GW-WARD3-0412-003	GW-WARD3-1012-004	GW-WARD3-0513-013
Sample Date:					11/4/2016	4/11/2017	11/23/2017	11/23/2017 Duplicate	5/12/2010 Field Blank	11/29/2010 Field Blank	5/25/2011 Field Blank	11/22/2011 Field Blank	4/22/2012 Field Blank	11/26/2012 Field Blank	5/13/2013 Field Blank
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**											
Metals															
Aluminum (dissolved)	mg/L	-	-	-	0.0103	<0.0050	0.0203	0.0227	<0.010	0.059	0.013	0.025	<0.01	0.016	<0.010
Boron (dissolved)	mg/L	5	IMAC	1.5	0.324	0.097	0.233	0.222	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050
Calcium (dissolved)	mg/L	-	-	-	206	167	190	182	<0.50	3.55	<0.5	<0.50	<0.5	<0.50	<0.50
Iron (dissolved)	mg/L	0.3	AO	0.17	**25.1**	**0.343**	**24.4**	**24.8**	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050
Magnesium (dissolved)	mg/L	-	-	-	29.2	21.7	24.8	25.4	<0.50	<0.50	<0.5	<0.50	<0.5	<0.50	<0.50
Manganese (dissolved)	mg/L	0.05	AO	0.03	**1.45**	**1.38**	**1.41**	**1.43**	<0.0010	0.0029	<0.001	<0.0010	<0.001	<0.0010	<0.0010
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	9.67	5.76	8.24	8.24	<1.0	<1.0	<1	<1.0	<1	<1.0	<1.0
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	642	515	577	588	<10	<10	<10	<10	<10	<10	<10
Ammonia-N	mg/L	-	-	-	9.1	3.73	9.88	7.13	<0.050	<0.050	<0.05	<0.050	<0.05	<0.050	<0.050
Chloride	mg/L	250	AO	126	8.7	1.96	4.10	3.98	<2.0	<2.0	<2	<2.0	<2	<2.0	<2.0
Conductivity	µS/cm	-	-	-	1220	1070	1070	1060	2.36	3.17	1.68	2.68	<3	3.3	<3.0
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	**9.1**	**5.1**	**7.0**	**7.4**	<1.0	1.2	<1	1.6	<1	<1.0	<1.0
Hardness	mg/L	80-100	OG	-	634	507	578	559	<10	<10	<10	<10	<10	<10	<10
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	2.46	<0.020	<0.020	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10
Nitrite (as N)	mg/L	1	MAC	0.3	<0.050	0.043	<0.010	<0.010	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10
Orthophosphate	mg/L	-	-	-	-	<0.0030	<0.0030	<0.0030	<0.0030	0.0049	<0.003	<0.0030	0.0031	<0.0030	<0.0030
pH, lab	s.u.	-	-	-	6.55	7.23	7.22	7.31	6.74	7.63	7.55	7.44	7.3	7.24	7.4
Phenolics (total)	mg/L	-	-	-	0.0037	0.0032	<0.0010	0.0048	<0.0010	0.003	<0.001	<0.0010	<0.001	<0.0010	<0.0010
Sulfate	mg/L	500	AO	269	<1.5	72.2	1.93	2.17	<2.0	<2.0	<2	<2.0	<2	<2.0	<2.0
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	12.8	4.94	10.9	11.4	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	0.24
Field Parameters															
Conductivity, field	µS/cm	-	-	-	1130	1060	1150	1150	-	-	-	-	-	-	-
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, field	s.u.	6.5-8.5	OG	-	6.83	6.71	6.41	6.41	-	-	-	-	-	-	-
Temperature, field	Deg C	15	AO	-	9.7	5.3	9.6	9.6	-	-	-	-	-	-	-

Notes:

[1] Ministry of the Environment (MOE), Ontario Drinking Water Standards (ODWS), August 2000, revised January 2001 and June 2003, where applicable.
[2] Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.5

General Chemistry and Dissolved Metals
Groundwater Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:					Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Sample ID:					GW-WARD3-1013-015	GW-WARD3-DD-061514-013	GW-WARD3-103014-015	GW-WARD3-8/6/15-015	GW-WARD3-161115-015	GW-WARD3-042616-015	GW-WARD3-110416-013
Sample Date:					10/21/2013	6/15/2014	10/30/2014	6/8/2015	11/16/2015	4/26/2016	11/4/2016
Parameters	**Units**	**ODWS[1]**	**ODWS Source**	**MABC[2]**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**	**Field Blank**
Metals											
Aluminum (dissolved)	mg/L	-	-	-	<0.010	0.014	<0.010	0.013	0.0133	<0.0050	<0.0050
Boron (dissolved)	mg/L	5	IMAC	1.5	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010	<0.010
Calcium (dissolved)	mg/L	-	-	-	<0.50	<0.50	<0.50	<0.50	0.089	0.055	<0.050
Iron (dissolved)	mg/L	0.3	AO	0.17	<0.050	<0.050	<0.050	<0.050	<0.010	<0.010	<0.010
Magnesium (dissolved)	mg/L	-	-	-	<0.50	<0.50	<0.50	<0.50	<0.050	<0.050	<0.050
Manganese (dissolved)	mg/L	0.05	AO	0.03	<0.0010	<0.0010	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050
Phosphorus (dissolved)	mg/L	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (dissolved)	mg/L	-	-	-	<1.0	<1.0	<1.0	<1.0	<0.050	<0.050	<0.050
General Chemistry											
Alkalinity, total (as CaCO3)	mg/L	30-500	OG	-	<10	<10	<10	<10	<10	<10	<10
Ammonia-N	mg/L	-	-	-	0.053	<0.050	<0.050	0.068	<0.050	0.12	0.025
Chloride	mg/L	250	AO	126	<2.0	<2.0	<2.0	<0.50	<0.50	<0.50	<0.50
Conductivity	µS/cm	-	-	-	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Dissolved organic carbon (DOC)	mg/L	5	AO	3.05	<1.0	<1.0	<1.0	<1.0	<1.0	2.2	<1.0
Hardness	mg/L	80-100	OG	-	<10	<10	<10	<10	<10	<10	<10
Nitrate (as N)	mg/L	10	MAC	2.6	<0.10	<0.10	<0.10	<0.020	<0.020	<0.020	<0.020
Nitrite (as N)	mg/L	1	MAC	0.3	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	-	-	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	-
pH, lab	s.u.	-	-	-	6.82	7.23	7.03	7.21	7.38	6.7	7.56
Phenolics (total)	mg/L	-	-	-	<0.0010	0.0067	0.0016	0.0093	0.0269	0.0025	0.0028
Sulfate	mg/L	500	AO	269	<2.0	<2.0	<2.0	<0.30	<0.30	<0.30	<0.30
Total kjeldahl nitrogen (TKN)	mg/L	-	-	-	<0.15	<0.15	<0.15	0.22	0.19	<0.15	<0.15
Field Parameters											
Conductivity, field	µS/cm	-	-	-	-	-	-	-	-	-	-
Dissolved oxygen (DO), field	mg/L	-	-	-	-	-	-	-	-	-	-
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.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
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.

Table 4.6

General Chemistry and Total Metals
Surface Water Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1
Sample Date:				**5/12/2010**	**11/29/2010**	**5/25/2011**	**11/22/2011**	**4/22/2012**	**11/26/2012**	**5/13/2013**	**10/21/2013**	**6/15/2014**	**10/30/2014**	**6/8/2015**	**11/16/2015**	**4/26/2016**	**4/11/2017**	**11/23/2017**
Parameters	**Units**	***PWOO*** [1]	**Median Background 2012 - 2017**															
Metals																		
Aluminum	mg/L	0.075 (a)	0.212	0.024	**0.111**	**0.1**	**0.128**	**0.251**	0.011	0.015	**0.391**	0.065	0.05	**0.342**	**0.212**	**0.263**	**1.51**	0.036
Boron	mg/L	0.2	0.05	0.086	<0.050	<0.05	<0.050	<0.05	0.061	<0.050	<0.050	<0.050	0.052	0.018	0.044	0.056	0.026	0.034
Calcium	mg/L	-	87.7	93.9	84.5	84.6	88.1	77.2	90.3	82.4	87.7	81.3	93.2	91.3	96.5	80.2	52.7	92.8
Iron	mg/L	0.3	0.495	**0.306**	0.093	**0.75**	0.123	**0.803**	0.128	0.1	**0.495**	**0.385**	**0.497**	**4.55**	**0.425**	**0.516**	**1.24**	0.289
Magnesium	mg/L	-	17.6	21.4	22.8	21	14.5	15.2	20.4	17.3	23.1	16	22.8	17.6	22.9	16.7	13.5	21.8
Manganese	mg/L	-	0.0703	0.05	0.0223	0.217	0.0228	0.206	0.0141	0.028	0.0538	0.266	0.383	0.514	0.0703	0.0591	0.0231	0.0945
Phosphorus	mg/L	0.01-0.03 (b)	0.05	**0.052**	<0.050	**0.075**	**0.056**	**0.077**	<0.10	**0.052**	**0.067**	<0.050	<0.050	**0.274**	<0.050	<0.050	<0.050	<0.050
Potassium	mg/L	-	2.39	3.3	2	2.3	1.4	2.2	2.6	2.3	3.2	2.2	2.9	1.6	2.39	2.75	1.62	1.90
General Chemistry																		
Alkalinity, total (as CaCO3)	mg/L	-	305	313	275	288	269	289	315	277	306	280	329	305	340	286	184	329
Ammonia-N	mg/L	-	0.082	0.443	0.298	0.607	<0.050	0.082	0.052	<0.050	<0.083	0.313	<0.050	0.207	0.062	0.526	0.117	0.504
Chloride	mg/L	-	2.9	3.4	2.4	<2	2.2	2.9	2.9	2.2	10.2	<2.0	6.9	0.99	7.96	3.53	1.81	4.68
Conductivity	µS/cm	-	523	563	532	528	438	523	385	502	595	507	604	553	634	507	351	595
Dissolved organic carbon (DOC)	mg/L	-	6.4	3.9	5.6	6.2	4.8	4.1	5.1	4.7	8	5.3	6.8	9.7	8	6.4	5.5	4.0
Hardness	mg/L	-	300	323	305	298	280	255	309	277	314	269	327	300	335	269	187	321
Nitrate (as N)	mg/L	-	0.33	0.16	0.16	0.18	0.42	0.33	0.14	0.36	2.64	0.24	<0.10	<0.020	0.418	0.579	0.491	0.055
Nitrite (as N)	mg/L	-	0.1	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	0.018	0.021	0.014	<0.010	<0.010
Orthophosphate	mg/L	-	0.0062	<0.0030	0.0076	0.0041	0.0092	0.0037	0.0047	<0.0030	0.0189	0.0077	0.009	0.0106	0.0131	<0.0030	<0.0030	0.0072
pH, lab	s.u.	-	8.01	7.87	8.03	7.8	7.93	8.07	7.83	8.07	8.01	8.03	7.75	7.74	7.95	8.06	7.93	8.05
Phenolics (total)	mg/L	0.001	0.001	<0.0010	<0.0010	0.001	<0.0010	<0.001	<0.0010	0.001	<0.0010	**0.0034**	<0.0010	**0.0041**	**0.0167**	<0.0010	0.0010	<0.0010
Phosphorus	mg/L	0.01-0.03 (b)	0.0394	0.0181	0.0144	0.0296	**0.0679**	**0.562**	**0.0358**	0.0202	**0.0394**	**0.0336**	**0.0514**	**0.232**	**0.0624**	0.0168	**0.0733**	0.0291
Sulfate	mg/L	-	5.4	5.7	8	4	9.4	4.4	31.5	5	10.5	<2.0	5.4	0.41	9.06	6.35	3.38	3.23
Total kjeldahl nitrogen (TKN)	mg/L	-	0.53	1.11	0.83	0.81	<0.15	0.58	0.33	<0.39	0.3	0.67	0.53	0.97	0.49	0.73	0.56	0.88
Un-ionized ammonia	mg/L	0.02 (c)	0.00061	0.00458	0.00064	0.00129	<0.00072	0.0007	<0.00001	<0.0002188	0.0011449	0.01408	<0.00052	0.00008	0.00104	-	0.00135	0.00023
Field Parameters																		
Dissolved oxygen (DO), field	mg/L	<4 (d)	4.77	7.01	8.32	**2.75**	-	7.6	4.24	6.3	4.77	-	**1.62**	7.92	**2.84**	-	7.3	-
pH, field	s.u.	6.5-8.5	7.71	7.74	7.25	7	7.87	7.47	6.87	7.46	7.87	8.09	7.71	**5.91**	7.96	7.97	7.76	**6.49**
Temperature, field	Deg C	-	8.7	7.8	2.2	9.2	8.3	12.4	2.7	7.5	10.2	16.7	8.7	18.9	7.5	7.1	8.5	4.5

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) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(c) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(d) 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.
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

Table 4.6

General Chemistry and Total Metals
Surface Water Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2
Sample Date:			**5/12/2010**	**11/29/2010**	**5/25/2011**	**11/22/2011**	**4/22/2012**	**11/26/2012**	**5/13/2013**	**10/21/2013**	**6/15/2014**	**10/30/2014**	**6/8/2015**	**11/16/2015**	**4/26/2016**	**11/3/2016**	**4/11/2017**	**11/23/2017**
Parameters	**Units**	***PWOO*** [1]																
Metals																		
Aluminum	mg/L	0.075 (a)	<0.010	**0.084**	0.025	0.03	0.059	<0.010	0.022	**0.083**	0.035	0.033	0.07	0.024	0.072	0.047	**1.01**	0.066
Boron	mg/L	0.2	0.196	0.077	0.111	**0.214**	0.173	**0.233**	0.172	0.144	**0.351**	0.165	0.195	0.146	0.129	**0.776**	0.067	0.100
Calcium	mg/L	-	94.9	94	94.6	115	90.5	95.5	103	97.6	128	99.4	94.2	106	92.8	137	56.8	103
Iron	mg/L	0.3	**1.2**	**0.611**	**1.33**	0.235	**1.88**	<0.050	**1.67**	**0.463**	**1.16**	**0.728**	**2.9**	0.28	**1.05**	**0.416**	**1.26**	**1.30**
Magnesium	mg/L	-	32.1	29.2	26.3	27.6	25.3	31	28.2	27.7	36.8	28.3	25.8	30.2	22.7	48.8	15.9	27.2
Manganese	mg/L	-	0.18	0.114	0.195	0.142	0.176	0.0275	0.208	0.151	0.483	0.14	0.322	0.0873	0.141	0.783	0.0453	0.166
Phosphorus	mg/L	0.01-0.03 (b)	<0.050	<0.050	<0.05	<0.050	<0.05	<0.10	**0.051**	**0.088**	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium	mg/L	-	9.6	5.3	5.9	10.2	9.5	9.8	8.5	7.8	15	8.1	8.8	7.43	5.98	25.8	2.83	5.37
General Chemistry																		
Alkalinity, total (as CaCO3)	mg/L	-	400	327	345	414	407	380	403	378	536	399	365	393	347	559	219	377
Ammonia-N	mg/L	-	1.59	0.751	1.27	1.68	1.8	1.46	2.18	1.03	7.19	2.07	2.66	1.16	1.53	3.57	0.400	1.53
Chloride	mg/L	-	4.9	3.7	3.3	7.7	5.5	7.8	4.6	11.9	9.6	7.8	4.22	7.59	3.58	19.1	2.20	5.19
Conductivity	µS/cm	-	706	621	621	750	721	450	656	708	957	726	649	725	614	1090	408	680
Dissolved organic carbon (DOC)	mg/L	-	4	5.2	6.8	6.7	5.8	6.6	6.5	8.5	8.3	7.8	6.8	7.7	7.2	10.5	6.1	5.0
Hardness	mg/L	-	369	355	345	401	330	366	374	358	470	365	341	389	325	544	207	368
Nitrate (as N)	mg/L	-	0.35	0.2	0.35	0.49	0.58	0.65	0.36	1.38	0.33	0.22	0.284	0.435	0.628	0.06	0.506	0.201
Nitrite (as N)	mg/L	-	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	0.049	<0.010	0.014	0.011	<0.010	<0.010
Orthophosphate	mg/L	-	<0.0030	0.0032	<0.003	0.0039	0.0033	0.003	<0.0030	0.0031	<0.0030	0.0047	0.0035	<0.0030	<0.0030	-	<0.0030	<0.0030
pH, lab	s.u.	-	7.92	7.96	7.87	7.85	7.94	7.84	8.12	7.86	7.88	7.66	8.13	7.94	7.94	7.55	7.97	8.07
Phenolics (total)	mg/L	0.001	<0.0010	<0.0010	<0.001	<0.0010	<0.001	<0.0010	<0.0010	<0.0010	**0.0047**	**0.0014**	**0.0047**	**0.0043**	**0.0018**	**0.0041**	**0.0015**	<0.0010
Phosphorus	mg/L	0.01-0.03 (b)	0.0179	0.0119	0.011	0.0086	0.0126	0.0038	0.0119	0.0125	**0.0318**	0.0133	0.025	0.0115	0.0128	**0.0474**	**0.0425**	0.0298
Sulfate	mg/L	-	10.7	11.8	5.3	17	7.5	35	6.5	12.6	2	7.1	1.75	15.4	4.28	24.5	6.41	5.19
Total kjeldahl nitrogen (TKN)	mg/L	-	2.6	1.16	1.65	2.88	3.19	2.05	2.52	1.28	6.72	2.24	2.96	1.54	1.76	4.58	0.84	1.87
Un-ionized ammonia	mg/L	0.02 (c)	0.01304	0.00113	0.00426	0.01357	0.0117	0.0014	0.0079486	0.0175503	**0.22494**	**0.02246**	0.00054	0.01565	-	-	0.00252	0.00055
Field Parameters																		
Conductivity, field	µS/cm	-	659	447	632	772	690	570	657	639	1400	712	526	564	602	1080	409	570
Dissolved oxygen (DO), field	mg/L	<4 (d)	6.58	8.52	6.4	-	7.87	4.33	5.81	4.68	-	**2.8**	8.55	4.17	-	-	6.95	-
pH, field	s.u.	6.5-8.5	7.68	7.08	7.18	7.88	7.31	6.9	7.37	7.97	7.95	7.71	**5.82**	7.84	7.44	7.99	7.49	**6.42**
Temperature, field	Deg C	-	6.6	2.7	9.8	0.8	14.5	2.4	7.8	10	16	9.2	13.9	8.2	7.1	10.6	8.7	3.7

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) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(c) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(d) 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.
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

Table 4.6

General Chemistry and Total Metals
Surface Water Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3
Sample Date:			**5/12/2010**	**5/25/2011**	**11/22/2011**	**4/22/2012**	**11/26/2012**	**5/13/2013**	**10/21/2013**	**6/15/2014**	**10/30/2014**	**6/8/2015**	**11/16/2015**	**4/26/2016**	**11/3/2016**	**4/11/2017**	**11/23/2017**
Parameters	**Units**	***PWOO*** [1]															
Metals																	
Aluminum	mg/L	0.075 (a)	0.068	**0.118**	0.044	**0.106**	0.05	0.057	**10**	**0.412**	**0.199**	**0.64**	**0.274**	**1.15**	**0.942**	**3.25**	**1.20**
Boron	mg/L	0.2	0.171	0.121	<0.050	<0.05	<0.050	0.113	<0.10	0.175	<0.050	0.025	0.014	0.017	**0.241**	0.025	0.012
Calcium	mg/L	-	96.3	104	84.7	65.2	84.6	102	73.4	101	92.8	102	88	63.1	108	44.0	70.0
Iron	mg/L	0.3	0.207	0.247	<0.050	0.177	<0.050	0.098	**6.74**	**0.614**	**0.347**	**0.881**	0.276	**1.02**	**1.32**	**3.01**	**1.45**
Magnesium	mg/L	-	32.4	25.8	19.6	17.9	23.8	26.5	24.6	23.6	28.6	30.3	25.4	19.1	29.3	14.4	22.2
Manganese	mg/L	-	0.106	0.0474	0.0133	0.0213	0.01	0.0226	0.092	0.0828	0.0437	0.109	0.018	0.0404	0.199	0.0405	0.0857
Phosphorus	mg/L	0.01-0.03 (b)	<0.050	**0.055**	**0.063**	**0.064**	**0.13**	<0.050	<0.50	<0.050	**0.062**	**0.19**	**0.082**	**0.18**	**0.056**	**0.253**	**0.148**
Potassium	mg/L	-	7.5	7	2.7	2.1	6.1	7.2	<10	8.2	3.5	4.8	2.94	4.79	9.73	3.22	2.55
General Chemistry																	
Alkalinity, total (as CaCO3)	mg/L	-	364	321	252	248	279	321	253	368	340	319	273	224	364	162	253
Ammonia-N	mg/L	-	0.09	0.209	<0.050	<0.05	0.284	<0.050	<0.148	0.076	0.099	0.095	0.06	0.193	0.114	0.110	0.272
Chloride	mg/L	-	5.6	10.2	14.6	21.1	24.2	17.5	14.8	20.9	19.4	35.4	18.3	19	27.2	7.19	8.50
Conductivity	µS/cm	-	662	615	543	520	415	606	529	691	675	766	634	485	731	340	502
Dissolved organic carbon (DOC)	mg/L	-	4.3	8.2	7.2	7.8	8.2	3	9.4	9.1	9.2	7.7	9.3	11.7	7.8	8.2	7.1
Hardness	mg/L	-	374	365	292	236	309	365	285	349	350	379	324	236	391	169	266
Nitrate (as N)	mg/L	-	0.66	0.72	1.13	0.33	1.98	0.84	3.03	0.27	1.83	5.97	2.39	1.09	<0.020	1.14	0.854
Nitrite (as N)	mg/L	-	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	0.06	<0.010	0.027	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	<0.0030	0.0048	0.0379	0.022	0.0271	0.007	0.0552	<0.0030	0.0273	0.082	0.0491	0.0764	-	0.099	0.0383
pH, lab	s.u.	-	8.17	8.1	8.15	8.18	8.01	8.29	7.85	8.33	7.92	8.31	8.1	8.12	7.9	7.96	8.11
Phenolics (total)	mg/L	0.001	<0.0010	<0.001	<0.0010	<0.001	<0.0010	**0.002**	<0.0010	**0.0038**	**0.0017**	**0.0049**	**0.0063**	**0.0024**	**0.0023**	**0.0024**	**0.0012**
Phosphorus	mg/L	0.01-0.03 (b)	0.0107	0.0102	**0.0503**	**0.0372**	**0.0583**	0.0231	**0.164**	0.0239	**0.0623**	**0.112**	**0.0834**	**0.144**	**0.347**	**0.251**	**0.0584**
Sulfate	mg/L	-	14.8	14.6	25.2	10.5	33.6	21.4	11.5	18.8	14.9	27.3	15.9	9.38	19.1	6.10	8.01
Total kjeldahl nitrogen (TKN)	mg/L	-	0.62	0.59	0.42	0.58	1.53	<0.56	1.02	0.68	0.86	1.06	0.55	0.99	1.71	1.28	0.67
Un-ionized ammonia	mg/L	0.02 (c)	0.00241	0.00092	<0.00099	<0.0005	0.0005	<0.0001663	0.0015441	0.00628	0.00163	0.00006	0.00141	-	-	0.00145	0.00009
Field Parameters																	
Conductivity, field	µS/cm	-	610	629	537	471	486	388	491	1000	622	617	478	441	688	324	431
Dissolved oxygen (DO), field	mg/L	<4 (d)	8.12	6.73	-	**3.69**	4.98	6.56	7.12	-	6.76	11.83	8.32	-	-	6.98	-
pH, field	s.u.	6.5-8.5	8.2	7.34	8.1	7.67	7.03	7.33	7.71	8.32	7.86	**6.4**	8.02	7.79	8.11	7.82	**6.32**
Temperature, field	Deg C	-	6.6	8.6	5.7	8.5	6	7.8	11.3	18.2	10.2	11.4	10.1	6.7	10.4	8.5	5.3

Notes:

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(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.
(b) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(c) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(d) 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.
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

Table 4.6

General Chemistry and Total Metals
Surface Water Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4
Sample Date:			**5/12/2010**	**11/29/2010**	**5/25/2011**	**11/22/2011**	**4/22/2012**	**11/26/2012**	**5/13/2013**	**10/21/2013**	**6/15/2014**	**10/30/2014**	**6/8/2015**	**11/16/2015**	**4/26/2016**	**11/3/2016**	**4/11/2017**	**11/23/2017**
Parameters	**Units**	***PWOO*** [1]																
Metals																		
Aluminum	mg/L	0.075 (a)	0.019	**1.12**	0.051	**0.446**	**0.263**	**0.443**	**0.271**	**0.407**	0.027	**0.698**	**1.1**	**0.184**	**0.078**	**2.51**	0.063	0.069
Boron	mg/L	0.2	0.073	0.069	0.067	0.075	0.064	0.1	0.092	0.101	0.074	0.089	0.076	0.086	0.062	0.101	0.077	0.059
Calcium	mg/L	-	37.8	87.3	29.8	66.9	45.9	80.2	57	62.2	20.1	67.8	18.2	60.7	52.3	58.8	57.2	62.7
Iron	mg/L	0.3	0.188	**1.6**	**0.331**	**1.02**	**0.397**	**0.849**	**0.403**	**1.49**	0.246	**1.41**	**1.13**	**1.32**	0.268	**3.68**	**0.437**	**0.309**
Magnesium	mg/L	-	22.4	28.5	19.2	18.7	20.4	26.7	27.1	23.3	15.2	22.5	19.4	23.3	18.3	20.5	18.3	21.5
Manganese	mg/L	-	0.0034	0.11	0.0324	0.0609	0.0187	0.0507	0.0184	0.153	0.0182	0.0816	0.0578	0.171	0.0607	0.203	0.110	0.0189
Phosphorus	mg/L	0.01-0.03 (b)	**0.052**	**0.127**	**0.058**	**0.134**	**0.064**	**0.27**	**0.088**	**0.292**	<0.050	**0.194**	**0.141**	**0.323**	**0.062**	**0.799**	**0.124**	<0.050
Potassium	mg/L	-	2	11.4	4.2	11.1	5	14.5	4.5	14.2	<1.0	9.9	1.2	13	4.34	18.1	5.35	8.42
General Chemistry																		
Alkalinity, total (as CaCO3)	mg/L	-	163	275	149	249	216	290	195	269	117	279	111	254	204	242	214	255
Ammonia-N	mg/L	-	<0.050	0.478	<0.05	3.14	0.056	3.29	<0.050	1.83	0.071	4.05	0.172	0.095	0.113	9.78	<0.020	1.99
Chloride	mg/L	-	<2.0	12.2	9.1	12.2	5.6	13.5	6.5	10.9	5.4	10.3	8.67	13	8.59	17.2	10.4	12.0
Conductivity	µS/cm	-	308	563	274	533	404	386	302	525	216	550	213	494	393	529	428	493
Dissolved organic carbon (DOC)	mg/L	-	9.2	10.6	11	15.9	9.9	25.4	9.9	19.1	14.2	14.2	12.6	24.5	8.6	23	8.5	9.9
Hardness	mg/L	-	187	335	153	244	199	310	254	251	113	262	125	247	206	231	218	245
Nitrate (as N)	mg/L	-	<0.10	<0.10	<0.1	0.15	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.020	0.022	<0.020	0.023	<0.020	0.220
Nitrite (as N)	mg/L	-	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	0.011	<0.010	<0.010
Orthophosphate	mg/L	-	<0.0030	0.0031	0.0032	0.0266	0.0041	0.0145	0.0034	0.008	0.0081	0.0452	0.0232	0.011	<0.0030	-	<0.0030	0.0070
pH, lab	s.u.	-	8.59	8.17	8.7	8.07	8.48	8.08	8.49	7.93	10.33	7.99	9.42	8.19	8.23	7.53	8.26	8.21
Phenolics (total)	mg/L	0.001	<0.0010	<0.0010	**0.002**	**0.002**	<0.001	<0.0010	**0.003**	<0.0010	**0.0037**	<0.0010	**0.0071**	**0.015**	**0.0035**	**0.0034**	**0.0018**	<0.0010
Phosphorus	mg/L	0.01-0.03 (b)	0.0237	**0.113**	0.0293	**0.111**	0.028	**0.173**	0.0287	**0.189**	0.0288	**0.16**	**0.14**	**0.439**	**0.0486**	**0.854**	**0.0994**	0.0273
Sulfate	mg/L	-	4.8	8.6	4.4	20.2	11	25.3	8.1	3.1	3.2	2.9	3.22	3.55	5.35	7.23	10.4	4.82
Total kjeldahl nitrogen (TKN)	mg/L	-	0.79	1.94	0.61	6	<0.15	5.61	<0.67	3.23	1.1	5.19	1.05	4.09	0.81	17.7	1.24	2.90
Un-ionized ammonia	mg/L	0.02 (c)	<0.00546	0.00059	<0.00198	**0.02633**	0.003	0.0058	<0.0006833	**0.0302638**	**0.07756**	**0.09838**	0.01551	0.00113	-	-	<0.00140	0.00063
Field Parameters																		
Conductivity, field	µS/cm	-	298	432	285	579	399	458	355	575	287	532	182	377	359	514	396	416
Dissolved oxygen (DO), field	mg/L	<4 (d)	8.61	9.55	8.31	-	10.26	5.26	7.74	**3.37**	-	5.33	6.95	8.26	-	-	8.57	-
pH, field	s.u.	6.5-8.5	**8.78**	7.06	8.15	7.9	8.25	7.15	7.9	7.95	**10.41**	8.07	8.38	7.85	8.06	7.96	8.45	**6.39**
Temperature, field	Deg C	-	8.4	0.9	13.2	0.7	14.1	2.6	9.2	10.2	18	9.05	17.6	6.3	9.3	11.9	11.9	2.9

Notes:

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Table 4.6

General Chemistry and Total Metals
Surface Water Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5	SW5
Sample Date:			5/12/2010	11/29/2010	5/25/2011	11/22/2011	4/22/2012	5/13/2013	6/8/2015	6/8/2015	4/26/2016	4/11/2017	11/23/2017
Parameters	Units	*PWOO* [1]											
Metals													
Aluminum	mg/L	0.075 (a)	**1.34**	**0.905**	0.043	**0.442**	**2.38**	**0.132**	**33.5**	**33.5**	0.014	0.037	**2.50**
Boron	mg/L	0.2	**0.208**	0.157	**0.223**	**0.268**	<0.5	0.195	**0.37**	**0.37**	**0.269**	**0.250**	**0.29**
Calcium	mg/L	-	143	175	113	181	142	139	271	271	120	105	166
Iron	mg/L	0.3	**5.21**	**1.65**	0.139	**5.21**	**13.2**	0.134	**123**	**123**	0.072	0.086	**4.60**
Magnesium	mg/L	-	40.1	46.1	29.4	41.8	36.4	36.4	72.3	72.3	30.3	28.4	50.6
Manganese	mg/L	-	0.645	0.38	0.337	0.888	1.17	0.348	4.23	4.23	0.114	0.182	0.634
Phosphorus	mg/L	0.01-0.03 (b)	**0.181**	**0.113**	<0.05	**0.1**	**0.81**	**0.067**	**6.47**	**6.47**	<0.050	<0.050	<0.50
Potassium	mg/L	-	22.3	18.7	16.1	27.1	17	17	26	26	13.1	11.5	21.9
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	-	499	581	407	603	480	467	507	507	437	374	586
Ammonia-N	mg/L	-	1.57	4.85	1.43	3.88	1.2	0.79	5.32	5.32	0.71	0.557	3.14
Chloride	mg/L	-	39.2	42.3	19.9	38.3	40.6	37.8	26.5	26.5	19.8	14.6	33.7
Conductivity	µS/cm	-	1140	1290	835	1180	1080	926	1020	1020	834	778	1150
Dissolved organic carbon (DOC)	mg/L	-	7.4	6.4	9	9.8	7.7	8.1	12.2	12.2	9.4	7.9	8.7
Hardness	mg/L	-	522	626	403	623	505	496	975	975	424	380	623
Nitrate (as N)	mg/L	-	1.21	0.46	0.78	<0.10	1.16	1.97	0.3	0.3	1.13	1.53	0.559
Nitrite (as N)	mg/L	-	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	0.083	0.083	0.01	<0.010	<0.010
Orthophosphate	mg/L	-	<0.0030	<0.0030	<0.003	0.0041	0.0034	<0.0030	0.0039	0.0039	<0.0030	<0.0030	<0.0030
pH, lab	s.u.	-	7.68	7.75	7.68	7.58	7.78	7.88	8.12	8.12	7.9	7.77	7.73
Phenolics (total)	mg/L	0.001	<0.0010	<0.0010	0.001	0.001	<0.001	0.001	**0.0103**	**0.0103**	<0.0010	**0.0023**	**0.0036**
Phosphorus	mg/L	0.01-0.03 (b)	**0.0961**	**0.127**	0.0035	**0.0659**	**0.349**	**0.126**	**20**	**20**	0.0165	0.0108	**0.466**
Sulfate	mg/L	-	62.8	65.2	35.2	58.9	68.6	61	15.4	15.4	26.9	36.9	26.2
Total kjeldahl nitrogen (TKN)	mg/L	-	3.73	7.44	1.87	6.63	2.78	1.74	9.79	9.79	1.06	1.21	11.7
Un-ionized ammonia	mg/L	0.02 (c)	0.00888	0.00222	0.00216	0.01972	0.0035	0.0016786	0.00236	0.00236	-	0.00272	0.00225
Field Parameters													
Conductivity, field	µS/cm	-	1140	1200	804	1230	1100	923	990	990	730	711	1110
Dissolved oxygen (DO), field	mg/L	<4 (d)	7.09	4.18	**3.16**	-	9.58	4.18	6.09	6.09	-	5.67	-
pH, field	s.u.	6.5-8.5	7.49	**6.48**	6.87	7.62	7.02	7.18	**6.16**	**6.16**	7.52	7.48	6.53
Temperature, field	Deg C	-	7.4	5	8.7	2.4	12.6	6.5	13.9	13.9	6.7	5.79	9.1

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) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(c) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(d) 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.
\- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

Table 4.6

General Chemistry and Total Metals
Surface Water Analytical Results
2017 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW6	SW6	SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW7
Sample Date:			**5/12/2010**	**11/29/2010**	**5/12/2010**	**11/29/2010**	**11/29/2010**	**5/25/2011**	**11/22/2011**	**4/22/2012**	**5/13/2013**	**6/15/2014**	**10/30/2014**	**6/8/2015**	**4/26/2016**	**4/11/2017**	**11/23/2017**
Parameters	**Units**	***PWOO*** [1]															
Metals																	
Aluminum	mg/L	0.075 (a)	**0.11**	**0.385**	0.01	**0.132**	**0.266**	0.026	0.019	0.027	0.012	0.014	0.046	0.021	0.011	0.027	0.032
Boron	mg/L	0.2	<0.050	<0.050	<0.050	<0.050	0.092	<0.05	<0.050	<0.05	<0.050	<0.050	<0.050	0.017	0.015	0.011	0.020
Calcium	mg/L	-	91.1	85.3	78.7	55	108	75.3	76.7	76.8	89.5	88.4	73.4	92.1	79.8	53.2	76.1
Iron	mg/L	0.3	**0.393**	**0.46**	0.068	0.155	0.27	0.267	0.266	0.161	0.108	0.217	**1.74**	**1.15**	0.17	0.077	0.269
Magnesium	mg/L	-	21.7	23.8	20.1	14.2	31.7	17	16.8	16.5	19.7	19.4	15.8	18.8	17.4	13.3	17.1
Manganese	mg/L	-	0.0429	0.0283	0.0091	0.0493	0.0578	0.0797	0.0571	0.017	0.0283	0.055	0.0721	0.111	0.031	0.0230	0.128
Phosphorus	mg/L	0.01-0.03 (b)	**0.071**	**0.205**	<0.050	**0.097**	<0.050	**0.056**	<0.050	**0.079**	**0.065**	**0.055**	**0.073**	**0.066**	<0.050	**0.070**	<0.050
Potassium	mg/L	-	<1.0	10.4	<1.0	1.4	6.7	1.2	<1.0	<1	1.4	1.4	<1.0	1.1	0.964	1.17	1.08
General Chemistry																	
Alkalinity, total (as CaCO3)	mg/L	-	270	246	260	142	334	225	217	290	288	303	220	279	275	185	254
Ammonia-N	mg/L	-	<0.050	0.059	<0.050	0.052	0.48	<0.05	<0.050	<0.05	<0.050	<0.050	0.062	0.186	0.062	<0.020	0.217
Chloride	mg/L	-	42.8	8	<2.0	2.9	11	<2	<2.0	<2	3.1	<2.0	<2.0	1.07	0.96	0.62	0.86
Conductivity	µS/cm	-	664	549	477	330	682	411	406	506	396	533	482	521	474	352	473
Dissolved organic carbon (DOC)	mg/L	-	5.5	14.2	13.7	26	4.8	24	29.2	21.9	31.5	30.2	39.8	26	15.8	13.0	22.5
Hardness	mg/L	-	317	311	279	196	400	258	260	260	305	300	248	307	271	187	260
Nitrate (as N)	mg/L	-	<0.10	0.15	<0.10	<0.10	0.42	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.020	0.026	0.023	<0.020
Nitrite (as N)	mg/L	-	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	<0.10	<0.1	<0.10	<0.10	<0.10	<0.010	<0.010	<0.010	<0.010
Orthophosphate	mg/L	-	0.0047	0.076	0.0077	0.0035	0.0044	<0.003	0.0038	0.0045	0.003	0.0105	<0.0030	0.0177	<0.0030	0.0051	<0.0030
pH, lab	s.u.	-	7.99	8	8.02	7.69	8.12	7.75	7.64	8.01	7.91	7.89	7.09	7.98	7.97	7.83	7.61
Phenolics (total)	mg/L	0.001	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	**0.002**	**0.002**	<0.001	0.001	**0.0028**	**0.0013**	**0.0165**	**0.0012**	**0.0015**	**0.0027**
Phosphorus	mg/L	0.01-0.03 (b)	0.0246	**0.325**	0.0114	**0.0495**	0.013	0.017	0.0273	0.0182	**0.0369**	**0.0775**	**0.0558**	**0.0931**	0.0271	0.0257	**0.0323**
Sulfate	mg/L	-	20.1	13.8	<2.0	27	24.2	<2	38.2	3.7	4.2	<2.0	50.6	2.53	1.96	7.07	6.96
Total kjeldahl nitrogen (TKN)	mg/L	-	0.52	3.72	0.88	1.11	0.9	0.63	0.59	0.85	<1.14	1.14	1.71	1.62	0.64	0.77	1.14
Un-ionized ammonia	mg/L	0.02 (c)	<0.00069	0.00005	<0.00058	0.00007	0.00063	<0.00009	<0.00014	<0.0001	<0.0000800	-	0.00022	0.00014	-	<0.00007	0.00004
Field Parameters																	
Conductivity, field	µS/cm	-	608	413	438	244	244	631	496	522	513	-	503	418	451	500	380
Dissolved oxygen (DO), field	mg/L	<4 (d)	4.86	6.73	**3.74**	**1.45**	**1.45**	10.1	-	4.99	**3.3**	-	**0.16**	7.17	-	**2.92**	-
pH, field	s.u.	6.5-8.5	7.87	6.93	7.83	7.04	7.04	6.9	7.37	6.84	7.06	7.83	7.23	**6.38**	7.49	7.18	**6.20**
Temperature, field	Deg C	-	7.7	0	6.7	2.1	2.1	10.6	2.2	12.4	6.4	-	9.2	14.4	7.2	10.6	3.0

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) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.
(c) Unionized ammonia is calculated based on pH, temperature, and total ammonia concentration.
(d) 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.
- Parameter not analyzed / no information
< Parameter detected below the laboratory method detection limit
36.0 Parameter exceeds the PWQO.

Appendix E.3

Historical Groundwater Elevations 1987 to 2023

Appendix E.3

Historic Groundwater Elevations
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	1-Jul-87	1-Mar-89	1-Dec-90	1-Jun-91	1-May-92	1-Jun-93	1-Aug-93	1-Nov-93	1-Jun-94	1-Sep-94	1-Apr-95	1-Oct-95
MW1	36.37	32.77	34.21	33.79	33.00	33.80	33.57	32.64	33.41	33.51	32.87	33.56	32.68
MW2	36.91	34.95	35.64	35.59	35.01	35.46	35.25	34.62	35.11	35.29	34.74	35.49	34.57
MW3	36.80	31.99	34.97	35.84	35.12	35.49	35.40	34.99	35.28	35.51	35.05	35.38	34.87
MW5	37.41	32.13	36.15	35.95	35.41	35.99	35.77	35.06	35.23	35.86	35.17	35.89	35.11
MW6	36.29	31.09	34.50	34.44	34.09	34.24	34.10	-	34.05	34.21	33.96	34.19	33.98
MW7	32.52	31.40	31.81	31.23	-	30.65	-	-	30.65	31.17	31.06	31.57	30.82
MW8	32.75	29.17	31.89	31.78	30.91	31.64	-	25.48	30.23	30.86	30.72	30.95	30.65
MW9	32.16	24.12	29.94	29.90	29.53	29.70	29.56	28.62	29.79	29.69	29.49	29.62	29.44
MW10	32.06	-	-	-	-	-	-	28.95	30.38	30.47	30.20	30.44	29.70
MW11	38.07	-	-	-	-	-	-	33.98	35.20	35.95	35.31	36.01	35.39
MW12	36.78	-	-	-	-	-	-	35.23	35.71	36.00	35.40	36.03	35.93
MW13	38.18	-	-	-	-	-	-	-	-	-	-	-	-
MW14	39.01	-	-	-	-	-	-	-	-	-	-	-	-
LW1-S	38.66	-	-	-	-	-	-	-	-	-	-	-	-
LW1-D	38.65	-	-	-	-	-	-	-	-	-	-	-	-
LW2	35.21	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

mAMSL	metres above mean sea level.
mbtor	metres below top of riser pipe.
-	No information/not surveyed.
NA	No access
NM	Not monitored

Survey information taken from an assumed elevation. A complete geodetic survey has not been completed at the Ward III Site.
All measurements are relative to a chosen elevation and measured in metres.

Appendix E.3

Historic Groundwater Elevations
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	1-May-96	1-Oct-96	1-Apr-97	1-Oct-97	1-Apr-98	1-Oct-98	1-Apr-99	1-Oct-99	1-May-00	1-Oct-00	1-May-01	1-Oct-01	1-Apr-02	1-Oct-02
MW1	36.37	33.74	33.34	33.84	32.75	33.82	32.41	33.15	32.43	33.26	33.00	34.12	33.79	34.01	32.39
MW2	36.91	35.57	35.09	35.58	34.59	35.48	34.26	35.24	34.34	35.31	34.89	36.04	35.19	35.65	34.28
MW3	36.80	35.66	35.24	35.56	34.87	35.46	34.40	35.31	34.64	35.48	35.18	36.03	35.46	35.62	34.31
MW5	37.41	36.05	35.38	36.04	35.14	35.74	34.80	35.64	34.8	35.81	35.08	35.84	35.47	35.84	34.66
MW6	36.29	34.29	34.13	34.31	33.85	34.26	33.23	34.01	33.39	34.05	33.95	34.14	33.83	34.15	32.95
MW7	32.52	31.47	31.34	31.81	30.56	31.66	29.03	31.40	30.15	31.54	31.56	31.67	31.30	32.08	29.33
MW8	32.75	30.99	31.15	30.83	30.33	31.03	29.09	30.21	29.35	30.44	30.77	30.94	30.35	30.84	29.05
MW9	32.16	29.68	29.82	29.78	28.90	29.56	26.68	27.70	28.06	29.51	29.59	29.66	29.06	29.55	25.75
MW10	32.06	30.47	30.52	30.49	29.58	30.41	26.90	30.09	28.68	30.32	30.24	30.42	30.06	30.46	26.87
MW11	38.07	36.22	35.91	36.30	35.15	35.96	34.19	35.07	34.32	35.67	35.51	36.11	35.27	36.14	34.67
MW12	36.78	36.03	35.83	36.06	35.13	36.03	34.78	35.93	34.88	35.98	35.52	36.04	35.94	36.00	33.80
MW13	38.18	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW14	39.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LW1-S	38.66	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LW1-D	38.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LW2	35.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

mAMSL	metres above mean sea level.
mbtor	metres below top of riser pipe.
-	No information/not surveyed.
NA	No access
NM	Not monitored

Survey information taken from an assumed elevation. A complete geodetic survey has not been completed at the Ward III Site.
All measurements are relative to a chosen elevation and measured in metres.

Appendix E.3

Historic Groundwater Elevations
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	22-Apr-03	19-Nov-03	1-Jun-04	10-Nov-04	18-Jul-05	9-Nov-05	9-May-06	30-Nov-06	10-Jun-07	14-Oct-07	31-Jul-08	5-Dec-08	30-Apr-09	20-Nov-09
MW1	36.37	33.73	33.49	33.71	32.87	31.96	32.95	33.38	33.47	33.17	32.34	33.18	33.74	33.95	33.07
MW2	36.91	35.58	35.11	35.20	34.49	34.22	34.64	35.34	35.12	34.82	34.20	35.14	35.51	35.60	34.79
MW3	36.80	35.30	34.85	35.02	34.33	34.45	34.30	35.27	34.80	34.78	34.23	35.20	35.22	35.40	34.74
MW5	37.41	35.79	35.24	35.26	34.71	34.69	34.76	35.53	35.25	35.47	34.51	35.55	35.74	35.90	34.90
MW6	36.29	33.85	-	-	-	-	-	33.96	33.74	33.36	32.67	33.09	34.30	34.18	33.50
MW7	32.52	31.72	31.05	31.34	-	-	29.99	31.55	31.79	31.54	29.50	31.55	31.75	31.40	30.80
MW8	32.75	30.43	30.40	30.25	30.09	29.72	29.32	30.47	30.79	30.15	28.80	30.54	30.71	30.81	29.99
MW9	32.16	28.33	29.30	29.05	28.75	28.77	25.73	29.32	29.76	28.94	27.77	29.51	30.25	29.98	30.00
MW10	32.06	30.06	30.05	30.12	29.25	29.52	28.03	30.30	30.42	30.38	27.36	30.46	30.55	30.47	29.97
MW11	38.07	35.11	35.59	35.86	34.61	36.07	33.46	36.31	35.77	35.63	33.23	36.09	36.28	36.46	34.65
MW12	36.78	36.08	35.96	35.99	35.33	33.75	35.46	35.95	35.98	35.82	34.79	35.90	36.02	36.05	35.46
MW13	38.18	-	-	-	-	-	-	-	36.19	35.56	34.75	35.88	36.27	36.46	35.28
MW14	39.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LW1-S	38.66	-	-	-	-	-	-	-	35.94	35.49	34.89	35.71	36.13	36.24	35.35
LW1-D	38.65	-	-	-	-	-	-	-	34.32	35.07	34.62	35.32	35.69	35.65	35.03
LW2	35.21	-	-	-	-	-	-	-	33.26	33.24	31.55	33.69	33.61	33.43	33.33

Notes:

mAMSL	metres above mean sea level.
mbtor	metres below top of riser pipe.
-	No information/not surveyed.
NA	No access
NM	Not monitored

Survey information taken from an assumed elevation. A complete geodetic survey has not been completed at the Ward III Site.
All measurements are relative to a chosen elevation and measured in metres.

Historic Groundwater Elevations
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	12-May-10	29-Nov-10	25-May-11	22-Nov-11	22-Apr-12	26-Nov-12	12-May-13	21-Oct-13	15-Jun-14	30-Oct-14	8-Jun-15	16-Nov-15	26-Apr-16	4-Nov-16
MW1	36.37	33.14	33.49	33.79	NA	NA	NA	NA	33.11	33.23	33.32	32.90	33.27	33.74	32.69
MW2	36.91	35.15	35.15	35.53	35.10	35.23	34.92	35.56	34.79	35.19	35.01	35.07	34.85	35.62	34.41
MW3	36.80	35.05	35.00	35.39	34.80	35.09	34.81	35.15	34.96	35.18	34.98	34.95	34.94	35.13	34.50
MW5	37.41	35.51	35.07	35.94	35.08	35.65	34.90	35.98	34.96	35.48	35.13	35.40	35.00	NM	34.74
MW6	36.29	33.91	34.08	34.14	33.67	33.99	33.19	34.10	33.79	34.02	33.99	34.93	33.93	34.19	33.23
MW7	32.52	31.55	31.73	31.60	31.42	31.52	31.12	31.50	31.35	31.52	31.63	31.46	31.59	31.62	29.83
MW8	32.75	30.49	30.85	30.75	30.47	30.64	29.12	30.69	29.86	NA	30.75	30.49	30.70	30.83	NM
MW9	32.16	29.91	30.39	30.08	30.19	30.05	29.90	30.07	30.14	NA	30.33	30.02	30.47	30.25	NM
MW10	32.06	30.38	30.41	30.48	29.93	30.37	29.04	30.91	30.26	30.44	30.52	30.38	30.42	30.54	29.17
MW11	38.07	36.10	35.69	36.54	36.24	36.48	35.74	36.88	37.04	36.50	36.57	36.27	36.41	36.77	33.47
MW12	36.78	35.93	35.99	36.02	35.86	35.97	35.38	36.00	35.37	35.83	35.74	35.84	35.51	36.02	34.85
MW13	38.18	35.95	35.93	36.40	35.73	36.04	35.22	36.28	35.19	35.87	35.54	35.76	35.30	36.40	34.78
MW14	39.01	-	-	-	-	-	-	-	35.33	35.97	35.73	35.88	35.45	36.33	34.89
LW1-S	38.66	35.71	35.77	36.25	35.62	35.77	35.36	36.08	35.40	35.76	35.52	35.42	35.63	36.15	34.97
LW1-D	38.65	35.26	35.33	35.71	35.35	35.45	35.11	35.78	35.06	35.46	35.24	35.08	35.30	35.85	34.78
LW2	35.21	33.26	33.48	33.46	33.81	33.48	33.57	33.53	33.69	33.59	33.75	33.60	33.40	33.58	33.54

Notes:

mAMSL	metres above mean sea level.
mbtor	metres below top of riser pipe.
-	No information/not surveyed.
NA	No access
NM	Not monitored

Survey information taken from an assumed elevation. A complete geodetic survey has not been completed at the Ward III Site.
All measurements are relative to a chosen elevation and measured in metres.

Appendix E.3

Historic Groundwater Elevations
Kincardine Ward 3 Landfill Site
Municipality of Kincardine, Ontario

Monitoring Location	Reference Elevation (m)	11-Apr-17	23-Nov-17	18-May-18	4-Nov-18
MW1	36.37	34.07	33.68	33.74	33.34
MW2	36.91	35.72	35.36	35.53	34.96
MW3	36.80	34.76	35.08	34.85	34.97
MW5	37.41	36.21	35.94	36.01	35.09
MW6	36.29	34.04	34.24	34.11	34.03
MW7	32.52	31.58	31.75	31.59	31.69
MW8	32.75	30.66	31.17	30.75	NA
MW9	32.16	30.19	30.62	30.16	NA
MW10	32.06	30.38	30.59	30.45	30.45
MW11	38.07	37.06	36.15	37.06	34.96
MW12	36.78	36.05	36.01	36.02	35.86
MW13	38.18	36.64	36.19	36.37	35.61
MW14	39.01	36.94	36.40	36.52	35.81
LW1-S	38.66	36.63	36.14	36.25	35.65
LW1-D	38.65	35.96	35.69	35.82	35.36
LW2	35.21	33.53	33.73	NM	33.71

Notes:

mAMSL	metres above mean sea level.
mbtor	metres below top of riser pipe.
-	No information/not surveyed.
NA	No access
NM	Not monitored

Survey information taken from an assumed elevation. A complete geodetic survey has not been complete
All measurements are relative to a chosen elevation and measured in metres.

Appendix E.4

Historical Results 2017 - 2023

Appendix E.4

2017 to 2023 Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D	LW1-D
Sample ID:				LW-WARD3-041117-003	LW-WARD3-112317-002	LW-WARD3-051818-002	LW-WARD3-110418-003	LW-WARD3-19-003	LW-WARD3-19-003	LW-WARD3-19-003	LW1-D	LW-WARD 3-003	LW-WARD 3-017	LW-WARD 3-018	LW-WARD3-12/2/22-02	LW1-D
Sample Date:				4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	5/14/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum	mg/L	0.10 (OG)	-	0.64	0.844	1.65	1.24	0.511	0.664	0.354	0.453	0.509	1.49	0.766	0.591	56
Boron	mg/L	5	1.5	0.46	0.42	0.49	0.46	0.433	0.409	0.373	0.392	0.456	0.422	0.458	0.407	0.262
Calcium	mg/L	--	-	16.3	22.9	33.4	28.7	22	18.4	18.3	18.2	26.7	32.2	23.7	20	608
Iron	mg/L	0.30 (AO)	0.17	**0.72**	**0.96**	**2**	**1.55**	**0.655**	**0.852**	**0.462**	**0.513**	**0.715**	**1.63**	**1.54**	**0.693**	**86**
Manganese	mg/L	0.05 (AO)	0.03	**0.0541**	**0.0777**	**0.11**	**0.111**	**0.0661**	-	**0.0531**	0.0457	**0.0687**	**0.0882**	**0.067**	0.0356	**2.74**
Phosphorus	mg/L	--	-	<0.5	<0.5	<0.5	<0.5	0.037	0.025	0.022	0.014	0.043	0.069	0.029	0.02	2.41
Potassium	mg/L	--	-	1.25	1.2	1.49	1.34	1.14	1.12	0.99	1.04	1.12	1.37	1.33	1.11	10.4
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	-	180	177	163	168	175	171	165	164	168	176	173	178	397
Ammonia-N	mg/L	--	-	<0.02	0.224	0.18	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	2.08	2.06	<10	<10	3	2	3	3	3	3	5	4	5
Conductivity	uS/cm	--	-	369	359	343	357	368	341	344	366	360	345	371	382	374
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1.5	1.4	1.7	2.06	2	2	2	<1	2	1	1	1	1
Hardness	mg/L	80-100 (OG)	-	69	96	136	116	85.8	74.1	71	69.8	106	132	92.5	77.1	2210
Nitrate (as N)	mg/L	10	2.6	0.065	0.073	<0.4	<0.4	0.14	0.14	0.14	0.12	0.1	0.11	0.11	0.11	0.14
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.01	<0.2	<0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	-	<0.003	<0.003	0.0034	0.0057	-	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.08
pH	s.u.	6.5-8.5 (OG)	-	8.31	8.29	8.29	8.11	8.25	8.07	8.34	8.36	8.09	8.29	8.23	8.05	8.2
Phenolics (total)	mg/L	--	-	<0.0011	<0.001	0.0052	0.0016	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001
Sulfate	mg/L	500 (AO)	269	17.6	17.4	19.2	18.8	17	16	15	15	21	19	20	17	17
Total kjeldahl nitrogen (TKN)	mg/L	--	-	<0.15	0.32	0.36	0.17	<0.5	<0.5	0.9	<0.5	<0.5	<0.5	<0.5	<0.5	5.5
Field Parameters																
Conductivity, field	uS/cm	--	-	351	327	220	467	371	444	-	435	460	591	394	423	345000
pH, field	s.u.	6.5-8.5 (OG)	-	7.75	6.51	7.54	7.22	7.79	7.89	NM	7.36	7.16	6.28	6.9	7.41	7.84
Temperature, field	Deg C	15 (AO)		9	9.5	9.32	9.65	8.85	8.54	-	9.78	9.7	8.9	13.1	8.55	10.54

Notes:
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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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(a)	Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim 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.

2017 to 2023 Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				LW1-D	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S	LW1-S
Sample ID:				LW1-D	LW-WARD3-041117-002	LW-WARD3-112317-003	LW-WARD3-051818-003	LW-WARD3-110418-002	LW-WARD3-19-002	LW-WARD3-19-002	LW-WARD3-19-002	LW1-S	LW-WARD 3-001	LW-WARD 3-016	LW-WARD 3-017	LW-WARD3-12/2/22-01
Sample Date:				11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	5/14/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum	mg/L	0.10 (OG)	-	5.09	6.61	6.04	5.81	13.7	1.62	11.4	3.59	6.98	1.35	0.567	1.23	0.951
Boron	mg/L	5	1.5	0.417	<0.1	<0.1	<0.1	0.13	0.049	0.062	0.056	0.066	0.054	0.141	0.08	0.287
Calcium	mg/L	--	-	114	157	152	151	363	167	309	167	203	171	190	111	301
Iron	mg/L	0.30 (AO)	0.17	**7.07**	**57.2**	**21.4**	**33.2**	**52**	**39.9**	**32.9**	**36.7**	**22.8**	**8.98**	**9.38**	**21.2**	**17.5**
Manganese	mg/L	0.05 (AO)	0.03	**0.387**	**1.17**	**0.753**	**1.43**	**1.66**	**1.19**	-	**1.31**	**1.2**	**0.825**	**1.17**	**0.824**	**1.66**
Phosphorus	mg/L	--	-	0.35	<0.5	<0.5	<0.5	0.72	0.085	0.544	0.185	0.246	0.135	0.075	0.099	0.247
Potassium	mg/L	--	-	2.52	5.71	5.85	5.13	8.42	6.78	7.87	4.22	7.64	7.12	16.9	7.47	29.6
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	-	165	269	359	243	599	303	736	342	499	330	498	276	451
Ammonia-N	mg/L	--	-	<0.1	0.29	0.315	0.209	0.553	0.6	0.2	0.4	0.4	0.5	0.9	0.6	2.8
Chloride	mg/L	250 (AO)	126	6	26.6	10.9	34	40	15	18	29	32	98	150	18	92
Conductivity	uS/cm	--	-	351	589	660	544	1149	578	1030	628	1010	1000	1420	606	1570
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	1.5	2.1	2.2	**5.52**	2	3	2	3	**6**	**11**	2	**14**
Hardness	mg/L	80-100 (OG)	-	453	546	517	520	1240	544	1060	557	668	556	623	362	1030
Nitrate (as N)	mg/L	10	2.6	0.11	<0.02	<0.02	<0.4	<0.4	<0.06	<0.06	<0.06	0.11	<0.06	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.01	<0.01	<0.2	<0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	-	<0.03	<0.003	<0.003	<0.003	<0.003	0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	-	8.1	7.82	7.96	7.9	6.88	7.86	7.08	7.55	7.45	8.07	7.62	8.01	7.51
Phenolics (total)	mg/L	--	-	<0.001	<0.0019	<0.001	0.0116	0.0043	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003
Sulfate	mg/L	500 (AO)	269	16	11.8	6.25	12.4	10.3	9	3	10	23	44	170	49	500
Total kjeldahl nitrogen (TKN)	mg/L	--	-	3.4	0.45	<1.5	0.37	1.34	<0.5	<0.5	1.4	<0.5	0.5	1.8	0.6	4
Field Parameters																
Conductivity, field	uS/cm	--	-	367000	559	548	330	957	611	898	-	1000	1060	1220	529	1650
pH, field	s.u.	6.5-8.5 (OG)	-	8.48	7.44	6.58	7.25	6.91	7.55	7.41	NM	6.72	6.72	6.92	6.63	6.86
Temperature, field	Deg C	15 (AO)		9.56	7	10.2	7.39	10.67	7.17	7.47	-	10.57	8.3	7.8	13.6	7.07

Notes:
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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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(a) Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L.

OG Operation Guideline (water treatment and distribution).

IMAC Interim 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.

2017 to 2023 Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				LW1-S	LW1-S	LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2	LW2
Sample ID:				LW1-S	LW1-S	LW-WARD3-041117-001	LW-WARD3-112317-001	LW-WARD3-051818-001	LW-WARD3-110418-001	LW-WARD3-19-001	LW-WARD3-19-001	LW-WARD3-19-001	LW2	LW-WARD 3-002	LW-WARD 3-015	LW-WARD 3-016
Sample Date:				5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	5/14/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]													
Metals																
Aluminum	mg/L	0.10 (OG)	-	1.47	8.68	0.18	0.2	0.517	0.25	0.103	0.402	0.119	0.277	0.068	0.126	0.168
Boron	mg/L	5	1.5	0.045	0.192	0.4	0.38	0.44	0.45	0.389	0.339	0.363	0.383	0.39	0.409	0.464
Calcium	mg/L	--	-	120	823	21.7	21.5	25.8	23.3	25	26.3	24.6	24.8	24.5	23.8	24.2
Iron	mg/L	0.30 (AO)	0.17	**28.6**	**48.3**	<0.5	<0.5	**0.81**	**0.35**	0.184	**1.29**	0.228	**0.491**	0.151	0.206	**0.782**
Manganese	mg/L	0.05 (AO)	0.03	**1.37**	**2.86**	0.0386	**0.0534**	**0.109**	**0.0529**	**0.0523**	-	0.031	**0.0565**	0.0329	0.0349	**0.267**
Phosphorus	mg/L	--	-	0.13	1.07	<0.5	<0.5	<0.5	<0.5	0.013	0.044	0.023	0.017	0.015	0.026	0.043
Potassium	mg/L	--	-	8.83	13.4	0.92	0.84	0.95	0.91	0.839	0.894	0.798	0.858	0.835	0.867	0.911
General Chemistry																
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	-	305	370	154	151	146	143	149	149	141	142	145	149	148
Ammonia-N	mg/L	--	-	0.7	0.5	<0.02	0.328	0.021	0.282	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	8	37	1.18	1.19	<10	<10	1	1	1	2	2	1	1
Conductivity	uS/cm	--	-	680	975	379	366	350	343	389	352	353	375	368	354	370
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	4	**6**	2	1.4	1.6	2.01	1	2	<1	1	1	1	<1
Hardness	mg/L	80-100 (OG)	-	394	2750	101	98	114	101	105	111	105	103	105	103	104
Nitrate (as N)	mg/L	10	2.6	<0.06	<0.06	0.022	<0.02	<0.4	<0.4	<0.06	<0.06	<0.06	<0.06	<0.06	0.08	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.01	<0.01	<0.2	<0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	-	<0.03	<0.03	0.0117	0.0111	0.009	0.011	-	<0.03	<0.03	<0.03	<0.03	<0.03	0.04
pH	s.u.	6.5-8.5 (OG)	-	7.9	7.7	8.24	8.24	8.21	8.11	8.29	8.06	8.32	8.31	8.24	8.27	8.17
Phenolics (total)	mg/L	--	-	<0.001	<0.001	<0.001	0.0013	0.0058	0.0028	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	30	230	42.3	42.4	53	62.1	46	43	46	44	49	52	50
Total kjeldahl nitrogen (TKN)	mg/L	--	-	4.1	4.5	<0.15	0.32	<0.15	0.4	<0.5	<0.5	0.8	<0.5	<0.5	<0.5	<0.5
Field Parameters																
Conductivity, field	uS/cm	--	-	536000	987000	353	326	226	458	376	444	-	447	479	390	389
pH, field	s.u.	6.5-8.5 (OG)	-	7.13	7.33	8.02	6.45	7.67	7.48	8.01	7.35	NM	7.77	7.4	7.55	7.94
Temperature, field	Deg C	15 (AO)		10.62	10.86	8.6	10.8	8.32	9.76	8.47	8.25	-	9.67	7.8	9.8	12.8

Notes:
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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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(a)	Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim 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 E.4

2017 to 2023 Leachate Well Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				**LW2**	**LW2**
Sample ID:				**LW2**	**LW2**
Sample Date:				**5/19/2023**	**11/7/2023**
Parameters	**Units**	***ODWS*** [1]	**MABC**[2]		
Metals					
Aluminum	mg/L	0.10 (OG)	-	0.331	1.12
Boron	mg/L	5	1.5	0.348	0.38
Calcium	mg/L	--	-	29.3	30.5
Iron	mg/L	0.30 (AO)	0.17	**0.897**	**1.66**
Manganese	mg/L	0.05 (AO)	0.03	**0.0637**	0.0476
Phosphorus	mg/L	--	-	0.042	0.059
Potassium	mg/L	--	-	0.899	1.23
General Chemistry					
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	-	143	143
Ammonia-N	mg/L	--	-	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	<1	1
Conductivity	uS/cm	--	-	369	366
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	1
Hardness	mg/L	80-100 (OG)	-	121	128
Nitrate (as N)	mg/L	10	2.6	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03
Orthophosphate	mg/L	--	-	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	-	8.3	7.98
Phenolics (total)	mg/L	--	-	0.001	<0.001
Sulfate	mg/L	500 (AO)	269	47	51
Total kjeldahl nitrogen (TKN)	mg/L	--	-	3	2.1
Field Parameters					
Conductivity, field	uS/cm	--	-	346000	379000
pH, field	s.u.	6.5-8.5 (OG)	-	8.23	8.49
Temperature, field	Deg C	15 (AO)		12.33	11.4

Notes:
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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)	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(a)	Current criteria for arsenic is provided which came into affect 2018. Previous data is subjected to a limit of 0.025 mg/L.
OG	Operation Guideline (water treatment and distribution).
IMAC	Interim 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 E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1	MW1
Sample ID:				GW-WARD3-041117-005	GW-WARD3-112317-005	GW-WARD3-051818-002	GW-WARD3-110418-007	GW-WARD3-19-003	GW-WARD3-19-004	GW-WARD3-19-005	MW1	GW-WARD 3-002	GW-WARD 3-004
Sample Date:				4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	<0.005	<0.005	<0.005	0.0242	0.002	<0.001	0.003	0.002	<0.001	-
Boron (dissolved)	mg/L	5	1.5	0.358	0.41	0.355	0.355	-	0.438	0.335	0.391	0.366	-
Calcium (dissolved)	mg/L	--	--	129	123	121	42.7	127	139	125	135	167	124
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.138	**0.641**	<0.01	0.021	<0.048	0.156	**0.618**	**1.03**	0.151	0.066
Magnesium (dissolved)	mg/L	--	--	55.8	55	55.9	23.6	51.6	53.3	53.5	53.2	57.8	55.9
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	**0.0526**	**0.119**	0.0013	0.00717	**0.0534**	0.0405	**0.126**	**0.0932**	0.0104	0.00761
Phosphorus (dissolved)	mg/L	--	--	<0.05	0.065	<0.05	0.38	0.041	0.021	0.027	0.019	0.02	0.039
Potassium (dissolved)	mg/L	--	--	8.1	8.66	7.74	5.26	7.99	8.95	8.29	10.7	10.1	9.76
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	510	456	484	222	486	494	519	513	516	527
Ammonia-N	mg/L	--	--	0.293	0.722	<0.059	<0.284	<0.1	<0.1	0.1	0.2	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	26.3	21.8	18.6	3.08	15	31	15	21	16	18
Conductivity	uS/cm	--	--	1080	1030	1000	566	988	1000	963	1060	1040	1040
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1.7	1.8	2.1	<2.67	2	2	2	1	<2	2
Hardness	mg/L	80-100 (OG)	--	552	534	533	204	529	566	533	555	654	539
Nitrate (as N)	mg/L	10	2.6	0.041	<0.02	0.066	0.073	<0.06	0.21	0.1	0.15	0.24	0.68
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.003	<0.003	<0.003	0.0103	<0.03	0.04	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	7.86	7.89	7.81	7.83	8.17	7.75	7.56	7.66	8.22	7.83
Phenolics (total)	mg/L	--	--	<0.0012	<0.001	<0.0158	<0.0025	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	71.3	68.9	101	99.8	85	65	66	64	67	70
Total kjeldahl nitrogen (TKN)	mg/L	--	--	1.45	3.4	1.06	<0.24	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	967	1000	548	1130	1420	1130	930	900	1120	975
pH, field	s.u.	6.5-8.5 (OG)	--	7.27	6.4	7.63	6.99	7.52	6.68	7.06	6.99	6.68	6.9
Temperature, field	Deg C	15 (AO)	--	8	10.7	8.42	10.64	7.9	8.81	14.7	9.93	8.1	9.3

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.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
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.
R Rejected.
36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW1	MW1	MW1	MW2	MW2	MW2	MW2	MW2	MW2	MW2
Sample ID:				GW-WARD 3-002	MW1	MW1	GW-WARD3-041117-009	GW-WARD3-112317-006	GW-WARD3-051818-006	GW-WARD3-110418-009	GW-WARD3-19-002	GW-WARD3-19-006	GW-WARD3-19-006
Sample Date:				6/28/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.001	0.01	0.003	0.0786	<0.0294	0.0209	0.0513	0.011	0.04	0.037
Boron (dissolved)	mg/L	5	1.5	0.419	0.326	0.368	0.161	0.165	0.163	0.161	-	0.184	0.151
Calcium (dissolved)	mg/L	--	--	136	152	118	70.1	68.9	66	65.6	72.9	76.9	78.9
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.059	0.118	0.13	0.049	0.023	0.019	0.047	<0.011	0.041	0.046
Magnesium (dissolved)	mg/L	--	--	60.2	54.8	52.7	32.4	34.6	34.3	34.8	32.3	32.5	34.7
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0155	0.00865	0.0417	0.012	0.00762	0.00448	0.00813	0.00158	0.00713	0.01548
Phosphorus (dissolved)	mg/L	--	--	0.11	0.092	0.528	<0.05	<0.05	<0.05	<0.05	<0.003	0.097	0.079
Potassium (dissolved)	mg/L	--	--	9.61	12.1	9.42	1.14	1.2	1.15	1.22	1.09	4.01	1.36
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	526	465	530	355	347	319	304	328	318	334
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	0.039	<0.02	<0.071	<0.628	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	13	18	25	8.39	7.82	7.9	7.98	8	7	7
Conductivity	uS/cm	--	--	1040	946	1120	647	637	601	565	614	587	613
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1	2	2	2.2	2.1	2.1	3.36	3	2	2
Hardness	mg/L	80-100 (OG)	--	587	604	511	308	315	306	307	315	326	340
Nitrate (as N)	mg/L	10	2.6	0.31	0.38	0.2	0.052	0.052	0.042	<0.02	<0.06	0.12	0.16
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	0.0032	0.0045	<0.003	<0.003	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	7.93	8.06	7.86	8.06	8.16	8.06	7.79	8.22	8.14	8.08
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.0017	<0.001	<0.0182	<0.004	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	76	68	64	12.6	12.5	13	13.6	13	13	14
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<5	0.24	<0.22	0.42	<0.53	<0.5	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	875	922000	1330000	596	544	371	747	1110	730	695
pH, field	s.u.	6.5-8.5 (OG)	--	6.8	7.23	7.82	8.04	6.52	7.33	7.3	7.64	7.29	7.43
Temperature, field	Deg C	15 (AO)	--	13.1	12.12	8.17	7.3	9.4	7.04	10.22	7.23	7.5	15.2

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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW2	MW2	MW2	MW2	MW2	MW2	MW2	MW3	MW3	MW3
Sample ID:				MW2	GW-WARD 3-001	GW-WARD 3-005	GW-WARD 3-001	GW-WARD3-12/2/22-15	MW2	MW2	GW-WARD3-041117-001	GW-WARD3-112317-009	GW-WARD3-051818-008
Sample Date:				11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.042	0.041	-	0.049	0.088	0.042	0.097	<0.005	<0.0076	0.0055
Boron (dissolved)	mg/L	5	1.5	0.183	0.163	-	0.194	0.167	0.394	0.149	0.268	0.301	0.308
Calcium (dissolved)	mg/L	--	--	75	83.8	68.7	63.5	61.8	24	70.6	29.9	29.9	28.6
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.042	0.036	0.071	0.07	0.173	0.044	0.17	<0.01	0.013	<0.01
Magnesium (dissolved)	mg/L	--	--	31.3	34.5	33.8	34.1	32.9	13.5	33.9	13.9	14.6	13.8
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0139	0.0072	0.00615	0.00605	0.0192	0.0104	0.0245	<0.0005	0.00264	0.00121
Phosphorus (dissolved)	mg/L	--	--	0.005	0.036	0.038	0.024	0.064	0.15	0.36	<0.05	<0.05	<0.05
Potassium (dissolved)	mg/L	--	--	1.19	1.32	1.26	1.18	1.34	1.45	1.2	0.87	1.25	0.888
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	318	317	317	296	330	306	332	184	186	176
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.046	<0.02
Chloride	mg/L	250 (AO)	126	7	9	10	10	9	8	7	1.62	1.42	1.41
Conductivity	uS/cm	--	--	628	621	581	578	597	597	662	427	407	388
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	<2	2	2	2	2	2	<1	<1	1
Hardness	mg/L	80-100 (OG)	--	316	351	311	299	290	116	316	132	135	128
Nitrate (as N)	mg/L	10	2.6	0.07	0.11	0.13	0.13	0.27	0.47	0.09	0.076	0.072	0.103
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	0.03	<0.03	<0.03	<0.03	0.0051	0.0063	0.0049
pH	s.u.	6.5-8.5 (OG)	--	8.14	8.32	8.31	8.18	8.11	8.17	8	8.22	8.25	8.2
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0011	<0.001	<0.0077
Sulfate	mg/L	500 (AO)	269	12	16	17	16	15	15	15	38.4	38.7	43.5
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	<0.15	<0.15	<0.15
Field Parameters													
Conductivity, field	uS/cm	--	--	710	950	681	458	463	565000	800000	398	357	239
pH, field	s.u.	6.5-8.5 (OG)	--	7.37	6.99	7.43	7.9	7.87	7.9	7.79	8.14	6.59	7.64
Temperature, field	Deg C	15 (AO)	--	8.81	6.9	8.4	14.8	7.78	11.48	3.65	7.7	8.6	7.79

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3	MW3
Sample ID:				GW-WARD3-110418-001	GW-WARD3-19-008	GW-WARD3-19-010	GW-WARD3-19-001	MW3	GW-WARD 3-006	GW-WARD 3-007	GW-WARD 3-006	GW-WARD3-12/2/22-05	Field Duplicate
Sample Date:				11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.0085	0.002	0.006	0.008	0.022	<0.014	-	0.002	0.011	-
Boron (dissolved)	mg/L	5	1.5	0.306	-	0.346	0.366	0.342	0.284	-	0.369	0.31	-
Calcium (dissolved)	mg/L	--	--	28.4	28.2	30	30.1	28.2	32.3	28.2	29.4	27.9	-
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.018	<0.007	0.008	0.033	0.032	0.027	<0.007	<0.007	0.019	-
Magnesium (dissolved)	mg/L	--	--	13.8	12.7	12.7	13.4	11.8	13.1	13	13.1	12	-
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00236	<0.00017	0.00093	0.00326	0.00342	0.0024	0.0007	0.0002	0.00165	-
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.003	0.008	0.053	<0.003	0.011	0.025	0.007	0.017	-
Potassium (dissolved)	mg/L	--	--	0.881	0.776	0.891	1.57	0.779	0.939	0.916	0.812	0.871	-
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	173	172	162	165	155	159	161	162	162	-
Ammonia-N	mg/L	--	--	<0.229	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-
Chloride	mg/L	250 (AO)	126	1.43	2	1	<1	2	<1	<1	<1	<1	-
Conductivity	uS/cm	--	--	374	412	397	396	400	396	377	402	398	-
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1.89	<1	1	<1	<1	<1	<1	1	1	-
Hardness	mg/L	80-100 (OG)	--	128	123	127	130	119	134	124	127	119	-
Nitrate (as N)	mg/L	10	2.6	0.073	0.11	0.12	0.25	0.12	0.14	0.13	0.15	0.26	-
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-
Orthophosphate	mg/L	--	--	0.0066	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-
pH	s.u.	6.5-8.5 (OG)	--	8.01	8.17	8.16	8.25	8.35	8.12	8.34	8.25	8.09	-
Phenolics (total)	mg/L	--	--	<0.0043	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Sulfate	mg/L	500 (AO)	269	44.2	54	44	45	45	49	51	50	48	-
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.31	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-
Field Parameters													
Conductivity, field	uS/cm	--	--	489	400	575	451	451	593	450	397	476	365000
pH, field	s.u.	6.5-8.5 (OG)	--	7.62	7.88	8.28	7.58	7.63	6.98	7.6	7.62	8.09	8.25
Temperature, field	Deg C	15 (AO)	--	9.56	8.19	6.86	13.8	9.02	8.4	8.6	12.5	8.39	11.64

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW3	MW3	MW3	MW5	MW5	MW5	MW5	MW5	MW5	MW5
Sample ID:				MW3	Field Duplicate	MW3	GW-WARD3-041117-002	GW-WARD3-112317-007	GW-WARD3-051818-001	GW-WARD3-110418-012	GW-WARD3-110418-014	GW-WARD3-19-015	GW-WARD3-19-009
Sample Date:				5/19/2023	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	11/4/2018	5/21/2019	12/7/2019
					Duplicate						Duplicate		
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.009	0.013	0.036	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0.001
Boron (dissolved)	mg/L	5	1.5	0.099	0.317	0.342	0.129	0.194	0.141	0.19	0.187	-	0.126
Calcium (dissolved)	mg/L	--	--	171	25.7	24.7	35.2	36	46.3	41	41	38.7	37.4
Iron (dissolved)	mg/L	0.30 (AO)	0.17	**1.87**	0.027	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.007	<0.007
Magnesium (dissolved)	mg/L	--	--	18.4	11.9	11.4	13.2	18.2	22.1	20.3	20.9	17.7	12.7
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	**1.13**	0.00117	0.00217	<0.0005	0.00066	0.00055	<0.0005	0.00056	0.00034	<0.00051
Phosphorus (dissolved)	mg/L	--	--	<0.003	0.004	0.024	<0.05	<0.05	<0.05	0.056	0.058	0.007	0.009
Potassium (dissolved)	mg/L	--	--	3.75	0.734	0.808	1.88	1.56	1.47	1.94	1.94	1.48	4.16
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	160	156	156	208	222	258	244	225	268	212
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.02	0.153	<0.036	<0.545	<0.688	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	<1	<1	2	1.11	1.24	1.86	1.79	1.82	2	3
Conductivity	uS/cm	--	--	396	392	393	463	516	570	537	492	510	392
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	<1	1	2	1.3	2	<2.44	<2.28	<1	3
Hardness	mg/L	80-100 (OG)	--	502	113	109	142	165	207	186	188	170	146
Nitrate (as N)	mg/L	10	2.6	0.14	0.14	0.19	0.092	0.11	0.078	0.147	0.152	0.09	0.08
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	0.0077	0.0097	0.0061	0.0343	0.0337	0.06	0.05
pH	s.u.	6.5-8.5 (OG)	--	8.3	8.3	7.96	8.25	8.17	8.1	7.82	7.92	7.7	8.26
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.0012	<0.001	<0.0051	<0.0032	<0.0049	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	47	47	43	35.8	55.7	50.2	50.9	50.8	53	28
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<5	<0.15	<1.5	0.87	<0.68	<0.94	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	365000	-	401000	431	428	327	635	635	509	483
pH, field	s.u.	6.5-8.5 (OG)	--	8.25	-	8.4	8.19	6.6	7.44	7.72	7.72	8.41	7.42
Temperature, field	Deg C	15 (AO)	--	11.64	-	9.97	7.5	10.3	7.87	10.13	10.13	8.65	8.34

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5	MW5
Sample ID:				GW-WARD3-19-002	MW5	GW-WARD 3-005	GW-WARD 3-008	GW-WARD 3-009	GW-WARD3-12/2/22-08	MW5	Field Duplicate	MW5	Field Duplicate
Sample Date:				8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	11/7/2023	11/7/2023 Duplicate
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.018	<0.001	<0.001	-	<0.001	0.003	0.004	-	0.003	0.002
Boron (dissolved)	mg/L	5	1.5	0.126	0.172	0.082	-	0.113	0.101	0.055	-	0.092	0.089
Calcium (dissolved)	mg/L	--	--	52.9	47.1	73.2	72.8	76.7	54	77.1	-	54.9	54.5
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.023	<0.007	<0.007	<0.007	<0.007	<0.007	0.01	-	<0.007	0.014
Magnesium (dissolved)	mg/L	--	--	18.9	17	21.3	22.5	22.4	17	19.4	-	17.3	17.2
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00182	0.00018	<0.00019	0.0007	0.00018	0.0008	0.00151	-	0.00221	0.00252
Phosphorus (dissolved)	mg/L	--	--	0.008	<0.003	0.013	0.007	0.006	0.02	0.012	-	0.009	0.012
Potassium (dissolved)	mg/L	--	--	2.46	1.92	2.56	1.83	1.58	1.63	1.71	-	1.78	1.96
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	254	223	257	297	283	230	259	-	237	260
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	1	2	3	3	5	4	7	-	3	3
Conductivity	uS/cm	--	--	479	490	517	542	549	458	519	-	505	500
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	1	<3	2	3	3	2	-	2	2
Hardness	mg/L	80-100 (OG)	--	210	188	270	274	284	205	272	-	208	207
Nitrate (as N)	mg/L	10	2.6	0.08	0.13	0.06	0.11	<0.06	<0.06	<0.06	-	0.07	0.07
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	0.06	<0.03	<0.03	<0.03	<0.03	0.06	-	0.16	0.1
pH	s.u.	6.5-8.5 (OG)	--	8.05	8.13	8.35	8.18	8.1	8	8.25	-	8.13	8.09
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	30	33	26	22	14	22	11	-	32	32
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	0.8	<5
Field Parameters													
Conductivity, field	uS/cm	--	--	559	560	619	672	582	688	554000	479000	479000	-
pH, field	s.u.	6.5-8.5 (OG)	--	7.72	7.64	7.34	7.2	7.12	8.19	7.12	8.16	8.16	-
Temperature, field	Deg C	15 (AO)	--	14.3	9.29	7.98	9.5	14.1	3.87	11.85	10.58	10.58	-

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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6	MW6
Sample ID:				GW-WARD3-041117-014	GW-WARD3-112317-008	GW-WARD3-051818-003	GW-WARD3-110418-004	GW-WARD3-19-014	GW-WARD3-19-002	GW-WARD3-19-010	MW6	GW-WARD 3-012	GW-WARD 3-014
Sample Date:				4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.0199	<0.0154	0.014	0.0123	0.009	0.031	0.012	0.01	<0.008	-
Boron (dissolved)	mg/L	5	1.5	0.339	0.357	0.352	0.361	-	0.425	0.369	0.38	0.326	-
Calcium (dissolved)	mg/L	--	--	14.2	15.4	14.7	15.1	14.4	18	16.2	14.9	17.2	13.9
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.019	0.016	0.017	0.012	<0.009	0.034	0.018	0.01	<0.007	0.017
Magnesium (dissolved)	mg/L	--	--	5.81	6.53	6.06	6.26	5.76	6.16	6.23	5.76	6.29	5.42
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00061	0.00073	0.001	0.00069	0.00029	0.00088	0.00041	0.00043	<0.00018	0.00022
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.05	<0.05	<0.05	<0.003	0.008	<0.003	<0.003	0.005	<0.003
Potassium (dissolved)	mg/L	--	--	0.594	0.616	0.604	0.638	0.529	0.644	0.615	0.54	0.646	0.531
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	151	140	139	137	172	165	132	136	131	150
Ammonia-N	mg/L	--	--	<0.02	<0.165	<0.086	<0.093	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	0.83	0.78	0.83	0.87	2	1	<1	1	1	<1
Conductivity	uS/cm	--	--	278	277	270	255	274	275	263	276	272	264
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1.3	1.1	1.9	<1.65	2	1	1	1	<2	<1
Hardness	mg/L	80-100 (OG)	--	59	65	62	63	59.6	70.4	66.1	60.8	68.8	56.9
Nitrate (as N)	mg/L	10	2.6	0.072	0.029	0.041	0.04	<0.06	<0.06	0.07	0.1	0.09	0.09
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.0075	0.0039	0.005	0.0031	0.06	0.1	<0.03	<0.03	<0.03	0.04
pH	s.u.	6.5-8.5 (OG)	--	8.3	8.27	8.22	8.14	7.8	8.11	8.27	8.32	8.07	8.23
Phenolics (total)	mg/L	--	--	<0.0024	<0.001	0.0314	<0.0035	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	7.83	7.71	7.98	8.84	8	12	16	7	8	8
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.15	<0.19	<0.15	<0.15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	314	296	181	345	353	344	333	324	338	306
pH, field	s.u.	6.5-8.5 (OG)	--	8.03	6.44	7.36	7.58	7.9	7.57	8.09	7.78	7.35	7.66
Temperature, field	Deg C	15 (AO)	--	8.1	8.4	8.04	9.42	8.28	6.52	11.8	9.12	8.1	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.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW6	MW6	MW6	MW6	MW7	MW7	MW7	MW7	MW7	MW7
Sample ID:				GW-WARD 3-014	GW-WARD3-12/2/22-10	MW6	MW6	GW-WARD3-041117-004	GW-WARD3-041117-006	GW-WARD3-112317-003	GW-WARD3-051818-007	GW-WARD3-110418-010	GW-WARD3-19-004
Sample Date:				6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	4/11/2017 Duplicate	11/23/2017	5/18/2018	11/4/2018	5/21/2019
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.008	0.121	0.017	0.019	<0.005	<0.005	<0.005	<0.005	<0.005	0.001
Boron (dissolved)	mg/L	5	1.5	0.434	0.31	0.32	0.358	0.329	0.329	0.378	0.283	0.326	-
Calcium (dissolved)	mg/L	--	--	16.5	17.3	14.9	14.4	30	29.2	30.3	63.3	47	41.8
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.008	0.194	0.025	0.02	<0.01	<0.01	<0.01	**0.833**	0.091	**0.39**
Magnesium (dissolved)	mg/L	--	--	5.98	6.23	5.95	5.94	17.9	17.4	18.5	33.5	27.7	22.2
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00027	0.00658	0.00055	0.00163	<0.0005	<0.0005	<0.0005	**0.129**	**0.0595**	**0.131**
Phosphorus (dissolved)	mg/L	--	--	0.009	0.021	0.004	0.01	<0.05	<0.05	<0.05	<0.05	0.055	0.041
Potassium (dissolved)	mg/L	--	--	0.601	0.661	0.652	0.584	1.1	1.08	1.24	1.45	1.54	1.19
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	137	140	236	139	208	207	216	313	260	258
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.02	<0.02	0.129	<0.13	<0.924	<0.1
Chloride	mg/L	250 (AO)	126	<1	<1	8	7	4.91	4.96	3.38	16.5	11.4	8
Conductivity	uS/cm	--	--	277	278	263	269	476	477	475	643	536	541
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	1	<1	1	1.1	1.2	1.5	2.9	<3.04	2
Hardness	mg/L	80-100 (OG)	--	65.9	68.9	61.6	60.5	149	144	152	296	231	196
Nitrate (as N)	mg/L	10	2.6	0.08	0.08	0.08	0.11	0.132	0.14	0.047	<0.02	<0.02	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03
Orthophosphate	mg/L	--	--	0.04	<0.03	0.98	0.16	0.0164	0.0151	0.0266	<0.003	0.0323	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.22	8	8.24	8	8.22	8.23	8.12	7.9	7.67	8.18
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.0011	<0.0014	<0.001	<0.0091	<0.0061	<0.002
Sulfate	mg/L	500 (AO)	269	9	9	<2	29	39.2	39.6	38.6	32	32.4	33
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<5	<0.15	<0.15	0.36	0.46	<1.22	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	332	294	261000	272000	439	439	400	371	687	685
pH, field	s.u.	6.5-8.5 (OG)	--	7.34	7.84	8.35	8.48	8.03	8.03	6.45	7.23	7.43	7.86
Temperature, field	Deg C	15 (AO)	--	10.9	7.73	11.14	9.73	7.5	7.5	8.3	7.47	8.87	7.53

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7	MW7
Sample ID:				GW-WARD3-19-003	GW-WARD3-19-007	MW7	GW-WARD 3-003	GW-WARD 3-006	GW-WARD 3-008	GW-WARD3-12/2/22-13	GW-WARD3-12/2/22-14	MW7	MW7
Sample Date:				12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	12/2/2022 Duplicate	5/19/2023	11/7/2023
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.002	0.002	0.002	<0.009	-	0.004	0.004	0.004	0.005	0.005
Boron (dissolved)	mg/L	5	1.5	0.384	0.356	0.359	0.345	-	0.422	0.36	0.353	0.062	0.396
Calcium (dissolved)	mg/L	--	--	41.3	34.3	35.1	41	32	34.8	31.9	32.6	75.9	29.2
Iron (dissolved)	mg/L	0.30 (AO)	0.17	**0.361**	**0.873**	0.021	**0.805**	0.02	**0.979**	0.065	0.052	0.012	0.042
Magnesium (dissolved)	mg/L	--	--	21.3	19.4	17.8	19.9	18.4	19	17.9	17.6	19	18.3
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0146	**0.13**	0.00198	**0.144**	0.00052	**0.0966**	0.0082	0.00873	0.00165	**0.0657**
Phosphorus (dissolved)	mg/L	--	--	0.051	0.126	0.069	0.108	0.061	0.131	0.33	0.354	0.013	2.06
Potassium (dissolved)	mg/L	--	--	1.56	1.56	1.64	1.56	1.48	1.23	2.03	2.02	1.71	3.32
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	237	220	209	217	213	217	217	219	217	292
Ammonia-N	mg/L	--	--	<0.1	0.3	<0.1	0.1	<0.1	0.1	0.1	0.1	0.2	17.8
Chloride	mg/L	250 (AO)	126	6	4	4	4	4	5	4	4	6	6
Conductivity	uS/cm	--	--	479	458	472	476	450	468	469	469	479	600
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	2	2	<3	1	4	2	2	2	**13**
Hardness	mg/L	80-100 (OG)	--	191	166	161	184	156	165	153	154	268	149
Nitrate (as N)	mg/L	10	2.6	0.28	<0.06	0.18	<0.06	0.2	<0.06	0.13	0.13	0.14	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03	0.06	0.03	0.04	0.05	0.14	0.13	0.04	1.3
pH	s.u.	6.5-8.5 (OG)	--	7.94	8.08	8.21	8.28	8.18	8.25	8.04	8.05	8.31	7.95
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	0.26
Sulfate	mg/L	500 (AO)	269	30	28	32	34	37	37	36	37	32	5
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	19.6
Field Parameters													
Conductivity, field	uS/cm	--	--	582	5.49	533	592	459	528	503	503	457000	710000
pH, field	s.u.	6.5-8.5 (OG)	--	7.23	7.49	7.47	7.13	7.35	7.36	7.66	7.66	7.94	7.59
Temperature, field	Deg C	15 (AO)	--	7.33	11.1	8.62	7.23	7.8	11.9	6.71	6.71	13	7.56

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8	MW8
Sample ID:				GW-WARD3-041117-008	GW-WARD3-112317-001	GW-WARD3-051818-004	GW-WARD3-19-007	GW-WARD3-19-001	GW-WARD3-19-008	GW-WARD3-19-004	MW8	GW-WARD 3-002	GW-WARD 3-001
Sample Date:				4/11/2017	11/23/2017	5/18/2018	5/21/2019	12/7/2019	12/7/2019 Duplicate	8/11/2020	11/29/2020	12/12/2021	12/12/2021 Duplicate
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	<0.005	<0.005	<0.005	0.002	0.001	0.002	0.002	0.002	-	-
Boron (dissolved)	mg/L	5	1.5	0.447	0.454	0.455	-	0.523	0.533	0.445	0.457	-	-
Calcium (dissolved)	mg/L	--	--	22.1	22.2	22.6	22.9	25	25.5	23.8	22.2	20.2	19.8
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.01	<0.01	<0.01	<0.007	<0.007	<0.007	0.01	<0.007	0.007	<0.007
Magnesium (dissolved)	mg/L	--	--	13.8	14.9	14.3	13.5	13.9	14.1	14.6	13.2	11.8	11.6
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	<0.0005	0.00099	<0.0005	0.00074	0.00092	<0.00054	0.00081	0.00038	0.00253	0.00235
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.05	<0.05	0.009	0.017	0.012	0.003	<0.003	0.094	0.089
Potassium (dissolved)	mg/L	--	--	0.947	1.08	0.974	0.917	1.04	1.05	1	0.902	8.11	7.98
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	190	177	174	185	177	178	184	171	153	165
Ammonia-N	mg/L	--	--	0.095	0.057	<0.027	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	1.21	1.18	1.24	2	1	1	<1	2	2	2
Conductivity	uS/cm	--	--	439	435	409	440	416	429	415	431	368	363
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	<1	<1	2	1	2	1	<1	<1	<1
Hardness	mg/L	80-100 (OG)	--	112	117	115	113	120	122	119	110	98.7	97.1
Nitrate (as N)	mg/L	10	2.6	0.079	<0.02	0.094	0.08	<0.06	<0.06	<0.06	<0.06	0.98	0.98
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.0083	0.0046	0.0078	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.27	8.27	8.21	8.23	8.22	8.18	8.26	8.22	8.23	8.22
Phenolics (total)	mg/L	--	--	<0.0016	<0.001	<0.0098	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	42.5	41.4	42.7	48	43	43	42	42	41	41
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.15	0.36	<0.15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	449	448	252	448	502	502	519	534	476	476
pH, field	s.u.	6.5-8.5 (OG)	--	8.44	6.46	7.67	8.38	7.4	7.4	7.65	7.7	7.29	7.29
Temperature, field	Deg C	15 (AO)	--	8.1	10.2	8.33	8.3	8.7	8.7	14.1	8.57	8.9	8.9

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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW8	MW8	MW8	MW8	MW9	MW9	MW9	MW9	MW9	MW9
Sample ID:				GW-WARD 3-011	GW-WARD3-12/2/22-09	MW8	MW8	GW-WARD3-041117-007	GW-WARD3-112317-002	GW-WARD3-051818-005	GW-WARD3-19-001	GW-WARD3-19-005	GW-WARD3-19-003
Sample Date:				6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	5/21/2019	12/7/2019	8/11/2020
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.001	0.004	0.012	0.006	0.0111	<0.0365	0.0265	0.018	0.039	0.038
Boron (dissolved)	mg/L	5	1.5	0.499	0.39	0.297	0.475	0.43	0.415	0.435	-	0.51	0.43
Calcium (dissolved)	mg/L	--	--	25.2	24.2	27.4	20	24.8	24.4	26.9	26.2	29.2	26.6
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.007	0.011	0.018	<0.007	<0.01	0.05	0.036	<0.014	0.038	0.046
Magnesium (dissolved)	mg/L	--	--	14.3	13.7	11.4	12.7	12.7	14.1	13.7	13.3	13.5	13.7
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00379	0.0135	0.00127	0.00281	0.00169	0.00448	0.00378	0.00118	0.00308	0.00421
Phosphorus (dissolved)	mg/L	--	--	0.034	0.021	<0.003	0.308	<0.05	<0.05	<0.05	0.042	0.025	0.025
Potassium (dissolved)	mg/L	--	--	1.11	1.44	0.813	1.08	0.917	0.936	0.909	0.925	0.993	0.97
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	179	160	186	180	179	182	165	175	168	174
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.02	<0.123	<0.031	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	1	1	<1	4	0.74	0.79	0.8	1	<1	<1
Conductivity	uS/cm	--	--	426	375	441	431	441	435	411	441	423	413
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	<1	3	3	1.1	<1	<1	2	1	1
Hardness	mg/L	80-100 (OG)	--	122	117	115	102	114	119	124	120	128	123
Nitrate (as N)	mg/L	10	2.6	0.08	0.32	0.11	0.12	0.073	0.027	0.077	0.09	<0.06	0.13
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.03	<0.03	<0.03	0.04	0.0189	0.0122	0.0155	<0.03	0.05	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.22	8.02	8.33	8.1	8.27	8.28	8.22	8.24	8.17	8.24
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.0016	<0.001	<0.0077	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	48	40	44	42	43	49.1	54.8	60	55	52
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<5	<0.15	0.47	0.26	<0.5	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	412	384	410000	514000	456	424	255	444	494	489
pH, field	s.u.	6.5-8.5 (OG)	--	7.91	7.83	8.26	8.04	8.42	6.51	7.7	8.29	7.48	7.16
Temperature, field	Deg C	15 (AO)	--	12.5	8.57	13.61	8.59	8.2	10.4	8.54	8.57	9.55	12.6

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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW9	MW9	MW9	MW9	MW9	MW9	MW9	MW10	MW10	MW10
Sample ID:				MW9	DUP	GW-WARD 3-003	GW-WARD 3-010	GW-WARD 3-012	GW-WARD3-12/2/22-11	MW9	GW-WARD3-041117-003	GW-WARD3-112317-004	GW-WARD3-051818-009
Sample Date:				11/29/2020	11/29/2020	12/12/2021	6/28/2022	6/28/2022	12/2/2022	11/7/2023	4/11/2017	11/23/2017	5/18/2018
Parameters	Units	*ODWS* [1]	MABC [2]		Duplicate			Duplicate					
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.016	0.018	-	0.015	0.011	0.157	0.016	<0.005	<0.0153	0.0406
Boron (dissolved)	mg/L	5	1.5	0.419	0.426	-	0.519	0.461	0.396	0.456	0.257	0.272	0.267
Calcium (dissolved)	mg/L	--	--	25.4	24.7	22.6	28.3	28.4	26.5	23.8	31.4	31.6	31.1
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.014	0.012	0.025	0.014	0.015	0.216	0.053	<0.01	0.015	0.039
Magnesium (dissolved)	mg/L	--	--	12.7	12.3	11.9	14.2	14.4	14.1	12.8	21.9	23.3	22.8
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00104	0.0013	0.00213	0.00108	0.00108	0.0116	0.0205	0.00054	0.00236	0.00697
Phosphorus (dissolved)	mg/L	--	--	0.015	0.017	0.051	0.024	0.025	0.053	0.509	<0.05	<0.05	<0.05
Potassium (dissolved)	mg/L	--	--	0.866	0.851	0.882	0.926	0.911	1.06	0.912	1.09	1.2	1.08
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	161	165	170	170	170	175	174	245	234	235
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.02	<0.076	<0.02
Chloride	mg/L	250 (AO)	126	1	1	<1	<1	<1	<1	1	<0.5	0.53	0.57
Conductivity	uS/cm	--	--	430	425	407	426	427	421	436	476	480	460
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	1	<1	1	<1	2	2	<1	<1	<1
Hardness	mg/L	80-100 (OG)	--	116	112	105	129	130	124	112	169	175	172
Nitrate (as N)	mg/L	10	2.6	0.17	0.19	0.24	0.1	0.1	<0.06	0.08	0.034	0.143	0.052
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01
Orthophosphate	mg/L	--	--	0.04	0.04	<0.03	0.05	0.04	<0.03	0.03	0.0053	0.0531	0.0041
pH	s.u.	6.5-8.5 (OG)	--	8.39	8.33	8.28	8.16	8.18	8.08	7.88	8.2	8.26	8.2
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0013	<0.001	<0.0065
Sulfate	mg/L	500 (AO)	269	52	51	57	56	58	49	54	19	23	23.9
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	<0.15	<0.15	<0.15
Field Parameters													
Conductivity, field	uS/cm	--	--	498	498	448	410	410	435	512000	439	404	281
pH, field	s.u.	6.5-8.5 (OG)	--	7.83	7.83	7.45	7.8	7.8	7.79	8.09	7.91	6.51	7.42
Temperature, field	Deg C	15 (AO)	--	7.87	7.87	9.5	12.3	12.3	8.37	8.24	7.3	9.7	7.3

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.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
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.
R Rejected.
36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW10	MW11	MW11
Sample ID:				GW-WARD3-110418-005	GW-WARD3-19-005	GW-WARD3-19-007	GW-WARD3-19-008	MW10	GW-WARD 3-004	GW-WARD 3-009	GW-WARD 3-007	GW-WARD3-041117-013	GW-WARD3-112317-014
Sample Date:				11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	4/11/2017	11/23/2017
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.0915	0.019	0.062	0.069	0.079	0.081	-	0.033	<0.005	<0.0057
Boron (dissolved)	mg/L	5	1.5	0.283	-	0.328	0.264	0.309	0.279	-	0.322	0.295	0.333
Calcium (dissolved)	mg/L	--	--	33.6	32.8	37.1	35.3	36.3	38.6	33.2	36.3	55.8	46.4
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.106	<0.018	0.033	0.084	0.053	0.066	0.031	0.121	<0.01	0.016
Magnesium (dissolved)	mg/L	--	--	23.8	21	22.4	23.6	21.5	22.7	22.4	24.2	27.5	25.6
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0109	0.00146	0.00237	0.00614	0.00583	0.0072	0.00495	**0.157**	0.00054	0.00164
Phosphorus (dissolved)	mg/L	--	--	<0.05	0.006	0.016	0.013	0.019	0.033	0.026	0.085	<0.05	0.141
Potassium (dissolved)	mg/L	--	--	1.25	1.02	1.32	1.23	1.5	1.3	1.2	1.3	1.23	3.21
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	225	237	225	231	241	226	235	230	258	248
Ammonia-N	mg/L	--	--	<0.109	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	<0.02	<0.316
Chloride	mg/L	250 (AO)	126	0.59	1	<1	<1	1	<1	<1	<1	5.14	3.73
Conductivity	uS/cm	--	--	429	478	474	452	471	468	450	473	730	657
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1.2	<1	1	1	<1	<2	<1	<1	2.4	1.8
Hardness	mg/L	80-100 (OG)	--	182	168	185	185	179	190	175	190	253	221
Nitrate (as N)	mg/L	10	2.6	0.101	0.06	0.11	<0.06	0.14	0.1	0.13	<0.06	0.049	0.023
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01
Orthophosphate	mg/L	--	--	0.0147	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	0.0038	0.005
pH	s.u.	6.5-8.5 (OG)	--	8.12	8.21	8.24	8.16	8.36	8.35	8.26	8.24	8.1	8.22
Phenolics (total)	mg/L	--	--	<0.0019	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.017	<0.0022	<0.001
Sulfate	mg/L	500 (AO)	269	24.4	30	24	25	22	28	27	32	127	107
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.15	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.15	<0.63
Field Parameters													
Conductivity, field	uS/cm	--	--	561	447	647	569	524	536	510	464	696	546
pH, field	s.u.	6.5-8.5 (OG)	--	7.49	7.82	7.52	7.68	7.67	7.21	7.59	7.42	7.46	6.44
Temperature, field	Deg C	15 (AO)	--	10.34	7.57	7.65	13.2	9.27	7.3	8.6	12.2	7.6	9.9

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11	MW11
Sample ID:				GW-WARD3-051818-014	GW-WARD3-110418-008	GW-WARD3-19-009	GW-WARD3-19-013	GW-WARD3-19-012	MW11	GW-WARD 3-008	GW-WARD 3-009	GW-WARD 3-011	GW-WARD 3-005
Sample Date:				5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	5/12/2021 Duplicate	12/12/2021	6/28/2022
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	<0.005	<0.05	0.003	0.052	0.023	0.02	<0.005	<0.005	-	0.016
Boron (dissolved)	mg/L	5	1.5	0.332	0.45	-	0.407	0.31	0.374	0.319	0.29	-	0.358
Calcium (dissolved)	mg/L	--	--	46.9	114	45.1	44.5	46.3	43.1	51.6	51.9	41.6	48.4
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.012	0.28	<0.007	0.023	0.024	0.013	<0.007	<0.007	0.01	0.021
Magnesium (dissolved)	mg/L	--	--	24.1	54.7	22.6	21.8	23.1	19.7	23.7	23.2	22	24.3
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0029	**0.0965**	0.001	0.00508	0.00327	0.00307	0.00097	0.00099	0.00216	0.00229
Phosphorus (dissolved)	mg/L	--	--	0.082	0.51	0.063	0.149	0.08	0.028	0.016	0.017	0.109	0.095
Potassium (dissolved)	mg/L	--	--	1.78	10.1	1.32	2.75	1.99	1.45	1.21	1.2	2.08	1.92
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	239	499	245	217	234	208	223	228	222	231
Ammonia-N	mg/L	--	--	<0.029	4.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	3.37	20	3	2	2	3	2	3	3	3
Conductivity	uS/cm	--	--	645	948	648	589	589	583	613	613	559	620
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2.1	3.72	1	2	2	1	<2	<2	2	1
Hardness	mg/L	80-100 (OG)	--	216	510	206	201	211	189	227	225	194	221
Nitrate (as N)	mg/L	10	2.6	0.111	0.054	0.08	0.08	0.09	0.09	0.1	0.1	0.21	0.09
Nitrite (as N)	mg/L	1	0.3	<0.01	0.011	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.0139	0.099	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.15	7.25	8.17	8.17	8.16	8.12	8.19	8.21	8.24	8.17
Phenolics (total)	mg/L	--	--	<0.0041	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	105	71.2	99	93	99	91	96	100	96	96
Total kjeldahl nitrogen (TKN)	mg/L	--	--	0.17	10.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	392	721	612	714	680	686	718	718	1010	539
pH, field	s.u.	6.5-8.5 (OG)	--	7.22	7.31	7.73	7.87	7.16	7.13	6.85	6.85	6.46	7.28
Temperature, field	Deg C	15 (AO)	--	7.67	9.55	7.78	8.29	11.3	8.89	8.1	8.1	7.9	13.5

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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW11	MW11	MW11	MW12	MW12	MW12	MW12	MW12	MW12	MW12
Sample ID:				GW-WARD3-12/2/22-01	MW11	MW11	GW-WARD3-041117-010	GW-WARD3-112317-012	GW-WARD3-051818-010	GW-WARD3-110418-006	GW-WARD3-19-010	GW-WARD3-19-011	GW-Ward3-19-011
Sample Date:				12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.096	0.314	0.16	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001
Boron (dissolved)	mg/L	5	1.5	0.327	0.3	0.357	0.128	0.116	0.186	0.042	-	0.075	0.095
Calcium (dissolved)	mg/L	--	--	43.3	55.1	43.5	125	131	157	93.4	117	121	116
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.101	**0.432**	0.22	**0.454**	**3.99**	**17.3**	0.144	**2.71**	0.047	**1.52**
Magnesium (dissolved)	mg/L	--	--	20.7	22.9	22.3	29.1	31.2	34	20.4	23.4	22.7	22.5
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0158	0.02143	0.0171	**0.159**	**0.141**	**0.237**	0.0296	**0.177**	**0.16**	**0.109**
Phosphorus (dissolved)	mg/L	--	--	0.21	0.079	0.122	<0.05	<0.05	<0.05	<0.05	<0.003	<0.003	<0.003
Potassium (dissolved)	mg/L	--	--	1.57	1.26	1.61	7.87	6.6	7.95	2.86	5.64	4.17	3.98
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	221	235	222	557	583	515	295	447	365	394
Ammonia-N	mg/L	--	--	<0.1	<0.1	<0.1	4.41	3.54	3.51	<0.727	3.3	1.2	2
Chloride	mg/L	250 (AO)	126	3	3	4	4.7	4.99	4.36	1.27	3	2	1
Conductivity	uS/cm	--	--	587	626	602	1020	1060	967	539	800	658	684
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	1	4	4.5	4.8	**6.5**	3.96	4	3	3
Hardness	mg/L	80-100 (OG)	--	193	232	200	431	455	533	317	390	396	382
Nitrate (as N)	mg/L	10	2.6	0.06	0.08	0.15	0.029	0.131	0.022	0.888	<0.06	0.36	0.29
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.18	<0.03	0.2	<0.003	<0.003	<0.003	<0.003	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	8.1	8.29	8.08	7.45	7.68	7.29	7.32	7.22	7.95	7.43
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.0036	0.0013	<0.0063	<0.0039	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	90	90	89	12	9.01	14.4	14	8	7	9
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<0.5	0.8	5.36	4.92	4.57	<1.05	2.8	1.1	2.4
Field Parameters													
Conductivity, field	uS/cm	--	--	602	576000	666000	968	682	609	649	1290	797	719
pH, field	s.u.	6.5-8.5 (OG)	--	7.81	7.88	7.34	6.87	6.45	6.62	7.14	7.06	7.6	6.99
Temperature, field	Deg C	15 (AO)	--	8.57	10.33	10.53	7.1	8.7	7.24	10	6.92	7.53	13.4

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
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.
R Rejected.
36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW12	MW12	MW12	MW12	MW12	MW12	MW12	MW13	MW13	MW13
Sample ID:				MW12	GW-WARD 3-010	GW-WARD 3-012	GW-WARD 3-003	GW-WARD3-12/2/22-04	MW12	MW12	GW-WARD3-041117-011	GW-WARD3-112317-013	GW-WARD3-051818-011
Sample Date:				11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	<0.001	<0.001	-	<0.001	<0.001	0.001	<0.001	0.0099	<0.0051	<0.005
Boron (dissolved)	mg/L	5	1.5	0.047	0.085	-	0.124	0.071	0.081	0.069	0.016	0.015	0.02
Calcium (dissolved)	mg/L	--	--	93	152	107	129	113	182	135	60.2	59.7	57.8
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.071	**11.1**	**0.752**	**3.21**	**3.66**	**14.7**	**9.91**	<0.01	<0.01	0.022
Magnesium (dissolved)	mg/L	--	--	18.2	28.1	24.1	29.5	24.7	37.1	29.9	18.3	18.7	20.8
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0484	**0.188**	**0.102**	**0.166**	**0.205**	**0.299**	**0.21**	<0.0005	0.00088	0.00388
Phosphorus (dissolved)	mg/L	--	--	<0.003	<0.003	<0.003	<0.003	0.008	<0.003	<0.003	<0.05	<0.05	<0.05
Potassium (dissolved)	mg/L	--	--	2.51	6.25	4.51	5.55	3.72	5.22	3.74	0.385	0.391	0.386
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	285	422	354	445	387	606	500	250	249	234
Ammonia-N	mg/L	--	--	0.3	2.6	1.4	2.3	1.1	2.5	2	0.156	<0.145	<0.065
Chloride	mg/L	250 (AO)	126	2	3	2	3	3	5	4	<0.5	<0.5	0.52
Conductivity	uS/cm	--	--	580	775	642	793	704	1090	933	441	453	410
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	2	<3	2	3	3	4	3	<1	<1	1.1
Hardness	mg/L	80-100 (OG)	--	307	495	365	443	385	607	461	226	226	230
Nitrate (as N)	mg/L	10	2.6	0.98	<0.06	0.91	<0.06	0.31	<0.06	<0.06	0.024	<0.02	0.021
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.003	<0.003	<0.003
pH	s.u.	6.5-8.5 (OG)	--	7.63	8.03	7.63	7.96	7.82	8.1	7.79	8.06	8.1	8.01
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0017	0.0011	<0.0028
Sulfate	mg/L	500 (AO)	269	18	9	9	14	11	24	18	5.26	6.25	7.95
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	2.6	1.4	2.8	0.9	2.7	2.5	0.77	<1.6	0.18
Field Parameters													
Conductivity, field	uS/cm	--	--	630	949	718	771	741	1000000	928000	413	378	273
pH, field	s.u.	6.5-8.5 (OG)	--	7	6.46	6.8	6.36	6.64	6.78	7.18	7.68	6.5	7.03
Temperature, field	Deg C	15 (AO)	--	9.28	7.7	8.9	11.6	8.04	10.72	10.92	6.3	9.5	6.98

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]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW13	MW13
Sample ID:				GW-WARD3-110418-003	GW-WARD3-19-013	GW-WARD3-19-014	GW-WARD3-19-014	MW13	GW-WARD 3-011	GW-WARD 3-013	GW-WARD 3-013	GW-WARD3-12/2/22-02	MW13
Sample Date:				11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.0081	0.082	0.064	0.061	0.134	0.041	-	0.051	0.002	0.011
Boron (dissolved)	mg/L	5	1.5	0.02	-	<0.016	0.043	0.018	<0.025	-	0.028	0.039	0.016
Calcium (dissolved)	mg/L	--	--	56.7	68.8	69.9	68.5	66.4	65.7	51.7	62.7	66	72.4
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.01	0.062	0.043	0.079	0.114	0.046	0.019	0.059	<0.007	0.017
Magnesium (dissolved)	mg/L	--	--	20.6	20.1	17.1	20.9	16.7	18.5	16.1	21	17.7	18.9
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.0014	0.00654	0.00814	0.00538	0.00714	0.0076	0.00251	0.0051	0.00009	0.00235
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.003	0.033	0.009	<0.003	0.005	<0.003	0.011	0.003	<0.003
Potassium (dissolved)	mg/L	--	--	0.434	0.426	0.501	0.535	0.311	0.44	0.332	0.402	0.352	0.344
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	235	383	380	257	247	220	311	232	244	226
Ammonia-N	mg/L	--	--	<0.184	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	0.52	1	<1	<1	1	<1	<1	<1	<1	<1
Conductivity	uS/cm	--	--	407	453	412	421	423	416	407	418	443	418
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<2.01	1	1	1	<1	<1	<1	<1	2	1
Hardness	mg/L	80-100 (OG)	--	226	254	245	257	234	240	195	243	238	259
Nitrate (as N)	mg/L	10	2.6	0.027	<0.06	<0.06	<0.06	0.13	<0.06	<0.06	0.06	0.08	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.003	0.05	<0.03	<0.03	0.11	<0.03	0.05	<0.03	<0.03	0.05
pH	s.u.	6.5-8.5 (OG)	--	7.64	7.68	8.14	7.95	8.05	8.23	8.08	8.22	8.04	8.13
Phenolics (total)	mg/L	--	--	<0.0045	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Sulfate	mg/L	500 (AO)	269	6.93	7	5	7	5	6	6	8	6	6
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.51	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Field Parameters													
Conductivity, field	uS/cm	--	--	491	456	496	497	439	502	499	575	473	418000
pH, field	s.u.	6.5-8.5 (OG)	--	6.91	7.63	7.23	7.24	7.15	6.88	7.22	6.83	7.47	7.8
Temperature, field	Deg C	15 (AO)	--	9.77	7.32	6.98	12.3	8.95	7.6	7.5	11.3	8.69	10.87

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.

(3) Trigger Level concentrations (CRA, 2012).

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.

R Rejected.

36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW13	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14
Sample ID:				MW13	GW-WARD3-041117-012	GW-WARD3-112317-010	GW-WARD3-112317-011	GW-WARD3-051818-012	GW-WARD3-051818-013	GW-WARD3-110418-002	GW-WARD3-19-006	GW-WARD3-19-012	GW-WARD3-19-012
Sample Date:				11/7/2023	4/11/2017	11/23/2017	11/23/2017 Duplicate	5/18/2018	5/18/2018 Duplicate	11/4/2018	5/21/2019	5/21/2019 Duplicate	12/7/2019
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.005	<0.005	<0.0203	<0.0227	0.009	0.0083	0.012	0.002	0.002	0.009
Boron (dissolved)	mg/L	5	1.5	0.014	0.097	0.233	0.222	0.073	0.072	0.189	-	-	0.283
Calcium (dissolved)	mg/L	--	--	65.6	167	190	182	129	128	164	114	115	236
Iron (dissolved)	mg/L	0.30 (AO)	0.17	0.023	**0.343**	**24.4**	**24.8**	**5.19**	**5.15**	**15.3**	**0.347**	**0.359**	**26.5**
Magnesium (dissolved)	mg/L	--	--	18	21.7	24.8	25.4	17.4	17.6	20.5	11.4	11.6	25.3
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	0.00286	**1.38**	**1.41**	**1.43**	**1.38**	**1.36**	**1.41**	**1.05**	**1.07**	**1.73**
Phosphorus (dissolved)	mg/L	--	--	0.003	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.003	<0.003	0.015
Potassium (dissolved)	mg/L	--	--	0.223	5.76	8.24	8.24	4.55	4.45	6.53	1.85	1.89	7.44
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	241	515	577	588	365	371	532	564	467	984
Ammonia-N	mg/L	--	--	<0.1	3.73	9.88	7.13	2.62	2.63	6.33	1	1	5.2
Chloride	mg/L	250 (AO)	126	2	1.96	4.1	3.98	1.13	1.15	2.84	2	2	10
Conductivity	uS/cm	--	--	457	1070	1070	1060	672	681	996	834	765	1260
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	1	**5.1**	**7**	**7.4**	4.1	**6.1**	**9.26**	4	4	**9**
Hardness	mg/L	80-100 (OG)	--	238	507	578	559	393	391	494	331	334	695
Nitrate (as N)	mg/L	10	2.6	0.07	2.46	<0.02	<0.02	0.035	0.043	0.549	<0.06	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	0.043	<0.01	<0.01	<0.01	0.013	<0.01	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	0.12	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.03	<0.03	0.04
pH	s.u.	6.5-8.5 (OG)	--	7.94	7.23	7.22	7.31	7.35	7.45	6.61	7.01	7.17	6.96
Phenolics (total)	mg/L	--	--	<0.002	<0.0032	<0.001	0.0048	<0.004	<0.0031	<0.01	<0.002	<0.002	0.005
Sulfate	mg/L	500 (AO)	269	7	72.2	1.93	2.17	11.6	12.2	7.82	21	20	11
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<5	4.94	10.9	11.4	4.52	4.16	7.94	0.8	0.9	8.1
Field Parameters													
Conductivity, field	uS/cm	--	--	467000	1060	1150	1150	614	614	985	1470	1470	1240
pH, field	s.u.	6.5-8.5 (OG)	--	7.91	6.71	6.41	6.41	6.54	6.54	6.36	7.09	7.09	7.31
Temperature, field	Deg C	15 (AO)	--	10.52	5.3	9.6	9.6	6.2	6.2	10.19	6.48	6.48	7.38

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
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.
R Rejected.
36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	MW14	Field Blank
Sample ID:				GW-WARD3-19-009	GW-WARD3-19-015	MW14	GW-WARD 3-007	GW-WARD 3-010	GW-WARD 3-004	GW-WARD3-12/2/22-12	MW14	MW14	GW-WARD3-041117-015
Sample Date:				8/11/2020	8/11/2020 Duplicate	11/29/2020	5/12/2021	12/12/2021	6/28/2022	12/2/2022	5/19/2023	11/7/2023	4/11/2017 Field Blank
Parameters	**Units**	***ODWS*** [1]	**MABC** [2]										
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.008	0.005	0.005	<0.011	-	0.003	0.015	0.002	0.006	<0.005
Boron (dissolved)	mg/L	5	1.5	0.177	0.175	0.221	0.265	-	0.266	0.264	0.319	0.165	<0.01
Calcium (dissolved)	mg/L	--	--	180	184	190	239	188	197	238	36.5	181	<0.05
Iron (dissolved)	mg/L	0.30 (AO)	0.17	**20.3**	**19.3**	**16.3**	**39.6**	**22.6**	**4.26**	**32.8**	**0.763**	**14.4**	<0.01
Magnesium (dissolved)	mg/L	--	--	29.1	29.5	24.9	29.3	28	28.1	31.5	17	24.3	<0.05
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	**0.916**	**0.948**	**1.62**	**1.68**	**0.702**	**1.38**	**2.08**	**0.05598**	**1.54**	<0.0005
Phosphorus (dissolved)	mg/L	--	--	<0.003	<0.003	<0.003	0.008	0.025	0.004	0.026	0.137	0.004	<0.05
Potassium (dissolved)	mg/L	--	--	6.15	6.08	7.23	9.62	7.7	7.05	7.36	1.28	4.95	<0.05
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	459	531	675	453	629	371	705	452	608	<10
Ammonia-N	mg/L	--	--	6.3	6.2	8.4	4.6	7.8	2.3	5.8	3.2	5.6	<0.02
Chloride	mg/L	250 (AO)	126	2	2	8	4	6	2	14	2	7	<0.5
Conductivity	uS/cm	--	--	856	836	1230	890	1040	711	1280	929	1120	<3
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	5	5	**7**	<4	**7**	**6**	**9**	4	**6**	<1
Hardness	mg/L	80-100 (OG)	--	570	582	576	717	586	607	725	161	552	<10
Nitrate (as N)	mg/L	10	2.6	0.43	0.43	0.36	0.62	0.53	0.49	<0.06	0.23	<0.06	<0.02
Nitrite (as N)	mg/L	1	0.3	<0.03	0.03	<0.03	0.03	<0.03	<0.03	<0.3	<0.03	<0.03	<0.01
Orthophosphate	mg/L	--	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.003
pH	s.u.	6.5-8.5 (OG)	--	7.17	7.01	6.91	7.84	7.11	7.77	7.28	7.95	7.56	6.17
Phenolics (total)	mg/L	--	--	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.0013
Sulfate	mg/L	500 (AO)	269	18	18	20	39	51	27	59	78	12	<0.3
Total kjeldahl nitrogen (TKN)	mg/L	--	--	7	7.3	9	5.9	8.1	2.6	7.3	3.3	6.8	<0.15
Field Parameters													
Conductivity, field	uS/cm	--	--	971	971	1190	950	1030	660	1280	752000	987000	-
pH, field	s.u.	6.5-8.5 (OG)	--	6.57	6.57	6.31	6.43	6.48	6.8	6.46	6.71	6.83	-
Temperature, field	Deg C	15 (AO)	--	12.9	12.9	8.98	7.2	8.6	11.9	8.92	9.49	10.59	-

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) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
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.
R Rejected.
36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 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
Sample ID:				GW-WARD3-112317-015	GW-WARD3-051818-015	GW-WARD3-110418-013	GW-WARD3-19-011	GW-WARD3-19-015	GW-WARD3-19-013	FB	GW-WARD 3-013	GW-WARD 3-015	GW-WARD3-12/2/22-03
Sample Date:				11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	8/11/2020	11/29/2020	5/12/2021	6/28/2022	12/2/2022
Parameters	Units	*ODWS* [1]	MABC [2]	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank
Metals													
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.016	<0.005	<0.005	<0.001	<0.001	0.042	0.003	0.004	0.004	0.035
Boron (dissolved)	mg/L	5	1.5	<0.01	<0.01	<0.01	-	0.009	0.038	<0.002	0.01	0.014	0.027
Calcium (dissolved)	mg/L	--	--	0.121	0.107	<0.05	0.02	0.01	0.3	0.07	0.1	0.05	0.01
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.01	<0.01	<0.01	0.011	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Magnesium (dissolved)	mg/L	--	--	<0.05	<0.05	<0.05	0.004	0.013	0.053	0.008	0.009	0.002	0.003
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	<0.0005	<0.0005	<0.0005	0.00004	0.00012	0.00019	0.00014	0.00013	0.00021	0.00006
Phosphorus (dissolved)	mg/L	--	--	<0.05	<0.05	<0.05	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Potassium (dissolved)	mg/L	--	--	<0.05	<0.05	<0.05	<0.009	0.012	0.039	<0.009	<0.009	<0.009	<0.009
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	<10	<10	<10	<2	<2	3	5	9	<2	2
Ammonia-N	mg/L	--	--	0.331	0.034	0.375	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	<0.5	<0.5	<0.5	<1	<1	<1	<1	<1	<1	<1
Conductivity	uS/cm	--	--	3.2	<3	<3	<2	<2	3	<2	22	2	3
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	<1	0.61	<1	<1	<1	<1	1	<1	<1
Hardness	mg/L	80-100 (OG)	--	<10	<10	<10	0.06	0.08	0.98	0.2	0.28	0.13	<0.05
Nitrate (as N)	mg/L	10	2.6	<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	0.3	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.003	<0.003	<0.003	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	6.81	6.6	5.85	5.63	6	7.58	6.8	7.08	6.18	5.96
Phenolics (total)	mg/L	--	--	<0.001	0.0047	0.0023	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	<0.3	<0.3	<0.3	<2	<2	<2	<2	<2	<2	<2
Total kjeldahl nitrogen (TKN)	mg/L	--	--	0.35	<0.15	0.42	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
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.
(2) Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
(3) Trigger Level concentrations (CRA, 2012).
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.
R Rejected.
36.0 Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Groundwater Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:				**Field Blank**	**Field Blank**
Sample ID:				**Field Blank**	**Field Blank**
Sample Date:				**5/19/2023**	**11/7/2023**
Parameters	**Units**	***ODWS*** [1]	**MABC**[2]	**Field Blank**	**Field Blank**
Metals					
Aluminum (dissolved)	mg/L	0.10 (OG)	--	0.015	0.013
Boron (dissolved)	mg/L	5	1.5	<0.002	<0.002
Calcium (dissolved)	mg/L	--	--	<0.01	0.05
Iron (dissolved)	mg/L	0.30 (AO)	0.17	<0.007	<0.007
Magnesium (dissolved)	mg/L	--	--	0.001	0.002
Manganese (dissolved)	mg/L	0.05 (AO)	0.03	<0.00001	0.00004
Phosphorus (dissolved)	mg/L	--	--	<0.003	<0.003
Potassium (dissolved)	mg/L	--	--	<0.009	<0.009
General Chemistry					
Alkalinity, total (as CaCO3)	mg/L	30-500 (OG)	--	2	2
Ammonia-N	mg/L	--	--	<0.1	<0.1
Chloride	mg/L	250 (AO)	126	<1	<1
Conductivity	uS/cm	--	--	3	2
Dissolved organic carbon (DOC)	mg/L	5.0 (AO)	3.05	<1	<1
Hardness	mg/L	80-100 (OG)	--	<0.05	0.14
Nitrate (as N)	mg/L	10	2.6	<0.06	<0.06
Nitrite (as N)	mg/L	1	0.3	<0.03	<0.03
Orthophosphate	mg/L	--	--	<0.03	<0.03
pH	s.u.	6.5-8.5 (OG)	--	6.24	6.55
Phenolics (total)	mg/L	--	--	<0.002	<0.002
Sulfate	mg/L	500 (AO)	269	<2	<2
Total kjeldahl nitrogen (TKN)	mg/L	--	--	<0.5	<5
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.
[2]	Maximum Acceptable Boundary Concentration as calculated based on the ODWS guidelines for AO, IMAC and MAC parameters.
[3]	Trigger Level concentrations (CRA, 2012).
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.
R	Rejected.
36.0	Parameter exceeds the ODWS.

Appendix E.4

2017 to 2023 Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW1	SW2
Sample ID:			**SW-WARD3-041117-002**	**SW-WARD3-112317-004**	**SW-WARD3-051818-002**	**SW-WARD3-110418-003**	**SW-WARD3-19-004**	**SW-WARD3-19-003**	**SW1**	**SW-WARD 3-001**	**SW-WARD 3-002**	**SW-WARD3-12/2/22-04**	**SW-Ward3-001**	**SW1**	**SW-WARD3-041117-003**
Sample Date:			**4/11/2017**	**11/23/2017**	**5/18/2018**	**11/4/2018**	**5/21/2019**	**12/7/2019**	**11/29/2020**	**5/12/2021**	**12/12/2021**	**12/2/2022**	**5/19/2023**	**11/7/2023**	**4/11/2017**
Parameters	**Units**	**PWQO[1]**													
Metals															
Aluminum	mg/L	0.075 (a)	**1.51**	0.036	0.027	0.023	0.044	0.054	0.037	**0.119**	**0.208**	**0.083**	0.022	**0.111**	**1.01**
Boron	mg/L	0.2	0.026	0.034	0.062	0.045	0.067	0.032	0.078	0.095	0.039	0.083	**0.204**	0.032	0.067
Calcium	mg/L	--	52.7	92.8	87.7	97	88	80.9	104	137	69.4	110	133	102	56.8
Iron	mg/L	0.3	**1.24**	0.289	**0.308**	0.23	0.288	0.128	0.114	0.227	0.284	**0.565**	**3.22**	**1.26**	**1.26**
Magnesium	mg/L	--	13.5	21.8	18.5	22.5	16	16.3	21.5	22.2	18.1	26.7	25.8	28.5	15.9
Manganese	mg/L	--	0.0231	0.0945	0.138	0.0793	0.077	0.0138	0.0421	0.0373	0.0244	0.084	0.44	0.238	0.0453
Phosphorus	mg/L	0.03 (e)	<0.05	<0.05	<0.05	<0.05	0.02	0.01	0.024	0.022	0.021	0.025	0.03	**0.066**	<0.05
Potassium	mg/L	-	1.62	1.9	2.43	2.07	2.22	1.74	1.92	2.51	1.63	4.22	6.76	2.48	2.83
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	--	184	329	288	321	293	285	318	328	239	316	402	344	219
Ammonia-N	mg/L	--	0.117	0.504	0.379	0.262	<0.1	0.1	<0.1	<0.1	0.2	0.7	3.4	0.2	0.4
Chloride	mg/L	--	1.81	4.68	2.91	2.54	2	2	3	4	3	14	9	9	2.2
Conductivity	uS/cm	--	351	595	539	548	521	506	607	595	409	620	754	671	408
Dissolved organic carbon (DOC)	mg/L	--	5.5	4	4	6.24	3	3	3	4	5	3	4	5	6.1
Hardness	mg/L	--	187	321	295	335	286	269	349	432	248	386	437	372	207
Nitrate (as N)	mg/L	--	0.491	0.055	0.23	0.04	0.36	0.22	0.19	0.29	0.3	1.66	0.2	0.06	0.506
Nitrite (as N)	mg/L	--	<0.01	<0.01	<0.01	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01
Orthophosphate	mg/L	--	<0.003	0.0072	<0.003	0.0117	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.003
pH	s.u.	6.5-8.5	7.93	8.05	7.98	7.52	8.15	8.14	8.03	7.99	7.72	7.78	7.64	8	7.97
Phenolics (total)	mg/L	0.001	<0.001	<0.001	**0.0021**	**0.0045**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0015
Phosphorus	mg/L	0.03 (e)	**0.0733**	0.0291	0.0177	0.0204	-	-	-	-	-	-	-	-	**0.0425**
Sulfate	mg/L	--	3.38	3.23	2.48	3.92	4	13	6	3	5	14	6	9	6.41
Total kjeldahl nitrogen (TKN)	mg/L	--	0.56	0.88	0.66	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	0.5	3.5	0.8	0.84
Un-ionized ammonia	mg/L	0.02 (g)	0.00135	0.00023	0.00122	-	<0.00088	0.00034	<0.00038	<0.00017	0.00076	0.00042	0.00684	0.00058	0.00252
Field Parameters															
Conductivity, field	uS/cm	--	335	514	315	-	520	647	680	865	436	915	731000	858000	409
Dissolved oxygen (DO), field	mg/L	<4 (f)	7.3	-	**2.06**	-	**0.09**	**2.86**	6.93	5.63	-	**1.46**	**2.87**	**0**	6.95
pH, field	s.u.	6.5-8.5	7.76	**6.49**	7.2	NM	7.61	7.33	7.35	7	7.31	6.59	6.9	7.12	7.49
Temperature, field	Deg C	--	8.5	4.5	8.56	-	9.37	5.38	6.21	6.7	7.5	5.05	11.41	9.68	8.7

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

2017 to 2023 Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW2	SW3	SW3
Sample ID:			SW-WARD3-112317-003	SW-WARD3-051818-003	SW-WARD3-110418-002	SW-WARD3-19-003	SW-WARD3-19-002	SW2	SW-WARD 3-002	SW-WARD 3-008	SW-WARD3-12/2/22-10	SW-Ward3-002	SW2	SW-WARD3-041117-004	SW-WARD3-112317-002
Sample Date:			11/23/2017	5/18/2018	11/4/2018	5/21/2019	12/7/2019	11/29/2020	5/12/2021	12/12/2021	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017
Parameters	**Units**	**PWQO[1]**													
Metals															
Aluminum	mg/L	0.075 (a)	0.066	**0.077**	<0.01	0.058	**0.081**	0.069	0.006	**0.157**	**0.404**	**0.248**	**0.118**	**3.25**	**1.2**
Boron	mg/L	0.2	0.1	0.149	0.154	0.162	0.122	0.189	0.176	0.065	0.128	**0.202**	0.112	0.025	0.012
Calcium	mg/L	--	103	100	112	102	90.9	119	114	69.6	112	125	116	44	70
Iron	mg/L	0.3	**1.3**	**2.86**	**1.15**	**1.98**	**0.71**	**1.06**	**1.85**	**0.696**	**2.62**	**1.57**	**0.836**	**3.01**	**1.45**
Magnesium	mg/L	--	27.2	24.3	28.8	22.2	22.6	27.8	27.4	19.1	26.6	28.9	27.7	14.4	22.2
Manganese	mg/L	--	0.166	0.295	0.238	0.228	0.0954	0.179	0.212	0.0812	0.298	0.187	0.206	0.0405	0.0857
Phosphorus	mg/L	0.03 (e)	<0.05	<0.05	<0.05	0.015	0.009	0.018	0.008	0.018	**0.049**	**0.039**	0.013	**0.253**	**0.148**
Potassium	mg/L	-	5.37	5.78	6.54	6.81	5.99	6.6	7.1	2.69	5.43	8.1	5.57	3.22	2.55
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	--	377	348	392	378	332	370	391	285	322	383	371	162	253
Ammonia-N	mg/L	--	1.53	1.55	1.61	2	1.5	1	2.1	0.5	1.1	2.1	0.3	0.11	0.272
Chloride	mg/L	--	5.19	3.87	3.94	3	4	4	4	3	8	6	6	7.19	8.5
Conductivity	uS/cm	--	680	634	672	667	616	720	714	469	607	707	707	340	502
Dissolved organic carbon (DOC)	mg/L	--	5	4.8	7.41	5	4	4	4	4	5	4	5	8.2	7.1
Hardness	mg/L	--	368	350	399	347	320	411	397	252	390	432	403	169	266
Nitrate (as N)	mg/L	--	0.201	0.288	0.188	0.32	0.43	0.34	0.32	0.27	1.25	0.81	0.75	1.14	0.854
Nitrite (as N)	mg/L	--	<0.01	0.012	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01
Orthophosphate	mg/L	--	<0.003	<0.003	<0.003	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.03	<0.03	0.099	0.0383
pH	s.u.	6.5-8.5	8.07	7.88	7.45	8.05	8.15	8.02	8.19	7.67	7.94	8.04	8.18	7.96	8.11
Phenolics (total)	mg/L	0.001	<0.001	**0.0096**	**0.0047**	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.0024**	**0.0012**
Phosphorus	mg/L	0.03 (e)	0.0298	**0.0612**	0.0099	-	-	-	-	-	-	-	-	**0.251**	**0.0584**
Sulfate	mg/L	--	5.19	4.69	8.86	3	11	8	2	7	17	3	5	6.1	8.01
Total kjeldahl nitrogen (TKN)	mg/L	--	1.87	2.46	2.11	1.7	1.4	0.7	2.6	<0.5	1.2	1.6	0.7	1.28	0.67
Un-ionized ammonia	mg/L	0.02 (g)	0.00055	0.0037	-	0.0191	0.00429	0.00375	0.00218	0.00036	0.0009	0.00862	0.00145	0.00145	0.00009
Field Parameters															
Conductivity, field	uS/cm	--	570	369	-	650	760	780	857	1380	877	703000	827000	324	431
Dissolved oxygen (DO), field	mg/L	<4 (f)	-	**2.41**	-	**0.09**	**3.08**	5.82	4.41	-	-	**1.25**	6.61	6.98	-
pH, field	s.u.	6.5-8.5	**6.42**	7.06	NM	7.64	7.27	7.31	6.77	6.68	6.85	7.23	7.37	7.82	**6.32**
Temperature, field	Deg C	--	3.7	8.88	-	9.61	5.12	7.34	6.8	4.92	1.64	10.83	8.83	8.5	5.3

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

2017 to 2023 Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW3	SW4	SW4	SW4	SW4
Sample ID:			SW-WARD3-051818-005	SW-WARD3-110418-004	SW-WARD3-19-002	SW-WARD3-19-001	SW3	SW-WARD 3-007	SW-WARD 3-004	SW-Ward3-003	SW3	SW-WARD3-041117-001	SW-WARD3-112317-001	SW-WARD3-051818-001	SW-WARD3-19-001
Sample Date:			5/18/2018	11/4/2018	5/21/2019	12/7/2019	11/29/2020	5/12/2021	6/28/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	5/21/2019
Parameters	**Units**	**PWQO[1]**													
Metals															
Aluminum	mg/L	0.075 (a)	**0.149**	**0.158**	**0.1**	0.052	0.06	0.07	**0.106**	**0.113**	**0.559**	0.063	0.069	**0.237**	**0.164**
Boron	mg/L	0.2	0.042	0.027	0.074	0.019	0.034	0.021	0.043	0.174	0.199	0.077	0.059	0.057	0.076
Calcium	mg/L	--	81.8	83	91.8	73.5	105	94.8	122	119	133	57.2	62.7	29.5	56.7
Iron	mg/L	0.3	**0.304**	0.233	0.203	0.075	0.09	0.157	0.201	0.235	**1.28**	**0.437**	**0.309**	**0.409**	**0.432**
Magnesium	mg/L	--	22.7	24.4	21.2	20.6	29.5	28	36.2	27.6	34.9	18.3	21.5	18.7	16.3
Manganese	mg/L	--	0.0441	0.0201	0.0439	0.0083	0.0171	0.0212	0.0225	0.0941	0.708	0.11	0.0189	0.0311	0.0901
Phosphorus	mg/L	0.03 (e)	**0.051**	**0.063**	**0.038**	**0.032**	**0.038**	0.024	**0.072**	0.017	**0.273**	**0.124**	<0.05	**0.064**	**0.035**
Potassium	mg/L	-	3.09	2.91	4.21	2.38	2.33	1.59	3.61	7.77	13.7	5.35	8.42	2.02	3.83
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	--	265	273	299	263	298	299	326	391	431	214	255	136	203
Ammonia-N	mg/L	--	0.068	0.126	<0.1	<0.1	<0.1	<0.1	<0.1	0.3	2.3	<0.02	1.99	0.025	<0.1
Chloride	mg/L	--	15.5	12.8	15	14	17	19	27	18	28	10.4	12	8	9
Conductivity	uS/cm	--	559	533	581	523	669	636	730	736	922	428	493	255	394
Dissolved organic carbon (DOC)	mg/L	--	6.8	9.06	6	5	4	5	4	7	10	8.5	9.9	9.1	7
Hardness	mg/L	--	298	308	316	268	385	352	453	411	476	218	245	151	209
Nitrate (as N)	mg/L	--	1.76	1.12	0.78	1.28	2.77	2	3.78	1.04	0.67	<0.02	0.22	<0.02	<0.06
Nitrite (as N)	mg/L	--	0.021	<0.01	<0.03	<0.03	<0.03	<0.03	<0.03	0.03	<0.03	<0.01	<0.01	<0.01	<0.03
Orthophosphate	mg/L	--	0.0255	0.037	<0.03	0.03	<0.03	<0.03	0.06	<0.03	<0.03	<0.003	0.007	<0.003	<0.03
pH	s.u.	6.5-8.5	8.12	7.72	8.21	8.29	8.22	8.03	8.3	8.27	8.21	8.26	8.21	**8.9**	8.34
Phenolics (total)	mg/L	0.001	**0.0102**	**0.0031**	<0.001	<0.002	<0.001	**0.002**	<0.001	<0.001	0.001	<0.0018	<0.001	**0.0028**	**0.003**
Phosphorus	mg/L	0.03 (e)	**0.0466**	**0.0506**	-	-	-	-	-	-	-	**0.0994**	0.0273	**0.0463**	-
Sulfate	mg/L	--	9.52	10.9	9	23	19	17	54	22	48	10.4	4.82	2.75	4
Total kjeldahl nitrogen (TKN)	mg/L	--	0.62	0.66	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	3.4	1.24	2.9	0.98	<0.5
Un-ionized ammonia	mg/L	0.02 (g)	0.0003	-	<0.00162	<0.00051	<0.00085	<0.00046	<0.00199	0.00635	**0.02745**	<0.0014	0.00063	0.00116	<0.00318
Field Parameters															
Conductivity, field	uS/cm	--	323	-	560	634	731	747	686	677000	1110000	396	416	160	379
Dissolved oxygen (DO), field	mg/L	<4 (f)	**2.09**	-	**0.1**	4.75	7.65	7.35	5.71	**3.11**	**3.33**	8.57	-	5.63	**0.1**
pH, field	s.u.	6.5-8.5	7.32	NM	7.88	7.51	7.61	7.39	7.77	7.87	7.82	8.45	**6.39**	8.22	8.05
Temperature, field	Deg C	--	9.19	-	9.41	5.38	9.02	7.7	15.4	13.16	7.22	11.9	2.9	13.21	13.17

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

Appendix E.4

2017 to 2023 Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW4	SW5	SW5	SW5	SW5	SW5
Sample ID:			**SW-WARD3-19-004**	**SW-WARD3-19-001**	**SW4**	**SW-WARD 3-003**	**SW-WARD 3-001**	**SW-WARD3-12/2/22-07**	**SW-Ward3-004**	**SW4**	**SW-WARD3-041117-005**	**SW-WARD3-112317-005**	**SW-WARD3-051818-004**	**SW-WARD3-19-005**	**SW-WARD3-19-006**
Sample Date:			**12/7/2019**	**8/11/2020**	**11/29/2020**	**12/12/2021**	**6/28/2022**	**12/2/2022**	**5/19/2023**	**11/7/2023**	**4/11/2017**	**11/23/2017**	**5/18/2018**	**5/21/2019**	**12/7/2019**
Parameters	**Units**	**PWQO[1]**													
Metals															
Aluminum	mg/L	0.075 (a)	**0.188**	**1.26**	**0.376**	**0.197**	**0.995**	**0.982**	**0.155**	**0.381**	0.037	**2.5**	**0.118**	**0.18**	**1.52**
Boron	mg/L	0.2	0.066	0.086	0.08	0.058	0.078	0.072	0.05	0.04	**0.25**	**0.29**	0.197	**0.233**	**0.231**
Calcium	mg/L	--	80.2	46.7	72.8	69.2	22	71.8	21.2	65.7	105	166	132	138	185
Iron	mg/L	0.3	**0.309**	**2.36**	**0.824**	**0.599**	**1.36**	**2.6**	**0.636**	**0.726**	0.086	**4.6**	**0.511**	**8.18**	**71.4**
Magnesium	mg/L	--	24.6	24	21.6	20.6	17.9	21.2	15.5	18.3	28.4	50.6	38.6	35.3	49.3
Manganese	mg/L	--	0.084	0.117	0.132	0.107	0.0608	0.288	0.0363	0.0568	0.182	0.634	0.333	0.569	0.854
Phosphorus	mg/L	0.03 (e)	**0.064**	**0.173**	**0.204**	**0.114**	**0.166**	**0.192**	**0.146**	**0.066**	<0.05	<0.5	**0.388**	**0.049**	**0.276**
Potassium	mg/L	-	9.18	4.7	10.9	6.85	1.33	8.92	0.976	1.82	11.5	21.9	20.1	21.7	25.7
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	--	266	174	231	239	104	232	115	193	374	586	488	497	561
Ammonia-N	mg/L	--	0.4	<0.1	<0.1	2.4	<0.1	2.1	<0.1	<0.1	0.557	3.14	1.93	4.7	6.1
Chloride	mg/L	--	20	15	17	14	11	20	<1	4	14.6	33.7	35.2	45	67
Conductivity	uS/cm	--	538	360	505	471	249	470	203	373	778	1150	964	1030	1330
Dissolved organic carbon (DOC)	mg/L	--	12	17	12	6	15	11	9	8	7.9	8.7	7	8	11
Hardness	mg/L	--	301	215	271	257	129	267	117	239	380	623	489	490	665
Nitrate (as N)	mg/L	--	0.12	<0.06	<0.06	0.13	<0.06	<0.06	<0.06	<0.06	1.53	0.559	1.58	0.58	0.14
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.01	<0.01	<0.01	<0.03	<0.03
Orthophosphate	mg/L	--	0.03	<0.03	0.04	<0.03	0.04	0.03	<0.03	<0.03	<0.003	<0.003	<0.003	<0.03	<0.03
pH	s.u.	6.5-8.5	8.24	8.12	**8.51**	8.19	**9.86**	8.04	8.32	8	7.77	7.73	7.63	7.85	7.77
Phenolics (total)	mg/L	0.001	<0.005	**0.002**	**0.002**	<0.001	**0.003**	**0.002**	<0.001	<0.001	**0.0023**	**0.0036**	**0.0046**	**0.003**	<0.006
Phosphorus	mg/L	0.03 (e)	-	-	-	-	-	-	-	-	0.0108	**0.466**	**0.349**	-	-
Sulfate	mg/L	--	14	4	6	5	<2	10	<2	3	36.9	26.2	18.5	34	110
Total kjeldahl nitrogen (TKN)	mg/L	--	1.1	0.9	1.6	2.3	<0.5	3.4	<0.5	0.9	1.21	11.7	6.41	4.7	7.4
Un-ionized ammonia	mg/L	0.02 (g)	0.00151	<0.00254	<0.00235	0.01781	<0.05699	0.01499	<0.00439	<0.00138	0.00272	0.00225	0.00449	**0.0347**	0.00788
Field Parameters															
Conductivity, field	uS/cm	--	682	401	560	477	223	509	225000	482000	711	1110	563	950	1610
Dissolved oxygen (DO), field	mg/L	<4 (f)	**1.74**	4.65	4.8	-	7.99	5.01	**1.86**	4.57	5.67	-	**3.14**	**1.03**	**2.1**
pH, field	s.u.	6.5-8.5	7.31	7.61	7.95	7.54	**9.38**	7.78	8.16	7.9	7.48	6.53	7.06	7.57	6.92
Temperature, field	Deg C	--	7.42	23.8	12.18	9.31	18.9	1.99	14.23	6.75	5.79	9.1	8.56	8.37	5.24

Notes:

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(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

Appendix E.4

2017 to 2023 Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW5	SW5	SW5	SW5	SW5	SW5	SW7	SW7	SW7	SW7	SW7
Sample ID:			SW5	SW-WARD 3-008	SW-WARD 3-006	SW-WARD3-12/2/22-06	SW-Ward3-005	SW5	SW-WARD3-041117-006	SW-WARD3-112317-006	SW-WARD3-051818-006	SW-WARD3-110418-001	SW-WARD3-19-006
Sample Date:			11/29/2020	5/12/2021	12/12/2021	12/2/2022	5/19/2023	11/7/2023	4/11/2017	11/23/2017	5/18/2018	11/4/2018	5/21/2019
Parameters	**Units**	**PWQO[1]**											
Metals													
Aluminum	mg/L	0.075 (a)	**0.782**	0.005	0.014	**3.49**	0.011	**1.04**	0.027	0.032	0.015	0.018	0.006
Boron	mg/L	0.2	**0.319**	**0.379**	**0.472**	**0.352**	**0.212**	**0.332**	0.011	0.02	0.016	0.026	0.024
Calcium	mg/L	--	220	204	175	225	140	168	53.2	76.1	84.3	60.7	102
Iron	mg/L	0.3	**14.6**	**6.2**	**2.97**	**138**	**1.18**	**95.2**	0.077	0.269	**0.548**	0.193	**0.421**
Magnesium	mg/L	--	53	51.1	49.8	59.6	31.4	43.6	13.3	17.1	18.1	17.6	17.5
Manganese	mg/L	--	1.28	1.31	0.96	1.54	0.53	2.2	0.023	0.128	0.0623	0.0856	0.087
Phosphorus	mg/L	0.03 (e)	**0.094**	0.016	0.017	**0.591**	0.008	**0.292**	**0.07**	<0.05	<0.05	**0.07**	0.026
Potassium	mg/L	-	29.7	30.1	28.4	31.2	14.8	22.8	1.17	1.08	1.15	2.28	1.35
General Chemistry													
Alkalinity, total (as CaCO3)	mg/L	--	590	605	585	620	449	525	185	254	283	196	308
Ammonia-N	mg/L	--	3.1	7.8	6	7.8	3	6.6	<0.02	0.217	0.125	0.102	<0.1
Chloride	mg/L	--	250	120	130	80	33	46	0.62	0.86	1.02	0.89	2
Conductivity	uS/cm	--	1950	1600	1460	1380	956	1180	352	473	515	400	540
Dissolved organic carbon (DOC)	mg/L	--	9	14	15	15	9	11	13	22.5	15	62	13
Hardness	mg/L	--	768	719	643	808	478	599	187	260	285	224	327
Nitrate (as N)	mg/L	--	<0.06	0.42	2.52	0.86	0.18	0.47	0.023	<0.02	0.036	0.026	<0.06
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.01	<0.01	<0.01	<0.01	<0.03
Orthophosphate	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.0051	<0.003	<0.003	<0.003	<0.03
pH	s.u.	6.5-8.5	7.54	8.11	7.34	7.75	7.92	8	7.83	7.61	7.82	6.97	8.06
Phenolics (total)	mg/L	0.001	0.001	**0.002**	<0.001	**0.003**	**0.002**	<0.001	**0.0015**	**0.0027**	**0.0093**	**0.0089**	**0.004**
Phosphorus	mg/L	0.03 (e)	-	-	-	-	-	-	0.0257	**0.0323**	**0.0501**	**0.0615**	-
Sulfate	mg/L	--	93	98	160	120	57	73	7.07	6.96	1.03	20.5	<2
Total kjeldahl nitrogen (TKN)	mg/L	--	3.3	9.2	5.9	8.5	3.3	8.1	0.77	1.14	1.28	1.58	<0.5
Un-ionized ammonia	mg/L	0.02 (g)	0.00364	0.00811	**0.02058**	**0.02021**	**0.05849**	**0.02672**	<0.00007	0.00004	0.00042	-	<0.0003
Field Parameters													
Conductivity, field	uS/cm	--	1740	1610	440	1710	540000	1320000	500	380	294	-	536
Dissolved oxygen (DO), field	mg/L	<4 (f)	4.22	**3.9**	-	-	**0**	8.67	**2.92**	-	**1.98**	-	**0.1**
pH, field	s.u.	6.5-8.5	6.76	6.62	7.28	7.28	7.78	7.25	7.18	**6.2**	7.18	NM	7.1
Temperature, field	Deg C	--	8.64	11.2	7.09	3.62	14.79	10.06	10.6	3	9.87	-	10.56

Notes:

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(a) Aluminum objective is pH dependent. At pH >6.5-9.0, the interim PWQO is 0.075 mg/L.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

Appendix E.4

2017 to 2023 Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW7	SW7	SW7	SW7	SW7	SW7	SW7	SW8	SW8	SW9	SW9	SW10	SW10
Sample ID:			SW-WARD3-19-005	SW7	SW-WARD 3-009	SW-WARD 3-009	SW-WARD3-12/2/22-09	SW-Ward3-006	SW7	SW-WARD 3-004	SW-WARD 3-004	SW-WARD 3-005	SW-WARD 3-001	SW-WARD 3-006	SW-WARD 3-007
Sample Date:		PWQO[1]	12/7/2019	11/29/2020	5/12/2021	12/12/2021	12/2/2022	5/19/2023	11/7/2023	5/12/2021	12/12/2021	5/12/2021	12/12/2021	5/12/2021	12/12/2021
Parameters	**Units**														
Metals															
Aluminum	mg/L	0.075 (a)	**0.12**	0.019	0.01	0.037	**0.091**	0.012	0.046	**0.144**	**0.113**	0.046	**0.126**	0.073	**13.4**
Boron	mg/L	0.2	0.02	0.048	0.023	0.021	**0.211**	**0.35**	**0.26**	0.018	0.02	0.154	0.064	0.065	**0.555**
Calcium	mg/L	--	63	63.8	81.2	73.6	73.3	235	98.4	88.1	58	112	74	101	57.3
Iron	mg/L	0.3	**0.61**	0.084	0.153	**0.312**	0.281	**0.824**	**1.37**	0.268	0.213	**0.401**	**0.308**	0.154	**11**
Magnesium	mg/L	--	15.2	15.3	17.4	16.7	13.5	36.6	17.6	19.5	14.4	27.6	19.8	26.8	19.5
Manganese	mg/L	--	0.162	0.0677	0.0127	0.066	0.0919	0.598	0.377	0.0401	0.0284	0.0465	0.0672	0.0353	0.338
Phosphorus	mg/L	0.03 (e)	**0.095**	**0.041**	0.015	**0.034**	**0.034**	**0.157**	**0.063**	**0.124**	**0.037**	0.013	0.016	**0.031**	**0.8**
Potassium	mg/L	-	1.66	0.974	0.996	0.535	4.76	23.9	9.28	2.6	1.31	5.69	2.76	3.42	7.28
General Chemistry															
Alkalinity, total (as CaCO3)	mg/L	--	166	181	259	215	155	672	295	278	198	355	249	313	165
Ammonia-N	mg/L	--	<0.1	<0.1	<0.1	<0.1	<0.1	5.2	0.1	<0.1	<0.1	<0.1	0.3	0.2	0.1
Chloride	mg/L	--	2	2	2	1	8	31	6	8	6	5	4	22	11
Conductivity	uS/cm	--	391	403	478	375	339	1310	597	530	354	655	469	679	337
Dissolved organic carbon (DOC)	mg/L	--	34	28	15	11	22	18	26	11	6	4	6	6	6
Hardness	mg/L	--	220	222	274	253	238	736	318	300	204	393	266	363	224
Nitrate (as N)	mg/L	--	<0.06	<0.06	0.12	0.16	0.13	<0.06	<0.06	<0.06	<0.06	1.16	0.34	1.65	0.99
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	0.22	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.14
pH	s.u.	6.5-8.5	6.85	7.63	7.95	7.5	7.45	7.87	7.93	8.34	7.61	8.34	8	8.25	7.66
Phenolics (total)	mg/L	0.001	**0.025**	**0.002**	0.001	<0.001	**0.006**	**0.002**	**0.005**	<0.001	<0.001	**0.002**	<0.001	**0.002**	<0.001
Phosphorus	mg/L	0.03 (e)	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate	mg/L	--	52	22	2	<2	57	56	31	<2	7	3	6	21	13
Total kjeldahl nitrogen (TKN)	mg/L	--	0.8	<0.5	<0.5	<0.5	0.5	5.9	1.3	1.2	<0.5	<0.5	<0.5	<0.5	<0.5
Un-ionized ammonia	mg/L	0.02 (g)	<0.00053	<0.00019	<0.00019	<0.00012	<0.00004	**0.02157**	0.00064	<0.00034	<0.0003	<0.00025	0.00156	0.00081	0.00055
Field Parameters															
Conductivity, field	uS/cm	--	532	4590	592	478	671	1200000	617000	643	399	784	470	787	410
Dissolved oxygen (DO), field	mg/L	<4 (f)	**1.92**	**3.07**	**2.46**	-	**0**	**3.12**	**0.31**	**3.79**	-	4.49	-	7.11	-
pH, field	s.u.	6.5-8.5	7.67	7.05	7	6.91	6.54	7.2	7.48	7.28	7.28	7.17	7.37	7.35	7.43
Temperature, field	Deg C	--	1.41	6.55	7.7	4.81	2.73	11.85	9.22	6.8	5.23	6.4	9.76	7.2	8.79

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

< Parameter detected below the laboratory method detection limit

NM Not Measured.

36.0 Parameter exceeds the PWQO.

Appendix E.4

2017 to 2023 Surface Water Analytical Results
2023 Annual Monitoring Report
Kincardine Ward 3 Landfill Site
Kincardine, Ontario

Sample Location:			SW10	SW10	SW11	SW11	SW11	SW11	SW11
Sample ID:			SW-WARD 3-003	SW-WARD3-12/2/22-05	SW-WARD 3-003	SW-WARD 3-005	SW-WARD 3-002	SW-Ward3-008	SW11
Sample Date:			6/28/2022	12/2/2022	5/12/2021	12/12/2021	6/28/2022	5/19/2023	11/7/2023
Parameters	**Units**	**PWQO[1]**							
Metals									
Aluminum	mg/L	0.075 (a)	**0.141**	**0.092**	0.013	0.021	**0.886**	0.015	0.04
Boron	mg/L	0.2	0.118	0.069	0.186	**0.233**	0.183	0.179	**0.249**
Calcium	mg/L	--	122	90.4	129	120	128	134	135
Iron	mg/L	0.3	0.277	0.133	0.078	0.129	**1.36**	0.159	**0.317**
Magnesium	mg/L	--	32.5	25	29.3	30.8	28.4	29.1	35.1
Manganese	mg/L	--	0.0886	0.0199	0.186	0.193	0.344	0.239	0.225
Phosphorus	mg/L	0.03 (e)	**0.047**	**0.032**	<0.003	0.008	**0.088**	0.004	0.005
Potassium	mg/L	-	6.34	4.66	10.9	13.4	9.55	12.2	16.5
General Chemistry									
Alkalinity, total (as CaCO3)	mg/L	--	337	300	383	400	376	389	456
Ammonia-N	mg/L	--	<0.1	0.6	1.1	1.7	<0.1	1.8	4.2
Chloride	mg/L	--	33	26	42	44	39	30	35
Conductivity	uS/cm	--	752	660	887	838	783	812	1010
Dissolved organic carbon (DOC)	mg/L	--	6	6	8	9	8	7	10
Hardness	mg/L	--	439	329	443	427	437	455	481
Nitrate (as N)	mg/L	--	2.34	1.52	0.78	1.2	1.01	0.62	0.56
Nitrite (as N)	mg/L	--	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Orthophosphate	mg/L	--	0.04	<0.03	<0.03	<0.03	0.03	<0.03	<0.03
pH	s.u.	6.5-8.5	8.28	8.14	8.2	8.09	8.23	8.2	8.18
Phenolics (total)	mg/L	0.001	**0.002**	<0.001	<0.001	<0.001	<0.001	0.001	<0.001
Phosphorus	mg/L	0.03 (e)	-	-	-	-	-	-	-
Sulfate	mg/L	--	45	31	42	59	32	49	60
Total kjeldahl nitrogen (TKN)	mg/L	--	<0.5	1.2	1.3	1.7	<0.5	2.2	4.8
Un-ionized ammonia	mg/L	0.02 (g)	<0.00175	0.00036	0.0025	0.00697	<0.00151	**0.02978**	**0.05584**
Field Parameters									
Conductivity, field	uS/cm	--	777	678	950	750	778	885000	1240000
Dissolved oxygen (DO), field	mg/L	<4 (f)	7.37	**2.24**	**3.65**	-	5.89	**3.4**	5.59
pH, field	s.u.	6.5-8.5	7.69	6.62	7	7.34	7.64	7.83	7.85
Temperature, field	Deg C	--	16.1	4.34	10	7.6	15.6	11.12	7.72

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.

(e) No firm objective. Proposed objective is for protection against aesthetic deterioration and excessive plant growth in rivers and streams.

(g) 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.

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

\- Parameter not analyzed / no information

-- No guideline.

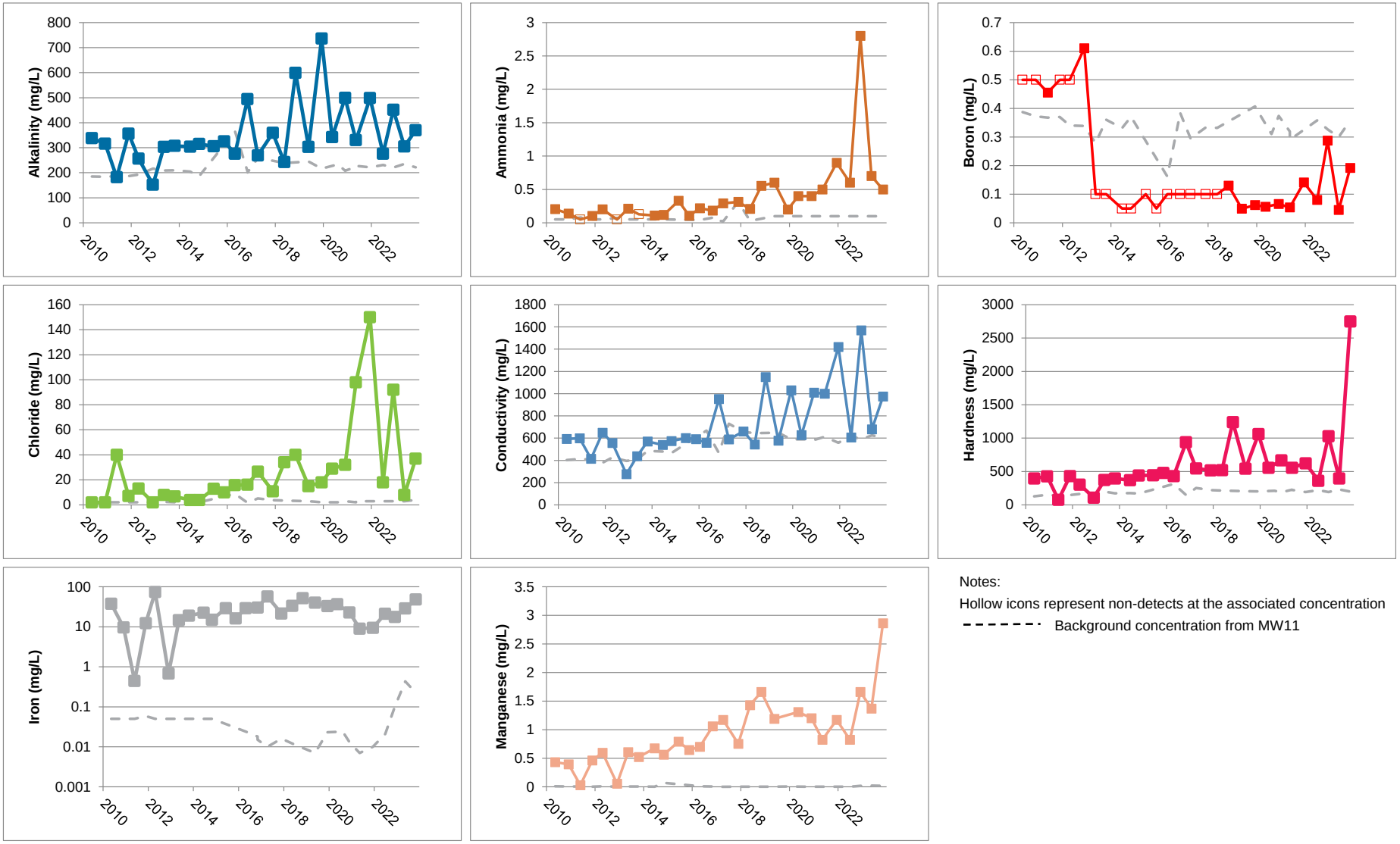
< Parameter detected below the laboratory method detection limit

NM Not Measured.

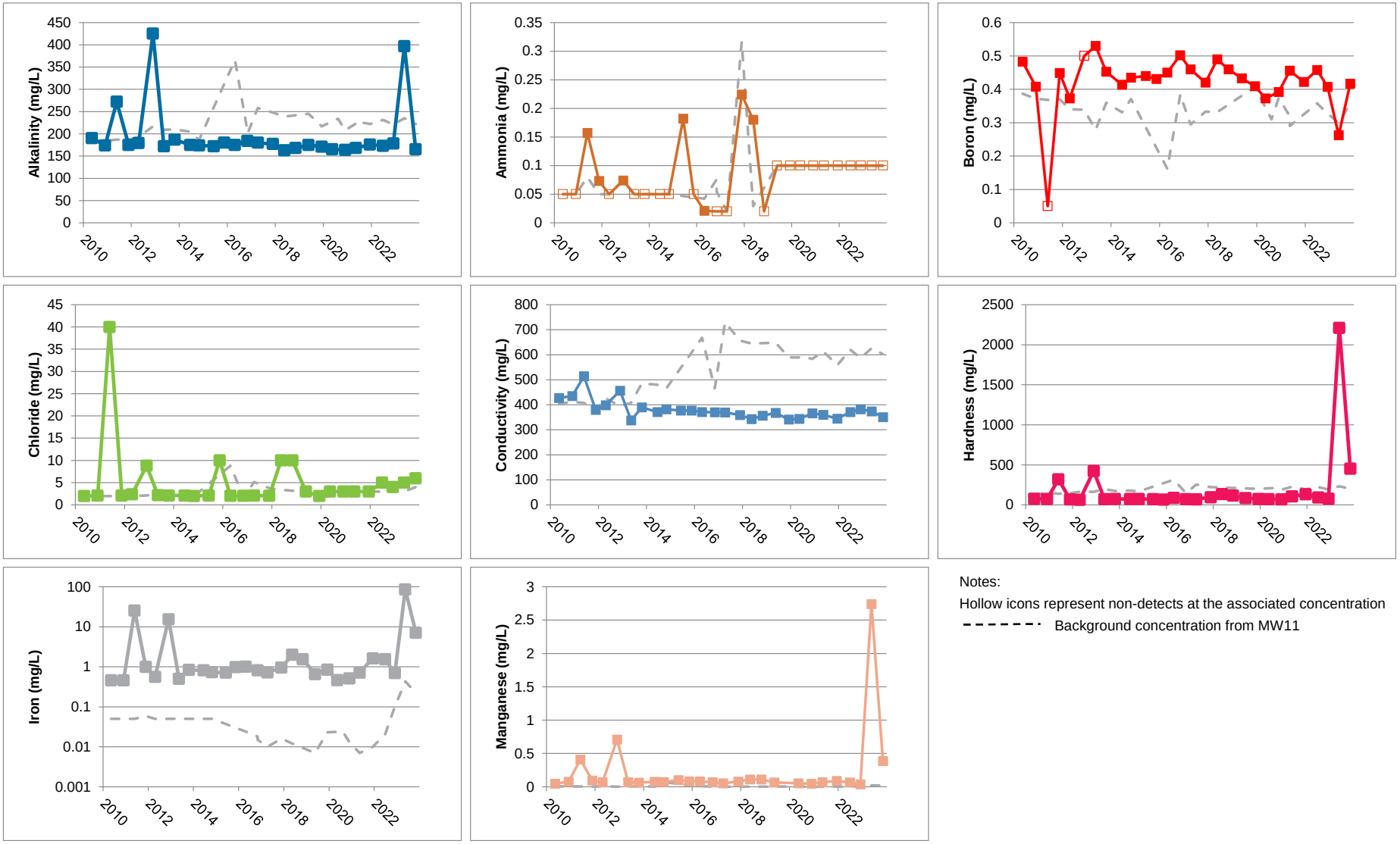
36.0 Parameter exceeds the PWQO.

Appendix F

Concentration Versus Time Plots



Appendix F - Figure 1
LW1-S - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

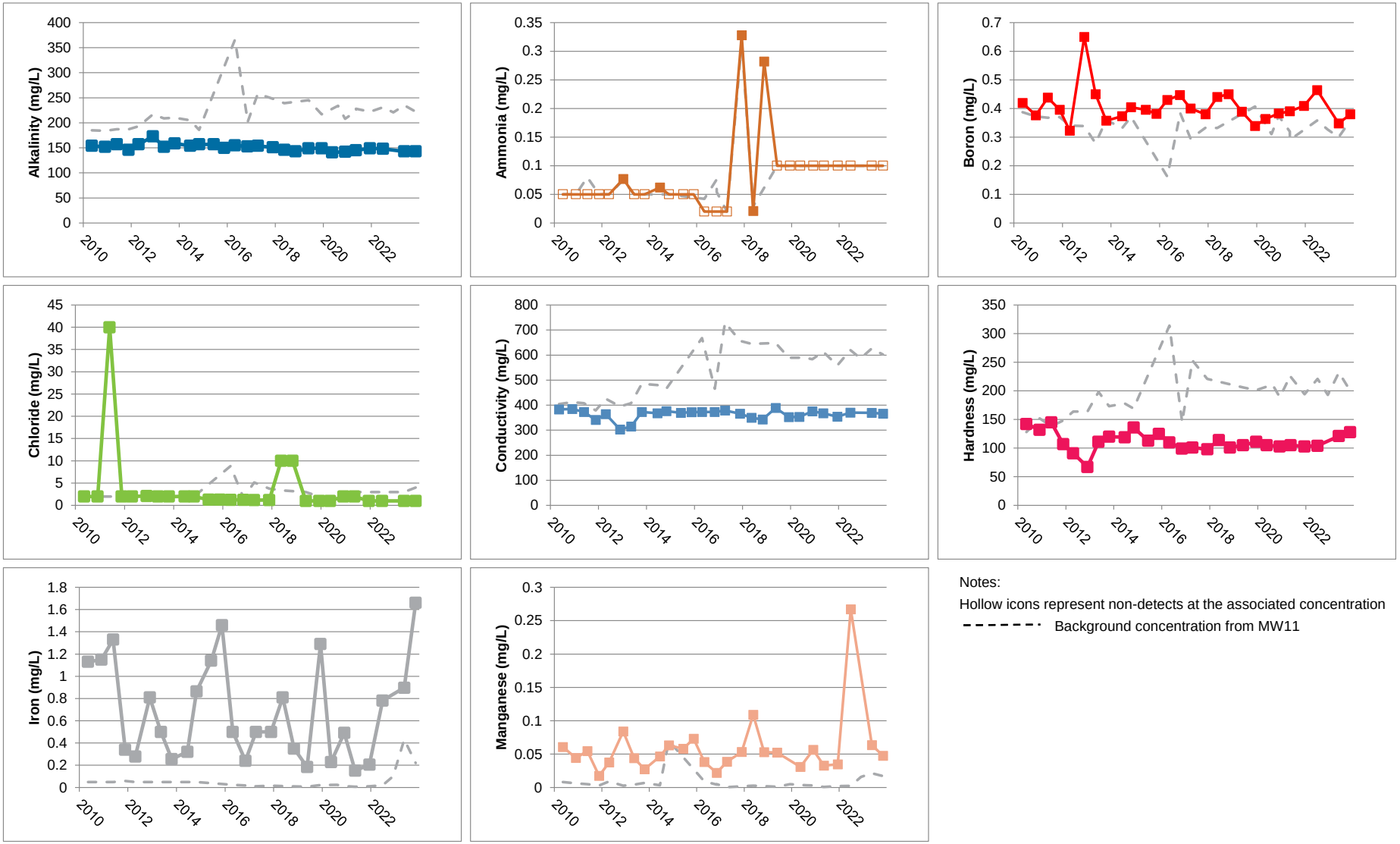


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 2
LW1-D - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

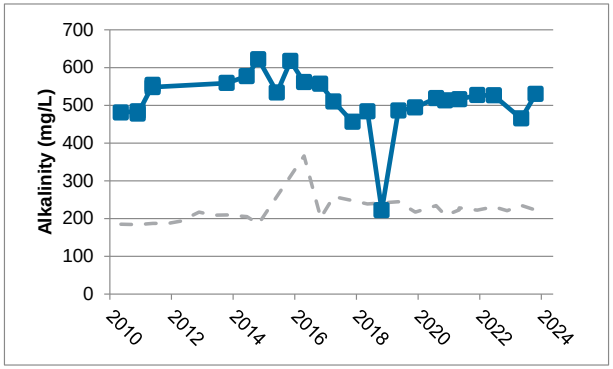


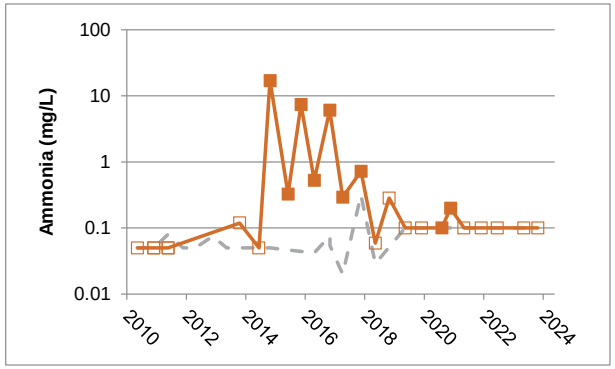
Notes:

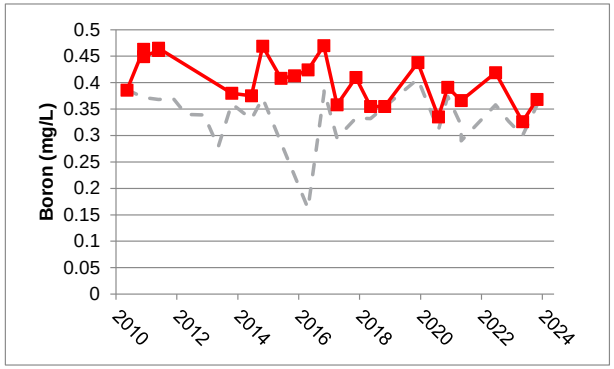
Hollow icons represent non-detects at the associated concentration

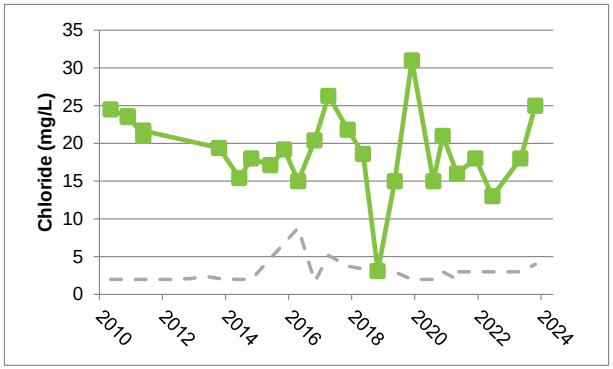
Background concentration from MW11

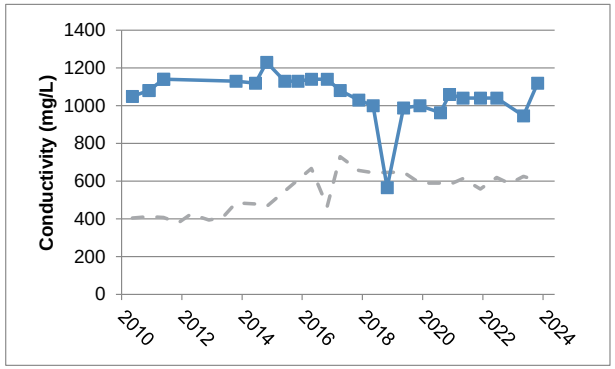
Appendix F - Figure 3
LW2 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

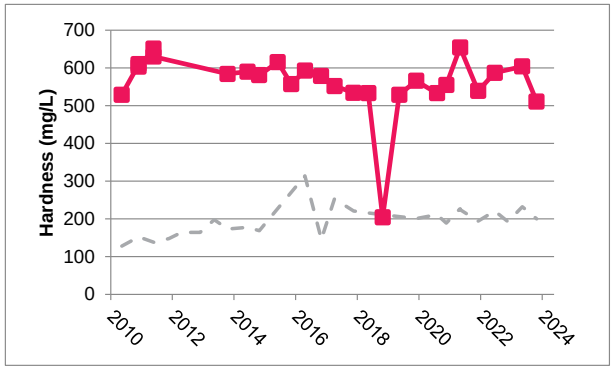


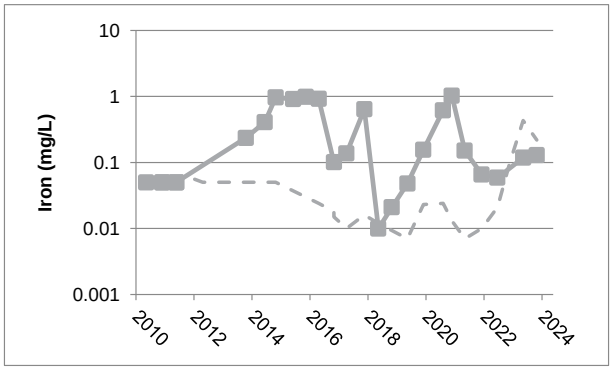


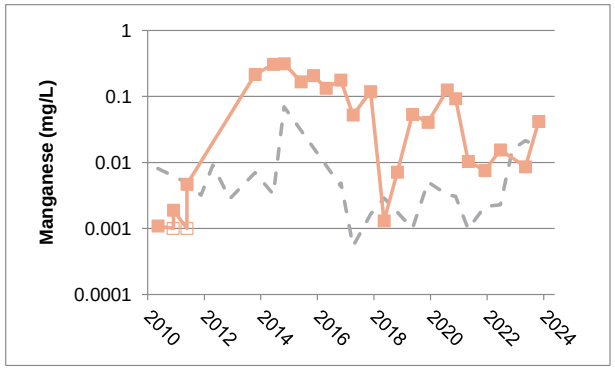










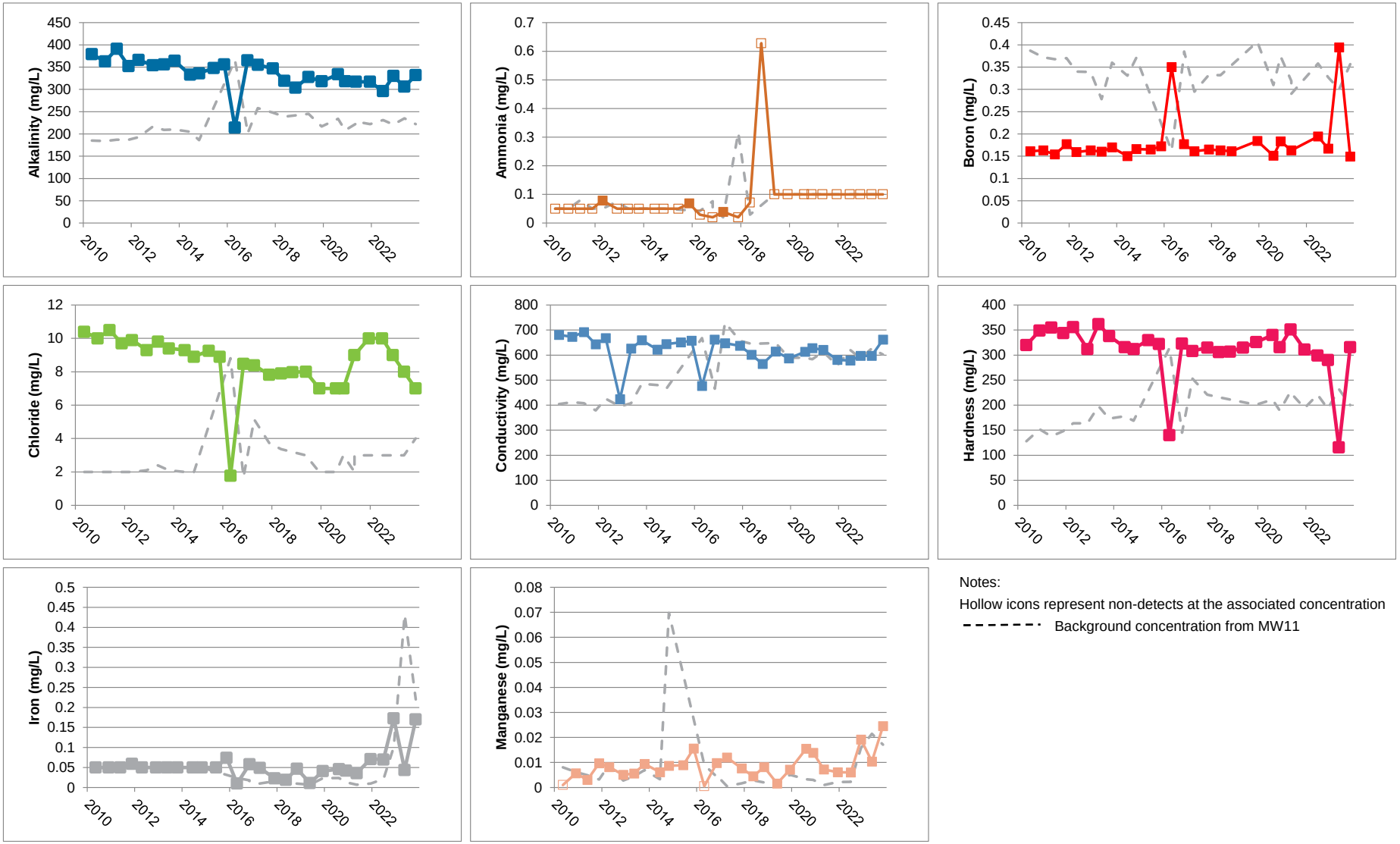


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 4
MW1 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

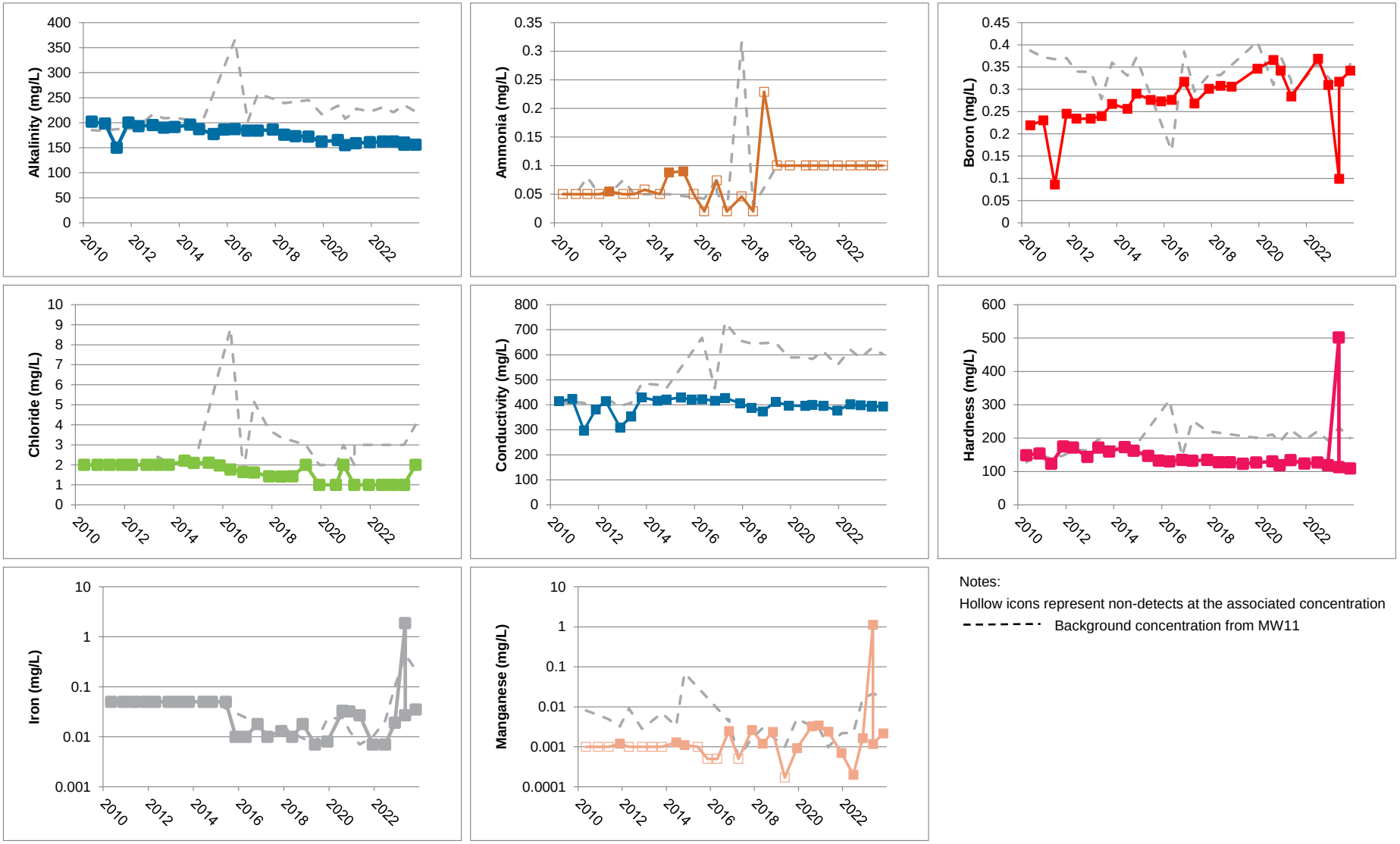


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 5
MW2 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

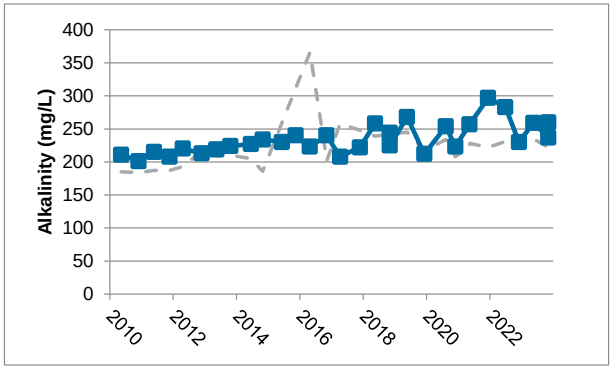


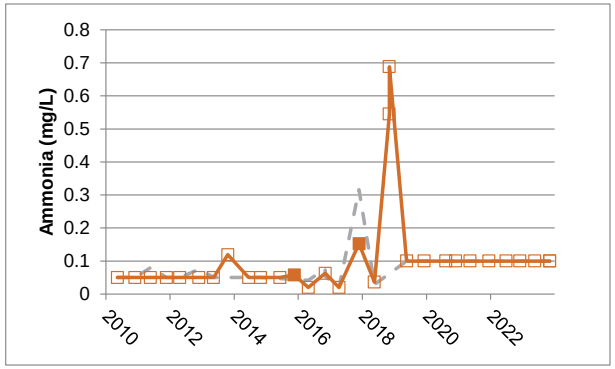
Notes:

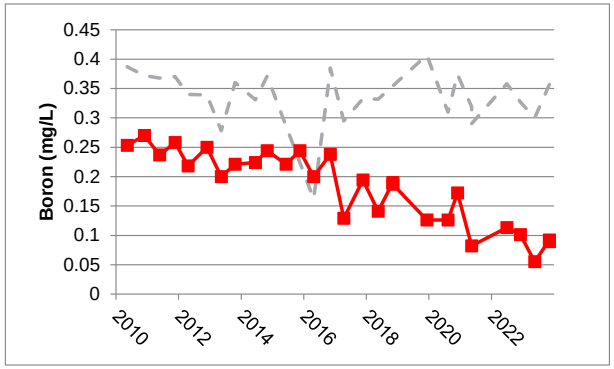
Hollow icons represent non-detects at the associated concentration

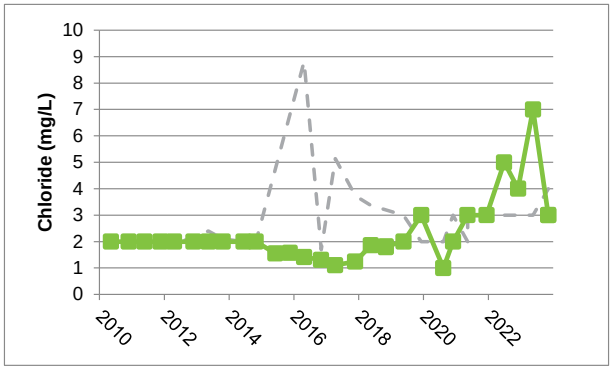
Background concentration from MW11

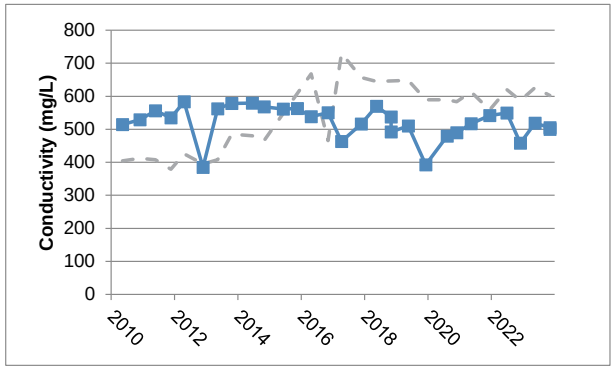
Appendix F - Figure 6
MW3 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

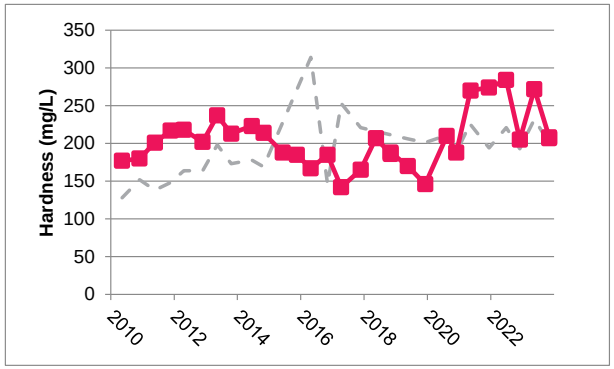


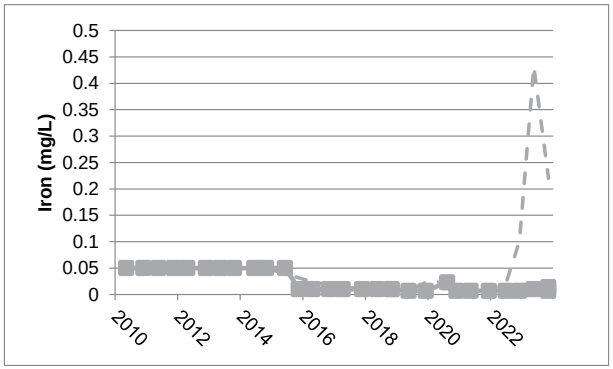


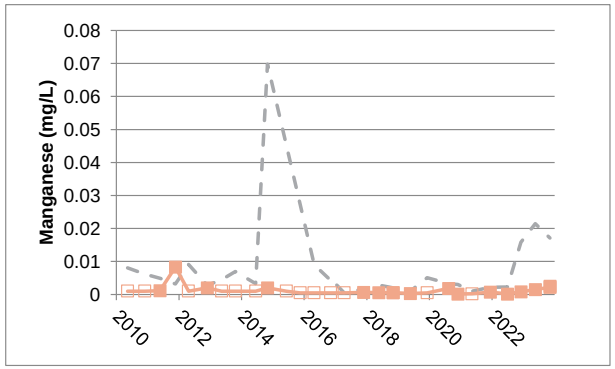










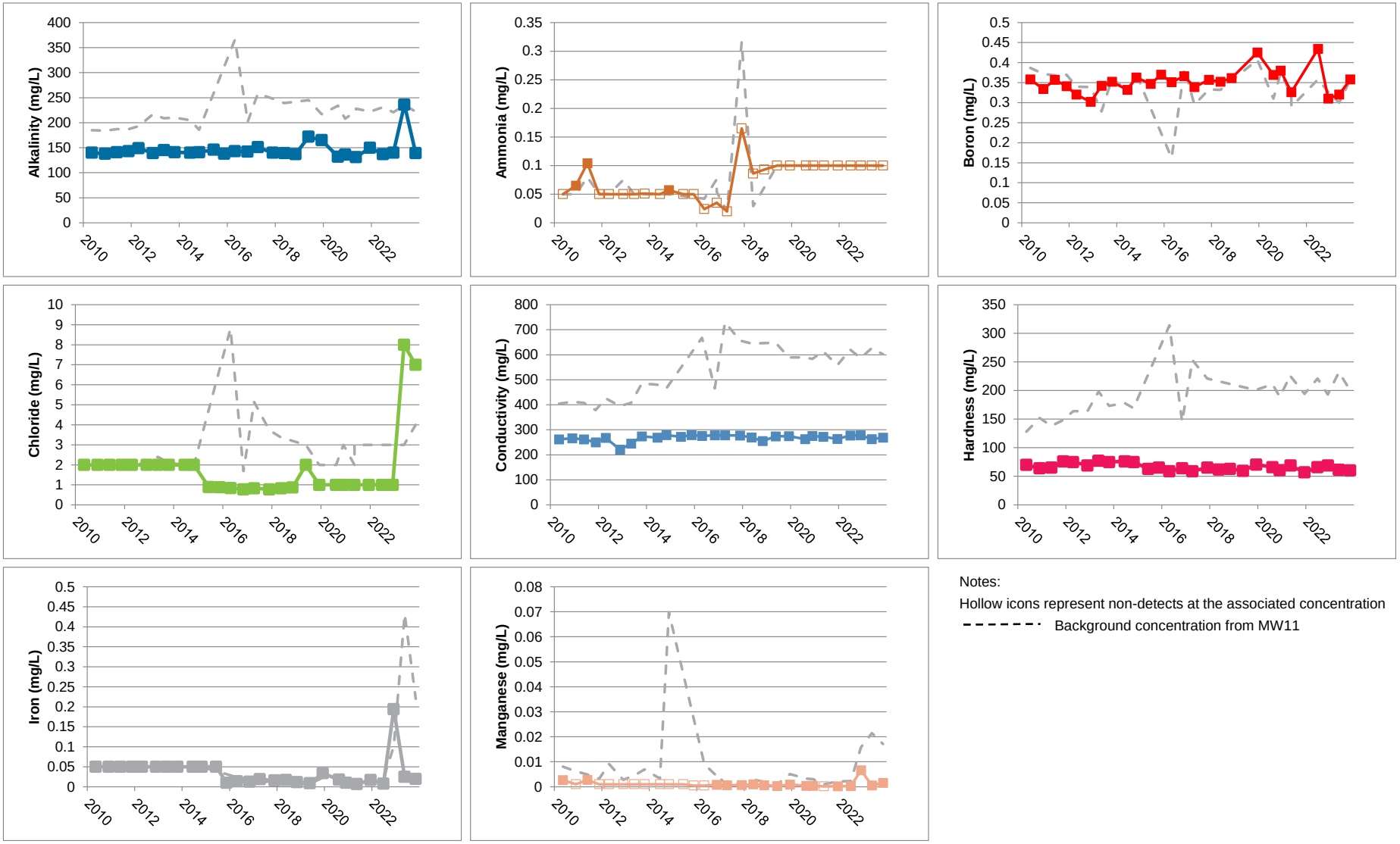


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 7
MW5 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

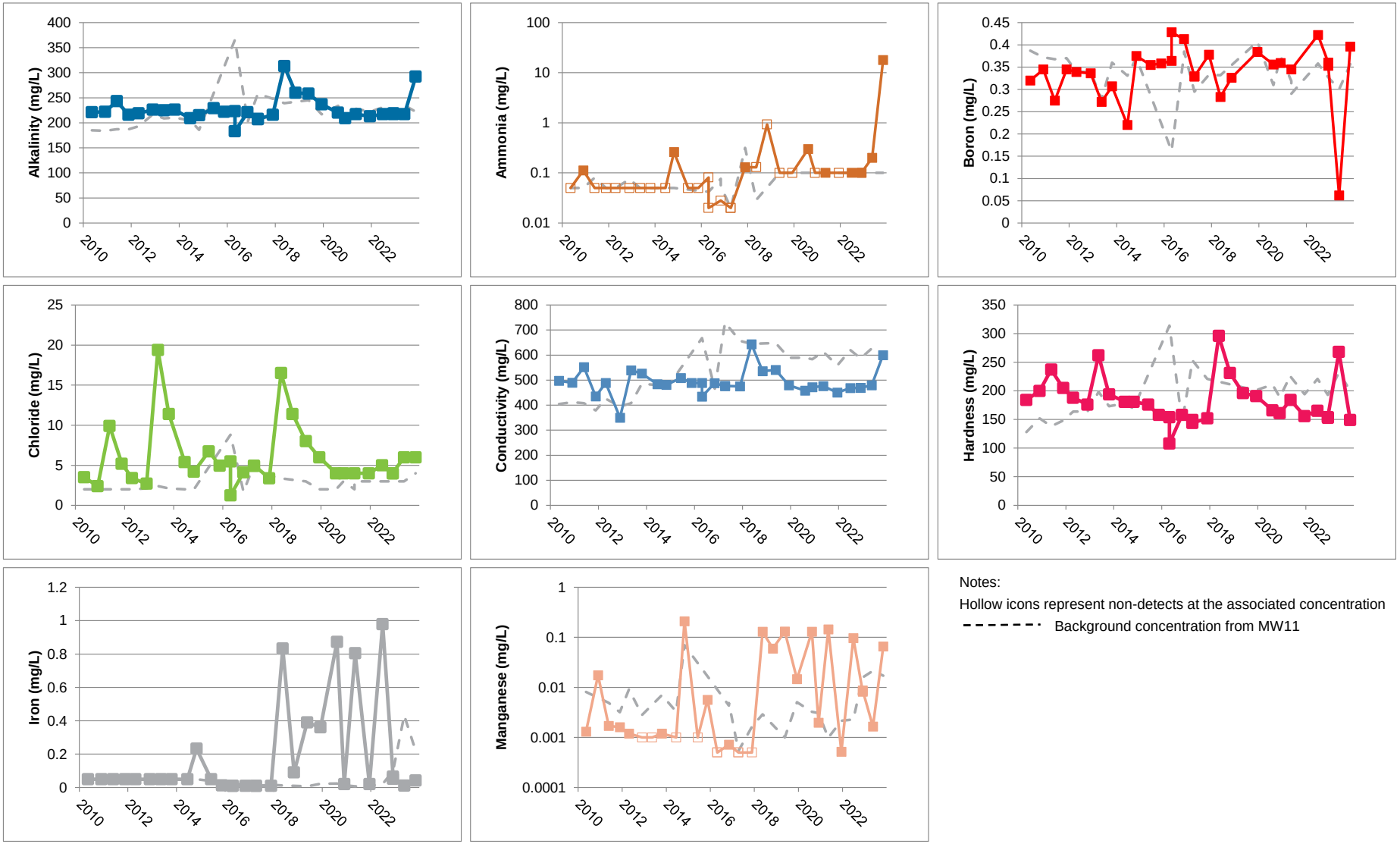


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 8
MW6 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

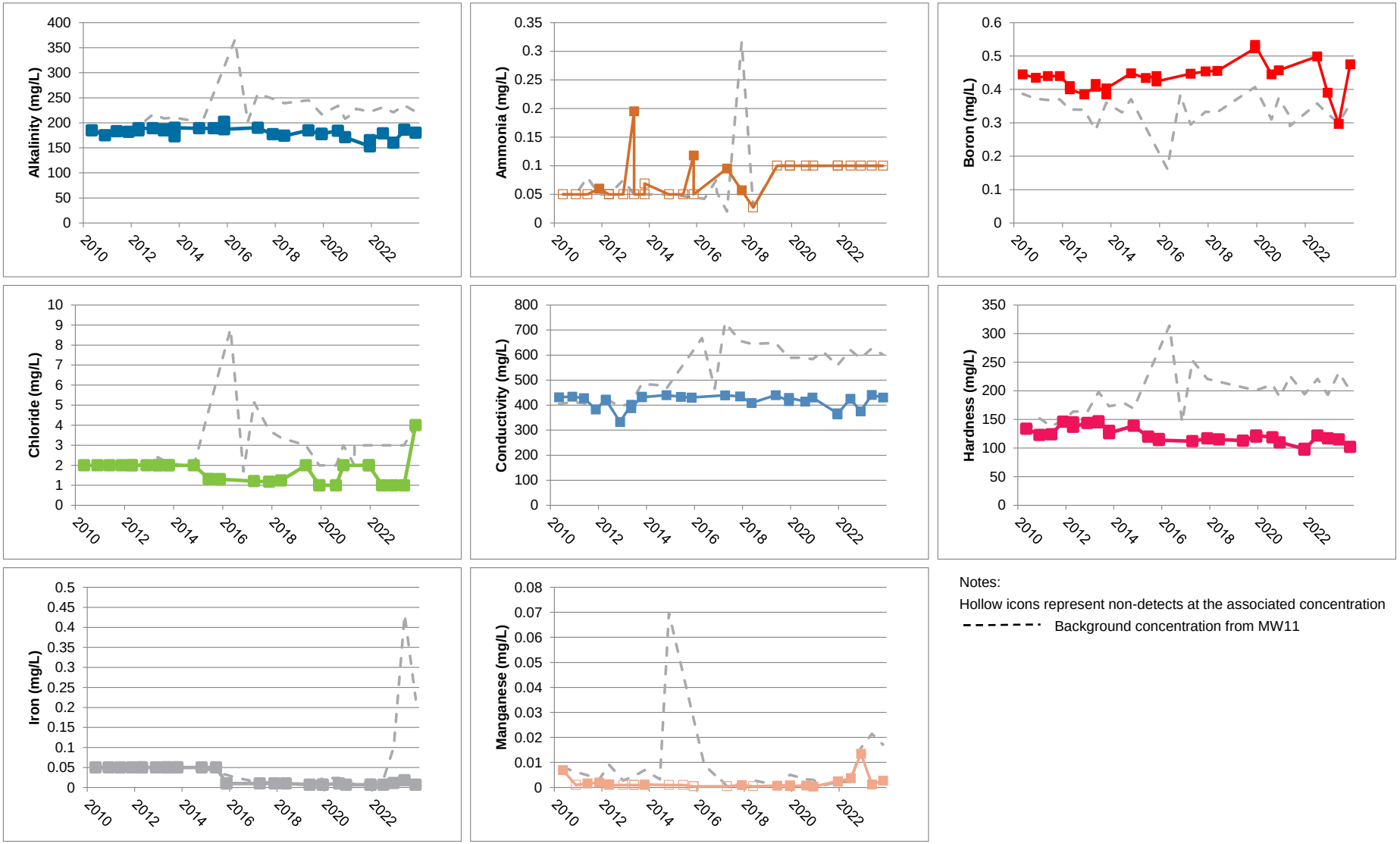


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 9
MW7 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

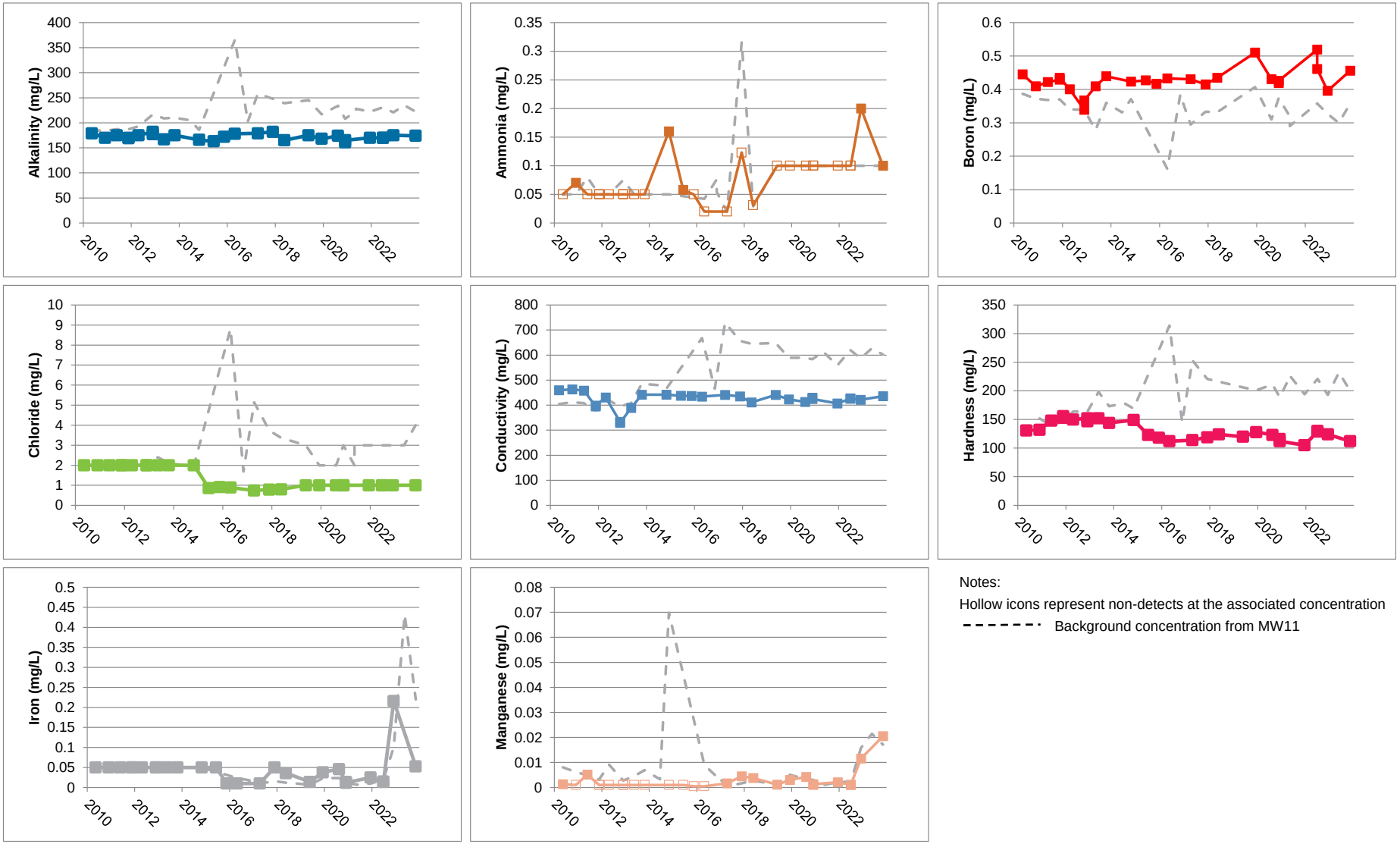


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 10
MW8 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

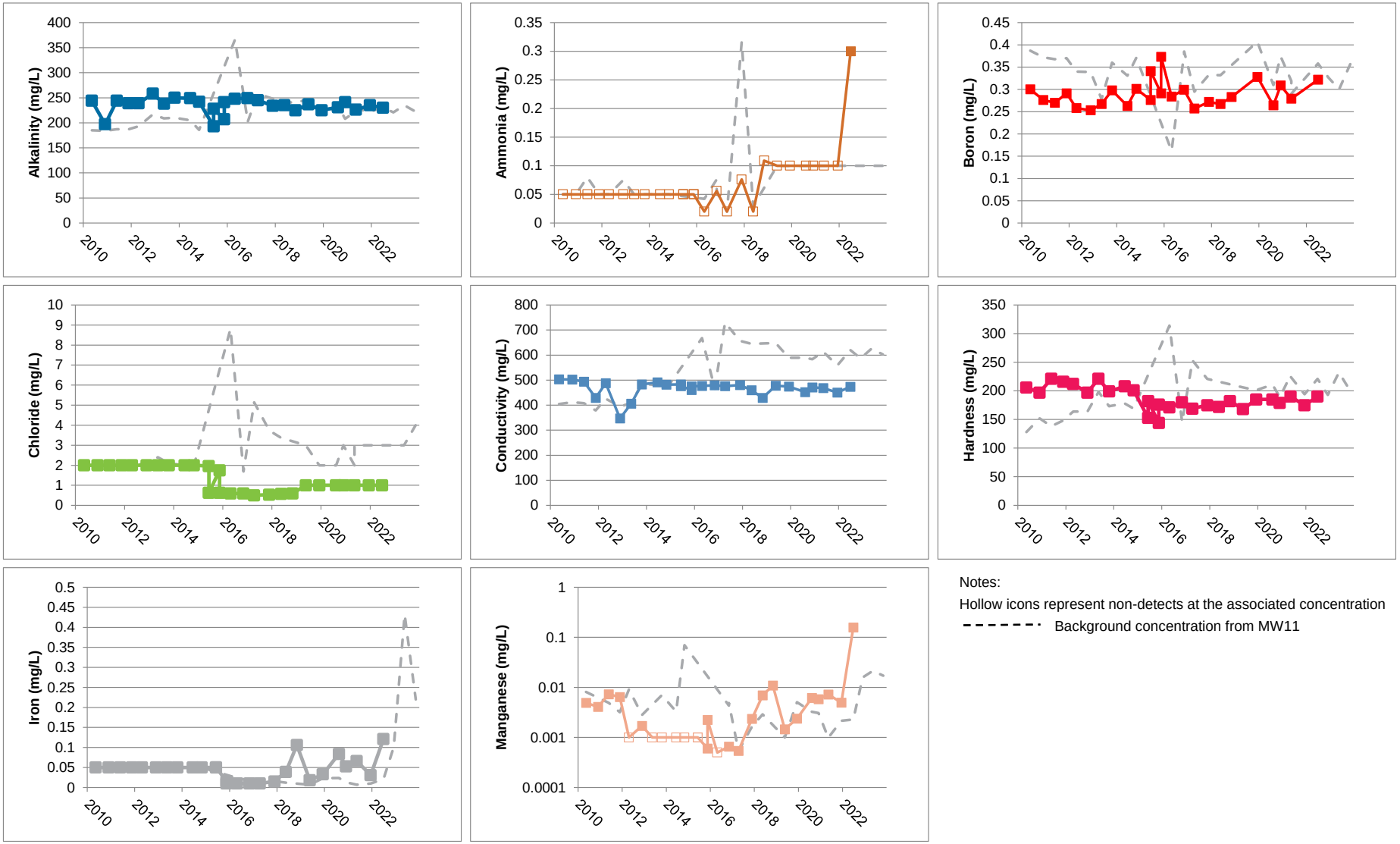


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 11
MW9 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

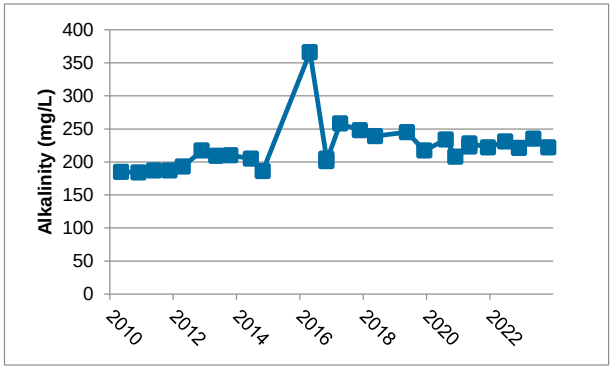


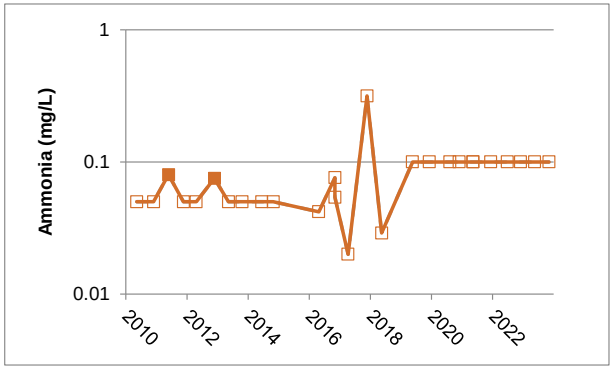
Notes:

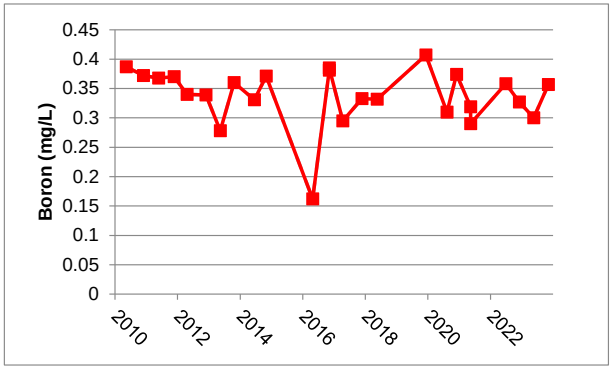
Hollow icons represent non-detects at the associated concentration

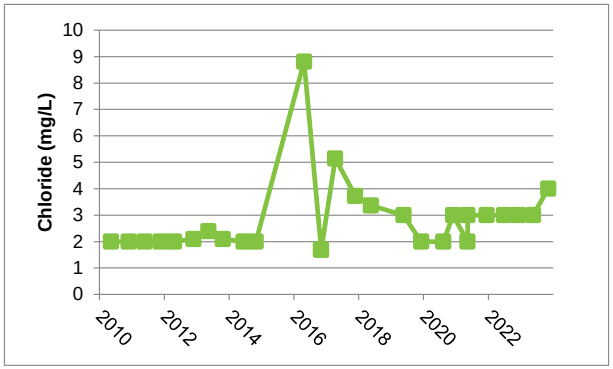
Background concentration from MW11

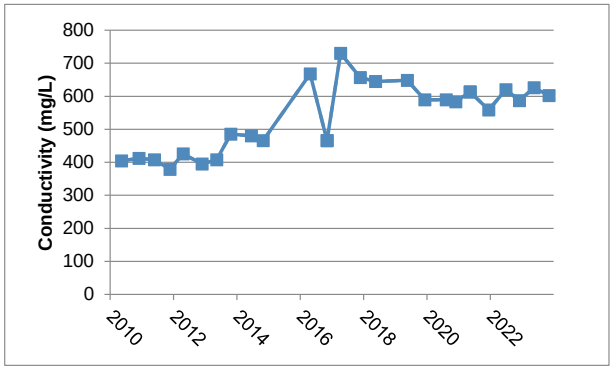
Appendix F - Figure 12
MW10 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

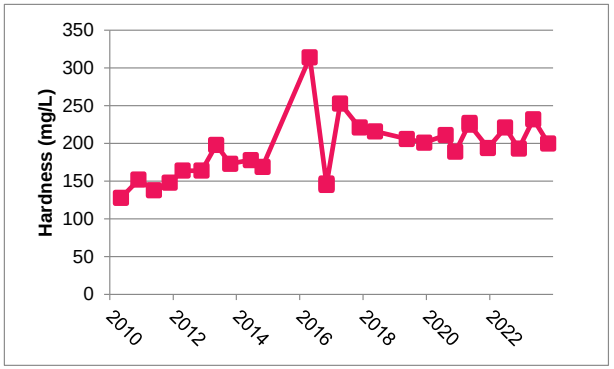


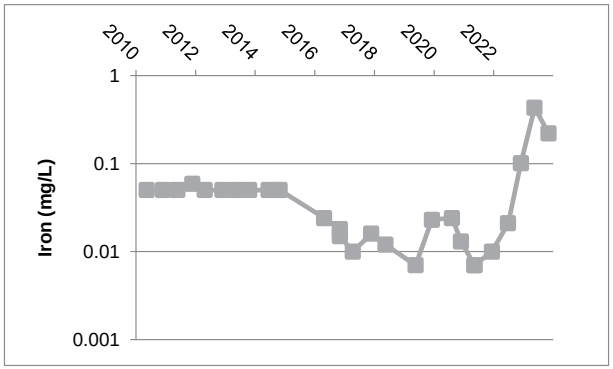


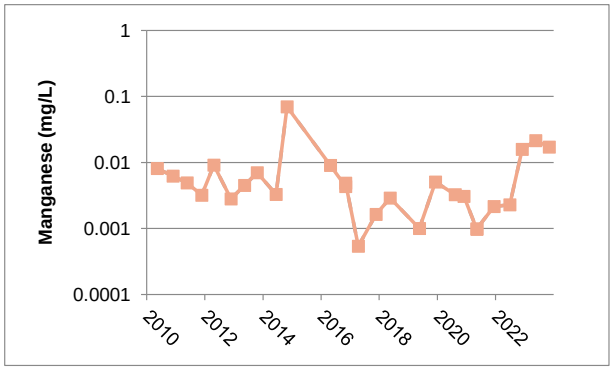










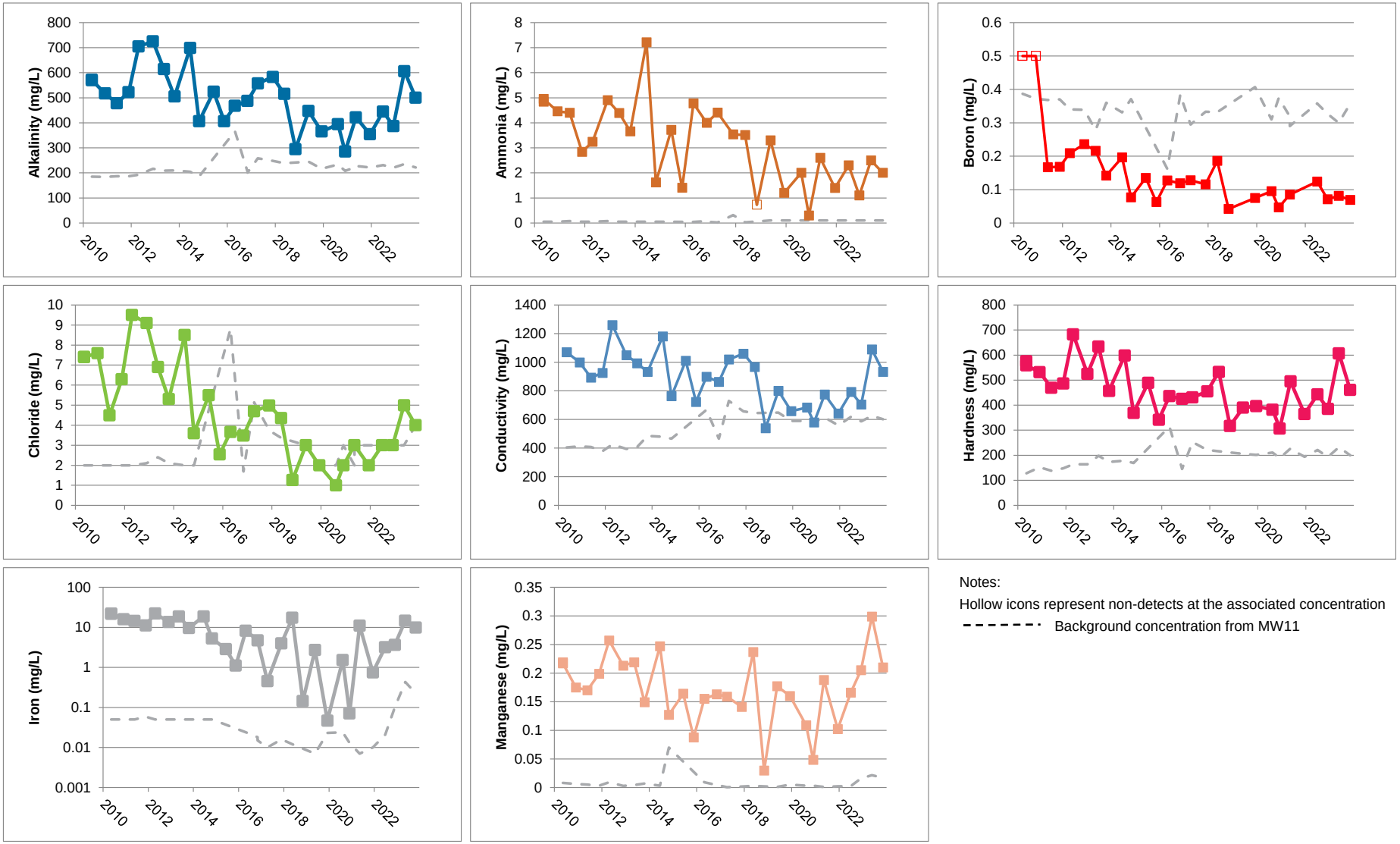


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 13
MW11 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

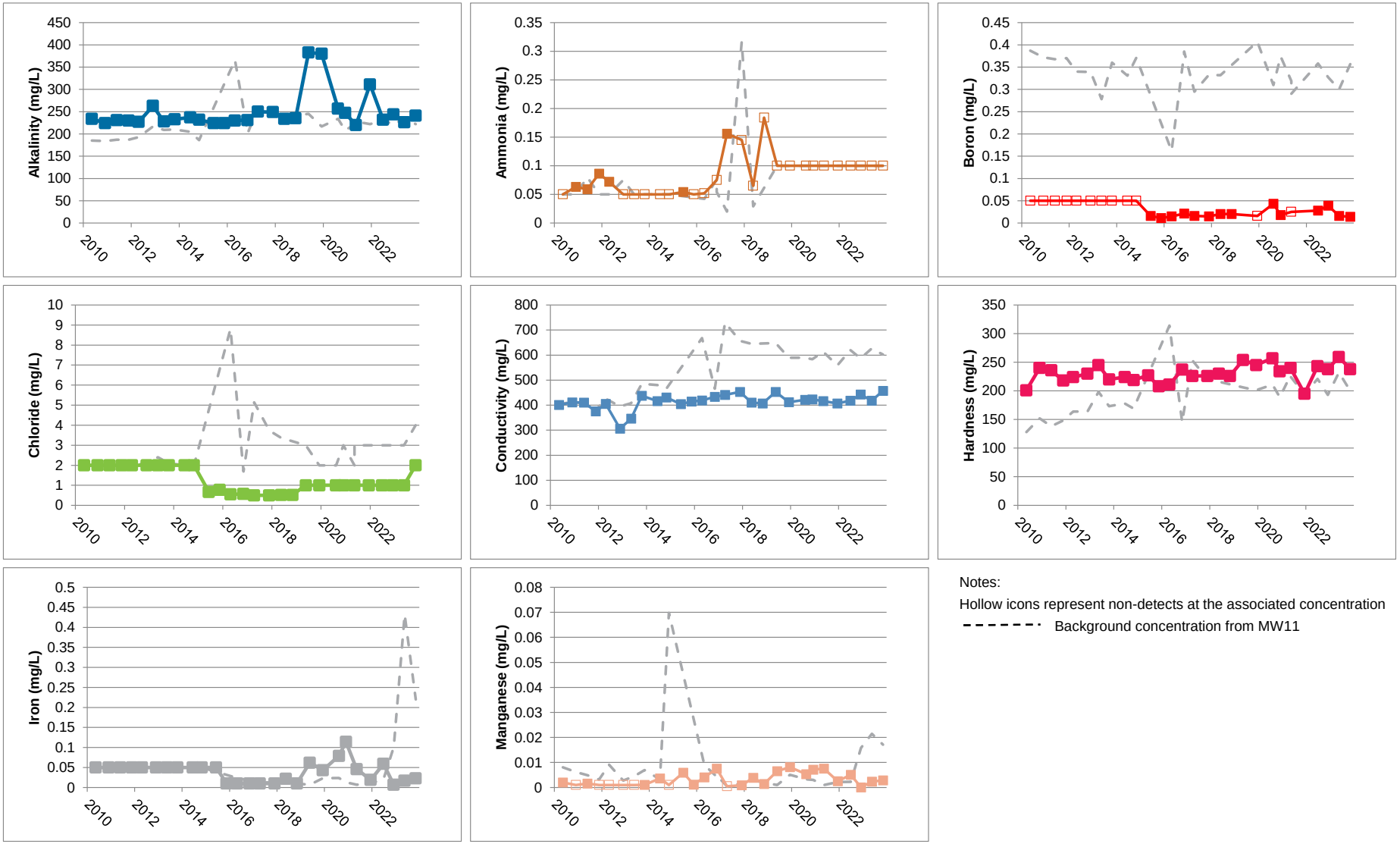


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 14
MW12 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

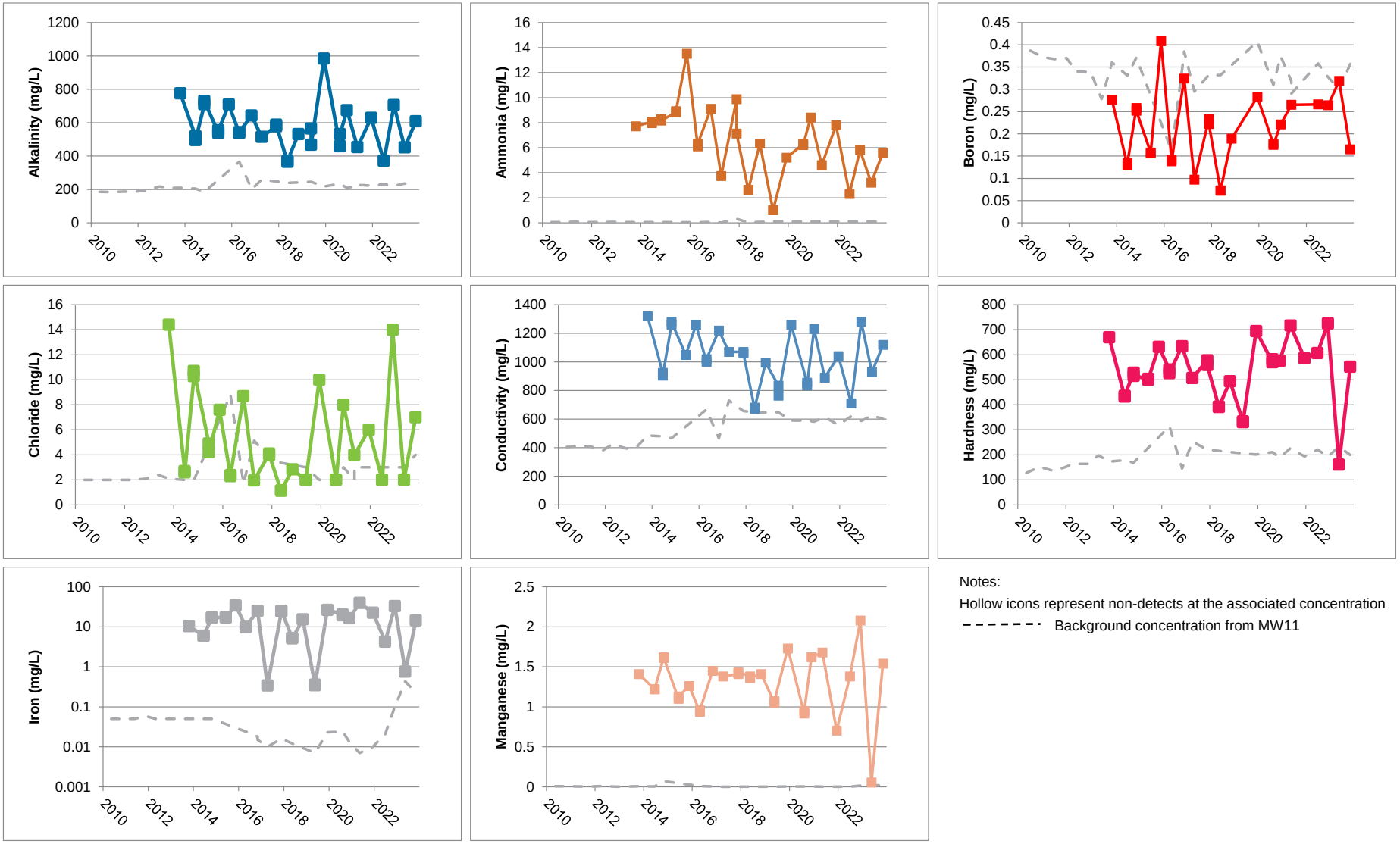


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentration from MW11

Appendix F - Figure 15
MW13 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

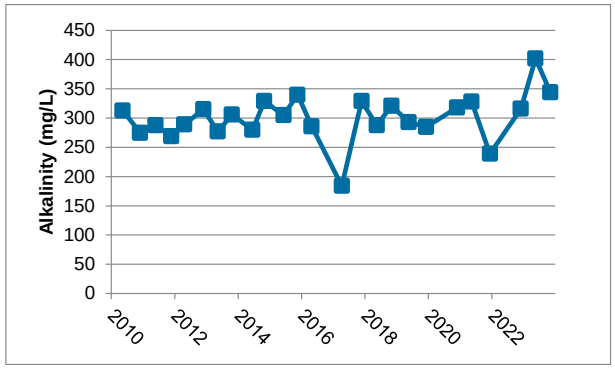


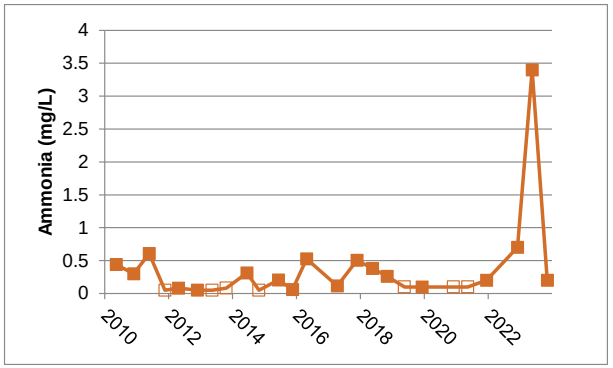
Notes:

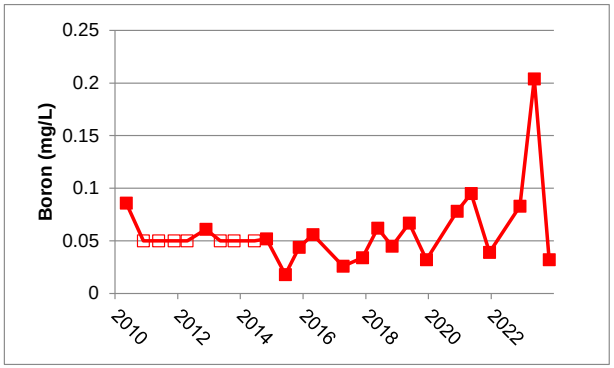
Hollow icons represent non-detects at the associated concentration

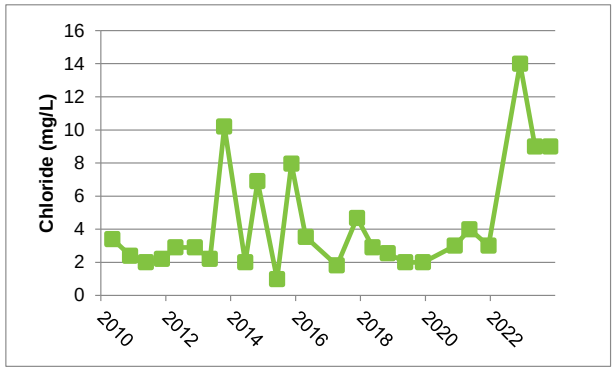
Background concentration from MW11

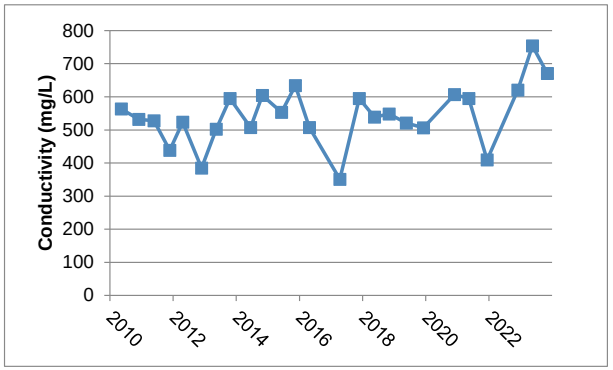
Appendix F - Figure 16
MW14 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

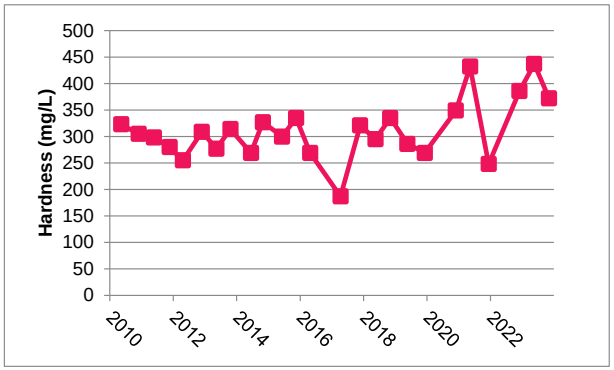


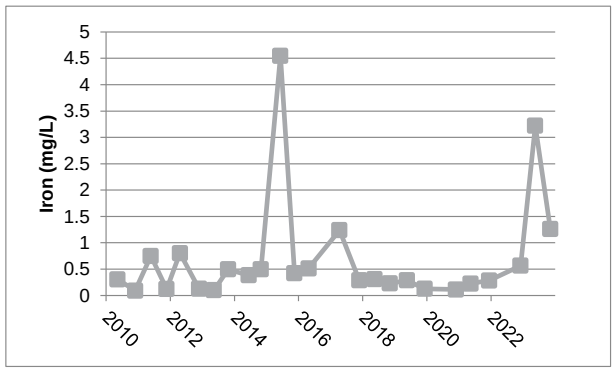


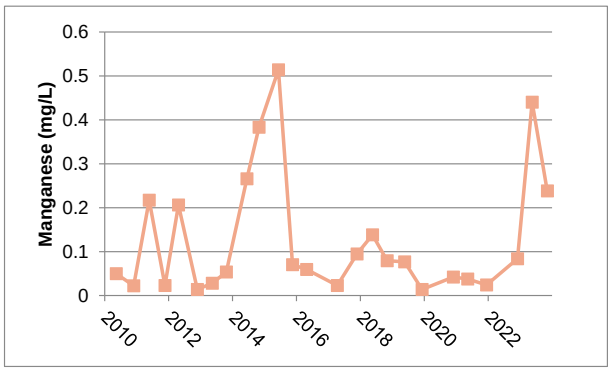








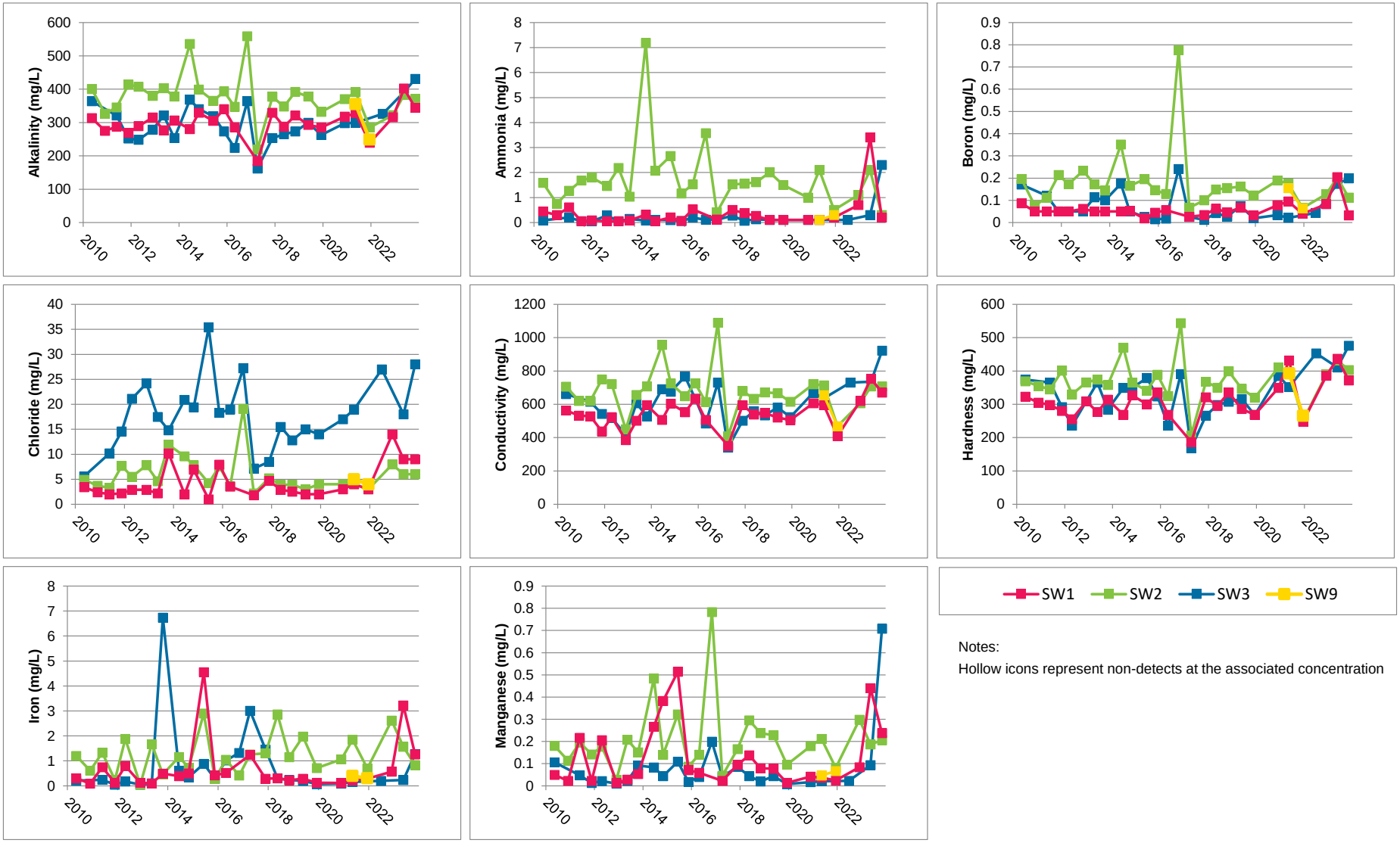




Notes:

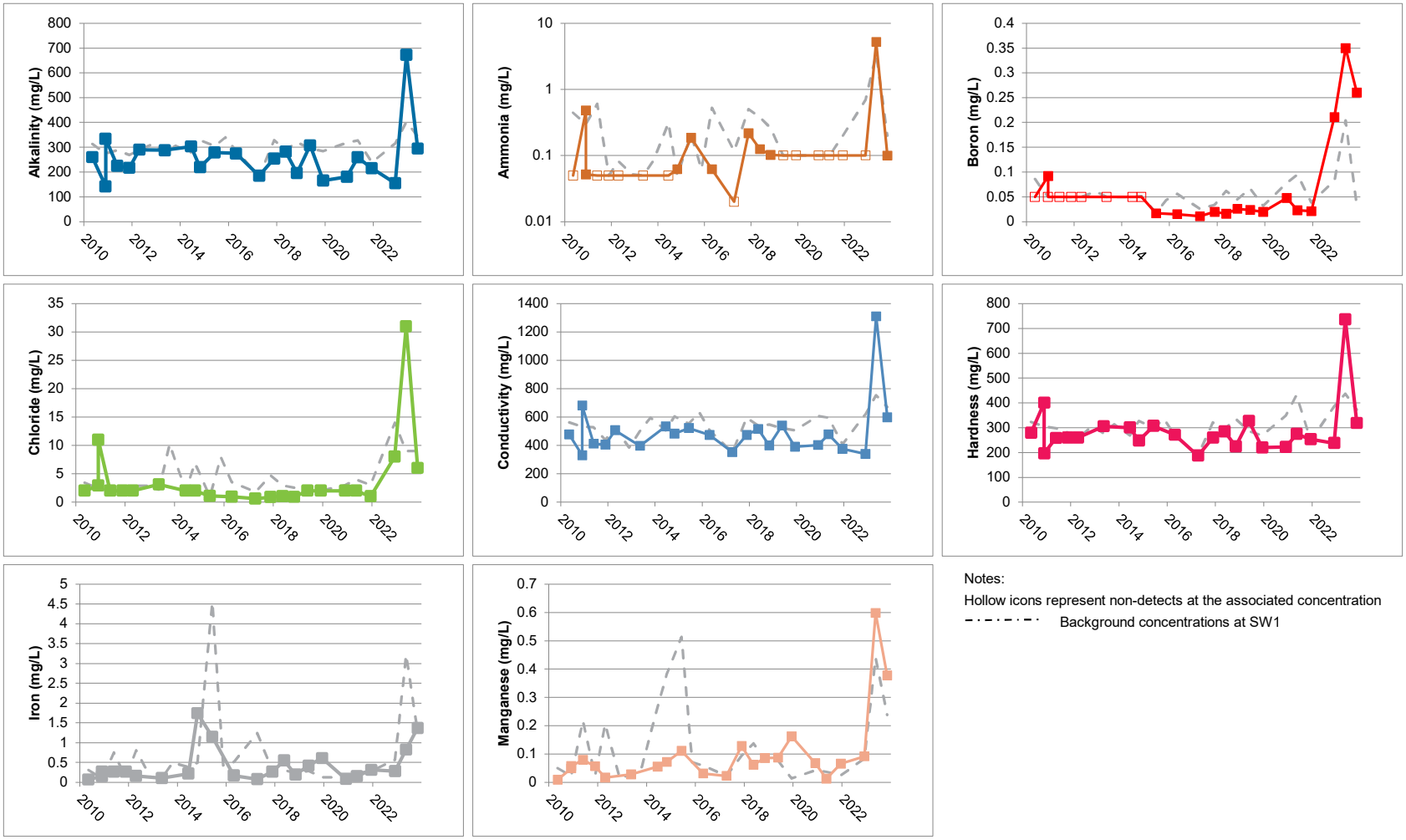
Hollow icons represent non-detects at the associated concentration

Appendix F - Figure 17
SW1 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario



Notes:
Hollow icons represent non-detects at the associated concentration

Appendix F - Figure 18
SW1, SW2, SW3, SW9 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

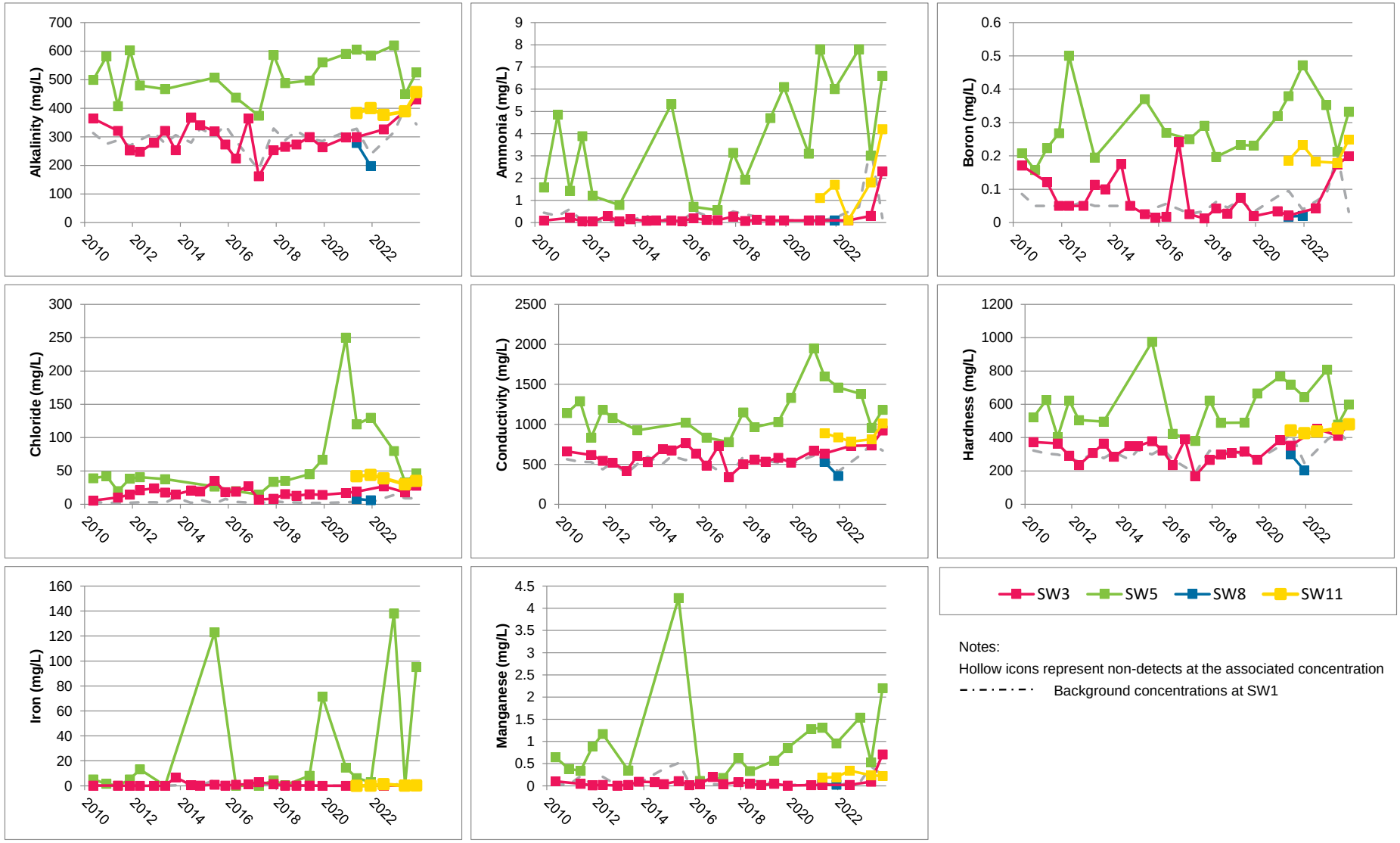


Notes:

Hollow icons represent non-detects at the associated concentration

Background concentrations at SW1

Appendix F - Figure 19
SW7 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario



Notes:

Hollow icons represent non-detects at the associated concentration

Background concentrations at SW1

Appendix F - Figure 20

SW3, SW5, SW8, SW11 - Water Quality Concentration versus Time Plots

2023 Annual Monitoring Report - Ward 3 Landfill

Municipality of Kincardine, Ontario

Notes:

Hollow icons represent non-detects at the associated concentration

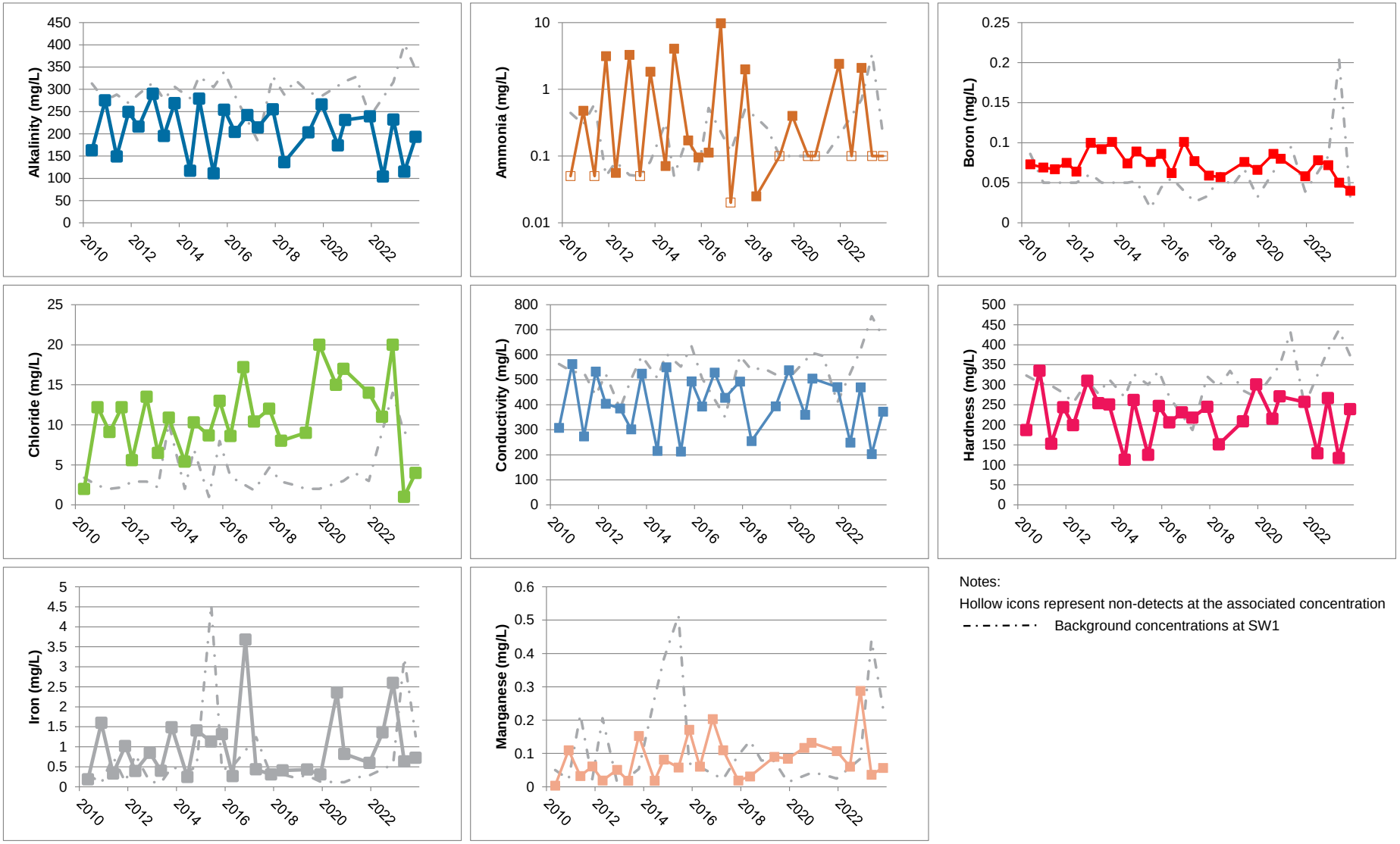
Background concentrations at SW1

Appendix F - Figure 21

SW3 & SW10 - Water Quality Concentration versus Time Plots

2023 Annual Monitoring Report - Ward 3 Landfill

Municipality of Kincardine, Ontario



Notes:

Hollow icons represent non-detects at the associated concentration

Background concentrations at SW1

Appendix F - Figure 21
SW4 - Water Quality Concentration versus Time Plots
2023 Annual Monitoring Report - Ward 3 Landfill
Municipality of Kincardine, Ontario

Appendix G

Annual 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 3 Landfill Site
Location (e.g. street address, lot, concession)	Eastern half of Lot 17, Concession 2 in the former Township of Bruce in the Municipality of Kincardine
GPS Location (taken within the property boundary at front gate/ front entry)	Not Available
Municipality	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)) :	A272001
Director's Order No.:	No
Provincial Officer's Order No.:	No

Other:	No		
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*	Cubic Metres
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*	Estimated		
Estimated Remaining Capacity	52,000	*Units*	Cubic Metres
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*			
Estimated Remaining Capacity *Date Last Determined*			
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)*	No		

Year Site Opened *(enter the Calendar Year only)*		**Current ECA Issue Date**	22-Sep-86
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:		Select Date	
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**	Results from the monitoring wells installed along the southern property boundary (MW12 and MW14) show landfill-derived impacts that are likely migrating across the Property boundary. Installation of an off-Site monitoring well is recommended to demonstrate the extent of the potential landfill-derived impacts. All wells are in good condition and are secured.
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**
See body of report for a listing of monitoring program deviations		

Type Here	Type Here	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**	Additional CAZ is required to the south of the Site to demonstrate the extent of the potential landfill-derived impacts; however, negotiations for the acquisition of property or groundwater rights to the south should be delayed until a second additional monitoring well is installed on the adjacent property and additional monitoring data can be obtained to determine the extent of potential landfill-derived impacts.
6) The site meets compliance and assessment criteria.	( ) **Yes** (●) **No**	Further investigation is required off-Site, along the southern property boundary.
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	(●) **Yes** ( ) **No**	If no, list exceptions and explain reason for increase/change (Type Here):

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**	Trigger levels have not been developed for the Site.	

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Select Date

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

○ **No changes to the monitoring program are recommended**	
◉ **The following change(s) to the monitoring program is/ are recommended:**	It is recommended that an additional monitoring well be installed on the property located immediately adjacent to the south of the landfill footprint.
◉ **No Changes to site design and operation are recommended**	
○ **The following change(s) to the site design and operation is/are recommended:**	Type Here
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)	several onsite, unnamed drainage ditches and swales intermittent creek (following across the northern portion of the Site) Lake Huron

Distance(s)	onsite 13 km east

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	◉ **Yes** ○ **No**	If no, identify issues (Type Here):
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

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 Table 4.6 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 from SW1 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	If yes, provide details and whether remedial measures are necessary (Type Here)
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ◉ **No** ○ **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here)

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:

Select Date

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

○ **No Changes to the monitoring program are recommended**	
◉ **The following change(s) to the monitoring program is/are recommended:**	Additional surfacewater monitoring stations are needed to assess potential off-Site migration of surface water impacts. See body of the report.
◉ **No changes to the site design and operation are recommended**	Type Here
○ **The following change(s) to the site design and operation is/ are recommended:**	

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**

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