2024 Annual Monitoring Report Final

BERNDT ROAD WASTE DISPOSAL SITE NORTH ALGONA WILBERFORCE

May 30, 2025 Jp2g Project # 17-60411





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EXECUTIVE SUMMARY

The Berndt Road WDS closed for landfilling in 2002 and converted to a waste transfer site. Based on Ministry (TSS) review comments, the environmental monitoring program was revised and approved by the Ottawa District Manager on February 8, 2016.

The approved monitoring program which was initiated in 2017 includes the sampling of three downgradient wells (BH4, BH5 and BH6).

Based on the Reasonable Use Assessment, an elevated concentration of TDS was detected in BH5 during the April 2024 sampling event. There does not appear to be any increasing trends in concentrations that are directly related to the closed landfill site and corrective action is not recommended.

In accordance with a Ministry review dated December 13, 2013, surface water sampling was not required. A surface water trigger mechanism is however applied at BH5, and accordingly if the trigger concentrations are exceeded over three (3) consecutive events, surface water sampling would be required. Based on the monitoring results at BH5, the trigger mechanism has been exceeded for TDS and surface water sampling has been completed.



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1.0 INTRODUCTION

Jp2g Consultants Inc. was retained by North Algona Wilberforce Township to conduct the 2024 Annual Monitoring Program for the Berndt Road Closed Waste Disposal Site (WDS). This program includes the sampling and evaluation of groundwater quality, surface water, and landfill gas monitoring at and in the vicinity of the site. This report fulfills the requirements of the Annual Monitoring Report for the Berndt Road WDS for submission to the Ministry of the Environment, Conservation and Parks (MECP, and its predecessors MOE, MOEE, MOECC and also known as the Ministry) and in doing so, satisfies Condition 38 of the ECA No. A411401. A copy of the ECA is provided in **Appendix A**. The Environmental Monitoring and Screening Checklist is provided in **Appendix B**.

1.1 Site Ownership and Key Personnel

The site is owned and operated by North Algona Wilberforce Township (The Township). Contacts for the Township and the Competent Environmental Practitioner (CEP) for both groundwater and surface water are as follows:

Municipal Contact North Algona Wilberforce Township 1091 Shaw Woods Road Eganville, ON KOJ 1TO Adrian Tomasini Public Works Superintendent Telephone: 613-628-2080 Fax: 613-628-3341 Email: publicworks@nalgonawil.com

<u>CEP Contact for Ground and Surface Water</u> Andrew Buzza, P.Geo Telephone: 613-828-7800 Fax: 613-828-2600 Email: <u>andrew.buzza@jp2g.com</u>

1.2 Background

For file continuity, many details in this report have been copied and are repeated in part or in whole from previous reports produced by AECOM Canada Ltd. (AECOM), formerly known as Gartner Lee Limited.

The Berndt Road Landfill site is located approximately 2 km northwest of the hamlet of Golden Lake in Part of Lot 7, Concession 3, Township of North Algona, as shown in **Figure 1**. The site is comprised of a 2.0 ha landfilling area within a total site area of 5.36 ha. The landfill site was operational between 1978 and January 2002. The site currently operates as a waste transfer facility under ECA No. A411401.



Gartner Lee Limited was retained in 1999 to conduct a preliminary geological and hydrogeological desktop study of the North Algona Landfill Site. A site capacity assessment was carried out by Janota Patrick and Associates (now Jp2g Consultants Inc.) in June 1999. The capacity assessment revealed that there was considerable theoretical remaining capacity at that time. Gartner Lee in 1999 recommended that a scoped groundwater assessment be carried out to assess the limit of impact, and to provide guidance as to the environmental capacity of the site. In 2000, Gartner Lee conducted a field program that consisted of completing a geophysical survey, installing two groundwater monitoring wells and two mini-piezometers. Groundwater and surface water sampling was completed. In 2001, Jp2g staff installed three additional mini-piezometers, and in 2004, two additional boreholes were drilled to confirm the bedrock surface (one upgradient of the waste (BH2) and one downgradient of the waste (BH3). The boreholes were constructed as required under Condition 36 of the ECA.

The ground and surface water monitoring programs are a condition of the amended ECA issued in January 2004. Since this time, the Ministry has provided several technical memorandums relating to the approved monitoring at the site. A summary of Ministry correspondence is as follows, and copies of the relevant correspondence are provided in **Appendix C**.

- Ministry memorandum dated February 23, 2010 agrees with the removal of VOC sampling.
- The Ministry's District Manager provides written approval for the removal of VOC sampling in correspondence dated December 13, 2012.
- A request for further modifications to the monitoring program was submitted to the Ministry in May 2015, including a reduction in the frequency of groundwater level measurements, change in the timing of groundwater sampling and discontinuation of the surface water program.
- The proposed changes to the monitoring program were approved by the District Manager in a letter dated February 8, 2016.
- Ministry correspondence dated March 17, 2021, confirms sampling of BH4 and BH6 in early April 2022

1.3 Ministry Correspondence

A summary of the most recent TSS correspondence is provided in **Table 1**.

Ministry 2016 Groundwater Comments on the 2014 Annual Report	Response
Groundwater flow direction beneath the waste is to the southwest, towards an intermittent stream about 300 m from the site boundary. This is consistent with previous results;	Agreed. 2024 groundwater levels show continued groundwater flow to the southwest.
Monitoring well BH2 was installed in 2004 to provide upgradient, overburden groundwater quality. This well is located about 15 m east of the fill area. Monitoring results indicate elevated concentrations of leachate parameters such as chloride, TDS, and alkalinity in 2004 – 2006. However, these parameters have declined since 2007 and the groundwater quality appears good in recent years. No	Agreed. Concentrations continue to be below the Ontario Drinking Water Quality Standards (ODWQS) at monitoring well BH-2.

Table 1 Ministry TSS Groundwater & Surface Water Comments and Response



exceedances of Ontario Drinking Water Quality Standards (ODWQS) were observed at well BH2 in 2014.	
AECOM reports that a private dug well (identified as well PWI) is located to the north of the site across Berndt Road. This well is hydraulically upgradient of the site and was sampled in 2014 to confirm background water quality. However, the analyzed groundwater samples from Well PWI showed elevated levels of TDS, sulphate, chloride, and conductivity, with the level of TDS exceeding ODWQS. Therefore, this well appears to be impacted by a source other than the landfill. The most likely source would be road salt application to Berndt Road.	Agreed. PWI has since been removed from the monitoring program due to the inability to provide accurate results due to interference from roadway operations.
Monitoring well BH1-II is located approximately 40 m downgradient of the waste mound and is the most impacted well at the site. Historical sampling data for this well shows that concentrations of chloride, sulphate, sodium, potassium, boron, alkalinity, electrical conductivity, ammonia, total Kjeldahl nitrogen (TKN), nitrate, TDS and manganese are elevated. These parameters were identified as leachate indicator parameters for this landfill site. The 2014 groundwater sampling results showed exceedances of ODWQS for alkalinity, organic nitrogen, and manganese. The nitrate concentration of 8 mg/L in 2014 continues to be high but still lower than the ODWQS of 10 mg/L.	Concentrations continue to be elevated at monitoring well BHI-II.
Monitor BH3 was installed in shallow bedrock and is located to the west of the waste mound. In 2014 only the concentration of TDS exceeded ODWQS.	Some parameters at this location have shown elevated levels and no parameters exceed the ODWQS in 2024
Monitor BH5 shows elevated indicator parameter concentrations compared to BH4 and BH6 though leachate indicator parameter concentrations are within the range of background concentrations, except for TKN. Indicator parameter concentrations at BH5 are lower than those of BH1-II, located closer to the fill area. BH5 appears to be in the groundwater flow path downgradient from the fill area.	BH5 is to remain in the monitoring program to continue monitoring any elevated concentrations from the leachate.
Reduction in the frequency of groundwater level measurement from three times per year (spring, summer, and fall) to twice per year (spring and late fall);	Groundwater levels have since been taken only twice per year.
Change the groundwater sampling from July/August to the spring; and	Sampling has since been conducted during spring months April-June when scheduling permits.
The new monitors, BH4, BH5 and BH6, have been sampled on two occasions since their installation in 2013. Preliminary review of the limited water quality results collected suggests that BH5 may have minor leachate effects though BH4 and BH6 are unaffected. AECOM proposes to continue to monitor all three locations until 2017 to establish water quality at these locations but retain only one for long term monitoring.	Monitors BH4 have not been sampled since 2022, BH6 was sampled in 2024. They are both still recommended to be removed from the monitoring program.
Ministry 2022 groundwater comments on the 2020 Annual Report	
BH4 and BH6 have been dry since 2019 given that the sampling event occurred in late spring or summer. Would you please arrange to collect the samples in early spring i.e. in April this year? Once monitoring wells BH4 and BH6 are still dry during such a sampling event, they can be removed from the monitoring program.	BH6 was sampled in April 2024, while BH4 was dry in 2024. A review of the BH4 and BH6 sampling has been provided in the 2024 Annual Report



1.4 Project Objective and Scope

The purpose of this report is:

- > to provide an assessment of the status of groundwater on and adjacent to the landfill site
- > to monitor and assess the presence of landfill gas, and
- to determine the extent of landfill effects if any

Specifically, under ECA No. A411401 Condition 38, the following subsections are provided in this report:

- (a) a plan of the site outlining monitoring locations;
- (b) tables outlining monitoring locations, analytical parameters sampled, and frequency of sampling;
- (c) an assessment of surface water quality in relation to the trigger concentrations (if and when the surface water trigger mechanism is in place) and the PWQO's;
- (d) an assessment of groundwater quality in relation to the trigger concentrations, RUP and ODWQS;
- (e) a contingency plan in the event that surface, or groundwater trigger concentrations are exceeded;
- (f) conclusions of the monitoring data, a review of the adequacy of monitoring programs, recommendations for any changes to monitoring programs that may be necessary;
- (g) a summary of the type and quantity of all incoming and outgoing wastes to and from the transfer station;
- (i) a report on any variances from the landfill monitoring program as described in Item 3 of Schedule 'A'; and
- (j) any recommendations to minimize environmental impacts from the operation of the site and to improve site operations and monitoring programs in this regard.

The scope of the Ministry approved monitoring program includes the sampling of the following:

- Groundwater: BH1-I, BH1-II, BH2, BH3, BH4, BH5, BH6.
- Gas monitoring at all well locations and on-site buildings.
- Mini piezometers are monitored for groundwater levels twice per year: MP1, MP2, MP3, MP4 and MP5
- Surface water sampling (SW1 and SW2) discontinued unless the surface water mechanism is triggered

Annual surface water and residential sampling (P1) have been discontinued as approved by the Ministry in June 2015 and February 2016, respectively.

Monitoring locations are shown on Figures 1 and 2, borehole logs are provided in Appendix D.

In 2024, groundwater level monitoring, ground and surface water sampling was completed in April 2024 and groundwater levels were also measured in December 2024. Landfill gas monitoring was completed concurrent with each event.



2.0 SITE SETTING AND GEOLOGY

A complete description of the site's background and physical setting is documented in the 2000 monitoring report (Gartner Lee, 2000).

The landfill site is located in a forested area, within a sand and gravel pit (the pit is still used on occasion by the Township). The site is located on the western flank of a hill at an elevation of approximately 98 mASL and is surrounded by vegetation. The site drains west into a wetland area, which subsequently drains beneath Highway 60, with the ultimate discharge to Golden Lake that is located approximately 1.3 kilometers downgradient. The closest private residence is located approximately 220 m north and upgradient of the site along Berndt Road. The tributary that drains the wetland lies between the site and the residences along the shore of Golden Lake.

The overburden at the site consists of sand and gravel. Bedrock outcrops occur along Berndt Road, and as a result, it is assumed that the topographic high to the northeast is bedrock controlled. At the site, a bedrock ridge located north of the waste traverses the property in an east west orientation. The wetland to the west is a result of a high-water table, maintained by either finer grained sediments and/or low permeability bedrock.

On-site boreholes penetrated between 4.7 m and 7.2 m of sand, gravel, and cobbles that overly granitic bedrock. Monitor BH1-I is screened within the upper bedrock. The bedrock beneath the site slopes in a southwesterly direction from an elevation of approximately 83 mASL in the northeast to 79 mASL in the southwest. The water table lies within the permeable sand and gravel unit. The water table at BH3 was measured at an elevation of 81.60 mASL during April 2024, also within the permeable sand and gravel unit. BH3 has historically been dry during approximately 30% of the monitoring events, suggesting that the water table occasionally lies within the weathered upper bedrock at this location (BH3 was terminated at the top of the bedrock). This is in contrast to historical results which have indicated a net groundwater movement upward from the bedrock to the sand and gravel overburden.

3.0 METHODOLOGY

Historic surface water monitoring locations are shown on **Figure 1**, groundwater monitoring wells are shown on **Figure 2**. Monitoring well BH2 is located upgradient of the waste pile and provides background overburden water quality at the site. Monitoring well nest BH1 (monitors 1-I and 1-II) and BH3 are located downgradient of the waste. Five mini-piezometers (MP1 to MP5) have been installed to supplement the groundwater elevation data collected from the groundwater monitors.

In 2012, it was decided, in concert with the Ministry, that a groundwater monitoring well or minipiezometer (suitable for water quality sampling) would be constructed along the southwest property boundary as a Guideline B-7 compliance location. This well would replace the need to sample surface water locations SW3 and SW4. Groundwater monitors (BH4, BH5 and BH6) were installed approximately 10m west of the southwest property boundary in May 2013. Soil samples were collected at regular intervals to confirm stratigraphy. The monitors were completed to a maximum depth of 2.4 m with 1.5 m, 51 mm-diameter PVC screens installed at each location. Upon completion, these monitoring wells were incorporated into the monitoring program. Borehole logs and groundwater monitoring well details are provided in **Appendix D**.



Water level measurements were collected from the monitoring wells and the mini piezometers in April and December 2024. Groundwater elevation data is provided in **Appendix E**.

Groundwater samples were collected from six (6) monitoring wells in the spring of 2024 (BH1-I, BH1-II, BH2, BH3, BH5, and BH6) and analyzed for a suite of inorganic parameters. BH4 did not have sufficient water to collect a sample. All sampling followed protocols established by Jp2g and are outlined in **Appendix F**. Mini piezometers are constructed from steel pipe and are not intended for water quality sampling. **Appendix G** provides photographs of monitoring wells and mini piezometers during the 2024 monitoring events.

Surface water sampling is not required at the site as per Ministry TSS correspondence dated January 29, 2010 (included in **Appendix C**). The discontinuation of the annual surface water sampling program was formally accepted by the Ministry's District Manager on June 17, 2015. As the surface water mechanism was triggered for TDS, surface water locations SW1 and SW2 were sampled as part of the April 2024 monitoring program.

Field measurements of pH, conductivity and temperature were collected at the time of sampling. Laboratory analysis was performed by Eurofins Laboratories. Water samples were stored in a cooler with ice upon collection and delivered by courier to the laboratory with the appropriate chain of custody within 48 hours of sampling. The groundwater quality results are presented in **Appendix H**. The surface water quality results are presented in **Appendix I**. Lab reports are provided in **Appendix J**.

The side slopes of the waste mound were inspected for stability and for the presence of leachate seeps by Jp2g staff concurrent with the water level monitoring. There were no reportable concerns at the time of the inspection in 2024.

4.0 GROUNDWATER FLOW DIRECTIONS

Groundwater elevations were collected from on-site monitoring wells and mini piezometers in April and December 2024. The water table contours for April are provided on **Figure 2**. The direction of groundwater flow beneath the waste is southwest, towards the intermittent tributary and is consistent with previous years. Previous reports have reported groundwater flow through the sand and gravel to be in the order of 1,000 m/year.

5.0 GROUNDWATER QUALITY RESULTS

5.1 Monitoring Well BH2

Monitoring well BH2 is located approximately 15 m east of the fill area and was drilled to a depth of 7.2m. The well is screened at the bedrock/overburden interface. Water quality samples collected from this location are representative of overburden background conditions at the site. Based on knowledge of similar sized landfills in similar geologic settings, typical leachate indicator parameters were identified. These parameters include chloride, sulphate, sodium, potassium, boron, alkalinity, electrical conductivity, ammonia, TKN, total dissolved solids (TDS) and manganese. **Table 2** is a summary of leachate indicator parameters from monitoring well BH2 for the period of 2004-2023 in comparison to the 2024 data, and the Ontario Drinking Water Standards (ODWS).



Parameter	ODWS	BH2 Range 2004 - 2023	BH2 2024
Chloride (mg/L)	250	29 - 89	89
Sulphate (mg/L)	500	18 - 56	33
Sodium (mg/L)	200	15.6 - 34	38
Potassium (mg/L)		1-7	2
Boron (mg/L)	5	<0.005 - 0.04	< 0.01
Iron (mg/L)	0.3	<0.005-0.410	<0.03
Alkalinity (mg/L)	30 - 500	211 - 317	314
Conductivity (uS/cm)		451-869	695
Ammonia (mg/L)		<0.01 - 0.03	<0.020
TKN (mg/L)		<0.1 - 0.5	0.297
TDS (mg/L)	500	296 - 910	562
Manganese (mg/L)	0.05	<0.002 - 1.14	<0.01

Table 2: Groundwater Quality Results – Monitoring Well BH2

NOTE:

BOLD items exceed ODWS

In 2024, there were no exceedances of ODWS at monitoring well BH2. Leachate indicator parameter concentrations are within the historical range.

5.2 Monitoring Well nest BH1 (BH1-I and BH1-II)

Monitoring nest BH1 is located approximately 40 m downgradient of the waste pile. Monitor BH1-I is the deep setting screened within the granitic gneiss bedrock and monitoring well BH1-II is the shallow setting screened in the water table within the sand and gravel. Water quality results from BH1-I and 1-II were compared to the ODWS, historic water quality results and concentrations from upgradient monitoring well BH2. **Table 3** provides a summary of the water quality results for the leachate indicator parameters.



Darameter	ODWS	Monitor BH2	Monito (Bed	or BH1-I Irock)	Monitor BH1-II (Overburden)		
Falancici		Range	2000 - 2023	2024	2000 - 2023	2024	
Chloride (mg/L)	250	29 - 89	4 - 83	43	59.2 - 146	141	
Sulphate (mg/L)	500	18 - 56	45 - 91	58	35 - 143	28	
Sodium (mg/L)	200	15.6 - 34	13 - 42.2	32	33 - 85.8	54	
Potassium (mg/L)		1 - 7	2 - 6	5	6 - 24	14	
Boron (mg/L)	5	<0.005 - 0.04	0.07 - 0.208	0.16	0.176 - 0.43	0.14	
Iron (mg/L)	0.3	<0.005-0.410	<0.005 - 0.1	<0.03	<0.005 - 5.23	<0.03	
Alkalinity (mg/L)	30 - 500	211 - 317	189 - 503	389	477 - 643	425	
Conductivity (Mhos)		451- 869	511 - 1140	889	1060 - 1570	1220	
Ammonia (mg/L)		<0.01 - 0.03	<0.01 - 0.07	0.165	<0.01 - 5.34	0.245	
TKN (mg/L)		<0.1 - 0.5	<0.05 - 0.42	0.306	0.2 - 5.78	0.245	
TDS (mg/L)	500	296 - 910	300 - 670	578	632 - 1020	793	
Manganese (mg/L)	0.05	<0.002 - 1.14	0.01 - 0.07	0.01	0.002 - 1.82	<0.01	

Table 3: Groundwater Quality Results for Monitoring Well Nest BH1, Downgradient of theWaste

NOTES:

1) BOLD items exceed ODWS

2) BH2 Range values taken from 2004 - 2023

The 2024 sampling revealed parameter exceedances of ODWS at the following monitoring locations:

BH1-I (deep setting)

• TDS (578 mg/L)

BH1-II (shallow setting)

• TDS (793 mg/L)

Parameter concentrations were within the range of historic concentrations at this location. All leachate indicator parameters in 2024 were elevated compared to background water quality. The elevated concentrations are likely a result of the monitoring well location, downgradient of the former waste pile.

A comparison of parameter levels (trend graph) from 2000-2024 is shown in **Graph 1** for the shallow piezometer setting.





Graph 1: Concentrations at Overburden Well BH1-II (2000-2024)

Monitoring location BH1-II shows dilute leachate effects, with indicator parameter concentrations that are normally higher than bedrock water quality. Leachate effects would be expected in the shallow subsurface at this location since monitoring well nest BH1 is located downgradient of the waste pile. Most leachate indicator parameters are elevated compared to background values. In 2024, TDS exceeded the ODWS, as they routinely have in the past. All indicator parameter concentrations were within historic ranges. The leachate strength is relatively weak, as would be expected for a landfill of this small size. The upward gradient that has been consistent in the past between the bedrock and overburden is expected to prevent the downward migration of leachate to the bedrock.

5.3 Monitoring Well BH3

Monitoring well BH3 is located approximately 20 m east of the western property boundary and is completed at the overburden/bedrock interface. Water quality results from BH3 were compared to the ODWS, historic water quality results and concentrations from upgradient monitoring well BH2. **Table 4** provides a summary of the water quality results for the leachate indicator parameters.



Parameter	ODWS	Monitor BH2 (Upgradient)	Monitor BH3		
		Range	2009-2023	2024	
Chloride (mg/L)	250	29 - 89	3.8 - 19	1	
Sulphate (mg/L)	500	18 - 56	20 - 77	115	
Sodium (mg/L)	200	15.6 - 34	7 - 21	8	
Potassium (mg/L)		1 - 7	1.8 - 3.1	2	
Boron (mg/L)	5	<0.005 - 0.04	0.07 - 0.42	0.1	
Iron (mg/L)	0.3	<0.005-0.410	<0.005 - 0.3 ^(a)	<0.03	
Alkalinity (mg/L)	30 - 500	211 - 317	280 - 516	269	
Conductivity (uS/cm)		451-869	548 - 852	674	
Ammonia (mg/L)		<0.01 - 0.03	<0.01 - 0.16	0.078	
TKN (mg/L)		<0.1 - 0.5	<0.1 - 0.53	0.376	
TDS (mg/L)	500	296 - 910	331 - 620	438	
Manganese (mg/L)	0.05	<0.002 - 1.14	<0.01 - 0.08 ^(b)	<0.01	

Table 4: Groundwater Quality Results for Monitoring Well BH3

NOTES:

1) **BOLD** items exceed ODWS

2) BH2 Range values taken from 2004 - 2023

3) BH3 Range values taken from 2009 - 2023

(a) Excludes anomolous value of 3.77mg/L May-20

(b) Excludes anomolous value of 0.64mg/L May-20

In 2024 there were no exceedances of ODWS. The 2024 parameter concentrations were comparable to historical ranges at this location. Parameters have generally declined since 2011 with fluctuating increases such that slight leachate effects are apparent, and any trends will be continued to be monitored.

Graph 2 shows a comparison of parameter concentrations at BH3 from 2009-2024.





Graph 2: Concentrations at Overburden Well BH3 (2009-2024)

5.4 Monitoring Wells BH4, BH5 and BH6

Monitoring wells BH4, BH5 and BH6 were installed in May 2013. They are located approximately 10 meters west of the downgradient southwestern property boundary and are used for compliance evaluation. These monitoring wells are shallow, approximately 2.5m deep, and completed in sand and gravel deposits. In April 2024, BH4 was not sampled due to insufficient water volumes. The results of the leachate indicator parameters are summarized in **Table 5** and are compared to background water quality from monitoring well BH2 as well as regulatory criteria.

Doromotor	ODWS (Upgradiant)		Monitor BH4		Monitor BH5		Monitor BH6	
Parameter		Range	2013 - 2022	2024	2013 - 2023	2024	2013 - 2023	2024
Chloride (mg/L)	250	29 - 89	<1-7	DRY	171 - 134	28	7 - 62	10
Sulphate (mg/L)	500	18 - 56	3 - 14		15 - 35	23	12 - 25	15
Sodium (mg/L)	200	15.6 - 34	2 - 10		11.8 - 34	24	4.5 - 7.6	6
Potassium (mg/L)		1-7	1 - 2.2		2.52 - 4	4	2.2 - 3	2
Boron (mg/L)	5	<0.005 - 0.04	0.02 - 0.03		0.03 - 0.08	0.06	0.01 - 0.03	0.02
Iron (mg/L)	0.3	<0.005-0.410	<0.005 - <0.03		<0.03 - 0.40	<0.03	< 0.005 - 0.13	<0.03
Alkalinity (mg/L)	30 - 500	211 - 317	66 - 124		270 - 437	316	240 - 319	257
Conductivity (uS/cm)		451-869	154 - 286		631 - 1060	677	557 - 830	511
Ammonia (mg/L)		<0.01 - 0.03	<0.01 - 0.06		<0.01 - 0.06	0.044	<0.01 - 0.06	0.057
TKN (mg/L)		<0.1 - 0.5	0.10 - 0.52		0.19 - 1.01	0.318	<0.10 - 0.40	0.326
TDS (mg/L)	500	296 - 910	68.8 - 186		360 - 722	440	276 - 478	332
Manganese (mg/L)	0.05	<0.002 - 1.14	0.003 - 0.08		<0.001 - 0.07	<0.01	0.04 - 0.31	<0.01

Table 5: Groundwater Quality Results for Monitoring Wells BH4, BH5, and BH6

NOTES:

1) **BOLD** items exceed ODWS

2) BH2 Range values taken from 2004 - 2023

3) No sample collected at BH4 (2016, 2019 -2021, 2023-2024) and BH6 (2019 - 2021)



Based on results from current and historical sampling, monitoring wells BH4, and BH6 do not appear to be affected by the landfill site. In the past, TDS at monitoring location BH5 exceeded the ODWS and trending up but in 2024 TDS was significantly reduced below the ODWS. Trends will continue to be tracked.

Monitoring well BH5 shows slightly elevated indicator parameter concentrations compared to monitoring wells BH4 and BH6. Indicator parameter concentrations at monitoring well BH5 are typically lower than those at monitoring well BH1-II that is located closer to the fill area. Monitoring well BH5 appears to be at the fringe of the groundwater flow path downgradient from the fill area. Concentration trends at overburden well BH5 are shown in **Graph 3**.



Graph 3: Concentrations at Overburden Well BH5 (2013-2024)

6.0 GROUNDWATER COMPLIANCE

Operating landfill sites are considered to be in compliance with regard to Ministry Guideline B-7 when parameter concentrations are within maximum concentration levels (C_m) at the site boundaries or edge of an approved Contaminant Attenuation Zone (CAZ). Ministry Guideline B-7 also applies to sites closed after 1986, and as a result, the Berndt Road Waste Disposal site is assessed for compliance with Ministry Guideline B-7. Guideline B-7 was applied in 2024 to off-site wells BH4, BH5 and BH6 samples were collected from BH5 and BH6 in 2024, BH4 had insufficient water to sample.

The median historic concentrations from background monitor BH2 were used to calculate the maximum concentration levels as presented in **Table 6**.

C_m is calculated as follows:

$$C_{\text{allow}} = C_{\text{b}} + F \times (C_{\text{ODWS}} - C_{\text{b}})$$



Where, $C_{\mbox{\scriptsize m}}$ is the maximum concentration,

C_b is the median background concentration,

C_{ODWS} is the maximum concentration (dependent on water use),

F is a constant – 0.5 mg/L for aesthetic parameters, 0.25 mg/L for health-related parameters.

Table 6: Guideline B-7	Calculated Maximum	Parameter	Concentrations
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Parameter	C _b F		ODWS	Callow
Nitrate (mg/L)	0.2	0.25	10	2.65
Boron (mg/L)	0.01	0.25 5		1.26
Sodium (mg/L)	24	0.5	200	112
Chloride (mg/L)	56	0.5	250	153
Sulphate (mg/L)	31	0.5	500	266
Manganese (mg/L)	0.01	0.5	0.05	0.03
Iron (mg/L)	0.03	0.5	0.3	0.17
TDS (mg/L)	439	0.5	500	470

Maximum allowable concentrations (C_{allow}) are compared to the groundwater quality results from the 2024 sampling and are provided in **Table 7**.



Parameters			Southwest Property Boundary			
Paramet	ers	Callow	BH4 (2022)	BH5	BH6	
Health Related	Nitrate (mg/L)	2.65	<0.10	0.11	0.25	
Parameters	Boron (mg/L)	1.26	0.02	0.04	0.02	
	Sodium (mg/L)	112	2	24	6	
	Chloride (mg/L)	153	<1	28	10	
Aesthetic	Sulphate (mg/L)	266	7	23	15	
Parameters	Manganese (mg/L)	0.03	<0.01	<0.01	<0.01	
	Iron (mg/L)	0.17	<0.03	<0.03	<0.03	
	TDS (mg/L)	470	86	440	332	

Table 7: Summary of Ministry Guideline B-7 (Reasonable Use) Calculations

NOTES:

1) **BOLD** items exceed Guideline B-7 Limits

2) *Itaicized* items exceed ODWS

3) NS - no sample

4) BH4 is represented by 2022 sample, no sample was collected in 2024

There are no exceedances to the Guideline B-7 limits for BH5 and BH6 in 2024. As there are no downgradient well users, corrective action is not recommended at this time.

7.0 SURFACE WATER QUALITY

Surface water sampling is not a requirement at this site, per confirmation from the District Manager dated February 2016. Surface water samples were however collected from SW1 and SW2 in 2024 as a result of previous exceedances of the site trigger mechanism.

Surface water station SW1 is located southwest of the site along the south side of highway 60 (**Figure 1**). There was no apparent visual or olfactory evidence of leachate impact. There is no defined channel at this location and flows could not be measured in 2024.



Monitoring station SW2 is located west of the site along the south side of Berndt Road (**Figure 1**). There was no apparent visual or olfactory evidence of leachate impact. There was no measurable flow observed at the time of sampling.

The analytical results are summarized in Table 8.

Parameter	PWQO	BH2	BH2 BH1-II (Lingradient) (Downgradient)		SW1			SW2		
Parameter	(CWQO)	Range	Range	2005 - 2008	Jun-23	Apr-24	2005 - 2008	Jun-23	Apr-24	
Chloride (mg/L)	120	29 - 89	59.2 - 146	10 - 38	19	3	7 - 16	11	19	
Sulphate (mg/L)		18 - 56	35 - 143	11 - 19	7	23	20 - 27	12	5	
Sodium (mg/L)		15.6 - 34	33 - 85.8	6 - 16	14	3	4 - 7	5	11	
Potassium (mg/L)		1-7	6 - 24	1-2	1	1	1	1	3	
Boron (mg/L)	0.2 (1.5)	<0.005 - 0.04	0.176 - 0.43	<0.01 - 0.01	0.01	<0.01	<0.01 - 0.02	< 0.01	0.01	
Iron (mg/L)	0.3	<0.005-0.410	<0.005 - 5.23	<0.03 - 0.04	0.04	<0.03	<0.03 - 0.04	< 0.03	0.03	
Phosphorus, Total (mg/L)	0.03			0.01 - 0.1	0.01	0.015	0.01 - 0.07	0.01	0.019	
Alkalinity (mg/L)	30 - 500	211 - 317	477 - 643	96 - 163	197	92	113 - 148	139	127	
Conductivity (uS/cm)		451-869	1060 - 1570	254 - 462	319	196	303 - 353	229	247	
Ammonia (mg/L)		<0.01 - 0.03	<0.01 - 5.34	<0.02 - 0.54	<0.02	0.046	<0.02 - 0.07	0.044	0.056	
TKN (mg/L)		<0.1 - 0.5	0.2 - 5.78	0.27 - 0.6	0.38	0.633	0.19 - 0.31	0.241	0.783	
TDS (mg/L)		296 - 910	632 - 1020	165 - 300	207	127	197 - 229	149	161	
Manganese (mg/L)		<0.002 - 1.14	0.002 - 1.82	<0.01 - 0.04	0.03	0.02	<0.01	0.02	<0.01	

Table 8: Surface Water Quality Results for SW1 and SW2

NOTES:

BOLD items exceed PWQO or CWQO
 BH2 Range values taken from 2004 - 2023

3) BH1-II Range values taken from 2000 - 2023

Concentrations of all leachate indicator parameters from SW1 and SW2 reveal values that are lower than, or within the range of concentrations from the overburden background groundwater monitoring location BH2 during the spring monitoring event. Additionally, no parameters revealed concentrations that were above the PWQO and or CWQOs. Historical values of total phosphorus have in the past been elevated at both surface water stations (i.e., SW1 and SW2). Elevated values at these locations may be a result of increased overland flow caused by rainfall events during the period preceding the sampling.

Surface water stations SW1 and SW2 are not considered to be impacted by landfill leachate.

8.0 LANDFILL GAS MONITORING

Landfill gas measurements were collected from each sampled monitoring well at site in April and December 2024. Gas detection was completed using a Drager X-am 2000 – 4 gas meter, calibrated to methane, hydrogen sulfide, carbon monoxide & oxygen. No gas was detected in any of the wells during the 2024 monitoring event.



9.0 QUALITY ASSURANCE/QUALITY CONTROL

Chain of Custody reports were completed in the field and accompanied the sample delivery to serve as a verification record of the analytical requests, and to document the receipt of the samples to the laboratory. These reports included the following information: project number, sample identification, type of analysis required, sampling date and time, sampler's name and whom the laboratory reports should be forwarded to, referenced guidelines to determine method detection limits, and when the results are required.

The QA/QC program included submission of an external blind duplicate sample and internal laboratory QA/QC procedures. In April 2024, a blind duplicate sample was collected at surface water location SW2 and labelled "Dup #1".

Laboratory QA/QC protocols included QC standards, method blanks and laboratory replicates. The blind duplicate groundwater was collected sequentially with the initial sample. The purpose of this sample is to determine the precision and reproducibility of the sample analysis. Laboratory precision and reproducibility for the groundwater samples were concluded to be within acceptable limits (±15%) for the 2024 analysis.

10.0 LANDFILL SLOPE INSPECTION

The side slopes of the landfill were inspected for leachate seepages during the April 2024 sampling event. The side slopes of the waste mound were stable, and no seepages were observed.

11.0 TRIGGER MECHANISM AND CONTINGENCY PLAN

Further to the removal of surface water sampling from the approved monitoring program, a trigger mechanism and contingency plan was established in 2013.

Relevant correspondence discussing the trigger mechanism is provided in **Appendix C**. The trigger parameters and values were confirmed to be:

Chloride	120 mg/l
Sulphate	100 mg/l
Sodium	100 mg/l
Boron	3 mg/L
TDS	375 mg/L

The trigger locations are BH4, BH5 and BH6, and the trigger mechanism is exceeded when the following conditions occur:

- concentrations exceed the trigger values on three consecutive occasions; and
- an increasing trend directly related to the landfill.

Groundwater concentrations from BH4, BH5 and BH6 are compared to the trigger values in Table 9.

Parameter	Trigger Concentration mg/L	BH4 (2022)	BH5	BH6
Chloride (mg/L)	120	<1	28	10
Sulphate (mg/L)	100	7	23	15
Sodium (mg/L)	100	2	24	6.0
Boron (mg/L)	3	0.02	0.04	0.02
TDS (mg/L)	375	86	440	332

Table 9: 2024 Trigger Concentration Comparison

NOTES:

1) **BOLD** items exceed Trigger Mechanism

2) NS = No sample

3) BH4 is represented by 2022 sample, no sample was collected in 2023

Historically, the trigger values have not been exceeded at monitoring locations BH4 and BH6. In 2024, concentrations of TDS exceeded the trigger values at BH5. Exceedances of TDS have occurred at BH5 since 2019 and from time to time on previous occasions. As a result, it is recommended to re-evaluate TDS as a compliance parameter.

As the trigger mechanism has again been exceeded, surface water sampling at SW1 and SW2 should continue in 2025

Condition 38(e) of the Certificate of Approval requires a contingency plan in the event that surface water or groundwater trigger concentrations are exceeded. Further assessment of BH 5 trends a contingency plan will be proposed.

12.0 MONITORNG PROGRAM

The following monitoring program is recommended (Table 10).



Location	Frequency	Parameter
BH1-I, BH1-II, BH2, BH3, BH4, BH5, BH6, MP1, MP2, MP3, MP4, and MP5	April and October/November	 measure water levels and landfill gas
BH1-I, BH1-II, BH2, BH3, BH4, BH5, BH6	April/May	 sample and analyze for: chloride, fluoride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, copper, iron, manganese, strontium, alkalinity, TKN, ammonia, phenols, COD, TDS field measurements: pH, temperature, and conductivity
Toe of Waste of Mound	April/May	• inspection of waste mound for any leachate seeps
SW-1, SW-2	April/May	 sample and analyze for: chloride, fluoride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, cadmium copper, iron, manganese, arsenic, strontium, zinc, alkalinity, TKN, ammonia, phenols, COD, TDS, BOD, ion balance, hardness field measurements: pH, temperature, dissolved oxygen, and conductivity

Table 10: Proposed 2024 Monitoring Program

13.0 DISCUSSION

The shallow on-site groundwater (BH1-II) is considered to be slightly affected by dilute leachate impacts. Monitoring well BH3 that is located approximately 20m east of the western property boundary, appears to be slightly affected by diluted landfill leachate.

An assessment of the Reasonable Use Guideline (i.e., B-7 assessment) revealed that TDS exceeded the B-7 limits at monitoring well BH5. Monitoring well BH6 did not reveal any B-7 exceedances and BH4 was not sampled in 2024. The downgradient water quality is expected to improve with time since no new waste has been added to the fill area since 2002.

Monitoring wells BH4 and BH6 are not considered to be impacted and removal from the monitoring program is recommended, pending further sampling of SW-1 and SW-2 and Ministry approval. Continued sampling from BH4, BH5 and BH6 is recommended for 2024.



14.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the 2024 monitoring program, the following conclusions and recommendations are provided:

- Geologically, the site lies within sandy overburden materials underlain by granite bedrock.
- Shallow groundwater monitoring wells that are located immediately southwest of the waste footprint show dilute leachate effects.
- No leachate effects were observed within the bedrock.
- The direction of groundwater flow is southwesterly following the bedrock surface topography, and eventually flowing through a wetland before discharging to the small intermittent off-site tributary.
- The landfill site does not affect existing private water wells in the vicinity or Golden Lake due to both the distance and the hydrogeologic setting.
- Guideline B-7 limits were exceeded at the southwestern property boundary (BH5) for TDS.
- There are no downgradient water well users, and the downgradient area is not conducive to residential development due to the low-lying wetland conditions and use as an aggregate pit. As a result, there is no reasonable use of the groundwater downgradient, and mitigative action is not required.
- It is recommended to remove monitoring wells BH4 and BH6 from the monitoring program pending the results of the 2025 sampling. Sampling of BH5 should continue.
- Complete environmental monitoring as outlined in **Table 10** with consideration for the removal of BH4 and BH56 from the program.
- Surface water stations SW1 and SW2 sampling has been completed in April 2024 and no impact was detected, sampling is proposed for 2025.



15.0 REFERENCES

AECOM Canada Limited, 2009-2016:

2008-2015 Groundwater and Surface Water Monitoring of the North Algona Landfill Site, Township of North Algona Wilberforce, prepared for Jp2g Consultants Inc.

Gartner Lee Limited, 2000-2008:

2000-2007 Groundwater and Surface Water Monitoring of the North Algona Landfill Site, Township of North Algona Wilberforce, Letter report prepared for Jp2g Consultants Inc.

Jp2g Consultants Inc. (2002)

Berndt Road Waste Disposal Site Interim Closure and Design and Operations Plan for a Waste Transfer Facility December 2002 North Algona Wilberforce Township.

Jp2g Consultants Inc. 2017 -2024:

2016-2023 Berndt Road Waste Disposal Site Annual Report, North Algona Wilberforce Township

Ontario Ministry of the Environment, Water Resources Branch (1986)

The Incorporation of the Reasonable Use Concept into the Groundwater Management Activities of the Ministry of the Environment.

Figures



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Date: May 2025

ENGINEERS · PLANNERS · PROJECT MANAGERS

Part Lot 7 Concession 3 North Algona



Appendix A

ECA No. A411401



Ministry Ministère of the de Environment l'Environnement AMENDED PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE NUMBER A411401

The Corporation of the Township of North Algona-Wilberforce Rural Route, No. 1 Eganville, Ontario K0J 1T0

Site Location: North Algona (Berndt Road) Waste Disposal Site Part of Lot 7, Concession III Township of North Algona Wilberforce, County Of Renfrew

You have applied in accordance with Section 27 of the Environmental Protection Act for approval of:

the establishment and operation of a transfer station and the use and operation of a 2.0 hectare landfill within a 5.36 hectare site.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

- (a) "Act" means the Environmental Protection Act, R.S.O. 1990, C.E-19, as amended;
- (b) "Certificate" means this Provisional Certificate of Approval;
- (c) "Director" means Director, Environmental Assessment and Approvals Branch, Ontario Ministry of the Environment;
- (d) "District Manager" means District Manager, Ottawa District Office, Ontario Ministry of the Environment;
- (e) "ICI" means industrial, commercial and institutional business sectors;
- (f) "Limit of Fill" means the area in which waste is approved for final disposal according to this Certificate;
- (g) "Ministry" and "MOE" means the Ontario Ministry of the Environment;
- (h) "OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended;
- (i) "ODWS" means the Ontario Drinking Water Standards;
- (j) "Ontario Regulation 347" means Ontario Regulation 347 R.R.O. 1990, General Waste

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Management, as amended from time to time, made under the EPA;

(k) "Owner" means the Township of North Algona Wilberforce as well as any person(s) responsible for managing the operations on a Site on behalf of the Owner;

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- (l) "PWQO" means the Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives*, as amended from time to time;
- (m) "RUP" means the Reasonable Use Policy (Guideline B-7) of the Ministry of the Environment;
- (n) "Scavenging" means the uncontrolled removal of reusable material from waste at a waste disposal site;
- (0) "Site" means the 5.36 hectare Site consisting of Part of Lot 7, Concession III in the Township of North Algona Wilberforce, County of Renfrew.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

<u>General</u>

- 1. This Certificate supersedes and replaces Provisional Certificate Number A411401 issued March 31, 1981 and the Notices issued May 15, 2000 and November 25, 2002.
- 2. Except as otherwise provided by these Conditions, the Site shall be designed, developed, used, maintained and operated, and all facilities, equipment and fixtures shall be built and or installed in accordance with the supporting documentation, and plans and specifications listed in Schedule "A".
- 3. The requirements specified in this Certificate are requirements under the Act. Issuance of this Certificate in no way abrogates the Owner's legal obligations to take all reasonable steps to avoid violating other applicable provisions of this legislation and other legislation and regulations.
- 4. The requirements of this Certificate are severable. If any requirements of this Certificate, or the application of any requirement of this Certificate to any circumstance, is held invalid, the application of such requirement to other circumstances and the remainder of this Certificate shall not be affected in any way.
- 5. The Owner must ensure compliance with all terms and conditions of this Certificate. Any non-compliance constitutes a violation of the Act and is grounds for enforcement.
- 6. (a) The Owner shall, forthwith upon request of the Director, District Manager, or

Provincial Officer (as defined in the Act), furnish any information requested by such persons with respect to compliance with this Certificate, including but not limited to, any records required to be kept under this Certificate; and

- (b) In the event the Owner provides the Ministry with information, records, documentation or notification in accordance with this Certificate (for the purposes of this condition referred to as "Information"),
 - (i) the receipt of Information by the Ministry;
 - (ii) the acceptance by the Ministry of the Information's completeness or accuracy; or
 - (iii) the failure of the Ministry to prosecute the Owner, or to require the Owner to take any action, under this Certificate or any statute or regulation in relation to the Information;

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

- 7. The Owner shall allow Ministry personnel, or a Ministry authorized representative(s), upon presentation of credentials, to;
 - (a) carry out any and all inspections authorized by Section 156, 157 or 158 of the Act, Section 15, 16 or 17 of the OWRA, or Section 19 or 20 of the Pesticides Act, R.S.O. 1990, as amended from time to time, of any place to which this Certificate relates; and,
 - (b) without restricting the generality of the foregoing, to:
 - (i) enter upon the premises where records required by the conditions of this Certificate are kept;
 - (ii) have access to and copy, at reasonable times, any records required by the conditions of this Certificate;
 - (iii) inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations required by the conditions of this Certificate; and
 - (iv) sample and monitor at reasonable times for the purposes of assuring compliance with the conditions of this Certificate.
- 8. Where there is a conflict between a provision of any document referred to in Schedule "A", and the conditions of this Certificate, the conditions in this Certificate shall take precedence. Where there is a conflict between the documents listed in Schedule "A", the document bearing the most recent date shall prevail.
- 9. Any information relating to this Certificate and contained in Ministry files may be made available to the public in accordance with the provisions of the *Freedom of Information* and Protection of Privacy Act, R.S.O. 1990, C. F-31.
- 10. All records and monitoring data required by the conditions of this Certificate must be kept on the Owner's premises for a minimum period of five (5) years from the date of their creation.

Notification

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- 11. The Owner shall ensure that all communications/correspondence made pursuant to this Certificate reference Certificate No. A411401.
- 12. The Owner shall notify the Director in writing of any of the following changes, within thirty (30) days of the change occurring:
 - (a) change of name of Owner;
 - (b) change of address of Owner;
 - (c) change of partners where the Owner is or at any time becomes a partnership, and a copy of the most recent declaration filed under the *Business Names Act*, 1991 shall be included in the notification to the Director;

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- (d) any change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (form 1 or 2 of O. Regulation 182, Chapter C-39, R.R.O. 1990, as amended from time to time), filed under the *Corporations Information Act* shall be included in the notification to the Director; and
- 13. (a) The Company shall notify the District Manager in writing within thirty (30) days of becoming aware of any of the following changes:
 - (i) change of Owner of the Site; and
 - (ii) address of the new Owner or change of address.
 - (b) In the event of any change in ownership of the Site, the Owner shall notify in writing the succeeding owner of the existence of this Certificate, and a copy of such notice shall be forwarded to the Director.

Certificate of Prohibition / Transferral of Site

- 14. Pursuant to Section 197 of the Act:
 - (a) The Owner shall have registered a Certificate of Prohibition in the appropriate Land Registry Office against the title of the Site and have submitted to the Director the duplicate registered copy; and
 - (b) neither the Owner nor any person having an interest in the Site shall deal with the Site in any way without first giving a copy of this Certificate to each person acquiring an interest in the Site as a result of the dealing.
- 15. No portion of this Site shall be transferred or encumbered prior to or after closing of the Site, unless the Director is notified in advance in writing and is satisfied with the arrangements made to ensure that all terms and conditions of this Certificate will be carried out and sufficient financial assurance (Act, Part XII) is deposited with the Ministry, if requested by the Director, to ensure that these terms and conditions will be carried out.

General Operations

- 16. The Owner shall maintain a visual screen around the perimeter of the Site, consisting of trees and vegetation, to reduce the negative impacts of Site operations.
- 17. The Site shall be maintained in a secure manner such that unauthorized persons can not enter the Site during non-operational hours.
- 18. A sign shall be posted at the entrance gate of the Site with the following information:(a) name of the Site and Owner;
 - (b) Certificate of Approval number;
 - (b) Certificate of Approval number;
 - (c) days and hours of operation;
 - (d) allowable and prohibited waste types;
 - (e) telephone number to call in the event of an emergency or complaint;
 - (f) warning against unauthorized access and against dumping outside the Site.

Transfer Station Operations

- 19. All transfer station facilities, equipment and fixtures shall be built and/or installed in accordance with Item 6 of Schedule "A". The Owner shall notify the District Manager, in writing, of any changes to the transfer station layout.
- 20. (a) The Owner shall set operating hours between the hours of 09:00 and 19:00, seven (7) days per week, which provides an adequate level of service. The operating hours may be altered at any time by the Owner provided that the Site users have received notice of the change and the sign at the entrance gate to the Site has been altered to reflect the new hours; and
 - (b) No waste shall be accepted at the Site except during the hours of operation and under the supervision of an attendant.
- 21. (a) Only solid, non-hazardous wastes generated by residential and ICI sectors, within the Township of North Algona Wilberforce, shall be received at this Site.
 - (b) The following waste types shall not be received at the transfer station:
 - (i) brush, lumber, leaf and yard waste;
 - (ii) construction and demolition waste;
 - (iii) bulk waste materials such as furniture and mattresses;
 - (iv) equipment and/or appliances containing refrigerants; and
 - (v) household hazardous waste.
- 22. All waste types shall be segregated either into bins or in designated areas as defined by barriers. Waste materials which can become wind blown litter shall be stored in bins equipped with lids or doors, which shall be kept closed during non-operating hours. All bins and designated waste storage areas shall be clearly labelled.
- 23. The total amount of waste received and stored on Site shall not exceed the following limits:(a) fiber wastes, including boxboard, corrugated cardboard, catalogues, magazines and

newspapers, shall not exceed 35 m³ total;

- (b) marketable scrap metal, including aluminium and steel cans, shall not exceed 30 m³;
- (c) plastics shall not exceed 40 m³ total compacted;
- (d) glass shall not exceed 30 m^3 ;
- (e) organic material shall not exceed 20 m^2 total;
- (f) propane cylinders shall be stored in a segregated, clearly marked area not exceeding 20 m² in size, in a manner which prevents cylinders from being knocked over or cylinder valves from breaking;
- (g) residual waste shall not exceed 45 m² total compacted;
- (h) rubber tires shall be stockpiled in an area not exceeding 50 m² in area and 2 m in height and shall be:
 - (i) located a minimum of 15 metres from the property line and any buildings;
 - (ii) separated from other waste piles by a minimum of 6 metres; and
 - (iii) be kept free of vegetation for at least 4.5 metres around the stockpile.
- 24. Scavenging of waste at the transfer station shall not be permitted. Items brought to the transfer station which may be reusable shall be placed in a designated area for the public to salvage for a period of ninety (90) days after which time the item will be deemed waste and managed accordingly.
- 25. The Owner shall maintain, at the Site, a log book which records the following information:(a) date of record;
 - (b) types, quantities and source of materials received;
 - (c) quantities of materials stored on Site;
 - (d) quantities and destination of waste and residual materials shipped from the Site;
 - (e) results of the inspection required under Condition 30, including the name and signature of the person conducting the inspection; and
 - (f) any spills or upsets as noted in Condition 33.
- 26. (a) Four (4) months prior to the closure of the transfer station, the Owner shall submit, for approval by the Director, a written Closure Plan. This plan must include, as a minimum, a description of the work that will be done to facilitate closure of the Site and a schedule for completion of that work; and
 - (b) Within ten (10) days after closure of the transfer station, the Owner must notify the Director, in writing, that the transfer station is closed and that the Closure Plan has been implemented.

Landfill Operations

- 27. The theoretical maximum approved capacity of this landfill is $152,400 \text{ m}^2$.
- 28. No further landfilling activities shall occur at this Site from this day forward, unless approved by the Director.
- 29. By June 30, 2004, the Owner shall:
 - (a) increase the granular cover material to a depth of 0.6 m; and
 - (b) apply 0.15 m of topsoil, seeded with both annual and perennial plant species, except for those areas approved for the establishment and use of a transfer station.

Site Inspection

- 30. (a) For the first two years following application of the final cover, the Owner shall:
 - (i) inspect the final cover integrity on a quarterly basis. If final cover integrity is damaged, then the necessary remedial measure shall be undertaken by the Owner within five (5) working days following the day of inspection (weather permitting);
 - (ii) inspect the vegetative cover in the fall and spring seasons. Any deficiencies in the vegetative cover shall be repaired as soon as weather and equipment availability permits;
 - (iii) inspect for leachate seeps on a quarterly basis. If a leachate seep is observed, then the necessary remedial measures shall be undertaken by the Owner within five (5) working days following the day of inspection (weather permitting);
 - (iv) inspect for slope erosion on a quarterly basis. If erosion is observed, then the necessary remediation measures shall be undertaken by the Owner within five
 (5) working days following the day of inspection (weather permitting);
 - (v) inspect for other nuisance factors (litter, rodents, bears) on a quarterly basis. If any problems are observed, then the necessary remedial measures shall be undertaken by the Owner within five (5) working days following the day of inspection (weather permitting);
 - (b) After the initial two (2) year period, and based on the initial results, the frequency of the inspections shall be re-evaluated and may be reduced with the concurrence of the District Manager.
- 31. (a) The Owner shall routinely, and not less than weekly, conduct a visual inspection of the transfer area(s) and storage area(s);
 - (b) The Owner shall routinely, and not less than monthly, conduct a visual inspection of the access road, signage and fencing condition;
 - (c) Any deficiencies noted in the course of the inspections shall be promptly rectified; and
 - (d) All inspections shall be recorded in a log book stating:
 - (i) date of inspection;
 - (ii) Site personnel conducting the inspection;
 - (iii) areas inspected;
 - (iv) deficiencies noted during the inspection;
 - (v) remedial action initiated as a result of noted deficiencies; and
 - (vi) date that deficiencies were rectified.

Litter Control

- 32. The Owner shall implement a litter control plan. The plan shall include, at a minimum,
 - (a) all practical steps which the Owner shall take to prevent the escape of litter from the Site including but not limited to use of bins with lids or doors for storage of waste material which can contribute to litter;

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- (b) daily litter pickup from the transfer area(s) and storage area(s) and weekly litter pickup from the Site perimeter, access roads, and adjacent private property (with permission for access from the property owner); and
- (c) tarping and cleaning loose debris from the sides and back of all vehicles with outgoing loads.

Complaints Procedure

- 33. If at any time the Owner receives complaints regarding the operation of the Site, the Owner shall respond to these complaints according to the following procedure:
 - (a) The Owner shall record each complaint on a formal complaint form entered in a sequentially numbered log book. The information recorded shall include:
 - (i) the nature of the complaint;
 - (ii) the name, address and telephone number of the complainant;
 - (iii) weather conditions and wind direction;
 - (iv) what operations were occurring at the time of the complaint; and
 - (v) the time and date of the compliant.
 - (b) The Owner, upon notification of the complaint shall initiate appropriate steps to determine all possible causes of the complaint and proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and
 - (c) The Owner shall verbally notify the District Office within five (5) business days of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the reoccurrence of similar incidents.

Spill Reporting

34. The Owner shall promptly take all necessary steps to contain and clean up any spills or upsets (including uncontrolled run-off to tile beds, drains, surface-water ad groundwater supplies and wells) which result from this operation. All spills and upsets shall be immediately reported to the Ministry's Spill Action Centre at 1-800-268-6060 and shall be recorded in a written log or an electronic file format, as to the nature of the spill or upset, and action taken for clean-up, correction and prevention of future occurrences.

Training

- 35. All operators of the Site shall be trained with respect to the following areas:
 - (a) terms, conditions and operating requirements of this Certificate;

- (b) operation and management of the depot;
- (c) an outline of the responsibilities of the Site personnel;
- (d) personnel training protocols;
- (e) any environmental concerns pertaining to the wastes and recyclable/reusable materials to be accepted at the Site;
- (f) proper receiving and recording procedures (including recording procedures of wastes which are refused at the Site);
- (g) proper storage, handling, sorting and shipping procedures;
- (h) occupational health and safety concerns pertaining to the wastes and recyclable/reusable material received;
- (i) relevant waste management legislation, including but not limited to *Ontario Regulation 347, R.R.O. 1990*, and
- (j) operation of equipment and procedures to be followed in the event of an emergency situation.

Monitoring Program

- 36. Prior to the implementation of the 2004 sampling program, the Owner shall install two additional groundwater monitoring wells, one upgradient and one downgradient to the waste mound.
- 37. (a) The Owner shall conduct groundwater and surface water monitoring in accordance with Schedule "B"; and
 - (b) Any future changes to either the groundwater or surface water monitoring program shall be approved, in writing, by the District Manager before the change is implemented.

Annual Report

- 38. By May 31, 2004, and on an annual basis thereafter, the Owner shall prepare and submit to the District Manager, an annual report covering the previous calendar year. Each report shall include, as a minimum, the following information:
 - (a) a plan of the Site outlining monitoring locations;
 - (b) tables outlining monitoring locations, analytical parameters sampled, and frequency of sampling;
 - (c) an assessment of surface water quality in relation to the trigger concentrations (if and when the surface water trigger mechanism is in place) and the PWQO;
 - (d) an assessment of groundwater quality in relation to the trigger concentrations, the RUP and the ODWS;
 - (e) a contingency plan in the event that surface water or groundwater trigger concentrations are exceeded;
 - (f) conclusions of the monitoring data, a review of the adequacy of monitoring programs, recommendations for any changes to monitoring programs that may be necessary;
 - (g) a summary of the type and quantity of all incoming and outgoing wastes to and from the transfer station;

- (h) a summary of complaints or operation problems and the Owner's response or action;
- a report on any variances from the landfill monitoring program and/or transfer operations as described in Item 3 of Schedule "A";

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- (j) a statement as to compliance with all Conditions of this Certificate and with the inspection and reporting requirements of the Conditions herein; and,
- (k) any recommendations to minimize environmental impacts from the operation of the Site and to improve site operations and monitoring programs in this regard.

Schedule "A"

This Schedule "A" forms part of Certificate of Approval No. A411404

- 1. Letter from Mark Bruce of Jp2g Consultants Ltd. to Heather Brodie-Brown of the Ministry of the Environment, dated October 31, 2002 with details pertaining to the theoretical maximum approved capacity of the landfill site.
- 2. North Algona Wilberforce Township Resolution #16, dated November 18, 2002 recommending that the site be available for landfilling for seven years before final closure.
- 3. Berndt Road Waste Disposal Site Interim Closure and Design and Operations Plan for a Waste Transfer Facility, Township of North Algona Wilberforce, prepared by Jp2g Consultants Inc., dated December 2002.
- 4. Drawing No. 1, Existing Conditions Plan, Township of North Algona Wilberforce Berndt Road Waste Disposal Site, plotted December 23, 2002.
- 5. Drawing No. 2, Final Contours and Section, Township of North Algona Wilberforce, Berndt Road Waste Disposal Site, plotted December 23, 2002.
- 6. Drawing No. 3, Waste Transfer Facility, Township of North Algona Wilberforce, Berndt Road Waste Disposal Site, plotted December 23, 2002.
- 7. North Algona Wilberforce Township, Council Resolution #28, dated January 19, 2004 stating that the Berndt Road Transfer Site will not accept appliances from which refrigerants have not been removed.

Schedule "B"

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This Schedule "B" forms part of Certificate of Approval No. A411404

Groundwater Monitoring Program

Location	Frequency	Parameter
upgradient well, downgradient well, BH1-I, BH1-II, MP1, MP2, MP3, MP4 and MP5	April/May July/August October	measure water levels
upgradient well, downgradient well, BH1-I and BH1-II	July/August	chloride, flouride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, copper, iron, manganese, strontium, alkalinity, TKN, ammonia, phenols, COD, TDS. Field measurements: pH, temperature, conductivity
downgradient well, BH1-II	July/August October	volatile organics (USEPA 624)

Surface Water Monitoring Program

Location	Frequency	Parameter	
SW-1, SW-2	April/May	chloride, flouride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, cadmium, copper, iron, manganese, total phosphorous, stronțium, zinc, alkalinity, TKN, ammonia, phenols, BOD, COD, TDS.	
		Field measurements: pH, temperature, conductivity	

Leachate Inspection Program

Location	Frequency	Parameter
Toe of waste mound	Quarterly	inspection of toe of mound for
		leachate seepage

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

The reason for Condition 1 is to make clear that all previously issued Certificate under Certificate of Approval No. A411401 are no longer in effect and are replace by this Certificate.

The reason for Conditions 2, 19 and 38 is to ensure that this waste disposal site is operated in accordance with the application submitted by the Owner, and not in a manner which the Director has not been asked to consider.

The reason for Conditions 3, 4, 5, 8, 9, 10, 11, 12, 13 and 35 is to clarify the legal responsibilities and obligations imposed by this Certificate.

The reason for Conditions 6 and 7 is to ensure that appropriate Ministry staff have ready access to the Site in order to confirm that the Site is being operated according to this Certificate. The condition is supplementary to the powers afforded a Provincial Officer pursuant to the Act, the OWRA, and the Pesticides Act, as amended.

The reason for the Conditions 14 and 15 is that Section 46 of the Act prohibits any use being made of the lands after they cease to be used for waste disposal purposes within a period of twenty-five years from the year in which such land ceased to be used unless the approval of the Minister for the proposed use has been given. The purpose of this prohibition is to protect future occupants of the site and the environment from any hazards which might occur as a result of waste being disposed of on the site. This prohibition and potential hazard should be drawn to the attention of future owners and occupants by the Certificate being registered on title.

The reason for Conditions 16, 20(a), 24, 25, 30, 31, 32, 36 and 37 is to ensure that the Site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

The reason for Condition 17 and 20(b) is to minimize the risk of unauthorized entry and to ensure the Site is only operated in the presence of trained personnel and to ensure proper management of waste.

The reason for Conditions 18, 21, 22 and 23 is to ensure that the types and quantities of waste received at the Site are in accordance with that approved under this Certificate, and that waste storage is done in a manner and duration which does not result in a nuisance or a hazard to the health and safety of the environment or people.

The reason for Condition 26 is to ensure that the Site is closed in accordance with MOE standards and to protect the health and safety of the environment.

The reason for Condition 27 is to acknowledge the physical maximum capacity of the landfill.

The reason for Condition 28 is to make clear that no further landfilling shall take place on the Site unless an application is received and approved by the Director.

The reason for Condition 29 is to properly cap the landfill to prevent negative impacts on the

environment or public health until such time as it may be approved for further landfilling in future.

The reason for Condition 33 is to ensure that complaints are properly and quickly resolved and that complaints and follow-up actions have been documented.

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The reason for Condition 34 is to ensure that the Owner immediately responds to a spill and notify the Ministry forthwith of any spills as required in Part X of the Act so that appropriate spills response can be determined.

This Provisional Certificate of Approval revokes and replaces Certificate(s) of Approval No. A411401 issued on March 31, 1981 and Notices issued May 15, 2000 and November 25, 2002

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary* Environmental Review Tribunal 2300 Yonge St., 12th Floor P.O. Box 2382 Toronto, Ontario M4P 1E4	The Director Section 39, Environmental Protection Act Ministry of Environment and Energy 2 St. Clair Avenue West, Floor 12A Toronto, Ontario M4V 1L5
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* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the

Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca

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

DATED AT TORONTO this 26th day of January, 2004

THIS CERTIFICATE WAS MAILED ON Jan, 30, 2004 2c (Signed)

VP/

c: District Manager, MOE Ottawa Mark A. Bruce, P. Eng., Jp2g Consultants Inc. ✓

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



Ministry Ministère of the de Environment l'Environnement AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE NUMBER A411401 Notice No. 1

The Corporation of the Township of North Algona Wilberforce Rural Route, No. 1 Eganville, Ontario K0J 1T0

Site Location: North Algona (Berndt Road) Waste Disposal Site Part of Lot 7, Concession 3 Township of North Algona Wilberforce, County Of Renfrew

You are hereby notified that I have amended Provisional Certificate of Approval No. A411401 issued on January 26, 2004 for the use and operation of a transfer station and the use and operation of a 2.0 hectare landfill within a 5.36 hectare site, as follows:

The following Conditions are hereby revoked and replaced with:

- 29. By June 30, 2005, the Owner shall:
 - (a) increase the granular cover material to a depth of 0.6 m; and
 - (b) apply 0.15 m of topsoil, seeded with both annual and perennial plant species, except for those areas approved for the establishment and use of a transfer station.
- 30. (a) Unitl such time as final cover is applied, and for the first two years following application of the final cover, the Owner shall:
 - (i) inspect the cover integrity on a quarterly basis. If cover integrity is damaged, then the necessary remedial measure shall be undertaken by the Owner within five (5) working days following the day of inspection (weather permitting);
 - (ii) inspect the vegetative cover in the fall and spring seasons. Any deficiencies in the vegetative cover shall be repaired as soon as weather and equipment availability permits;
 - (iii) inspect for leachate seeps on a quarterly basis. If a leachate seep is observed, then the necessary remedial measures shall be undertaken by the Owner within five (5) working days following the day of inspection (weather permitting);

- (iv) inspect for slope erosion on a quarterly basis. If erosion is observed, then the necessary remediation measures shall be undertaken by the Owner within five (5) working days following the day of inspection (weather permitting);
- (v) inspect for other nuisance factors (litter, rodents, bears) on a quarterly basis. If any problems are observed, then the necessary remedial measures shall be undertaken by the Owner within five (5) working days following the day of inspection (weather permitting);
- (b) After the initial two (2) year period following application of final cover, and based on the inspection results, the frequency of the inspections shall be re-evaluated and may be reduced with the concurrence of the District Manager.

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

to correct an error in the Certificate of Approval issued January 26, 2004.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A411401 dated January 26, 2004

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

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

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary* Environmental Review Tribunal 2300 Yonge St., 12th Floor P.O. Box 2382 Toronto, Ontario MAP 154	AND	The Director Section 39, <i>Environmental Protection Act</i> Ministry of Environment and Energy 2 St. Clair Avenue West, Floor 12A Toronto, Ontario
M4P 1E4		MAV II 5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the

Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act. DATED AT TORONTO this 13th day of February, 2004

NOTICE WAS WAILED ON 17,2004 (Signed)

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

VP/

c: District Manager, MOE Ottawa Mark A. Bruce, Project Engineer, Jp2g Consultants Inc.



Ministry Ministère of the de Environment l'Environnement AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE NUMBER A411401 Notice No. 2 Issue Date: December 20, 2006

The Corporation of the Township of North Algona Wilberforce Rural Route, No. 1 Eganville, Ontario K0J 1T0

Site Location: North Algona (Berndt Road) Waste Disposal Site 219 Berndt Road Part of Lot 7, Concession 3 Township of North Algona Wilberforce, County Of Renfrew

You are hereby notified that I have amended Provisional Certificate of Approval No. A411401 issued on January 26, 2004, as amended on February 13, 2004 for a transfer station and a 2.0 hectare landfill, both within a 5.36 hectare site, as follows:

The following Terms and Conditions are hereby revoked and replaced with:

- 21. (a) Only solid, non-hazardous wastes generated by residential and ICI sectors, within the Township of North Algona Wilberforce, shall be received at this Site.
 - (b) The following waste types shall not be received at the transfer station:
 - (i) construction and demolition waste;
 - (ii) equipment and/or appliances containing refrigerants; and
 - (iii) household hazardous waste.
- 23. The total amount of waste received and stored on Site shall not exceed the following limits:
 - (a) fiber wastes, including boxboard, corrugated cardboard, catalogues, magazines and newspapers, shall not exceed 35 m³ total;
 - (b) marketable scrap metal, including aluminium and steel cans, shall not exceed 35 m^3 ;
 - (c) plastics shall not exceed 46 m^3 total compacted;
 - (d) glass shall not exceed 30 m^3 ;
 - (e) organic material shall not exceed 20 m^2 total;
 - (f) propane cylinders shall not exceed 7.5 m^3 ;
 - (g) residual waste shall not exceed 45 m³ total compacted;
 - (h) tires shall not exceed 31 m^3 ;
 - (i) brush shall be stored on a concrete pad area not to exceed 50 m^2 ;

(j) leaf and yard waste shall be stored on a concrete pad area not to exceed 50 m²; and

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(k) bulky waste, such as mattresses and furniture, shall not exceed 31 m³ total.

The following Condition is hereby added:

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- 39. (a) The Owner shall ensure that the brush and leaf and yard waste storage areas are a minimum of 4.5 metres from the tree line; and
 - (b) The Owner shall ensure that all chipping is carried out using approved equipment and in accordance with the Terms and Conditions of the Certificate of Approval for such equipment.
- 40. (a) The Owner shall ensure that containers used to store organic waste are leakproof, lockable and bear resistance; and
 - (b) The Owner shall monitor the containers in which organic waste are stored for:
 - (i) decomposition to ensure that the organic waste has not decomposed to the point where it is unacceptable for the intended receiving facility; and
 - (ii) odours; and
 - (c) The Owner shall empty the containers used to store organic waste and transfer the organic waste from the Site forthwith when:
 - (i) the maximum capacity approved in Condition 23(e) has been reached; or
 - (ii) the organic waste has decomposed to the point where it is unacceptable to the receiving facility; or
 - (iii) the organic waste is creating odours that are creating a negative impact on Site users or off Site.

The following are hereby added to Schedule "A":

- 8. Application for a Provisional Certificate of Approval for a Waste Disposal Site dated September 19, 2006, signed by Ms. Marilyn Schruder, Clerk Treasurer, North Algona Wilberforce Township.
- 9. Letter from K. Mooder, Jp2g Consultants Inc., to Environmental Assessment and Approvals Branch, dated September 22, 2006, outlining amendment request.
- 10. Drawing No. 1, North Algona Wilberforce, Berndt Road Waste Transfer Site, Site Development and Operations Plan, dated September 2006.

All other Terms and Conditions on Provisional Certificate of Approval No. 411401, which was issued to The Corporation of the Township of North Algona-Wilberforce on January 26, 2004, and Notice No. 1 issued February 13, 2004, not affected by this amendment, continue to remain in effect.

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

Condition 21 has been amended to permit the Owner to receive brush, leaf and yard waste and bulky waste at this Site.

Condition 23 has been amended to reflect changes in the approved maximum storage amounts for metals, plastics, propane tanks and tires. In addition to volume changes, propane tanks and tires are now approved to be stored in waste containers (rather than open storage).

Condition 39(a) has been added to ensure that the storage of leaf and yard waste does not create a fire hazard. Condition 39(b) has been added to ensure that the chipping of yard waste does not create a negative impact on the public.

Condition 40 has been added to ensure that the temporary storage of organic waste is done in a manner which does not attract bears or other mammals, and is removed promptly so as not to create a nuisance.

This Notice also approves a revised Site plan.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A411401 dated January 26, 2004, as amended.

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

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;

2. The grounds on which you intend to rely at the hearing in relation to <u>each</u> portion appealed.

The Notice should also include:

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

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

This Notice must be served upon:

The Secretary*ThEnvironmental Review TribunalSe2300 Yonge St., Suite 1700MiP.O. Box 2382ANDToronto, OntarioToM4P 1E4M4

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

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the

Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca

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

DATED AT TORONTO this 20th day of December, 2006

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THIS NOTICE WAS MAILED ON Jan 14 2007 (Signed)

VP/

c: District Manager, MOE Ottawa Kevin Mooder, Jp2g Consultants Inc. ✓

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Appendix B

Monitoring & Screening 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	Berndt Road WDS		
Location (e.g. street address, lot, concession)	219 Berndt Road		
GPS Location (taken within the property boundary at front gate/ front entry)	E323156 N5051408		
Municipality	North Algona Wilberforce Township		
Client and/or Site Owner	Township		
Monitoring Period (Year)	2024		
This	Monitoring Report is being submitted under the following:		
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	A411401		
Director's Order No.:	none		
Provincial Officer's Order No.:	none		

Other:	Type Here		
Report Submission Frequency	Annual Other Specify (Type Here):		
The site is: (Operation Status)	Open Inactive Olosed		
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	unknown	Units	
Maximum Approved Fill Rate		Units	
Total Waste Received within Monitoring Period (Year)		Units	
Total Waste Received within Monitoring Period (Year) Describe the methodology used to determine this quantity			
Estimated Remaining Capacity		Units	
Estimated Remaining Capacity Describe the methodology used to determine this quantity			
Estimated Remaining Capacity <i>Date Last Determined</i>	Site Closed January 2002		_
Non-Hazardous Approved Waste Types	 Domestic Industrial, Commercial & Institutional (IC&I) Source Separated Organics (Green Bin) Tires 	 Contaminated Soil Wood Waste Blue Box Material Processed Organics Leaf and Yard Waste 	 Food Processing/Preparation Operations Waste Hauled Sewage Other:
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial (separate waste classes by comma)			

Year Site Opened (enter the Calendar Year <u>only</u>)	1978	Current ECA Issue Date	Notice No 2 December 20, 2006
Is your Site required to submit Financial Assurance?		O Yes No	
Describe how your WDS is designed.		Natural Attenuation only Fully engineered Facility Partially engineered Facility	
Does your Site have an approved C	Contaminant Attenuation Zone?	•	Yes No
If closed, specify ECA, control or authorizing document closure date:		ECA A411401 January 26, 2004 and Notice No 1 February 17, 2004	
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 Verifi	ication:		
Based on all available information	about the site and site knowled	ge, it is my opinion that:	•
			••
 The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure: 	● Yes ○ No	If no, list exceptions (Type F	lere):
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 cha (change in name or location, ad	ange ditions, deletions)	Date
BH 1-II and BH3	Removal of volatile organics (USEPA 624) Volatile organics have not been detected at the site, and the site is no longer active		13-Dec-2012
BH1-I, BH1-II, BH2, BH3, BH4, BH5, BH6, MP1, MP2, MP3, MP4, and MP5	Reduction in groundwater level measurements from three times a year April/May, July/August, and October to twice a year April/May and November Although suggestion was made to decommission MP1, MP2, MP3, MP4, and MP5 (technical review of the 2010 and 2011 monitoring reports) they are included in the water level monitoring program		17-Jun-2015

BH1-I, BH1-II, BH2, BH3, BH4, BH5, and BH6	Change in sampling from July/Au BH4, BH5, and BH6 were added to sampled in spring 2013) as new t replace former trigger mechanism SW3 and SW4)	17-Jun-2015	
PW1	Residential well PW1 was removed from the program Intended as a more suitable background well and was potentially impacted due to road salt activities or naturally elevated concentrations of chloride and conductivity. BH2 shows similar characteristics and was retained as the background well		8-Feb-2016
 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. 		able	
b) If yes, the sampling and mo for the monitoring period beir completed in accordance with frequencies, locations, and pa Technical Guidance Document	nitoring identified under 3(a) ng reported on was successfully established protocols, rameters developed as per the t: ONO 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 Mo	nitoring Program Resu	Its/WDS Conditions and Assessment:
5)	The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/ or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	● Yes ○ No	
6)	The site meets compliance and assessment criteria.	○ Yes ● No	Guideline B-7 exceedance of TDS at monitoring well BH5.
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	Monitoring nest BH1 experienced a horizontal gradient during spring flood conditions. Upward gradients have been historically observed at this location

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>i</i> .The site has developed stable leachate mound(s) and stable leachate plume geometry/ concentrations; and <i>ii</i> .Seasonal and annual water levels and water quality fluctuations are well understood.	 Yes No 	Note which practice(s):	□ (a) □ (b) ⊠ (c)
9)	Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	 ○ Yes ● No ○ Not Applicable 		

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005* (*E*)- *General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:		
Based on my technical review of th	ne monitoring results for the waste disposal site:	
No changes to the monitoring program are recommended		
The following change(s) to ○ the monitoring program is/ are recommended:	Type Here	
No Changes to site design and operation are recommended		
The following change(s) to the site design and operation is/are recommended:	Type Here	
Name:	Andrew Buzza, P.Geo	
Seal:	Add Image	

Signature:		Date:	Select Date
CEP Contact Information:	Andrew Buzza, P.Geo		
Company:	Jp2g Consultants Inc		
Address:	1150 Morrison Drive Ottawa ON K2H 8S9		
Telephone No.:	613 828 7800	Fax No. :	613 828 2600
E-mail Address:	andrewb@jp2g.com		
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)	Un-named intermittent tributary		
Name (s)	Un-named intermittent tributary		

Distance(s)

Based on all available information	and site knowledge, it is my opi	inion that:	
	Sampling and Monitor	ing Program Status	5.
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 Surface water sampling not required annually but was completed in response to trigger mechanism exceedance of TDS. 		
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 provi	de details in an attachment.
Surface Water Sampling Location	Description/Explanation for change ⁿ (change in name or location, additions, deletions)		Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.		 Yes No Not Applicable 	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:		 Yes No Not Applicable 	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)		Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
Type Here	Type Here		Select Date
4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	● Yes ○ No	Surface water sampling no completed in response to t TDS	t required annually but was trigger mechanism exceedance of
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): 			
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
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	Periods of rain may have cause a increase of background Phosphorous come into the water course.

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	2024 sampling is consistent with historical trends
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 	Total phosphorous was historically slightly elevated and in 2024 this was not observed.
9)	Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	 Yes No Not Applicable 	BH 5 has exceed TDS trigger for 3 years and over 75% of the monitoring events. therefore Surface water sampling was continued at SW1, SW2 in 2024

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Environmental Compliance Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories,* or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

● No Changes to the monitoring program are recommended	Type Here
The following change(s) to the monitoring program is/are recommended:	
No changes to the site design and operation are recommended	Type Here
The following change(s) to the	

CEP Signature		
Relevant Discipline	Education and experience	
Date:	Select Date	
CEP Contact Information:	Andrew Buzza, P.Geo	
Company:	Jp2g Consultants	
Address:	1150 Morrison Drive Ottawa ON K2H 8S9	
Telephone No.:	613 828 7800	
Fax No. :	613 828 2600	
E-mail Address:	andrewb@jp2g.com	
Save As		Print Form

Appendix C

Ministry Comments/Responses



January 21, 2010

Ministry of Environment Ottawa District Office 2430 Don Reid Drive Ottawa, ON K1H 1E1

- Attention: Lance Larkin Sr. Environmental Officer
- Re: North Algona Wilberforce Waste Transfer Sites 2010 Work Plans Our File No. 2106000A

Dear Lance:

On behalf of the municipality we have developed and initiated a work plan related to the two (2) municipal waste transfer sites for 2010. The purpose of this submission is to summarize the key issues and where noted we 'request MOE confirmation or comment.'

Berndt Road Waste Transfer Site Certificate No. A411401

- recently the Township is requesting tree planting over the waste mound, and as you acknowledged by e-mail December 23, 2009 'no problem provided the final cover is not impacted' Jp2g will provide supporting documentation in this regard
- 2009 Annual Report due May 31, 2010
- the December 20, 2006 amendment to the Certificate reflected the major changes to site development and operations of the waste transfer facilities 'as a participant in the OVWRA minor modifications have been implemented to accommodate the new programs and material accepted, trusting further amendments to the Certificate are not necessary'
- the 2008 Annual Report requested reduced frequency of final cover inspections as per Condition 30(b): 'no MOE response'
- the 2007 and 2008 Annual Report has requested approval to eliminate the VOC analysis and apply Gudieline B-9 compliance limits as per Condition 37(b): 'no MOE response'
- the proposed 2010 Water Quality Monitoring will be conducted as per the Certificate.

Shaw Woods Road Waste Transfer Site Certificate No. 0592-772KZZ

- under the October 9, 2007 Certificate the 2007/2008 Operations Report was filed March 24, 2009
- the 2009/2010 report is due by March 31, 2011

The municipality has taken a very active role in the development and implementation of waste diversion programs. We trust pending your opportunity to review the project files that the proposed modifications to the Berndt Road Site monitoring program can be favourably considered.

I would be pleased to discuss further.

Yours very truly,

Jp2g Consultants Inc. Engineers • Planners • Project Managers

10

Kevin Mooder, MCIP RPP Sr. Project Planner

KM/jlp

c.c. Marilyn Schruder, Clerk-Treasurer

Jp2g Consultants Inc.

Ministry of the Environment

P.O. Box 22032 Kingston, Ontario K7M 8S5 613/549-4000 or 1-800/267-0974 Fax: 613/548-6908

Ministère de l'Environnement

C.P. 22032 Kingston (Ontario) K7M 8S5 613/549-4000 ou 1-800/267-0974 Fax: 613/548-6908



MEMORANDUM

- TO: Lance Larkin Sr. Environmental Officer Ottawa District Office Eastern Region
- FROM: Dana Cruikshank Surface Water Scientist Water Resources Group Eastern Region
- RE: 2008 Annual Report Berndt Road Waste Disposal Site (Transfer Site) North Algona Wilberforce Township IDS Ref #: 7632-7SGJ8F

I have reviewed the above report prepared by Jp2g Consultants with respect to surface water concerns only. AECOM has prepared the surface water data report.

Report Overview

Jp2g and AECOM report for 2008:

- In 2006 the Township redeveloped the waste transfer station for better efficiency to accept new materials, brush, bulk waste and yard waste.
- Facilities as per Condition 23 of the CofA have been established.
- In 2008 a battery storage area was established. An electronic waste storage area is proposed.
- No waste has been landfilled since January 2002.
- Two surface water stations were sampled on April 17, 2008 that is located on an intermittent tributary 500 m west of the site.

January 29, 2010
- Groundwater flow is interpreted to be to the west towards the intermittent tributary.
- Measured flows were 6 L/s at SW2 (upstream) and 56 L/s at SW1 (downstream) in 2008.
- Flows at SW1 were twice the historical high measured at this station.
- The landfill generates 0.04 L/s of leachate.
- Slightly elevated leachate indicators parameter concentrations were found at SW1 compared to SW2. AECOM relates these impacts to Hwy 60 rather than landfill impacts.
- No impacts to surface water are likely in the future based on 8 years of monitoring data and therefore it is requested that surface water monitoring be discontinued.
- Guideline B-7 limits were exceeded at a downgradient monitor, AECOM suggests the site be governed by B-9 for several reasons including natural attenuation be a small wetland.

Reviewer's Comments:

The detection of slightly elevated leachate indicator parameters at SW1 could also be interpreted as being representative of a highly diluted sample whose concentrations would be much higher at lower flows. However the historical database also has concentrations from several low flow events and the concentrations while variable do not fall into the range where impacts to aquatic life are likely to occur.

AECOM in its argument that this site should be governed by B-9 instead of B-7 states as one of its reasons that leachate would be naturally attenuated in the small wetland adjacent to the site. This is not permitted. Wetlands in Ontario are considered waterbodies and should be treated in the same manner as a small stream. They can be used as polishing for treated leachate but cannot be used as part of the natural attenuation process.

AECOM has made a request for the elimination of the surface water sampling program at this site. Based on the data the surface water reviewer is willing to agree to this request with the following caveat. A trigger mechanism for groundwater wells BH3 and BH1 for leachate indicators is required so that when trigger concentrations are reached, sampling in SW1 and SW2 will continue until such time that potential impacts have been assessed. At the time the surface water sampling is triggered the small wetland pocket should be assessed as to whether potential water quality impacts affecting the ecology of the wetland are occurring.

Recommendations

 The reviewer agrees to the recommendation by AECOM that surface water monitoring at this site can be discontinued upon the acceptance by the Ministry of a groundwater trigger mechanism at BH1 and BH3. The trigger mechanism will trigger surface water sampling at SW1 and SW2 as soon as possible following the trigger event and will continue for at least one year following. An on-site assessment of the small pocket wetland adjacent to the site should be made including water quality sampling if possible.

If you have any questions regarding the above comments or recommendations I would be pleased to discuss them with you.

with a fulli

Dana Cruikshank DC/gl

c:

Greg Faaren Paul Kehoe File SW-05-04 NAWI (Berndt Rd WDS) File SW-13-02-02 (unnamed tributary to Golden Lake)

Y. 11	•					
Wong, Patty			•		•	· ·
From: Sent: To: Cc: Subject: Attachments:	Larkin, Lance (Thursday, Febr Janice Potvin Larkin, Lance (RE: Berndt Roa North Algona W	ENE) [Lance.Lark uary 04, 2010 4:3 ENE) ad WDS /ilberforce Januar	sin@ontario.ca] I3 PM 1y 21, 2010.pdf	; fdc-ll-Berndt	Road WDS-Tra	nsfer Site.pdf
Importance:	High	<i></i>				
This is in response to the January 21, 2010. The Township may redu	Berndt Road Wa	ste Disposal Site	comments mad	de under the a	attached Jp2g le in the 2008 Anni	iter dated
Applying P-9 is not perm	itted. Please refer	to the attached m	iemorandum p	repared by Da	ana Cruickshank	
In addition, the Townshir	should take the n	ecessarv steps to	o implement the	e recommend	ations discussed	l under Mr.
Cruickshank's memorand	dum.					
Acceptance of a groundv would be required.	vater trigger mech	anism by the mini	istry and appro	val under Cor	ndition 37(b) of t	ne Certificate
If you have any question	s or concerns abo	ut this email, plea	se do not hesil	ate to contac	t me at the numb	er below.
Lance Larkin			•.	. ·		· • •
Senior Environmenta	al Officer		· · · ·			· · · · ·
Ministry of the Environme	ent			•		· ·
Ottawa District Office						· ·
2430 Don Reid Drive	· ·	· · ·		· ·	•••	
Ottawa, ON K1H 1E1		•				· ·
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Ministry of the Environment

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Ministère de l'Environnement

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MEMORANDUM

February 23, 2010

TO:	Lance Larkin Senior Environmental Officer Ottawa District Office Eastern Region	
FROM:	Karén Kharatyan Hydrogeologist Technical Support Section Eastern Region	Greg Faaren Hydrogeologist Technical Support Section Eastern Region
RE:	2008 Annual Report North Algona (Berndt Road) Waste I Part Lot 7, Concession 3, Township of Certificate of Approval No. A411401	Disposal Site of North Algona

I have reviewed the hydrogeologically pertinent sections of the above noted report (dated May, 2009) submitted by Jp2g Consultants Inc. on behalf of North Algona Wilberforce Township. Included in the report is a document entitled "2008 Groundwater and Surface Water Monitoring of the North Algona Landfill Site, Township of North Algona Wilberforce" prepared by AECOM Canada Ltd. and dated May 2009. I offer the following comments for your consideration.

Summary

- The site does not conform to Guideline B-7 along the south-western boundary. The extent of the leachate impacts should be delineated and the site should be brought into conformance with Guideline B-7.
- Groundwater flow direction beneath the waste is to the southwest, towards an intermittent stream about 300 metres from the site boundary. The primary pathway for leachate migration is reportedly within the shallow overburden in a south-westerly direction.
- AECOM reports that monitoring well BH2 is not representative of unimpacted background groundwater quality. A proper background groundwater well should be installed at this site.

- Exceedances of the Ontario Drinking Water Standards (ODWS) at downgradient monitor BH1-II are reported to be the result of leachate impacts. Monitors MP2 and MP3, located downgradient of well BH1-II, should be added to the monitoring program to determine the extent of the leachate impacts.
- Well BH-3 is often dry at the time of sampling. Estimation of downgradient water quality is disputable without having the results from the monitoring well BH3. AECOM recommends that the results of sampling conducted at this location in spring 2009 be provided as part of the 2009 report. If this well is unable to be routinely sampled it should be replaced with a monitoring well able to consistently assess groundwater quality at this location.
- AECOM reports no leachate impacts at surface water and proposed discontinuing surface water monitoring at SW1 and SW2 stations. Sampling should restart if trigger concentrations are reached at the furthest downgradient monitors (i.e. wells MP2 and MP3).
- The consultant reports that the final cover applied at this landfill site comprised a granular cover material with a thickness of 0.6 m and 0.15 m of topsoil. This information would indicate that low permeability material was not used to cap the landfill. It is recommended that details regarding the composition of the cover material for this landfill be provided in the next annual report.
- With the additional monitoring well for background quality and the sampling of wells MP2 and MP3, the proposed annual monitoring program is acceptable. AECOM recommends that volatile organic compounds (VOC) sampling be removed from the sampling program. I have no objections to this proposal. The monitoring and reporting frequency should remain annual.

Certificate of Approval (CofA)

The Berndt Road waste disposal site (WDS) is located about 2 km northwest of the hamlet of Golden Lake in the Part Lot 7, Concession 3, in Township of North Algona. The site operates under Certificate of Approval No. A411401. The site was closed for waste disposal in January 2002 and since then has operated as a waste transfer site. There are no engineering systems in place to control generated leachate and therefore the site operates as a naturally attenuating landfill.

Geology

The geology of the site comprises the following units:

- A sand/gravel overburden unit;
- A granitic gneiss bedrock unit.

AECOM reports that a bedrock ridge extends from west to east in the northern part of the site.

Hydrogeology

AECOM determined the following:

- Groundwater flow direction beneath the waste is to the southwest, towards the intermittent stream. This is consistent with previous results.
- Groundwater flows through the overburden relatively rapidly, at rates in the ranges of 1,000 m/year.
- Monitoring wells BH1-I and BH1-II indicated upward vertical hydraulic gradients (recharging conditions).

AECOM reports that four (4) monitoring wells (BH1-I, BH1-II, BH2, BH3) were sampled once in 2008 (August). BH1 is a monitor nest with wells BH1-I (bedrock) and BH1-II (overburden).

Background Groundwater quality

Monitoring well BH2 was installed in 2004 to provide upgradient, overburden groundwater quality. This well is located about 15 m east of the fill area. Monitoring results indicate elevated concentrations of leachate parameters such as chloride and alkalinity since 2004. It is reported that BH2 appears to be affected by dilute leachate impacts. Therefore the monitor should not be considered as a representative of unimpacted background groundwater quality.

Leachate

Chloride, sulphate, sodium, potassium, boron, alkalinity, electrical conductivity, ammonia, total kjeldahl nitrogen (TKN), total dissolved solids (TDS) and manganese were identified as leachate indicator parameters for this landfill site.

Downgradient Water Quality

BH1-I is located downgradient of the waste and is screened within the granitic gneiss bedrock. In 2008, exceedances of ODWS were noted at this monitor for manganese and organic nitrogen. AECOM reports that high manganese and strontium concentrations are typical of the Precambrian bedrock and interprets the bedrock monitor to be unaffected by leachate.

The BH1-II is screened within the shallow water table within the sands and gravels. In 2008 TDS, alkalinity, manganese and organic nitrogen exceed the ODWS in this well. However, it is reported that all leachate parameters follow the historical trend and leachate strength is relatively

weak. AECOM indicates that the upward gradient between the bedrock and overburden would prevent downward flow of leachate to the bedrock at this location.

Monitor BH3, drilled on the top of bedrock was not sampled because this well was dry during 2008 monitoring event. The downgradient water quality at this location is not known as this well has been reportedly dry on multiple occasions since this well was first installed.

Groundwater Surface Water Interaction

AECOM reports slightly elevated leachate parameter concentrations at SW1 and relate these impacts to Highway 61. No impact is reported at upstream station SW2. The consultant indicates that no impacts on surface waters have been detected over the eight years surface water monitoring for the site and recommends discontinuing the surface water monitoring.

Guidelines B-7

Guideline B-7 applies to operating waste disposal sites and sites closed post 1986. AECOM conducted a Reasonable Use (RU) assessment for the site. The site does not comply with Guideline B-7 at monitor B1-II located southwest from the fill in overburden aquifer. Manganese, TDS and organic nitrogen exceed the RU concentrations.

AECOM indicates that the Guideline B-9 should apply to this site instead of B-7 and states as one of the reasons that the disposal site has been closed since 2002.

As noted above Guideline B-7 applies to operating waste disposal sites and sites closed post 1986. Therefore, as per Ministry policy, Guideline B-7 is applicable to this site. The owner should bring the site into conformance with B-7.

Cover Material

The consultant reports that the final cover applied at this landfill site comprises a granular cover material with a thickness of 0.6 m and 0.15 m of topsoil, seeded with annual and perennial plant species. This information would indicate that low permeability material was not used to cap the landfill.

Trigger/Contingency plan

As presented in 2003 annual report when the implementation of contingency plan is required, the Township will move to acquire a downgradient contaminant attenuation zone (CAZ). AECOM indicates that the initiation of contingency plan is not required at this time. However, as noted above the site does not comply with Guideline B-7. The monitoring program should be extended and should include the sampling of wells MP2 and MP3. The extent of leachate impact should

be delineated. If the extended monitoring program indicates exceedances of the trigger mechanisms for the site, the contingency plan should be initiated.

Groundwater monitoring

AECOM recommends continuing the current monitoring program with the existing monitors. However, the current monitoring program is showing impacts beyond the active monitoring well network. AECOM recommends that VOC sampling be removed from the sampling program as organic parameters have not been detected at the site. The reporting frequency is to be annual.

beg kun

Greg Faaren, P.Geo.

Karén Kharatyan GF/gl

c: Dana Cruikshank Paul Kehoe Peter Taylor File GW-03-03, NAWI (A411401) GF/IDS # 3113-7SGJ7L



Jp2g Consultants Inc.

ENGINEERS = PLANNERS = PROJECT MANAGERS Ottawa • Pembroke

April 30, 2010

Ministry of Environment Ottawa District Office 2430 Don Reid Drive Ottawa, Ontario K1H 1E1

Attention: Mr. Lance Larkin Sr. Environmental Officer

Re: Berndt Road Waste Transfer Site 2010 MOE Review Comments Our Project No. 2006041K

Dear Sir:

We acknowledge on behalf of North Algona Wilberforce Township recent TSS review comments. On February 4, 2010 we received surface water review comments dated January 29, 2010 and on March 2, 2010 the Township received groundwater review comments dated February 23, 2010. In consultation with Township Council and AECOM we provide the following response.

Background

- Provisional Certificate No. A411401 dated March 31, 1981 was issued in response to a 1977 application under the Environmental Protection Act (EPA) 1971.
- Notice No. 1 dated May 15, 2000 was issued in response to a request to include the former Township of Wilberforce into the service area subject to the proposed Work Plan and filing a Site Development and Operations Plan. This report dated September 25, 2000 included:
 - Preliminary Hydrogeology Study dated August 5, 1999
 - 2000 Groundwater and Surface Water Monitoring Report
- On September 23, 2002 MOE provided comments on the December 2001 Gartner Lee report which formed the basis of the approved monitoring program.
 - list of parameters
 - sampling frequency for groundwater
 - apply Guideline B-7 Reasonable Use Concept
- In December 2002 the Township filed the Interim Closure And Design And Operations Plan For A Waste Transfer Facility which included the Gartner Lee March 7, 2002 letter report and a November 26, 2002 reply to MOE detailing:
 - installation of mini-piezometers
 - hydraulic conductivity (slug) test on monitor BH1-I and BH1-II
 - establish SW1 and SW2

- Amended Certificate of Approval No. A411401 dated January 26, 2004 replaced the earlier Certificates and included the following conditions related to environmental monitoring:
 - 36. Prior to the 2004 sampling install two additional wells June 2004.
 - 37(a). Conduct monitoring in accordance with Schedule "B" of the Certificate.
 - 37(b). Any future changes in the monitoring program requires written approval by the District Manager
 - 38. Annual Report due May 31, 2004 and thereafter to include description of the program, assessment of compliance, trigger concentration and contingencies.
- Notice No. 1 an amendment to the Certificate dated February 13, 2004 required final cover by June 30, 2005 and a regular inspection program.
- In June 2004 two (2) boreholes were installed, BH-2 (proposed background) and BH-3 (western property line)
- Notice No. 2 an amendment to the Certificate dated December 20, 2006 approved the new waste transfer facilities and layout.
- In March 2007 TSS indicated closed landfill sites may apply MOE Guideline B-9 "Resolution of Groundwater Interference Problems" which is governed by Ontario Drinking Water Standards for groundwater and mitigation measures for exceedances beyond the site boundaries.
- In April 2009 TSS advised that MOE Guideline B-7 "Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities" is applied to all landfills closed after 1986 with limited exception.

Based on the preceding MOE approvals and review procedures, AECOM has prepared a response to the TSS comments summarized as follows:

Surface Water

Since 2000 monitoring at SW1 and SW2, there has been no detectable leachate impact at these surface water monitoring locations. The MOE has agreed to discontinue sampling provided the monitoring results at BH1-II and BH3 apply Provincial Water Quality Objectives (PWQO) criteria as a trigger to re-initiate surface water sampling.

Groundwater

The application of Guideline B-7 or B-9 has been confirmed with MOE. The Ministry is implying that due to elevated concentrations of manganese, TDS and organic nitrogen at BH1-11 that the site is not in compliance with Guideline B-7 (it would not be in compliance with B-9 either). TSS is recommending the installation of an additional background well – to replace BH2, and sampling of MP2 and MP3 – to assess downgradient impacts. AECOM does not agree.

MOE has agreed that a trigger mechanism of the shallow groundwater quality would support the request to discontinue surface water sampling and to discontinue the VOC analysis. AECOM has presented a proposal for MOE approval.

Final Cover

In December Harvey Reckzin made an enquiry with your office regarding the planting of pine trees around and on the closed waste disposal footprint. This writer followed up and you advised of no problem "provided that the final cover will not be impacted" (e-mail Dec. 23/09 and letter Jan. 21/10). In addition as noted, TSS requests confirmation on the composition of the cover material in the next annual report.

The cover application was conducted under the guidance of Jp2g Consultants Inc. to establish final grades, and was approved by Mr. Andrew Polley in November 2005. It is our submission that there will be no negative effect on the integrity of the final cover due to pine tree plantings on the waste mound. Soil and root depth are the key determinants for whether the mature tree roots will penetrate the landfilled waste. The thickness of cover material on the site ranges between 0.6m to 1.0m. The sandy nature of the cover material overlain by topsoil equivalent will encourage lateral root development. Pine trees do not develop a tap root which would extend into the waste layer. I attended the site during the planting on April 27, 2010 to inspect the waste mound, confirm the thickness of cover material and extent of plantings which will be reported in the 2009 Annual Report due May 31, 2010.

Yours truly, Jp2g Consultants Inc. Engineers • Planners • Project Managers

Kevin Mooder, MCIP, RPP Sr. Project Planner

KJM/dr

- c.c.: Marilyn Schruder, Township
 - Patty Wong, AECOM
 - Perry Larochelle, Jp2g

AECOM

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905 477 8400 tel 905 477 1456 fax

April 30, 2010

Mr. Lance Larkin Senior Environmental Officer Ottawa District Office Ministry of the Environment, Eastern Region P.O. Box 22032 Kingston, ON K7M 8S5

Dear Mr. Larkin:

Project No: 60147234-4

Regarding: 2008 Annual Report Review Comments, North Algona (Berndt Road) Waste Disposal Site, Wilberforce Township, IDS Ref # 7632-7SGJ8F

We are pleased to present our response to the surface water¹ and hydrogeological² review comments on the 2008 Groundwater and Surface Water Monitoring report for the aforementioned site. For ease of reference, the review comments will be addressed in the same order and headings as they appear in the MOE memorandums.

Surface Water

Recommendations

The reviewer agrees that the surface water monitoring of SW1 and SW2 can be discontinued provided that a trigger mechanism for BH1 and BH3 is implemented and approved by the MOE. Since the primary function of the trigger mechanism for this site is the protection of the ecology and aquatic life within the wetland and the intermittent tributary, we examined the potential for establishing triggers based on leachate indicator parameters and parameters with established Provincial Water Quality Objectives (PWQO). Leachate indicators have been identified as chloride, sulphate, sodium, potassium, boron, alkalinity, electrical conductivity, ammonia, TKN, total dissolved solids (TDS) and manganese. In addition, of the suite of parameters analyzed, cadmium, copper, iron, total phosphorus, zinc, phenols, un-ionized ammonia and pH have PWQO. However, historic surface water results have shown that most of the parameters with PWQO are at much lower concentrations in the surface water than the PWQO, often below the laboratory method detection limit and/or are not usually elevated in the landfill leachate. In addition, the Precambrian bedrock environment often results in naturally elevated concentrations of iron and manganese rendering these parameters

^{1.} MOE Memorandum from Dana Cruikshank to Lance Larkin dated January 29, 2010.

^{2.} MOE Memorandum from Karen Kharatyan and Greg Faaren to Lance Larkin dated February 23, 2010.



ineffective triggers. Thus, the triggers will be limited to the leachate indicator parameters with Ontario Drinking Water Standards (ODWS), which are chloride, sulphate, sodium and born. Of the leachate indicator parameters, only boron has a PWQO.

To establish reasonable groundwater trigger concentrations, the natural attenuation potential of the site was assessed. The calculation is based on a mass balance approach over the drainage sub-basin in which the landfill is located. The leachate from the landfill will slowly migrate into the groundwater beneath the site. It will move in a southwest direction within the sub-basin where it will be attenuated by dilution and dispersion in the groundwater flow system. Natural attenuation processes will occur within the area between the landfill footprint and the tributary.

The objective of the mass balance calculation is to predict the concentration of leachate contaminants that will discharge from the sub-basin into the tributary and to compare these concentrations to the province's standards for surface water, the Provincial Water Quality Objectives (PWQO), Ontario Drinking Water Objectives (ODWS) and to actual surface water quality data collected from the downstream surface water station, SW1.

It should be noted that the mass balance calculations presented here are conservative from the standpoint that they consider only dilution as the natural attenuation mechanism. In fact, a number of other natural attenuation mechanisms will further reduce leachate concentrations, including biological and chemical processes in the soils. These additional processes are difficult to quantify, but are nevertheless significant and can be treated as an additional and considerable factor of safety.

The mass balance equation for the sub-basin is as follows (for a particular chemical species):

$$Q_T \times C_T = Q_L \times C_L + Q_G \times C_G$$

Where: $Q_T =$ Total flow within the sub-basin

- C_T = Concentration of the chemical at the outlet of the sub-basin
- Q_L = Quantity of the leachate produced
- C_L = Concentration of the chemical in the leachate (taken at BH1-II)
- Q_G = Quantity of infiltration and groundwater flow through the sub-basin
- C_{G} = Concentration of the chemical species in the natural groundwater (taken at BH2)

The total annual precipitation and evapotranspiration are based on long-term averages of 22 years of actual meteorological data from the Pettawawa-Hoffman station, some 35 km north of the site. A water balance was prepared using the method described in Thornthwaite and Mather (1957)³.

Total Annual Precipitation = 0.810 m/a Total Annual Evapotranspiration = 510 m/a

Therefore, the surplus water available for infiltration can be calculated as the difference:

Surplus Water = 0.810 - 0.510 = 0.300 m/a

^{3.} Thornthwaite C.W., and J.R. Mather:

^{1957,} Instructions and Tables for Computing Potential Evapotranspiration and the Water Balance; Drexel Institute of Technology, Laboratory of Climatology, Volume X, Number 3, 1957, 311 pp.



The sub-basin has been divided into two categories:

- 1. The landfill (waste footprint area), where all surplus water is assumed to infiltrate and produce leachate. Total area = 0.735 ha or 7,350 m².
- 2. Groundwater infiltration area, where permeable surficial soils are assumed to allow all surplus water to infiltrate and produce groundwater flow. Total area = 4.75 ha or 47,500 m².

Using the calculated areas and assuming 70% infiltration of the annual water surplus, each of the annual flow quantities in the sub-basin can be calculated:

Leachate:	Q_L	Ξ	7,350 m² x 0.30 m/a x 0.7	=	1,575 m³/a
Groundwater:	Q_{G}	=	47,500 m ² x 0.30 m/a x 0.7	=	9,975 m³/a

The total contributing flow is the sum of all the other flows:

$$Q_T = Q_L + Q_G = 1,575 \text{ m}^3/\text{a} + 9,975 \text{ m}^3/\text{a} = 11,550 \text{ m}^3/\text{a}$$

The concentration parameters (C) in the mass balance equation come from the background monitor BH2. The leachate concentrations come from BH1-II, immediately downgradient of the fill area.

To show an example of the mass balance calculations using the background water quality and the leachate data, chloride was used. Chloride is an indicator parameter for the site and is mobile and persistent in the environment (i.e., it is attenuated only by dilution rather than other bio-chemical attenuation processes). However, since the background monitor shows elevated sodium and chloride, possibly from dilute leachate impacts and/or road salt, the median background (upstream) chloride concentration from SW2 of 8 mg/L was used in the calculations.

For chloride:	CL	=	Concentration in the leachate = 120 mg/L (monitor 1-II – April 2009)
	C_{G}	=	Concentration of the chloride in the natural groundwater
		Ξ	8 mg/L (median upstream unimpacted concentration at SW2)

Therefore, in the mass balance equation:

 $Q_T \times C_T = Q_L \times C_L + Q_G \times C_G$ (11,550 m³/a) x C_T = (1,575 m³/a) x (120 mg/L) + (9,975 m³/a) x (8 mg/L) C_T = (189,000 + 79,800)/11,550 m³/a = 23.3 mg/L

This value represents the concentration of chloride in the groundwater discharge to the tributary. The calculated chloride concentration of 23 mg/L is similar to the median chloride concentration at downstream surface water station SW1 of 33.5 mg/L. Table 1 presents the mass balance calculations for the four trigger parameters. As shown on Table 1, the calculations overestimate the concentrations in the tributary (except for chloride) indicating that this model is conservative and other attenuating factors contribute to the actual parameter concentrations in the tributary. These other factors include:

a) Attenuation processes along the groundwater flow path below the water table;



- b) Biological uptake and biodegradation in the low lying wetland areas between the site and the tributary; and
- c) Mixing at the discharge to the tributary. Flow in the tributary (0.08 to 56 L/s at SW1) is generally much higher than the average 0.04 L/s of leachate generated from the landfill and will attenuate the small amounts of contaminants that could remain in the groundwater discharge.

With the above calculations in mind, the groundwater trigger concentrations for chloride, sulphate, sodium and boron are set at 75% of the ODWS. The trigger concentrations are summarized below:

Parameter	Trigger Concentration (mg/L)
Chloride	188
Sulphate	375
Sodium	150
Boron	3.75

Table 1 also shows the theoretical concentrations of the trigger parameters at the discharge to the tributary, if the trigger concentrations were met. The theoretical concentrations for chloride, sulphate and sodium are well below ODWS. The theoretical manganese concentration at the tributary is at the ODWS. The theoretical boron concentration at the tributary is within the ODWS but exceeds the PWQO. As shown in the comparison of the theoretical to actual concentrations (Table 1), the boron concentration is about 80% overestimated suggesting that other attenuating factors are affecting these parameters. Therefore, concentrations in the discharge to the tributary are expected to be much lower than the theoretical concentrations. There will be no adverse impacts to the tributary if trigger concentrations are exceeded at monitor BH1-II and/or monitor BH3.

The trigger for BH1-II and BH3 (both in the overburden) will be exceeded when the following three conditions occur:

- concentrations over the trigger concentrations;
- · three consecutive elevated concentrations compared to the trigger concentrations; and
- an increasing trend directly relatable to the landfill.

If the trigger is exceeded, surface water sampling at SW1 and SW2 will be implemented as soon as possible following the trigger event and will continue for at least one year following. An on-site assessment of the small wetland pocket immediately southwest of the site (in the vicinity of MP3) will be completed if the trigger is exceeded. A wetland water quality sample (if possible) will be collected concurrent with the next groundwater and surface water monitoring event after the trigger is exceeded. The wetland assessment will be completed by a qualified ecologist and include documentation of the plant and animal life within the wetland and assessment of the possible impacts of landfill leachate on the function of the wetland.



Hydrogeology

Groundwater Summary

Guideline B-7

The site exceeds Guideline B-7 limits for a few aesthetic parameters within the southwest portion of the site (40 m from the waste). Groundwater flow is to the southwest beneath lands that are heavily wooded and topographically low. It is unlikely that this area will be developed. The Guideline B-7 exceedances within the downgradient property are relatively small and would be negligible (due to distance from the site) if a rural residence were to be developed along Highway 60. The landfill has been closed since January 2002 so no new waste has been added since this time. It is expected that the strength of the leachate (which is already weak) will decrease further with time. As a preliminary measure, the area upgradient to the southeast of the site and the downgradient property to the southwest will be inspected for surface water during the 2010 monitoring event. Surface water has previously been observed in the vicinity of MP1 (upgradient) and MP3 (downgradient). Due to the gravelly/sandy nature of the overburden soils in the area, the surface water will likely be an expression of the groundwater. If surface water is observed in the wetland/low lying areas, it will be sampled to determine potential leachate impacts. A hand auger or shovel sample in the deepest portion of the ponded water will be examined to determine the composition of the soils at the base of the pooled water. This will assist in determining if the pooled water is groundwater fed or surface water runoff. Air and water temperature will also be recorded (again to confirm a groundwater source). If significant impacts are detected, the Township will investigate the possibility of obtaining property along the southwest for use as a Contaminant Attenuation Zone (CAZ).

Groundwater Flow

The primary pathway for leachate impacted groundwater is within the shallow overburden to the southwest, into a poorly drained area which has no downgradient groundwater users within 500 m of the site.

Background Groundwater Monitor

BH2 appears to show dilute leachate impacts and may also be affected by road salt from Berndt Road/the landfill access road. Bedrock outcrops along Berndt Road and the bedrock scarp immediately north of the fill area indicate that there are limitations to the placement of an upgradient overburden monitor on the site. BH3 is installed at the overburden/bedrock contact. Frequent dry conditions at BH3 indicate that the water table is usually within the bedrock at this location. It is recommended that BH2 continue to be utilized as a background monitor along with our knowledge of typical background quality at landfill sites in similar settings and results from the unimpacted bedrock monitor at BH1-1. A new background monitor is not appropriate for the following reasons:

- site limitations based on shallow overburden upgradient of the waste;
- availability of water quality results from an unimpacted bedrock monitor on the site; and
- the weak strength of the leachate which will further decrease over time due to landfill closure in January 2002.

A residence is located on the north side of Berndt Road, off-gradient of the site (PW1 on Figure 1 of the monitoring report). Previous efforts to contact the well owner in 2003 to investigate the potential for this well to be used to provide background groundwater quality were unsuccessful. Efforts to



contact the well owner will be revived in 2010. This well may be suitable for providing background groundwater quality if it is completed in the overburden or shallow bedrock. These results may then be used to confirm unimpacted groundwater quality.

Exceedances of ODWS

The MOE suggests the inclusion of MP2 and MP3 in the water quality sampling program for the site. These MPs are constructed from ³/₄"-diameter coated iron pipe with lubricated threads and is meant for use as gas pipe. This pipe is not conducive for water quality sampling. Samples collected from these monitors will have elevated metals and traces of lubricants and other contaminants. Samples collected from the MPs will not be representative of groundwater conditions. For these reasons, sampling of the MPs is not recommended.

We have suggested sampling of surface water southeast and southwest of the site under the Guideline B-7 discussion above. Due to the gravelly/sandy nature of the overburden soils in the area, the surface water will likely be an expression of the groundwater. If surface water is observed in the wetland/low lying areas, it will be sampled to determine potential leachate impacts.

BH3

A sample was obtained from BH3 during the April 30, 2009 monitoring event for the site. Future sampling events for the site will be scheduled for the spring season to ensure that samples are collected on a routine basis.

Surface Water Sampling

The MOE hydrogeologist recommends re-starting of the surface water monitoring at SW1 and SW2 if trigger concentrations are reached at MP2 and MP3. As previously discussed, the MPs are not conducive for water quality sampling (see response under "Exceedances of ODWS"). To address potential future impacts to surface water, we have suggested a trigger mechanism for BH1-II and BH3 (see response under "Surface Water-Recommendations").

Final Cover

The application of final cover was completed in 2005 based on the MOE approved design drawing (item 5 Schedule "A" in the Certificate). Grades were established by Jp2g and the final application approved by Mr Andrew Polley MOE Ottawa District. The cover material consisted of a minimum thickness of 0.6 m native sand and silty sand, and an application of 0.15 m of topsoil, ditching excavation material etc. which was capable of promoting vegetative growth. See the Jp2g letter dated April 30, 2010.

VOC Analysis

The MOE agrees that the VOC sampling of monitor 1-II can be removed from the sampling program for the site. The MOE has also suggested installation of an additional monitoring well for background quality and sampling of wells MP2 and MP3. Our justification for not incorporating these suggestions has been previously discussed in the sections above. However, to provide a better understanding of the water quality, we will:

- incorporate additional surface water sampling of the wetland/low lying areas southeast and southwest of the site;
- continue to sample BH3 during the wetter periods of the year, and
- revive our efforts to locate a background private well for sampling purposes.



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We trust that this letter meets with your needs at this time. Should you have any questions or comments please contact me at ext. 252.

Sincerely, **AECOM Canada Ltd.**

thiling ,U

Patty Wong, B.Sc., P.Geo. Senior Geologist

PW:mm Encl.

cc: Dana Cruikshank, MOE Eastern Region
 Karen Kharatyan, MOE Eastern Region
 Greg Faaren, MOE Eastern Region
 Kevin Mooder, Jp2g Consultants Inc.
 Marilyn Schruder, Township of North Algona Wilberforce

TABLE 1. ANALYSIS OF NATURAL ATTENUATION -North Algona Landfill Site (Discharge Concentrations at the tributary)

 $Q_T C_T = Q_L C_L + Q_G C_G$

 \mathbf{Q}_T = Total flow within the sub-basin Where:

- C_{T} = Concentration of the chemical at the outlet from the sub-basin
 - \mathbf{Q}_{L} = Quantity of leachate produced
- $C_{L}^{-} = \mbox{Concentration in the leachate} \\ Q_{G} = \mbox{Quantity of infiltration and ground water flow through the sub-basin } \\ C_{S} = \mbox{Concentration of the chemical species in the natural ground water } \end{cases}$

													Conc. in	С.,	Mass	Trigger	Theoretical
								Annual	********		_		natural	at	Balanco	Conc.	Mass
					Ground		Annual	Flow			_	Max.	Bround	SW1	at	ar BH1-II	Balance at
Total	Total	Surplus	Surplus	Totat	wator	Total	Flow	Ground	Total		_	Cone in	water (CG)	(m o di a n)	Tributary	puq	Tributary
Annual	Annual	Water *	× 0,7 *	Landfill	Inditration	Area	Leachato	Water (QG)	Contributing	Paramotor	ODWS	Logonato (CL)	BH2			BH3	at Triggor
Precipitation	Evapotranspiration			Aroa	Aroa		(DL)	(aG)	F10~ (QT)		_	(II-1 H8)	(m e d i e n)				Conc.
(m/a)	(m / a)	(m/a)	(m/a)	(m2)	(m 2)	(m 2)	(m 3/ a)	(m 3/ a)	(m 3/a)		-	(()	(m g/L)	(m g/L)	(~ °/L)	(m g/L)	(m.g/L)
0.81	0.51	0.3	0,21	7,350	55,000	47,650	1,544	10,007	11,550	chloride	250	120	8	33.5	23	188	32
0.81	0.51	0.3	0.21	7,350	55,000	47,650	1,544	10,007	11,550	s uip hate	500	143	42.5	14	56	375	87
0.81	0.51	0.3	0.21	7,350	55,000	47,650	1,544	10,007	11,550	sodlum	200	17	5 2	13	14	150	24
0.81	0.51	0.3	0.21	7,350	55,000	47,650	1,544	10,007	11,550	boron	0.05/ 5 1	0.36	0.01	0.01	0.06	3.75	0.51

*Assuming 70% infiltration within the waste footprint and all ather areas. NOTE:

Maximum historic concentrations were used for BH1-II (CL) and SW1

Whore concontrations were loss then detection limits, to be conservative, the concentration was assumed to be at the detection limit.

Groundwater triggers set at 75% of ODWS, except for manganese (see attached letter for discussion).

1. Provincial Water Quality Objective.

2. Background modian SW2 sodium and chiorida concentrations essumed for BH2.

mass balance tables (3).xls 15-09-99 99-262

Ministry of the Environment

P.O. Box 22032 Kingston, Ontario K7M 8S5 613/549-4000 or 1-800/267-0974 Fax: 613/548-6908 Ministère de l'Environnement

C.P. 22032 Kingston (Ontario) K7M 8S5 613/549-4000 ou 1-800/267-0974 Fax: 613/548-6908



MEMORANDUM

- TO: Lance Larkin Sr. Environmental Officer Ottawa District Office Eastern Region
- FROM: Dana Cruikshank Surface Water Scientist Water Resources Group Eastern Region
- RE: 2009 Annual Report Berndt Road Waste Disposal Site (Transfer Site) North Algona Wilberforce Township CoA #: A411401 IDS Ref #: 5524-85JQKS

I have reviewed the above report prepared by Jp2g Consultants with respect to surface water concerns only. AECOM has prepared the surface water data report.

Report Overview

Jp2g and AECOM report for 2009:

- In 2006 the Township redeveloped the waste transfer station for better efficiency to accept new materials, brush, bulk waste and yard waste.
- Facilities as per Condition 23 of the CoA have been established.
- In 2009 an electronic waste storage area was established.
- No waste has been landfilled since January 2002. Application of final cover was completed in 2005.
- No seeps were observed in 2009.

December 1, 2010

- Jp2g has applied to Ottawa District for permission to plant trees on the final cover over the waste mound.
- No complaints were received in 2009.
- Two surface water stations were sampled on April 30, 2009 that are located on an intermittent tributary 500 m west of the site.
- Groundwater flow is interpreted to be to the west towards the intermittent tributary.
- Measured flows were 1 L/s at SW2 (upstream) and 32 L/s at SW1 (downstream) in 2009.
- The landfill generates 0.04 L/s of leachate.
- Slightly elevated leachate indicators parameter concentrations were found at SW1 compared to SW2. AECOM relates these impacts to Highway 60 rather than landfill impacts.
- No impacts to surface water are likely in the future based on 9 years of monitoring data and therefore it is requested that surface water monitoring be discontinued.
- AECOM provides a trigger mechanism for groundwater wells BH1-ll and BH3 that will initiate a return to surface water sampling if the trigger occurs.

Reviewer's Comments

The reviewer has calculated average concentrations for the leachate parameters for SW1 and SW2 and then a percentage difference between the means.

Table 1: refreetage unterence in Average Concentrations between 5 w 2 and 5 v	Table 1:	Percentage	difference i	in Average	Concentrations	between	SW2 and	SW
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Parameter	Cl	SO4	Na	B	Alk	Cong	NH3	TKN	TDS	Mn
% Difference	69	-52	62	8	13	23	79	51	22	41
Between SW2 and										
SW1										

Table 1 shows that there are significant differences in the average concentrations for many parameters. However based on Figure 1 of the report SW1 is located downstream of Highway 60 and therefore is subject to road salting/spring melt impacts (most samples taken during April). Many of the differences can be contributed to parameters that could be associated with road salting activities and coincidently are also leachate indicator parameters. One parameter unlikely associated with road salting is ammonia. The downstream location should be located upstream of Highway 60.

AECOM has proposed a trigger mechanism that is 75% of the ODWS guideline for each of boron, chloride, sulphate and sodium for either BH3 or BH1-11. The other conditions are three consecutive elevated concentrations compared to trigger concentrations and an increasing trend directly related to the landfill.

It would seem reasonable to the reviewer that a trigger mechanism to determine if shallow groundwater was impacted at a particular well would utilize the background well monitor as a comparison instead of OWDS. Many OWDS guidelines for some parameters are much higher than PWQO for the same parameter. PWQO is intended to protect aquatic biota and therefore OWDS is not necessary an appropriate guideline. In this case only boron has a PWQO associated with it.

The range of concentrations for the four selected parameters for each sampling location is presented in Table 2 below. Compared to the upper limit in the range for the background well BH1-11 has already exceeded the upper range for the four trigger parameters. In addition the 2009 monitoring event showed concentrations for chloride, sodium and boron that were the highest found since monitoring began in 2000. Other leachate indictors such as ammonia, alkalinity and conductivity were also higher in 2009.

AECOM was to conduct surface water sampling in two ponded areas to assess potential landfill impacts in 2010. Hopefully BH3 was also sampled so we have an additional year of data to examine.

Parameter	SW2	SW1	BH2	BH1-11	BH3	AECOM	MOE
	(Upstream) (2000-2009)	(Downstream) (2000-2009)	(Upgradient) (2004-2009)	(Downgradient) (2000-2009)	(Downgradient) 2009	Proposed Trigger	Proposed Trigger
	(2000 2005)	(#000 2005)	(2001/2007)	(1000 1007)			
Chloride	5-17	10-80	39-91	63-120	19	188	180
Sulphate	19-53	2-50	39-56	62-130	77	375	120
Sodium	4-7	6-32	16-23	33-71	21	150	50
Boron	< 0.01-	<0.01-	0.01-0.04	0.23-0.36	0.18	3.75	0.75
	< 0.05	< 0.05					
Ammonia	<0.02-	<0.01-	<0.02-	<0.02-0.46	< 0.05		1
	0.07	0.54	<1.5				

 Table 2: Range of Concentrations for Trigger Parameters at Berndt Road Monitoring

 Wells (mg/L)

Based on the fact that leachate indicator concentrations at the groundwater wells tends to be increasing in 2009, that SW1 data is compromised by its location downstream and potential additional information regarding sampling MP1 and MP3 the reviewer would recommend postponing the elimination of the surface water monitoring program till after spring 2011.

A new sampling location upstream of Highway 60 and not under the influence of the highway but potentially in a location that would intercept shallow groundwater from the landfill should be sampled. If the differences between SW2 and the new location eliminate the landfill as a source then the reviewer would agree to the removal of the surface water program. The new location should also resolve the question of whether elevated concentrations of parameters at SW1 associated with road salting are or not and therefore likely landfill related.

The reviewer does not accept using 75% of the OWDS for each parameter as the trigger for the reactivation of a surface water sampling program. Instead as indicated above and for reasons already stated the reviewer would prefer that the trigger be based on the background station BH2 and should include the parameter ammonia which is of more importance to surface waters. One proposal would be to set the trigger values at twice the upper limit of the background station as proposed in Table 2 above. A trigger for activation of the surface water program would require three of the five trigger parameters to exceed the trigger value in any one sampling event. If surface water sampling was triggered and the results of the sampling indicated no impacts from the landfill (using the new downstream location compared to SW2) followed by another confirmation sample then no additional work would be required. The reviewer is satisfied with AECOM's procedure should confirmation surface water sampling indicate leachate impacts. If this proposal is acceptable and if applied to 2009 data then only sodium exceeded the trigger value in 2009 and therefore no trigger was met.

Recommendations

- 1. The termination of the surface water sampling program should be postponed until after the 2011 spring survey and data reviewed.
- 2. The downstream location (SW1) should be moved upstream of Highway 60 so that road salting versus landfill impacts can be better assessed.
- 3. If the 2011 data indicates no issues with the landfill the reviewer would agree to removing surface water from the sampling program with modifications to the trigger as proposed above.

If you have any questions regarding the above comments or recommendations I would be pleased to discuss them with you.

1) Cuito Mall

Dana Cruikshank DC/gl

c: Greg Faaren Paul Kehoe File SW-05-04 NAWI (Berndt Rd WDS) File SW-13-02-02 (unnamed tributary to Golden Lake)

AECOM 300 – 300 Town Centre Boulevard Markham, ON, Canada L3R 5Z6 www.aecom.com

905 477 8400 tel 905 477 1456 fax

May 14, 2012

Mr. Jason Ryan District Manager – Ottawa District Office Ontario Ministry of the Environment 2430 Don Reid Drive Ottawa, ON K1H 1E1

Dear Mr. Ryan:

Regarding: 60246826-4 Revision of Monitoring Program Berndt Landfill Site, Part Lot 7, Concession III, Geographic Township of North Algona, Certificate of Approval No. A411401

This letter is to request revision to the Monitoring Program prescribed in the site Certificate of Approval No. A411404, Condition 37(a), Schedule B. Currently, the C of A includes groundwater level measurements three times per year, annual groundwater sampling of volatile organics (USEPA 624) of a downgradient well (BH3) and BH1-II, surface water sampling at two locations (SW1, SW2) and quarterly inspection of the toe of the waste mound for leachate seepage.

Conditions 37(b) states:

Any future changes to either the groundwater or surface water monitoring program shall be approved, in writing, by the District Manager before the change is implemented.

Groundwater level measurements have been collected since 2000 showing expected seasonal fluctuations with the highest water levels in the spring, the lowest water levels in the fall and intermediate water levels in the summer. This pattern has generally been consistent across the site over the 11 years of monitoring. As the seasonal fluctuations in water level have been established, it is proposed that the water level monitoring can be reduced from three times per year (spring, summer, fall) to twice per year (spring and late fall).

VOC samples were collected from monitor BH1-II and BH3 in 2011. No VOC were detected. Since 2005, we have recommended that the VOC sampling be discontinued, because historical concentrations showed there were no measurable VOCs on site. VOC sampling has continued to be

included in the monitoring program¹. The MOE has agreed to the removal of the VOC sampling from the monitoring program².

In addition, we request a change in the groundwater sampling from July/August to April/May since the downgradient monitor, BH3, is frequently dry during the summer months and therefore, cannot be sampled.

Surface water sampling of the intermittent tributary was discontinued in 2010. Discontinuation of the surface water program was based on the fact that no impacts to the surface water had been detected over the nine years of surface water monitoring for the site and, with the closure of the site in 2002, no impacts to the surface water are likely in the future. The MOE is in agreement with the removal of the surface water monitoring program with the provision that a groundwater trigger mechanism is implemented³.

As requested by the Township in 2010, the MOE agreed to reduce the frequency of final cover inspections from a quarterly basis to annually, in the spring, and agreed to allow planting of trees on the waste mound as long as the final cover was not compromised.

In light of the above requested changes, it is suggested that Schedule "B" of the Certificate of Approval is modified to:

Location	Frequency	Parameter
upgradient well, downgradient well, BH1-I, BH1-II, MP1, MP2, MP3, MP4, and MP5	April/May and November	measure water levels
upgradient well, downgradient well, BH1-I, BH1-II	April/May	 chloride, fluoride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, copper, iron, manganese, strontium, alkalinity, TKN, ammonia, phenols, COD, TDS. field measurements: pH, temperature, and conductivity

Groundwater Monitoring Program

Leachate Inspection Program

Location	Frequency	Parameter
Toe of Waste Mound	April/May	 inspection of toe of mound for leachate seepages

As previously mentioned, as part of the technical review of the 2008 Monitoring Report for the site, the MOE approved removal of the VOC sampling and the surface water sampling from the monitoring program. The MOE is directed to the most recent annual monitoring reports (2009, 2010 and 2011)

² MOE Memorandum Re: 2008 Annual Report, North Algona (Berndt Road) Waste Disposal Site, Part Lot 7, Concession 3, Township of North Algona, Certificate of Approval No. A411401, from Karen Kharatyan to Lance Larkin, dated February 23, 2010.

¹ 16 sets of VOC samples from BH1-II since 2003 and three sets of samples from BH3 since 2009.

³ MOE Memorandum Re: 2008 Annual Report, Berndt Road Waste Disposal Site (Transfer Site), North Algona Wilberforce Township, IDS Ref #: 7632-7SGJ8F, from Dana Cruikshank to Lance Larkin, dated January 29, 2010.

in further support the proposed modifications to the ground and surface water monitoring program. The reduction in the frequency of the seep inspections were approved by the MOE in 2010.

We request your written approval for the modifications to the monitoring program, as discussed above. No amendment of the C of A is required as this can be accomplished under the District Manager's discretion under Condition 37(b).

Should you have any questions or comments, please feel free to contact us.

Sincerely, **AECOM Canada Ltd.**

Gattyting

Patty Wong, B.Sc., P.Geo. Senior Geologist *patty.wong@aecom.com* PW:mm

Ministry of the Environment

P.O. Box 22032 Kingston, Ontario K7M 8S5 613/549-4000 or 1-800/267-0974 Fax: 613/548-6908

Ministère de l'Environnement

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September 5, 2012

MEMORANDUM

 TO: Lance Larkin Senior Environmental Officer Ottawa District Office Eastern Region
 FROM: Greg Faaren Hydrogeologist Technical Support Section Eastern Region
 RE: 2010 and 2011 Annual Monitoring Reports North Algona (Berndt Road) Waste Disposal Site Part Lot 7, Concession 3, Township of North Algona Certificate of Approval No. A411401

I have reviewed the hydrogeologically pertinent sections of the above noted reports (dated May, 2011 and May 2012, respectively) submitted by AECOM Canada Ltd. (AECOM) on behalf of the Township of North Algona Wilberforce. I offer the following comments for your consideration.

Summary

- The site is not in conformance with Guideline B-7 along the south-western property boundary. Exceedances of the Ontario Drinking Water Quality Standards (ODWQS) at downgradient monitor BH1-II are reported to be the result of leachate impacts. The extent of the leachate impacts should be delineated and the site should be brought into conformance with Guideline B-7.
- Groundwater flow direction beneath the waste is to the southwest, towards an intermittent stream about 300 metres from the site boundary. The primary pathway for leachate migration is reportedly within the shallow overburden in a south-westerly direction.
- AECOM reports that monitoring well BH2 is not representative of unimpacted background groundwater quality. AECOM proposed to use an upgradient private dug water supply well to determine background water quality. However, this well may be showing impacts related to possible road salt contamination. Further monitoring of this well is recommended.

- Groundwater at the site may discharge to wetlands located downgradient of the waste mound. It is recommended that AECOM determine if groundwater is discharging to surface water. Groundwater quality in wells upgradient of the wetlands should be compared to the Provincial Water Quality Objectives (PWQO) in addition to the ODWQS.
- Reasonable Use exceedances at the site are noted for manganese, TDS and organic nitrogen. None of these parameters are included in the trigger mechanism for the site. These parameters should be included in the trigger mechanism for the site.
- As per the MOE's November 2010 Monitoring and Reporting for Waste Disposal Sites Technical Guidance Document, a Monitoring and Screening checklist is to be submitted with all 2011 annual monitoring reports. In reviewing the submitted waste disposal site report, it is noted that the checklist was not included. It is recommended that the 2012 report, and all subsequent future reports, include a completed and signed checklist.
- The proposed annual monitoring program is acceptable. I have no objection to the removal of sampling for volatile organic compounds (VOCs) from the monitoring program. The monitoring and reporting frequency should remain annual.

Environmental Compliance Approval (ECA)

The Berndt Road waste disposal site (WDS) is located about 2 km northwest of the hamlet of Golden Lake in Part Lot 7, Concession 3, in the Township of North Algona. The site operates under ECA No. A411401. The site was closed for waste disposal in January 2002 and has since operated as a waste transfer site. There are no engineering systems in place to control generated leachate and therefore the site operates as a naturally attenuating landfill.

According to MOE's November 2010 Monitoring and Reporting for Waste Disposal Sites Technical Guidance Document, and as communicated by the ministry (through webinars and information distributed in coordination with the Ontario Waste Management Association both last year and earlier this year), a Monitoring and Screening checklist is to be submitted with all annual monitoring reports, commencing in 2011. In reviewing the 2011 North Algona (Berndt Road) waste disposal site report, it is noted that the checklist was not included.

Geology

The geology of the site comprises the following units:

- A sand/gravel overburden unit;
- A granitic gneiss bedrock unit.

AECOM reports that a bedrock ridge extends from west to east in the northern part of site.

Hydrogeology

AECOM determined the following hydrogeological characteristics for the site:

- Groundwater flow direction beneath the waste is to the southwest, towards an intermittent stream. This is consistent with previous results.
- Groundwater flows through the overburden relatively rapidly, at rates in the ranges of 1,000 m/year.
- Monitoring wells BH1-I and BH1-II indicate upward vertical hydraulic gradients (recharging conditions).

AECOM reports that four (4) monitoring wells (BH1-I, BH1-II, BH2, BH3) were sampled on an annual basis in May of 2010 and again May of 2011. It is noted that monitoring location BH1 is completed as a monitoring well nest with wells BH1-I (bedrock) and BH1-II (overburden).

AECOM reports that there are five (5) mini piezometers (labelled MP1 to MP5) located at the site. AECOM reports that these wells are not suitable for groundwater quality monitoring as they are constructed of galvanized steel and are only used for groundwater level measurements. Consideration should be given to decommissioning these wells if they are no longer required.

Background Groundwater Quality

Monitoring well BH2 was installed in 2004 to provide upgradient, overburden groundwater quality. This well is located about 15 metres east of the fill area. Monitoring results indicate elevated concentrations of leachate parameters such as chloride, TDS and alkalinity since 2004. Monitoring well BH2 may be impacted by leachate. Therefore the monitor should not be considered as a representative of unimpacted background groundwater quality.

To address this issue, AECOM reports that a private dug well (identified as well PW1), located to the north of the WDS across Berndt Road and hydraulically upgradient of the WDS, was sampled in 2011. Well PW1 was sampled to represent background water quality. However, well PW1 shows elevated levels of TDS, sulphate, chloride and conductivity. Therefore, this well appears to be impacted by a source other than the landfill. The most likely source would be road salt application to Berndt Road.

Leachate

Monitoring well BH1-II is the most impacted well at the site. Historical sampling data for this well shows that concentrations of chloride, sulphate, sodium, potassium, boron, alkalinity, electrical conductivity, ammonia, total kjeldahl nitrogen (TKN), total dissolved solids (TDS) and manganese are elevated. These parameters were identified as leachate indicator parameters for this landfill site.

Downgradient Water Quality

BH1-I is located downgradient of the waste and is screened within the granitic gneiss bedrock. In 2011, no exceedances of the ODWQS were noted at this monitor.

BH1-II is screened within the shallow water table within the sands and gravels. In 2011 concentrations of TDS, alkalinity, manganese and organic nitrogen exceed the ODWQS in this well. However, it is reported that all leachate parameters follow the historical trend and leachate strength is relatively weak. AECOM indicates that the upward gradient between the bedrock and overburden would prevent downward flow of leachate to the bedrock at this location.

Monitor BH3 was drilled on the top of bedrock and is located to the west of the waste mound. In 2011 the concentrations of TDS and organic nitrogen exceed the ODWQS in this well.

Groundwater/Surface Water Interaction

AECOM reports vertical hydraulic gradients indicate recharging conditions at the site. AECOM reports that there are wetlands located to the southeast, south and southwest of the waste mound. Groundwater at the site may be discharging to these wetlands and is showing weak leachate impacts. There are some exceedances of the ODWQS, however, groundwater quality was not compared to the PWQO.

Guideline B-7

Guideline B-7 applies to operating waste disposal sites and sites closed post 1986. AECOM conducted a Reasonable Use (RU) assessment for the site. The site does not comply with Guideline B-7 at monitor B1-II located to the southwest of the waste mound aquifer. Manganese, TDS and organic nitrogen exceed the RU concentrations.

Cover Material

The consultant reports that the final cover applied at this landfill site comprises a granular cover material with a thickness of 0.6 metres and 0.15 metres of topsoil, seeded with annual and perennial plant species. This information was confirmed in the 2010 monitoring report and indicates that low permeability material was not used to cap the landfill.

Trigger/Contingency Plan

As first presented in the 2003 annual report when the implementation of a contingency plan is required, the Township will move to acquire a downgradient contaminant attenuation zone (CAZ). AECOM indicates that the initiation of a contingency plan is not required at this time. However, as noted above the site does not comply with Guideline B-7. RU exceedances for manganese, TDS and organic nitrogen are present in downgradient wells. It is noted that none of

these parameters were included in the trigger mechanism for the site. The reason for not including these main leachate indicators in the trigger mechanism is not provided. Consideration should be given to acquiring additional land for a CAZ downgradient of the waste disposal site.

Groundwater Monitoring

AECOM recommends continuing the current monitoring program with the existing monitors. However, the current monitoring program is showing impacts beyond the active monitoring well network. AECOM recommends that VOC sampling be removed from the sampling program as organic parameters have not been detected at the site. The reporting frequency is to be annual.

neg han

Greg Faaren, P.Geo. GF/sh

ec: Tara MacDonald Peter Taylor

c: Dana Cruikshank File GW RE NA BE 01 03 (A411401) GF/IDS # 2455-8JKP84 / 4827-8V7RVH



December 4, 2012

Ministry of the Environment Ottawa District Office 2430 Don Reid Drive Ottawa, ON K1H 1E1

Attention: Emily Tieu Sr. Environmental Officer

Re: Berndt Road Waste Transfer Site ECA No. A411401 North Algona Wilberforce Township Our Project No. 2006041M

Dear Emily:

We acknowledge receipt of the Waste Disposal Site Inspection Report dated September 26, 2012 with the attached TSS groundwater review memo dated September 5, 2012, and the Waste Transfer Processing Inspection Report dated September 26, 2012.

In consultation with Township Staff and Council on December 3, 2012 we provide the following comments and response to the Action Items contained in the two (2) Inspection Reports respectively.

Closed Waste Disposal Site Inspection Report

1. By November 1, 2012 provide an action plan to the undersigned outlining how the Township will address the comments included in the memorandum, dated September 5, 2012, prepared by Greg Faaren, Hydrogeologist with MOE TSS.

Upon receipt of this memo I have consulted with the project hydrogeologist Patty Wong AECOM and the Jp2g field technician Perry Larochelle to address a number of the issues. Furthermore Patty Wong contacted Greg Faaren directly to discuss. For convenience the comments of Greg Faaren are reproduced and numbered for future reference, followed by our response *(in italic)* as components of the proposed Action Plan. A summary table of tasks and schedule is attached.

1) The site is not in conformance with Guideline B-7 along the south-western property boundary. Exceedances of the Ontario Drinking Water Quality Standards (ODWQS) at downgradient monitor BH1-II are reported to be the result of leachate impacts. The extent of the leachate impacts should be delineated and the site should be brought into conformance with Guideline B-7.

As reported since 2000 BH 1-II, the shallow monitoring well (screen depth 1.5 to 4.65 below ground) has exhibited leachate indicator parameters exceeding Ontario Drinking Water Standards (ODWS) limits and above background concentrations. Generally alkalinity, organic nitrogen, TDS and occasionally manganese have exceeded ODWS. Based on the Reasonable Use calculations nitrate, manganese and TDS concentrations exceeded the Guideline B-7 limits in 2011.

¹¹⁵⁰ Morrison Drive • Suite 410 • Ottawa • Ontario • K2H 8S9 • Tel (613) 828-7800 • Fax (613) 828-2600 • www.jp2g.com • ottawa@jp2g.com

Based on the direction of groundwater flow from the waste mound BH3 was installed in 2004 to assess Reasonable Use compliance (RUC). Jp2g field staff have been able to sample this monitor three times since 2009 when the monitoring event was changed to the spring. ODWS exceedances of TDS occurred twice and once for manganese and organic nitrogen, TDS concentrations exceeded RUC. The leachate indicator parameters are much lower than BH1-II, continued monitoring of BH3 will confirm trends over time.

In response to the TSS groundwater review dated February 23, 2010, AECOM proposed a modified monitoring program rather than sampling MP2 and MP3 (coated iron pipes with lubricated threads). SW4 was established upgradient in the vicinity of MP1 reflecting background groundwater conditions. SW3 was established downgradient in the vicinity of MP3 reflecting groundwater downgradient (south southeast) of the waste mound. The SW3 monitoring location is situated in a wetland approximately 25 m beyond the southwest boundary of the municipal landholdings (see attached revised Site Map from the 2011 Annual Report). Only naturally occurring Mn exceeded RUC at this location.

During recent discussions with the Greg Faaren, the MOE stated that it would like a groundwater monitor or mini-piezometer installed along the southwest property boundary as a compliance point for Guideline B-7. This monitoring point or points will be incorporated into the monitoring program and sampled by the end of 2013. The monitoring location will be downgradient of BH1-II on the waste site and/or on the private property.

2) Groundwater flow direction beneath the waste is to the southwest, towards an intermittent stream about 300 metres from the site boundary. The primary pathway for leachate migration is reportedly within the shallow overburden in a south-westerly direction.

The upward gradient between the bedrock (1-I) and the overburden (1-II) prevents the downward flow of leachate to the bedrock. A weak leachate plume has been detected at BH1-II installation of a downgradient monitor will determine potential impact on the intermittent stream.

3) AECOM reports that monitoring well BH2 is not representative of unimpacted background groundwater quality. AECOM proposed to use an upgradient private dug water supply well to determine background water quality. However, this well may be showing impacts related to possible road salt contamination. Further monitoring of this well is recommended.

The monitoring of PW1 will be included in the future monitoring program to provide additional information on the upgradient overburden water quality.

4) Groundwater at the site may discharge to wetlands located downgradient of the waste mound. It is recommended that AECOM determine if groundwater is discharging to surface water. Groundwater quality in wells upgradient of the wetlands should be compared to the Provincial Water Quality Objectives (PWQO) in addition to the ODWQS.

The 2011 Annual Report describes the additional investigative monitoring conducted to determine if groundwater is discharging to surface water and impacting water quality. Based on the sample of SW3 and SW4 it was concluded that the landfill was having no impact on the surface water downgradient of the site at SW3. Future monitoring reports will compare water quality results from BH1-II and BH3 to PWQO.

¹¹⁵⁰ Morrison Drive • Suite 410 • Ottawa • Ontario • K2H 8S9 • Tel (613) 828-7800 • Fax (613) 828-2600 • www.jp2g.com • ottawa@jp2g.com

5) Reasonable Use exceedances at the site are noted for manganese, TDS and organic nitrogen. None of these parameters are included in the trigger mechanism for the site. These parameters should be included in the trigger mechanism for the site.

The trigger mechanism and the rationale for selecting the trigger parameters is stated in the 2011 Annual Report and was presented in detail in the April 30, 2010 AECOM letter. The MOE reviewer agreed that surface water monitoring of SW1 and SW2 could be discontinued provided that a trigger mechanism for BH1 and BH3 was implemented and approved by the MOE. As discussed in AECOM's response letter, the primary function of the trigger mechanism is the protection of the ecology and aquatic life within the wetland and the intermittent tributary. As Precambrial bedrock environment often have naturally elevated concentrations of iron and manganese, these parameters were considered ineffective triggers. AECOM will review the potential for TDS and organic nitrogen to be included in the trigger mechanism and discuss in the 2012 annual monitoring report.

6) As per the MOE's November 2010 Monitoring and Reporting for Waste Disposal Sites Technical Guidance Document, a Monitoring and Screening checklist is to be submitted with all 2011 annual monitoring reports. In reviewing the submitted waste disposal site report, it is noted that the checklist was not included. It is recommended that the 2012 report, and all subsequent future reports, include a completed and signed checklist.

Patty Wong AECOM has discussed this requirement with Greg Faaren, a Screening Checklist will be provided, but not signed, accompanying the 2012 Annual Report.

7) The proposed annual monitoring program is acceptable. I have no objection to the removal of sampling for volatile organic compounds (VOCs) from the monitoring program. The monitoring and reporting frequency should remain annual.

As the VOC analysis has not detected leachate impacts we appreciate approval to delete from the program. Under Condition 37(b) we trust that written approval will be granted by the District Manager. Furthermore upon completion of the additional exploratory monitoring that the MOE will favourably consider a reduced post-closure monitoring and reporting requirement.

2. In the 2012 Annual Report, and all subsequent future reports, a completed and signed Monitoring and Screening Checklist, as per the MOE November 2010 Technical Guidance Document should be included.

It is the position of AECOM and many other hydrogeological and geoscientist professionals that they will not sign the checklist under the terms of the document.

Waste Transfer Processing Inspection Report

- 3. The following response to the report dated September 26, 2012 Section 5.0 Action Items is provided in consultation with Staff and Council.
- 1) The sign posted at the front entrance includes what waste types are allowable and prohibited as required by Condition 18(d) of the Certificate.

The Township will review the signage and confirm compliance requirements for the 2012 Annual Report.

2) A log book, required under Condition 25 of the Certificate, to record the results of the annual inspection of the final cover required under Condition 30 is maintained.

Condition 30 was reissued under Notice No. 1 dated February 13, 2004 to revoke and replace Condition 29 issued under the January 26, 2004 Certificate requiring final cover by June 30, 2004 which was changed to 2005. As requested since the 2008 Annual Report and in a letter to Lance Larkin dated November 24, 2009 and April 30, 2010 inspections of the cover material and reporting has been completed by trained Jp2g field personnel. Under Condition 30(b) we request written approval.

3) Monthly inspections of the fencing, required under Condition 31 of the Certificate, are completed and recorded.

The Township will insure monthly inspections and recording will be completed.

Yours very truly, Jp2g Consultants Inc. Engineers • Planners • Project Managers

Kevin Mooder, MCIP RPP Sr. Project Planner

KJM/jlp

c.c. Kathleen Thur, Township Patty Wong, AECOM
Summary of Action Plan and Schedule To Address MOE Site Inspection Comments Berndt Road Disposal Site

Schedule	Description of Work	Party	Schedule
1. Prepare Action Plan to	Review technical comments	Jp2g	Received Oct 22/12
Address	Preparation of draft Action Plan for review by Township Township Submission to MOE	Jp2g	For Dec 3/12
Site Report Sept 26/12	MOE Approval of Action Plan	MOE	Delote Dec 21/12
Item 1(1) MOE Guideline B-7 Compliance	Consultation land owner if access to private property feasible	Jp2g/Twp	Obtain permission for access Spring 2013
Compliance	Install westerly boundary monitor(s)2013 Annual Report	Jp2g AECOM	May 2014
Item 1(2) Confirm Primary	 On-going sampling of SW3 and SW4 to confirm southwesterly extent of leachate plume 	Jp2g	April/May 2013
Pathway in Overburden	• 2013 Annual Report	AECOM	May 2014
Item 1(3) Sample Private	 On-going sampling PW1 and comparison to BH2 to establish background water quality 	Jp2g	April/May2013
Well	2013 Annual Report	AECOM	May 2014
Item 1(4) Assess PQWO	 Include assessment of groundwater discharge to surface water in 2012 Annual Report 	AECOM	May 2013
Item 1(5) Trigger Parameters	 Analysis of the rationale for Mn, TDS and organic nitrogen as triggers completed in 2012 Annual Report 	AECOM	May 2013
Item 1(6)	See Item 2 below	AECOM	May 2013
Item 1(7) Revised Monitoring	 MOE Approval of revised monitoring program Eliminate VOC, add additional monitor(s) 	MOE Jp2g	April/May 2013
2. Signed Checklist	Consultation with G. Faaren confirmed a checklist unsigned is acceptable in Annual Report	AECOM	May 2013
3. Prepare Action Plan to Address Waste Transfer Site Report Sept 26/12	 Review Technical comments Prepare draft Action Plan for review by Township Township submission to MOE MOE Approval of Action Plan 	Jp2g Jp2g Jp2g/Twp MOE	Received Oct 22/12 For Dec 3/12 By Dec 21/12
3(1) Signage	Make recommendations in the 2012 Annual Report	Тwp	May 2013
3(2) Final Cover Inspection	Filed previous requests in Annual Reports to conduct inspection concurrent with monitoring	Jp2g	May 2013
3(3) Fencing	Include in the 2013 Annual Report	Тwp	May 2014

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Ministry of the Environment

Ottawa District Office

2430 Don Reid Drive Ottawa ON K1H 1E1

Tel: (613) 521-3450 Fax: (613) 521-5437

December 13, 2012

Kathleen Thur Deputy Clerk-Treasurer R.R. #1 1091 Shaw Woods Road Eganville ON K0J 1T0

Dear Ms. Thur:

Re: Proposed Monitoring Program Amendment North Algona (Berndt Road) Waste Disposal Site Environmental Compliance Approval (ECA) A411401 219 Berndt Road, Township of North Algona Wilberforce, Ontario

Ministère de l'Environnement

Ottawa District Office

2430. rue Don Reid

Ottawa ON K1H 1E1

Tél. : (613) 521-3450 Téléc. : (613) 521-5437

The Ministry of the Environment's Technical Support Section has completed its review of the 2010 and 2011 Annual Monitoring Reports for the North Algona (Berndt Road) Waste Disposal Site, dated May 2011 and May 2012, respectively, submitted by AECOM Canada Ltd. on behalf of the Township of North Algona Wilberforce. This review included the Township's request to remove sampling for volatile organic compounds from the groundwater monitoring program.

Pursuant to Condition 37(b) of Environmental Compliance Approval A411401 and based on the groundwater reviewer recommendations, please note that I hereby amend Schedule "B" to remove sampling for volatile organic compounds (VOCs) from the groundwater monitoring program.

Should you have any questions or concerns, please contact me at 613-521-3450 extension 224 or Emily Tieu at extension 235.

Yours truly,

Steve Burns Ottawa District Manager

SB/ET:jdv

cc: Kevin Mooder, Jp2g Consultants Inc. (kmooder@jp2g.com)



BY E-MAIL

file: SIRENA CO3 610

Ministry of the Environment

P.O. Box 22032 Kingston, Ontario K7M 8S5 613/549-4000 or 1-800/267-0974 Fax: 613/548-6908

MEMORANDUM

Emily Tieu

TO:

Ministère de l'Environnement

C.P. 22032 Kingston (Ontario) K7M 8S5 613/549-4000 ou 1-800/267-0974 Fax: 613/548-6908



November 12, 2013

Sr. Environmental Officer Ottawa District Office Eastern Region MINISTRY OF THE ENVIRONMENT FROM: Dana Cruikshank Surface Water Scientist NOV 1 5 2013 Water Resources Group Eastern Region OTTAWA RE: 2012 Annual Report Berndt Road Waste Disposal Site (Transfer Site) North Algona Wilberforce Township CoA #: A411401 IDS Ref #: 7413-98JMAW

I have reviewed the above report prepared by Jp2g Consultants with respect to surface water concerns only. AECOM has prepared the surface water data report.

Report Overview

Jp2g and AECOM report for 2012;

- In 2006 the Township redeveloped the waste transfer station for better efficiency to accept new materials, brush, bulk waste and yard waste.
- No waste has been landfilled since January 2002. Application of final cover was completed in 2005.
- No seeps were observed in 2009.
- Two surface water stations (SW3 and SW4) were sampled in May 2012 and will be discontinued as new groundwater monitors been installed near these locations.

Reviewer's Comments

The reviewer in his review of the 2009 report indicated that SW1 and SW2 could be discontinued and this has occurred. SW3 and SW4 were monitored until groundwater monitors adjacent to these sites were installed which has occurred and will be discontinued in 2013.

The trigger mechanism that would re-establish monitoring at SW1 and SW2 is not acceptable to the reviewer. In my November 2010 memorandum I proposed an alternative trigger mechanism based on the background monitor and stated my reasons why. I never received a response to those comments and therefore feel that my proposed trigger limits are more protective of the wetland environment. If the District received comments from AECOM regarding this matter I would be happy to review it. In reviewing data for BH-2 the background monitor none of the proposed MOE triggers were triggered in 2010-2012.

If you have any questions regarding the above comments or recommendations I would be pleased to discuss them with you.

Dana Cruikshank DC/gl



Greg Faaren Tara MacDonald File SW-05-04 NAWI (Berndt Rd WDS) File SW-13-02-02 (unnamed tributary to Golden Lake) **Ministry of the Environment**

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C.P. 22032 Kingston (Ontario) K7M 8S5 613/549-4000 ou 1-800/267-0974 Fax: 613/548-6908



MEMORANDUM

December 13, 2013

TO:	Kyle Straberger	
	Sr. Environmental Officer	MUNIC
	Ottawa District Office	MINISTRY OF THE
	Eastern Region	ENVIRONMENT
FROM:	Dana Cruikshank Surface Weter Scientist	DEC 1 8 2013
	Surface water Scientist	ΟΤΤΑΙ
	water Resources Group	AWA
	Technical Support Section	
	Eastern Region	
RE:	Surface Water Trigger Mechanism	
	Berndt Road Waste Disposal Site (Transfer	Site)
	North Algona Wilberforce Township	,
	Certificate of Approval #: A411401	
	IDS Def #	

I have reviewed the letter dated April 30, 2010 from AECOM which was responding to MOE comments made following the review of the 2008 AMR. This letter was copied to the reviewer but the reviewer has no record of seeing it nor is it in our file. The issue of surface water (SW) trigger mechanisms was addressed in the reviewer's November 30, 2010 memo. However updated guidelines and additional information have since occurred requiring a review of the SW trigger mechanism for this site.

AECOM had proposed the following trigger concentrations for chloride of 188 mg/L, sulphate 375 mg/L, sodium 150 mg/L and boron 3.75 mg/L based on theoretical calculations for BH-1-II and BH3. The calculations were made in the absence of Provincial Water Quality Objective (PWQO) guidelines for chloride and sulphate at that time. Standards Branch has directed us to adopt the CCME guideline for chloride (120 mg/L for acute and 640 mg/L for chronic). We have also been directed to accept the recent review of sulphate guidelines in British Columbia (100 mg/L not to be exceeded at any time). In addition groundwater in their September 2012 review determined that BH-1-II is not representative of background conditions.

SW3 and SW4 (ponded water) were monitored until groundwater monitors adjacent to these sites were installed which has supposedly occurred. SW3 and SW4 will be discontinued in 2013. The reviewer therefore proposes that the trigger mechanism be based on the groundwater wells that are replacing SW3 and SW4.

The reviewer proposes based on updated information that the new trigger concentrations are as follows:

Parameter	Trigger Concentration (mg/L)
Chloride	120
Sulphate	100
Sodium	100
Boron	3

Three consecutive exceedances of any parameter would result in a trigger to re-establish sampling at SW1 and SW2.

If you have any questions regarding the above comments or recommendations I would be pleased to discuss them with your and

Dana Cruikshank DRC/sh

c:

Greg Faaren Tara MacDonald File SW RE NA 03 06 (Berndt Road WDS) File SW 07 02 13 02 02 (Unnamed Tributary to Golden Lake)



AECOM 105 Commerce Valley Drive West, Floor 7 Markham, ON, Canada L3T 7W3 www.aecom.com

905 886 7022 tel 905 886 9494 fax

May 6, 2015

Mr. Steve Burns District Manager – Ottawa District Office Ontario Ministry of the Environment 2430 Don Reid Drive Ottawa, ON K1H 1E1

Dear Mr. Burns:

Project No: 60338061-4

Regarding: Proposed Monitoring Program Amendment North Algona (Berndt Landfill) Waste Disposal Site, 219 Berndt Road, Part Lot 7, Concession III, Geographic Township of North Algona, Environmental Compliance Approval (ECA) No. A411401

This letter is to request revision to the Monitoring Program prescribed in the site Certificate of Approval (now ECA) No. A411404, Condition 37(a), Schedule B. Currently, the ECA includes groundwater level measurements three times per year, annual groundwater sampling of volatile organics (USEPA 624) of a downgradient well (BH3) and BH1-II, surface water sampling at two locations (SW1, SW2) and quarterly inspection of the toe of the waste mound for leachate seepage. For convenience, attached find a copy of Schedule B to the ECA, dated January 26, 2004, as amended.

Conditions 37(b) states:

Any future changes to either the groundwater or surface water monitoring program shall be approved, in writing, by the District Manager before the change is implemented.

AECOM submitted a letter dated May 14, 2012¹ requesting several revisions to the monitoring program. Of the requested changes, only removal of the annual groundwater sampling of volatile organics was acknowledged in an e-mail correspondence dated December 13, 2012². The intent of this letter is to obtain written approval to further modify the monitoring program at the site.

The following revisions to the monitoring program are requested:

- Reduction in the frequency of groundwater level measurements;
- Change of the groundwater sampling from July/August to the spring; and
- Discontinuation of the surface water monitoring program;

AECOM letter to Jason Ryan (MOE), Re: 60246826-4, Revision of Monitoring Program, Berndt Landfill Site, Part Lot 7, Concession III, Geographic Township of North Algona, Certificate of Approval No. A411401, dated May 14, 2012.

MOE e-mail to Kathleen Thur (Township); Re: Proposed Monitoring Program Amendment North Algona (Berndt Road) Waste Disposal Site Environmental Compliance Approval (ECA) A411401, 219 Berndt Road, Township of North Algona Wilberforce, dated December 13, 2012.



The above revisions have been discussed in the annual monitoring reports for the site and have been agreed upon by the MOECC technical reviewers. Further discussion of each of the items along with the reference to the MOECC agreements with the changes are discussed below.

Groundwater Monitoring Program

Groundwater level measurements have been collected since 2000 showing expected seasonal fluctuations with the highest water levels in the spring, the lowest water levels in the fall and intermediate water levels in the summer. This pattern has generally been consistent across the site over the 14 years of monitoring. As the seasonal fluctuations in water level have been established, it is proposed that the water level monitoring can be reduced from three times per year (spring, summer, fall) to twice per year (spring and late fall).

In addition, we request a change in the groundwater sampling from July/August to April/May since the downgradient monitor, BH3, is frequently dry during the summer months and therefore, cannot be sampled.

The proposed groundwater monitoring program in the 2011 annual monitoring report is presented below:

Location	Frequency	Parameter
BH1-I, BH1-II, BH2, BH 3, MP1, MP2, MP3, MP4 and MP5	April/May and November	measure water levels
BH1-I, BH1-II, BH2, BH3, SW3 and SW4, PW1	April/May	 chloride, fluoride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, copper, iron, manganese, strontium, alkalinity, TKN, ammonia, phenols, COD, TDS. field measurements: pH, temperature, and conductivity

In his review of the 2010 and 2011 annual monitoring reports³, the MOECC hydrogeologist accepted the proposed monitoring program above. However, since that time, we have recommended the removal of SW3, SW4 and PW1. SW3 and SW4 were replaced by groundwater monitors BH4, BH5 and BH6, along the western property boundary. These monitors were installed in 2013 and incorporated into the monitoring program for Guideline B7 compliance purposes. PW1 was sampled in 2003 and 2011 to 2014 (five events). It is a shallow private well upgradient of the site that was included in the monitoring program to confirm upgradient background water quality. The results of PW1 verify that the results of the shallow upgradient monitoring well, BH1-II, reflect the upgradient water quality from the site and therefore, PW1 no longer needs to be included in the monitoring program.

Surface Water Monitoring Program

Surface water sampling of the intermittent tributary was discontinued in 2010. Discontinuation of the surface water program was based on the fact that no impacts to the surface water had been detected over the nine years of surface water monitoring for the site and, with the closure of the site in 2002,

^{3.} MOE Memorandum Re: 2010 and 2011 Annual Monitoring Reports North Algona (Berndt Road) Waste Disposal Site Part Lot 7, Concession 3, Township of North Algona Certificate of Approval No. A411401, from Greg Faaren to lance Larkin, dated September 5, 2012.



no impacts to the surface water are likely in the future. The MOE is in agreement with the removal of the surface water monitoring program with the provision that a groundwater trigger mechanism is implemented⁴.

Proposed Revised Monitoring Program

In light of the above requested changes, it is suggested that Schedule "B" of the Certificate of Approval is modified to:

Location	Frequency	Parameter
BH1-I, BH1-II, BH2, BH3, a monitor along the western property boundary, MP1, MP2, MP3, MP4, and MP5	April/May and November	measure water levels
BH1-I, BH1-II, BH2, BH3, a monitor along the western property boundary	April/May	 chloride, fluoride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, copper, iron, manganese, strontium, alkalinity, TKN, ammonia, phenols, COD, TDS. field measurements: pH, temperature, and conductivity

Groundwater Monitoring Program

Note: BH4, BH5 or BH6 will be monitored as the monitor along the western property boundary.

Leachate Inspection Program

Location	Frequency	Parameter
Toe of Waste Mound	April/May	 inspection of toe of mound for leachate seepages

The new monitors, BH4, BH5 and BH6, have been sampled on two occasions since their installation in 2013. Preliminary review of the limited water quality results collected suggests that BH5 may have minor leachate effects though BH4 and BH6 are unaffected. We propose to continue to monitor all three locations until 2017 to establish water quality at these locations but retain only one for long term monitoring. As such, this has been reflected in the proposed groundwater monitoring program above.

The reduction of the leachate inspection program from quarterly to annually was previously approved by the MOE in 2010⁵.

We request your written approval for the modifications to the monitoring program, as discussed above. No amendment of the ECA is required as this can be accomplished under the District Manager's discretion under Condition 37(b).

The proposed monitoring program and support for the changes are described in the 2014 Annual Report, to be filed before May 31, 2015.

MOE Memorandum Re: 2008 Annual Report, Berndt Road Waste Disposal Site (Transfer Site), North Algona Wilberforce Township, IDS Ref #: 7632-7SGJ8F, from Dana Cruikshank to Lance Larkin, dated January 29, 2010.

^{5.} MOE e-mail to Janice Potvin, RE: Berndt Road WDS, dated February 4, 2010.



Should you have any questions or comments, please feel free to contact us.

Sincerely, **AECOM Canada Ltd.**

Cattyling

Patty Wong, B.Sc., P.Geo. Senior Geologist Patty.Wong@aecom.com

PW:mm Encl.

cc: Marikyn Casselman, Township Clerk-Treasurer Kevin Mooder, Jp2g Consultants

Schedule "B"

This Schedule "B" forms part of Certificate of Approval No. A411404

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Groundwater Monitoring Program

Location	Frequency	Parameter
upgradient well, downgradient well, BH1-I, BH1-II, MP1, MP2, MP3, MP4 and MP5	April/May July/August October	measure water levels
upgradient well, downgradient well, BH1-I and BH1-II	July/August	 chloride, flouride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, copper, iron, manganese, strontium, alkalinity, TKN, ammonia, phenols, COD, TDS. Field measurements: pH, temperature, conductivity
downgradient well, BH1-II	July/August October	volatile organics (USEPA 624)

Surface Water Monitoring Program

Location	Frequency	Parameter
SW-1, SW-2	April/May	chloride, flouride, nitrite, nitrate, sulphate, calcium, magnesium, sodium, potassium, barium, boron, cadmium, copper, iron, manganese, total phosphorous, strontium, zinc, alkalinity, TKN, ammonia, phenols, BOD, COD, TDS. Field measurements: pH, temperature, conductivity

Leachate Inspection Program

Location	Frequency	Parameter	
Toe of waste mound	Quarterly	inspection of toe of mound for	
		leachate seepage	

Ministry of the Environment and Climate Change Ottawa District Office 2430 Don Reid Drive, Suite 103 Ottawa Ontario K1H 1E1 613-521-3450 or 1-800-860-2195 Fax: 613-521-5437 Ministère de l'Environnement et de l'Action en matière de changement climatique Bureau du district d'Ottawa 2430, promenade Don Reid, Unité 103 Ottawa (Ontario) K1H 1E1 613-521-3450 ou 1-800-860-2195 Téléc. : 613-521-5437



BY E-MAIL

June 17, 2015

Patty Wong AECOM 105 Commerce Valley Drive West Markham ON L3T 7W3

Dear Ms. Wong:

Re: Proposed Monitoring Program Amendment North Algona (Berndt Landfill) Waste Disposal Site, 219 Berndt Road, Part Lot 7, Concession III, Geographic Township of North Algona Environmental Compliance Approval (ECA) No. A411401

This letter is in response to your letter, dated May 6, 2015, regarding proposed changes to the monitoring program at the North Algona (Berndt Landfill) Waste Disposal Site, as follows:

- Reduction in the frequency of groundwater level measurements;
- Change of the groundwater sampling from July/August to the spring and
- Discontinuation of the surface water monitoring program.

Based on reviews by the surface water and groundwater units of the Ministry's Eastern Region Technical Support Section, in accordance with Condition 37(b) of ECA A411401, I accept the following proposed changes to the monitoring program:

- 1. Reduction in the frequency of groundwater level measurements from three times per year (spring, summer, fall) to twice per year (spring and late fall);
- 2. Change of the groundwater sampling from July/August to April/May; and
- 3. Discontinuation of the surface water monitoring program (i.e. sampling stations SW3 and SW4) now that groundwater monitors BH4, BH5 and BH6 have been installed and a groundwater trigger mechanism, accepted by the surface water reviewer, has been implemented.

At this time; however, I am unable to support the removal of the Private Well, PW1, from the monitoring program since the review by the groundwater unit of the Ministry's Eastern Region Technical Support Section is still pending.

If you have any questions, please contact me at 613-521-3450 extension 224 or Emily Tieu at extension 235.

Yours truly,

Steve Burns Ottawa District Manager

SB/ET:jdv

ec: Marilyn Casselman, Township Clerk-Treasurer Kevin Mooder, Jp2g Consultants Dana Cruikshank, surface water unit, Eastern Region Technical Support Section Shawn Trimper, groundwater unit, Eastern Region Technical Support Section Ministry of the Environment and Climate Change

P. O. Box 22032 Kingston, Ontario K7M 8S5 Tel.: 613/549-4000 or1-800/267-0934 Fax: 613/548-6908 Ministère de l'Environnement et de l'Action en matière de changement climatique



January 26, 2016

C.P. 22032 Kingston, Ontario K7M 8S5 Tél. : 613/549-4000 or1-800/267-0934 Téléc.: 613/548-6908

MEMORANDUM

TO: **Emily** Tieu Senior Environmental Officer Ottawa District Office Eastern Region FROM: Thomas Guo, P. Geo Hydrogeologist **Technical Support Section** Eastern Region RE: 2014 Annual Report and Proposed Monitoring Program Amendment Berndt Waste Disposal Site (Transfer site) North Algona Wilberforce Township Part Lot 7, Concession III, Geographic Township of North Algona County of Renfrew ECA: A411401

I have reviewed the hydrogeologically pertinent sections of the document entitled "2014 Annual Report, Berndt Waste Disposal Site (Transfer site), North Algona Wilberforce Township" prepared by JP2G Consultants Inc. (JP2G) and dated May 2015. The JP2G report included the report entitled "North Algona (Berndt Road) Landfill Site – 2014 Groundwater Monitoring Results" prepared by AECOM and dated May 2015. I have also reviewed the letter entitled "Proposed Monitoring Program Amendment, North Algona (Berndt Landfill) Waste Disposal Site, 219 Berndt Road, Part Lot 7, Concession III, Geographic Township of North Algona" submitted by AECOM and dated May 6, 2015. The report and proposal were provided on behalf of the Township of North Algona Wilberforce. I offer the following comments for your consideration.

Summary

- The site is assessed to be in compliance with Reasonable Use Guideline Criteria (RUG). However, a new monitoring well BH5 was found to be likely impacted by the landfill. Further sampling is required to determine the degree of leachate affects, if any;
- Groundwater flow direction beneath the waste is to the southwest, towards an intermittent stream about 300 m from the site boundary. The primary pathway for leachate migration is reportedly within the shallow overburden in a south-westerly direction;
- Previous data provided by AECOM may indicate that monitoring well BH2 is not representative of un-impacted background groundwater quality. AECOM proposed to use an upgradient private dug well (PW1) to determine background water quality. However, this well may be showing impacts related to possible road salt contamination. The quality of BH2 appears good in recent years. As such, AECOM suggests that PW1 be removed from the monitoring program. I concur with this recommendation;

- The total dissolved solid (TDS) trigger concentration should be 375 mg/L rather than 1,508 mg/L proposed by AECOM. The proposed trigger concentrations for chloride, sulphate, sodium and boron are acceptable;
- Groundwater at the site may discharge to wetlands located downgradient of the waste mound. The 2014 groundwater monitoring data show the surface water is unlikely impacted by the leachate; and
- I concur with AECOM's recommendations with respect to the groundwater monitoring program.

Environmental Compliance Approval (ECA)

The site is located about 2 km northwest of the hamlet of Golden Lake on Part Lot 7, Concession III, Township of North Algona, County of Renfrew. The site operates under ECA No. A411401. The site was closed for waste disposal in January 2002 and has since operated as a waste transfer site. There are no engineering systems in place to control generated leachate and therefore the site operates as a naturally attenuating landfill.

Geology

The geology of the site comprises a sand/gravel overburden unit overlying a granitic gneiss bedrock unit. The overburden thickness ranges approximately 4.7 to 7.2 m. AECOM reports that a bedrock ridge extends from west to east in the northern part of site.

Hydrogeology

AECOM determined the following hydrogeological characteristics for the site:

- Groundwater flow direction beneath the waste is to the southwest, towards an intermittent stream about 300 m from the site boundary. This is consistent with previous results;
- Groundwater flows through the overburden relatively rapidly, at rates in the range of 1,000 m/year;
- Monitoring wells BH1-I and BH1-II indicate upward vertical hydraulic gradients (discharging conditions). The upward vertical gradient at monitor nest BH1 during 2014 were between -0.007 and -0.009. Upward gradients at monitor nest BH1 indicate that there is a net potential for groundwater movement upward from the bedrock to the sand and gravel overburden; and
- The primary pathway for leachate migration is reportedly within the shallow overburden in a south-westerly direction.

Background Groundwater Quality

Monitoring well BH2 was installed in 2004 to provide upgradient, overburden groundwater quality. This well is located about 15 m east of the fill area. Monitoring results indicate elevated concentrations of leachate parameters such as chloride, TDS and alkalinity in 2004 - 2006. However, these parameters have declined since 2007 and the groundwater quality appears good in recent years. No exceedances of Ontario Drinking Water Quality Standards (ODWQS) were observed at well BH2 in 2014.

AECOM reports that a private dug well (identified as well PW1) is located to the north of the site across Berndt Road. This well is hydraulically upgradient of the site and was sampled in 2014 to confirm background water quality. However, the analysed groundwater samples from Well PW1 showed elevated levels of TDS, sulphate, chloride and conductivity, with the level of TDS exceeding ODWQS. Therefore, this well appears to be impacted by a source other than the landfill. The most likely source would be road salt application to Berndt Road.

AECOM uses BH2 as the background water quality in 2014.

Leachate

Monitoring well BH1-II is located approximately 40 m downgradient of the waste mound and is the most impacted well at the site. Historical sampling data for this well shows that concentrations of chloride, sulphate, sodium, potassium, boron, alkalinity, electrical conductivity, ammonia, total kjedahl nitrogen (TKN), nitrate, TDS and manganese are elevated. These parameters were identified as leachate indicator parameters for this landfill site. The 2014 groundwater sampling results showed exceedances of ODWQS for alkalinity, organic nitrogen and manganese. The nitrate concentration of 8 mg/L in 2014 continues to be high but still lower than the ODWQS of 10 mg/L.

Downgradient Water Quality

Monitoring well BH1-I is located downgradient of the waste and is screened within the granitic gneiss bedrock. In 2014, no exceedances of the ODWQS were noted for this monitor.

Monitor BH3 was installed in shallow bedrock and is located to the west of the waste mound. In 2014 only the concentration of TDS exceeded ODWQS.

Monitors BH4, BH5, BH6 were installed about 10 m west of the downgradient southwestern property boundary in May 2013 in response to MOECC requiring a determination of compliance with Guideline B7. These monitors are 2.3 m to 2.4 m deep, penetrating sand and gravel layers. Manganese at BH6 exceeds ODWQS but is within background concentrations. Monitors BH4 and BH6 appear to be unaffected by the landfill with indicator parameter concentrations within or lower than upgradient background concentrations.

Monitor BH5 shows elevated indicator parameter concentrations compared to BH4 and BH6 though leachate indicator parameter concentrations are within the range of background concentrations, except for TKN. Indicator parameter concentrations at BH5 are lower than those of BH1-II, located closer to the fill area. BH5 appears to be in the groundwater flow path downgradient from the fill area.

Groundwater Surface Water Interaction

AECOM reports that vertical hydraulic gradients indicate discharging conditions at the site. AECOM reports that there are wetlands located to the southeast, south and southwest of the waste mound. Groundwater at the site may be discharging to these wetlands. There are some exceedances i.e. boron of Provincial Water Quality Objective (PWQO) in leachate monitoring well BH1-II (overburden). The water qualities of the recently-installed monitors (BH4-6) show the concentrations of boron are much lower than PWQO, meaning that the surface water is unlikely impacted by the land fill.

Guideline B-7

Reasonable Use Guideline B-7 (RUG) applies to operating waste disposal sites and sites closed post 1986. AECOM conducted a RUG assessment for the site. Monitor BH6 exceeds the RUG for manganese. Monitors BH4 and BH6 have been interpreted as being unaffected by the landfill leachate based on similar indicator parameter concentrations as the upgradient monitor, which has also historically shown occasionally elevated manganese concentrations.

Although there are no exceedances of the RUG at monitor BH5, groundwater quality at monitor BH5 showed that this monitor may be affected by landfill leachate. The new monitors have each only been sampled on two occasions, so further sampling is required to determine the degree of leachate affects, if any.

Trigger/Contingency Plans

AECOM recommends a TDS trigger concentration of 1,508 mg/L, which is double the maximum TDS concentration that has been recorded in the upgradient groundwater. I disagree with this recommendation and recommend that the TDS trigger concentration remain at 375 mg/L. The proposed trigger concentrations for chloride, sulphate, sodium and boron are acceptable.

Groundwater Monitoring Program

AECOM submitted a separate letter to revise the groundwater monitoring program as follows:

- Reduction in the frequency of groundwater level measurement from three times per year (spring, summer, and fall) to twice per year (spring and late fall);
- Change the groundwater sampling from July/August to the spring; and
- Discontinuation of the surface water monitoring program.

In the revised monitoring program, AECOM suggested that PW1 be removed and one monitor of BH4, BH5 and BH6 be retained for long term monitoring.

PW1 is a shallow private dug well upgradient of the site that was included in the monitoring program to confirm upgradient background water quality. It was sampled in 2003 and 2011 to 2014 (five events). The concentrations of sulphate, sodium and nitrate in 2014 are elevated compared to BH2. The results of PW1 also verify that the elevated chloride and conductivity at BH2 are representative of background; therefore, PW1 no longer needs to be included in the monitoring program.

The new monitors, BH4, BH5 and BH6, have been sampled on two occasions since their installation in 2013. Preliminary review of the limited water quality results collected suggests that BH5 may have minor leachate effects though BH4 and BH6 are unaffected. AECOM proposes to continue to monitor all three locations until 2017 to establish water quality at these locations but retain only one for long term monitoring.

I concur with AECOM's recommendations.

Pland

Thomas Guo, M. Eng, P. Geo. Hydrogeologist Technical Support Section Ministry of the Environment and Climate Change – Eastern Region

TG/gl

- cc: Dana Cruikshank File No. RE NA 03 03 (Berndt Road WDS – A411401) TG/IDS# 0462-9XBJWB
- ec: G. Faaren, Water Resources Supervisor P. Taylor, Technical Support Manager K. Stephenson, Groundwater Group Leader

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BY E-MAIL

February 8, 2016

Patty Wong AECOM 105 Commerce Valley Drive West Markham ON L3T 7W3

Dear Ms. Wong:

Re: Proposed Monitoring Program Amendment North Algona (Berndt Landfill) Waste Disposal Site, 219 Berndt Road, Part Lot 7, Concession III, Geographic Township of North Algona Environmental Compliance Approval (ECA) No. A411401

This letter is in response to your letter, dated May 6, 2015, regarding proposed changes to the monitoring program at the North Algona (Berndt Landfill) Waste Disposal Site, as follows:

- Reduction in the frequency of groundwater level measurements;
- Change of the groundwater sampling from July/August to the spring and
- Discontinuation of the surface water monitoring program.

As stated in my letter, dated June 17, 2015, in accordance with Condition 37(b) of ECA A411401, I accepted the following proposed changes to the monitoring program:

- 1. Reduction in the frequency of groundwater level measurements from three times per year (spring, summer, fall) to twice per year (spring and late fall);
- 2. Change of the groundwater sampling from July/August to April/May; and
- 3. Discontinuation of the surface water monitoring program (i.e. sampling stations SW3 and SW4) now that groundwater monitors BH4, BH5 and BH6 have been installed and a groundwater trigger mechanism, accepted by the surface water reviewer, has been implemented.

At that time; however, I was not able to support the review of the removal of the Private Well, PW1, from the monitoring program. However, based on the recent review by the groundwater unit of the Ministry's Eastern Region Technical Support Section, dated January 26, 2016, I accept the removal of the Private Well, PW1, from the monitoring program.

If you have any questions, please contact me at 613-521-3450 extension 224 or Emily Tieu at extension 235.

Yours truly,

Steve Burns Ottawa District Manager

SB/ET:jdv

ec: Marilyn Casselman, Township Clerk-Treasurer Kevin Mooder, Jp2g Consultants Dana Cruikshank, surface water unit, Eastern Region Technical Support Section Thomas Guo, groundwater unit, Eastern Region Technical Support Section

Ministry of the Environment and Climate Change

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

Direction régionale de l'Est 2430 Promenade Don Reid, Unité 103 Ottawa ON K1H 1E1 Télécopieur: (613)521-5437 Sans Frais 1-800-860-2195 Tél:(613) 521-3450



January 16, 2018

Mr. Perry Ashick

Dear Sir,

RE: Closed Waste Disposal Site Inspection Report The Corporation of the Township of North Algona Wilberforce 219 Berndt Rd., North Algona Wilberforce, ON Reference Number 3381-ASYHK5

On October 25, 2017, the Ontario Ministry of the Environment and Climate Change (the Ministry) completed a Closed Waste Disposal Site Inspection at 219 Berndt Rd., North Algona Wilberforce, ON. The enclosed inspection report documents the inspection results.

The purpose of this inspection was to assess the closed waste disposal site for compliance with the associated environmental compliance approval and other applicable Ministry legislation.

There are no actions required at this time.

The co-operation extended to the Ministry during your facility inspection was appreciated. Yours truly,

Alexander J Baker Junior Environmental Officer Ottawa District Office

File Storage Number: SI RE NA BE 610



Ministry of the Environment and Climate Change Ministère de l'Environnement et de l'Action en matière de changement climatique

Closed Waste Disposal Site Inspection Report

Client:	The Corporation of the Townsh Mailing Address: 1091 Shaw W Canada, K0J 1T0 Physical Address: 1091 Shaw Renfrew, Ontario, Canada, K0J Telephone: (613)628-2080, Ext publicworks@naigonawil.com Client #: 8128-4JAR2D, Client	ip of North Algona Wilberforce oods Rd, Rural Route, 1, North Woods Rd, North Algona Wilber 1T0 ension: 204, FAX: (613)628-334 Type: Municipal Government	Algona Wilberforce, Ontario, force, Township, County of 11, email:
Inspection Site Address:	North Algona (Berndt Road) Waste Disposal Site Address: 219 Berndt Rd, North Algona Wilberforce, Township, County Of Renfrew District Office: Ottawa GeoReference: Map Datum: NAD83, Zone: 18, Accuracy Estimate: 1-10 metres eg. Good Quality GPS, Method: GPS, UTM Easting: 323156, UTM Northing: 5051421, UTM Location Description: Entrance gate on Berndt Roadt, LIO GeoReference: Zone: 18, UTM Easting: 323180.12, UTM Northing: 5051252.0, Latitude: 45.592316, Longitude: -77.26696 Site #: 3540-4 JAR3H		
Contact Name:	Perry Ashick	Title:	Acting Public Works Director
Contact Telephone:	(613)628-2080 ext	Contact Fax:	
Last Inspection Date:	2012/09/06		
Inspection Start Date:	2017/10/25	Inspection Finish Date:	2017/10/25
Region:	Eastern		

1.0 INTRODUCTION

In Ontario, landfilling sites and other waste management activities are subject to the Environmental Protection Act, R.S.O. 1990, c. E.19 (the Act) and the regulations made under the Act. The basic legislative framework for waste management is defined in Part V of the Act and the regulatory requirements for the design and operation of waste disposal sites are included in R.R.O. 1990, Reg. 347: General - Waste Management (O. Reg. 347).

Section 27 of the the Act requires that an environmental compliance approval (ECA) be obtained from the Ministry of the Environment and Climate Change (the Ministry) for the establishment, operation, alteration or enlargement of a landfill site. The Berndt Road Landfill / Transfer Station (the Site) operates under the authority of the Amended Provisional Certificate of Approval for a Waste Disposal Site Number A411401. Certificates of Approval are now referred to as ECAs and will be referenced as such in this inspection report. Since the issuance of this ECA there have been two (2) notices issued to update it.

The Township ceased landfill operations at the Site in 2002. Final cover was applied in 2005 in accordance with Condition 29 of the ECA, and the Site has since operated as a waste transfer site. The Township is a member of the Ottawa Valley Waste Recovery Centre (OVWRC). Therefore, all waste received at the Site, except for tires, is transferred to OVWRC.

The purpose of the inspection was to assess the Site for compliance with the ECA, O. Reg. 347, and other

Ministry legislation with respect to the operation and maintenance of the closed landfill. Conditions related to the non-hazardous waste transfer station were also reviewed at the time of the inspection. The details regarding that inspection are included in a separate report.

This inspection focused on the closed landfill which involved a site tour on top of the waste mound, discussions with Township staff, and a review of pertinent files at the Ottawa District Office. This inspection report reflects the observations made by the undersigned Environmental Officer during the October 25, 2017 inspection and file review. The Site was closed to the public at the time of the inspection.

2.0 INSPECTION OBSERVATIONS

Certificate of Approval Number(s): • Yes O No

Amended Provisional Certificate of Approval Number A411401

2.1 FINANCIAL ASSURANCE

Financial assurance is not required for municipally operated waste disposal / transfer sites.

2.2 CLOSURE PLAN

The Interim Closure Plan and Design and Operations Plan, dated December 2002 (Plan), was received by the Ottawa District Office on January 30, 2003. The Plan is listed as Item No. 3 under Schedule "A" which forms part of ECA A411401.

2.3 ACCESS CONTROL

Access to the Site is controlled through a locked gate and fencing. There was no evidence of any illegal dumping taking place.

2.4 FINAL COVER

Condition 29 of Notice No. 1 of the ECA, dated February 13, 2004, states that by June 30, 2005, the Owner shall: (a) increase the granular cover material to a depth of 0.6m; and (b) apply 0.15m of topsoil, seeded with both annual and perennial plant species, except for those areas approved for the establishment and use of a transfer station.

The 2016 Annual Report indicates that in August 2005, the Township initiated the application of final cover that included regrading the side slopes and placement of earth material with a thickness ranging from 0.6m to 1.0m. In October 2005, the Township applied organic rich soil material at a depth of 0.15m.

As per Condition 30(b) of the ECA, in 2010 the Township requested to reduce the frequency of final cover inspections from a quarterly basis to annually in the spring; the Ministry agreed. The 2016 Annual Report indicates that the annual inspection of the waste mound slopes was conducted on September 8, 2016. There was no evidence of erosion or seepage noted during the inspection conducted by Jp2g Consulting.

2.5 LEACHATE CONTROL SYSTEM

There is no leachate control system at this landfill site. The Site is a natural attenuating landfill site.

2.6 METHANE GAS CONTROL SYSTEM

There is no methane gas control system at this landfill site.

2.7 MONITORING PROGRAMS:

In accordance with Condition 38 of the ECA, the 2016 Annual Report was submitted to the District Manager by May 31, 2016. The 2016 Annual Report was forwarded to the Ministry's Technical Support Section (TSS) for a groundwater review; however, the review by TSS has not yet been completed. The most recent TSS memorandum is dated January 26, 2016 and provides comment on the 2014 Annual Monitoring Report and request for a proposed monitoring program amendment that was submitted in May 2015.

To date the proposed changes to the monitoring program at the Site that have been accepted by the Director are:

- Removal of sampling for volatile organic compounds from the groundwater monitoring program;

- Reduction in the frequency of groundwater level measurements from three times per year to twice per year (spring and late fall);

- Change of the groundwater sampling from July/August to April/May;

- Discontinuation of the surface water monitoring program (i.e. sampling stations SW3 and SW4) now that groundwater monitors BH4, BH5, and BH6 have been installed and a groundwater trigger mechanism has been implemented; and,

- Removal of the Private well, PW1, from the monitoring program.

The 2016 Annual Monitoring Report detailed the following:

Background Groundwater Quality:

- Monitoring well BH2 was installed in 2004 and is representative of overburden background conditions at the site. It is used as the background water quality for the 2016 Annual Report.

Downgradient Groundwater Quality:

- Monitoring nest BH1 is located approximately 40 m downgradient of the waste and includes a bedrock monitor (BH1-I) and an overburden monitor (BH1-II). Jp2g Consulting interpreted the bedrock monitor as being unaffected by leachate. Jp2g Consulting interpret the overburden monitor to show dilute leachate effects, as expected for a landfill of this size.

- Monitor BH3 is located approximately 20 m east of the western property boundary and is installed in shallow bedrock. In 2016 there was not sufficient water for sampling. TSS will need to comment on this upon their review of the 2016 Annual Report.

- Monitors BH4, BH5, and BH6 were installed about 10 m west of the downgradient southwestern property boundary in May 2013 in response to the Ministry requiring a determination of compliance with Guideline B-7. Manganese at BH6 exceeds the Guideline B-7 limits and ODWS; however, Jp2G interprets that this is not the result of landfill leachate based on similar indicator parameter concentrations as the upgradient monitoring well, which has also historically shown occasional elevated manganese concentrations. This will need to be confirmed by TSS in their review of the 2016 Annual Report.

Surface Water Quality:

A recommendation to discontinue the surface water monitoring was put forth because no landfill influences had been observed since sampling began in 2000. The landfill was closed in 2002, so no future effects were expected. The MOECC agreed to this recommendation in 2010, provided that if a trigger mechanism for monitors BH1-II and BH-3 for leachate indicators is reached, the surface water sampling will be re-instated. The monitors used for a trigger mechanism was switched to monitors BH4, BH5, and BH6. The trigger for these three (3) locations will be exceeded when there are three (3) consecutive exceedances of any parameter. The parameters for the trigger are: chloride, sulphate, sodium, boron, and TDS. Bsed on the results of the 2016 program the trigger mechanism has not been exceeded.

It was proposed to continue to monitor BH4, BH5, and BH6 for one more event in 2017 and then retain only one monitor for long term monitoring. The technical review of the 2014 Annual Report, dated January 26, 2016, concurred with these recommendations.

2.8 GROUND WATER/SURFACE WATER IMPACTS

At the time of the inspection, no leachate seeps or odours were observed at the Site.

It is the responsibility of the Township of North Algona Wilberforce to ensure the Site's groundwater parameters at the property boundary meet those as calculated by the Guideline B-7. The 2016 Annual Monitoring Report submitted by Jp2g provided the following conclusions/recommendations:

- The Guideline B-7 limits was exceeded at the southwestern property boundary downgradient of the fill area for manganese only. However, the exceeded concentration of manganese is in range of upgradient background overburden groundwater quality.

- There are no downgradient water well users and the downgradient is not conducive to residential development due to the low-lying wetland conditions and use as an aggregate pit. Therefore, there is no reasonable use for the downgradient area and no mitigative action is recommended.

- If the trigger concentration for BH5 continues to exceed the assigned value for TDS of 375 mg/L, or increasing trends develop, implementation of the contingency plan may be required in the future.

The 2016 Annual Report review by TSS should comment on these conclusions/recommendations.

2.9 Registration On Title:

According to the previous inspection report dated 2012-09-26, the Director signed the copy of the Certificate of Prohibition on October 20, 2006; however confirmation that the document has been registered was not found in the Ministry files.

3.0 REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES

There were no non-compliances at the time of the inspection.

4.0 SUMMARY OF INSPECTION FINDINGS (HEALTH/ENVIRONMENTAL IMPACT)

Was there any indication of a known or anticipated human health impact during the inspection and/or review of relevant material, related to this Ministry's mandate ? No

Specifics:

Was there any indication of a known or anticipated environmental impact during the inspection and/or review of relevant material ?

No Specifics:

Was there any indication of a known or suspected violation of a legal requirement during the inspection and/or review of relevant material which could cause a human health impact or environmental impairment ? No

Specifics:

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material ? No

Specifics:

Was there any indication of minor administrative non-compliance? No

Specifics:

5.0 ACTION(S) REQUIRED

None required at this time.

6.0 OTHER INSPECTION FINDINGS

A completed and signed Monitoring and Screening Checklist, as per the Ministry's November 2010 Monitoring and Reporting for Waste Disposal Sites Technical Guidance Document, was included.

7.0 INCIDENT REPORT

Not Applicable

8.0 ATTACHMENTS

PREPARED BY: Environmental Officer: Name: District Office: Date: Signature

Alexander J Baker Ottawa District Office 2017/12/27

REVIEWED BY: District Supervisor: Name: District Office: Date: Tara MacDonald Ottawa District Office 2018/01/15

Signature:

J. MacDonald

File Storage Number:

SI RE NA BE 610

Note:

"This inspection report does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they may apply to this facility. It is, and remains, the responsibility of the owner and/or the operating authority to ensure compliance with all applicable legislative and regulatory requirements"

From:	Andrew Buzza
То:	Guo, Thomas (MECP), Helena Vaughan
Cc:	Ponalo, Thandeka (MECP); Kevin Mooder
Bcc:	cd2e00c0-9c07-4926-bce9-51bec64c19a3.metaPublish@deltekpim.jp2g.com
Subject:	RE: 2020 AMR - Berndt Road WDS
Date:	Thursday, March 17, 2022 10:15:23 AM
Attachments:	image001.png cd2e00c0-9c07-4926-bce9-51bec64c19a3.png

Good morning Thomas, thanks for the email.

We have scheduled an early April event for this year, as requested.

Cheers

Andrew Buzza, P.Geo Jp2g Consultants Inc.

Email: andrewb@jp2g.com | Web: www.jp2g.com Cell:613. 266-8065 | Fax 613. 828-2600 1150 Morrison Drive, Suite 410, Ottawa, Ontario, K2H 8S9



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Keep it Clean - Go Green

From: Guo, Thomas (MECP) <Thomas.Guo@ontario.ca>
Sent: Wednesday, March 16, 2022 3:44 PM
To: Andrew Buzza <AndrewB@jp2g.com>; Helena Vaughan <HelenaV@jp2g.com>
Cc: Ponalo, Thandeka (MECP) <Thandeka.Ponalo@ontario.ca>
Subject: 2020 AMR - Berndt Road WDS

****EXTERNAL EMAIL**** Please use caution.

Hi Andrew and Helena,

I am currently reviewing the 2020 AMR for Berdt Road WDS prepared by you. The following is excerpted form the report:

- Limited sampling has been completed to date at location BH4, BH5 and BH6;
- Monitoring wells BH4 and BH6 are not considered to be impacted and removal from the monitoring program is recommended pending Ministry approval; and
- Continued sampling from BH5 is recommended for 2021.

I have noticed that BH4 and BH6 has been dry since 2019 given that the sampling event occurred in late spring or summer. Would you please arrange to collect the samples in early spring i.e in April in this year? Once monitoring wells BH4 and BH6 are still dry during such a sampling event, they can be removed from the monitoring program.

If my recommendations conflict with your schedule, please let me know.

Thank you for your attention.

Thomas Guo: M. Eng., P. Geo Hydrogeologist Technical Support Section, Eastern Region Ministry of the Environment, Conservation and Parks 1259 Gardinars Road, Unit 3, Kingston, ON K7P 3J6 Tel: 613-549-4000 ext 2717, Cell: 613-449-8704, Email: <u>Thomas.Guo@ontario.ca</u>

Appendix D

Borehole Logs & Monitoring Well Construction Details

GRAPHICS, SYMBOLS AND ABBREVIATIONS ON LOGS

SAMPLE TYPES and TESTS

夏 SS Split Spoon Sample SN Non-Standard Split Spoon Sample **J** ST Shelby Tube Sample : (unconfined compression or unconsolidated undrained test)] DS Denision Type Sample PS. Piston Type Sample Ξ CS Continuous Sample ∑ GS Grab Sample **≣ WS** Wash Sample **A** BQ **BQ** Core Sample R HQ HQ Core Sample E NO NQ Core Sample 2 DT **Dynamic Penetration Test** VT Field Vane Test (undisturbed) I + VT Field Vane Test (remoulded) ⊕

PENETRATION RESISTANCES

Standard Penetration Resistance(N Value)

The number of blows by a 63.6 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) Split Spoon Sampler for a distance of 300 mm (12 in.).

ABBREVIATIONS

DTPL: Drier Than Plastic Limit APL: About Plastic Limit WTPL: Wetter Than Plasic Limit K: Hydraulic Conductivity (m/s) Cu: Undrained Shear Strength (kPa) % REC : Percentage of Sample Recovered % RQD : Indirect Measure of the Number of Fractures and Soundness of Rock Mass Approximate Water Table

GRAIN SIZE CLASSIFICATION %

trace, "eg. trace sand"	1 - 10
some, "eg. some sand"	10 - 20
adjective, "eg. sandy"	20 - 35
and, "eg. and sand"	35 - 50
noun, "eg. sand"	>50

Note: Classification Divisions Based on Modified M.I.T. Grain Size Scale

SOIL DESCRIPTIONS

Cohesionless Soils

Relative Density Very loose Loose

0 to 4 4 to 10 10 to 30

N Value

30 to 50 over 50

Cohesive Soils

Compact

Very Dense

Dense

Consistency	Cu(kPa)	N Value					
Very soft	0 to 12	0 to 2					
Soft	12 to 25	2 to $\overline{4}$					
Firm	25 to 50	4 to 8					
Stiff	50 to 100	8 to 15					
Very Stiff	100 to 200	15 to 30					
Hard	over 200	over 30					

MONITOR DETAILS



Gartner Lee Limited

FOR: Convesting of North Algona Wiberforce GEOLOGIST B4.8 m DEPTH STRATIGRAPHIC DESCRIPTION Gamma and a stress and and gavel, some sit, moist. N VALUE V Geometry SAMPLE N VALUE V Geometry SAMPLE N VALUE V Geometry Sample Sample N VALUE V Geometry Sample Sample Sample N VALUE V Geometry Sample Sample Sample Sample Sample N VALUE V Geometry Sample Sample Sample Sample Sample Sample Sample N VALUE V Geometry Sample Sample </th <th>HYDROGH North Algo</th> <th>OLE LOG BOLOGICAL INVESTIGATION</th> <th>PROJECT:</th> <th>20-216</th> <th></th> <th></th> <th>I I</th> <th>BOR DAT</th> <th>EH E:</th> <th>OLE: 13 Jun</th> <th>1-I e 200(</th> <th>)</th>	HYDROGH North Algo	OLE LOG BOLOGICAL INVESTIGATION	PROJECT:	20-216			I I	BOR DAT	EH E:	OLE: 13 Jun	1-I e 200()
DEPTH (m) STRATIGRAPHIC DESCRIPTION SAMPLE (m) NVALUE (m) V 1 SAND.GRAVELAND COPELES Medium brown fine to costs sand and gavel, some silt, moist. 1 SS 13 80 1 15 15 10 5 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10 1 10	FOR: To	wnship of North Algona Wilberfor	ce ·				F F	SEC CLE	OLO VAJ	GIST FION	BJS 84.8	<u>m.</u>
SAND. GRA VEL AND COBBLES Medium brown fine to coarse sand and gravel, some silt, moie. 1 5 13 80 4 1 5 13 60 1 80 1 80 1 1 80 1 1 80 1 1 80 1 1 80 1 1 1 80 1 1 1 80 1	DEPTH (m)	STRATIGRAPHIC DES	CRIPTION	MONITOR DETAILS & NUMBER NITMBER	INTERVAL.	N VALUE	& WATER	k REC	k RQD	N VA	LUE	W CO
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		SAND, GRAVEL AND COBBLES Medium brown fine to coarse sand and moist.	gravel, some silt,		1 5	S 13		80			5 60	10
2 -boulders below approximately 1.82 m. 0.15m 0.15m 3 -becoming saturated below approximately 3.0 m. 4 SS 9 50 • 4 SS 9 50 • • • • • 4 SS 9 50 •		-trace cobbies below approximately 0.80) m.		2 S 3 S	S 13 S 12/		60 90	-	· · · ·	· · · · · · · · · · · · · · · · · · ·	1 1 1 1 1 1
 becoming saturated below approximately 3.0 m. comparison of the saturated below approximately 3.0 m. definition of the saturated below approximated below approximated below approximated below approximated below approximated below approximated below approximate approximate approximate approximate below approximate ap		-boulders below approximately 1.82 m.			4 SS	0.15n 5 9		50			4 8 9 1	8 8 8 8 8
4 6 SS 19 65 5 7 SS 29 70 6 7 SS 29 70 6 8 SS 43 80 7 SS 29 70 6 .5 .5 .5 7 SS 75// 70 .5 9 SS 75// 70 .5 .15m .10 CRANITIC GNEISS BEDROCK .15m 6 .15m .100 55 7 GRANITIC GNEISS BEDROCK .111 HQ 10 CGS .15m 11 HQ 100 55 8 SS 11 HQ 100 55 9 .4 Borehole terminated at 9.44 m in granitic gneiss bedrock. 12 HQ 100 22	11年、11年、11年 11年、11年、11年 3	-becoming saturated below approximate	ly 3.0 m.	5	5 SS	35		50			•	1 1 1 1 1 1 1 1 1
5 7 SS 29 70 7 6 7 GRANITIC GNEISS BEDROCK Grey, pink and black fine grained granitic gneiss bedrock with numerous fractures. Open fractures at about 7.2 m. 7.5 m, 7.8 m, 7.9 m and 9.2 m. Vertical fractures at about 8.1 m and 8.4 m. 10 55 9 8 SS 43 80 100 55 9 9 8 9 100 55 100 10 7 10 100 55 100 22 9 9 10 100 22 100 22 9 9 10 100 22 100 22 9 9 10 100 22 100 22 9 9 10 100 22 100 22 9 9 10 100 22 100 22 9 9 10 100 100 100 100 100 9 9 10 100 100 100 100 100 100 9 9 10 100				6	SS	19		65				4 1 4 4 4
6 9 I SS 75/ 0.15m 7 GRANITIC CNEISS BEDROCK Grey, pink and black fine grained granitic gneiss bedrock with numerous fractures. Open fractures at about 7.2 m. 7.5 m, 7.8 m, 7.9 m and 9.2 m. Vertical fractures at about 8.1 m and 8.4 m. 10 Z GS 11 HQ 100 55 8 12 HQ 100 22 9 9 9.4 Borehole terminated at 9.44 m in granitic gneiss bedrock. 10 I I I I I I I I I I I I I I I I I I I	(2) (2) (2) (2) (2) (2) (2) (2) (2) (2)		۰ ۲	7	SS SS	29 43		80				
6.9 7 GRANITIC GNEISS BEDROCK Grey, pink and black fine grained granitic gneiss bedrock with numerous fractures. Open fractures at about 7.2 m. 7.5 m, 7.8 m, 7.9 m and 9.2 m. Vertical fractures at about 8.1 m and 8.4 m. 9 9.4 Borehole terminated at 9.44 m in granitic gneiss bedrock.				9	SS	75/ 0.15m		70				· · ·
8 9 9.4 Borehole terminated at 9.44 m in granitic gneiss bedrock.	6.9 7	GRANITIC GNEISS BEDROCK Grey, pink and black fine grained granitic with numerous fractures. Open fractures a	gneiss bedrock at about 7.2 m.	- 10 - 11	∀ GS HQ		1	00 :	55.	b b b 1 4 1 1 5 1 4 1 1 6 1 1 6 1 1 1 1 1		· · ·
9 9.4 Borehole terminated at 9.44 m in granitic gneiss bedrock.	°	7.3 μ, 7.8 μ, 7.9 m and 9.2 m. Vertical f 8.1 m and 8.4 m.	ractures at about	12	HQ		10	00 Z	22		- - - - - -	· · · · · · · · · · · · · · · · · · ·
Borehole terminated at 9.44 m in granitic gneiss bedrock.	9									1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 4 1 1 3	* * * * * 1 * 3 * 5 * 6 * 4
		Borehole terminated at 9.44 m in granitic g	meiss bedrock.							т. т. т. 8 — т. т. 8 — т. т. 4 — т. т.		

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BOR	EH	OLE LOG	PROJECT:	20-216	ĵ			Γ	BOF	EH	OLE: 1-II	
HYDR North A FOR:	OGE Algon Tov	OLOGICAL INVESTIGATION a (Berndt Road) Landfill Site vnship of North Algona Wilberfor	ce			M] (]	DAT GEC ELE	E: LO VA1	13 June 200 GIST BJS TION 84.8	0 m.·
DEPTH (m)	FRATIGRAPHY	STRATIGRAPHIC DES	CRIPTION	MONITOR DETAILS & NUMBER	JMBER	VTERVAL YPE	VALUE VALUE	WATER T	REC	RQD	N VALUE	w co
1		SAND, GRAVEL AND COBBLES Medium brown fine to coarse sand and moist. -trace cobbles below approximately 0.80	gravel, some silt,) m.		IN		N	%	&	~~ '	15 30 45 60	10 2
2 -		-boulders below approximately 1.82 m.									7 8 8 7 8 8 8 8 8 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8 9 8 8 8	
3 -		-becoming saturated below approximatel	у 3.0 m.							-		
4.6		Borehole terminated at 4.57 m in sand, gr	avel and cobbles.	-								
												• • • • • • • • • • • • • • • • •
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BOREH	OLE LOG	PROJECT:	23-839)			BOREHOLE: 2 1 d					of 1	
Hydrogeolo Berndt Road	gical Investigation d Landfill Site						1	DATE: 01 June 2004 LOGGED BY MEW					
FOR: Toy	wnship of North Algona Wilberfo	orce					(GRC	UN	D ELEV	90.53	3 m AS	SL
(m) (m)	STRATIGRAPHIC DES	SCRIPTION	MONT TOR DETAI LS & NITMERP	NUMBER	INTERVAL TYPE	N VALUE	% WATER	% REC	% RQD	N VALU	JE	WAT CONT (%	ER ENT)
0.2	TOSOIL. Dark brown topsoil with rootlets. SAND, GRAVEL AND COBBLES Medium red-brown medium to fine san occassional cobbles, dry, loose.	d with gravel and		1	SS	8		62			•		
	boulders below about 2.1 m.			3	SS SS	4		0 8		-			
	· · ·			6	SS SS	16 8		0 34	1				
● - - - - - - - - - - - - -	Becoming saturated below about 5.7 m.			- 8	SS	36 76		85 65		=			
₩, 2 3 3 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 4 5 5 5 5 5 5 5 5 5 5 5 5 5	Borehole terminated at 7.16 m at the ove	rburden and		. 10	SS	100		100		~			
Printed: 15	bedrock contact. Feb 05												

BOREH	OLE LOG	PROJECT:	23-839)				BOREHOLE: 3 1 o					1 of 1	1	
Hydrogeolo Berndt Road FOR: Toy	gical Investigation 1 Landfill Site wnship of North Algona Wilberfo	orce						DATE:02 June 2004LOGGED BYMEWGROUND ELEV 85.69m ASL							
XI	음 SAN											I	$\overline{\neg}$		
(m) (m)	STRATIGRAPHIC DE	SCRIPTION	MONI TOR DETAL LS & NITMBER	NUMBER	INTERVAL.	TYPE	N VALUE	% WATER	* REC	* RQD	N V	ALUE	WATEH CONTEN (%)	₹ TT	
1 2 3 1 4 2 4 1	SAND, GRAVEL AND COBBLES Medium red-brown medium to coarse soccassional cobbles, dry, loose. boulders below about 2.3 m. Becoming saturated below about 3.8 m. Borehole terminated at 4.65 m at the owe bedrock contact.	sand with gravel and				SS	28 50 52	δ 90	26 26 0 38 46 -93	₩ 					
Printed: 15 File Location:	Feb 05					-			E		Gart	ner Le	e Limite		







Appendix E

Groundwater Elevation Data

Table E1: Groundwater Elevations North Algona Landfill

Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation
	(mASL)	(mASL)		Top of Pipe (m)	(mASL)
1-I	85.52	84.77	Jun-2000	2.71	82.81
	85.52	84.77	Aug-2000	3.10	82.42
	85.52	84.77	Jun-2001	2.77	82.75
	85.52	84.77	Aug-2001	3.38	82.14
	85.52	84.77	Nov-2001	3.31	82.21
	85.50	84.77	Oct-2002	3.54	81.96
	85.50	84.77	Jun-2003	2.60	82.90
	85.50	84.77	Aug-2003	3.01	82.49
	85.50	84.77	Nov-2003	3.54	81.96
	85.50	84.77	Apr-2004	2.46	83.04
	85.50	84.77	Aug-2004	3.41	82.09
	85.50	84.77	Sep-2004	3.57	81.93
	85.50	84.77	May-2005	2.22	83.28
	85.50	84.77	Aug-2005	3.57	81.93
	85.50	84.77	Dec-2005	3.20	82.30
	85.50	84.77	May-2006	2.49	83.01
	85.50	84.77	Sep-2006	3.20	82.30
	85.50	84.77	Nov-2006	2.99	82.51
	85.50	84.77	Apr-2007	2.46	83.04
	85.50	84.77	Aug-2007	3.20	82.30
	85.50	84.77	Oct-2007	3.31	82.19
	85.50	84.77	Apr-2008	2.09	83.41
	85.50	84.77	Aug-2008	3.24	82.26
	85.50	84.77	Nov-2008	3.27	82.23
	85.50	84.77	Apr-2009	2.38	83.12
	85.50	84.77	Aug-2009	3.19	82.31
	85.50	84.77	Oct-2009	3.43	82.07
	85.50	84.77	May-2010	2.76	82.74
	85.50	84.77	Sep-2010	3.37	82.13
	85.50	84.77	Nov-2010	3.02	82.48
	85.50	84.77	Nay-2011	2.29	83.21
	85.50	84.77	Sep-2011	3.47	82.03
	85.50	84.77	Nav 2012	2.37	83.13
	85.50 95.50	84.77	NOV-2012	3.23	82.27
	05.50 95.50	04.77	Nug 2012	2.29	05.21
	85.50	04.77 94.77	Aug-2013	2.92	02.30 82.35
	85.50	84.77	May-2014	2.25	82.23
	85.50	84.77	Διισ-2014	2.55	82 37
	85 50	84 77	May-2015	2 76	82.57
	85 50	84.77	Sen-2016	3 25	82.74
	85.50	84.77	Dec-2016	3.22	82.28
	85.50	84.77	Mav-2017	2.03	83.47
	85.50	84.77	Dec-2017	3.12	82.38
	85.50	84.77	Jun-2018	2.76	82.74
	85.50	84.77	Dec-2018	3.41	82.09
	85.50	84.77	Jul-2019	2.70	82.80
	85.50	84.77	Nov-2019	3.28	82.22
	85.50	84.77	May-2020	2.47	83.03
	85.50	84.77	Oct-2020	3.32	82.18
	85.50	84.77	Apr-2021	2.62	82.88
	85.50	84.77	Nov-2021	3.27	82.23
	85.50	84.77	Apr-2022	2.68	82.82
	85.50	84.77	Dec-2022	3.38	82.12
	85.50	84.77	May-2023	2.45	83.05
	85.50	84.77	Oct-2023	3.48	82.02
Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation
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	(mASL)	(mASL)		Top of Pipe (m)	(mASL)
	85.50	84.77	Apr-2024	2.92	82.58
	85.50	84.77	Dec-2024	3.19	82.31
1-II	85.51	84.82	Jun-2000	2.78	82.73
	85.51	84.82	Aug-2000	3.17	82.34
	85.51	84.82	Jun-2001	2.90	82.61
	85.51	84.82	Aug-2001	3.48	82.03
	85.51	84.82	Nov-2001	3.41	82.10
	85.51	84.82	Oct-2002	3.60	81.91
	85.51	84.82	Jun-2003	2.68	82.83
	85.51	84.82	Aug-2003	3.05	82.46
	85.51	84.82	Nov-2003	3.60	81.91
	85.51	84.82	Apr-2004	2.55	82.96
	85.51	84.82	Aug-2004	3.66	81.85
	85.51	84.82	Sep-2004	3.76	81.75
	85.51	84.82	May-2005	2.32	83.19
	85.51	84.82	Aug-2005	3.76	81.75
	85.51	84.82	Dec-2005	3.25	82.26
	85.51	84.82	May-2006	2.56	82.95
	85.51	84.82	Sep-2006	3.24	82.27
	85.51	84.82	Nov-2006	3.07	82.44
	85.51	84.82	Apr-2007	2.53	82.98
	85.51	84.82	Aug-2007	3.25	82.26
	85.51	84.82	Oct-2007	3.37	82.14
	85.51	84.82	Apr-2008	2.19	83.32
	85.51	84.82	Aug-2008	3.30	82.21
	85.51	84.82	Nov-2008	3.32	82.19
	85.51	84.82	Apr-2009	2.49	83.02
	85.51	84.82	Aug-2009	3.26	82.25
	85.51	84.82	Oct-2009	3.48	82.03
	85.51	84.82	May-2010	2.86	82.65
	85.51	84.82	Sep-2010	3.42	82.09
	85.51	84.82	Nov-2010	3.07	82.44
	85.51	84.82	Mav-2011	2.39	83.12
	85.51	84.82	, Sep-2011	3.53	81.98
	85.51	84.82	May-2012	2.81	82.70
	85.51	84.82	, Nov-2012	3.31	82.20
	85.51	84.82	May-2013	2.38	83.13
	85.51	84.82	, Aug-2013	2.99	82.52
	85.51	84.82	Nov-2013	3.29	82.22
	85.51	84.82	Mav-2014	2.39	83.12
	85.51	84.82	Aug-2014	3.18	82.33
	85.51	84.82	Mav-2015	2.82	82.69
	85.51	84.82	Sep-2016	3.29	82.22
	85.51	84.82	Dec-2016	3.26	82.25
	85.51	84.82	May-2017	2.03	83.48
	85.51	84.82	Dec-2017	3.13	82.38
	85.51	84.82	Jun-2018	2.77	82.74
	85.51	84.82	Dec-2018	3.39	82.12
	85,51	84.82	Jul-2019	2.72	82.79
	85.51	84.82	Nov-2019	3.29	82.22
	85,51	84.82	Mav-2020	2.48	83.03
	85,51	84.82	Oct-2020	3.33	82.18
	85.51	84.82	Apr-2021	2.63	82.88
	85,51	84.82	Nov-2021	3.28	82.23
	85.51	84.82	Apr-2022	2.69	82.82

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)
	(((
	85.51	84.82	Dec-2022	3.38	82.13
	85.51	84.82	May-2023	2.46	83.05
	85.51	84.82	Oct-2023	3.49	82.02
	85.51	84.82	Apr-2024	2.93	82.58
	85.51	84.82	Dec-2024	3.18	82.33
вн 2	91 21	90.53	Διισ-2004	7 25	83.96
DITZ	91 21	90.53	Sen-2004	7.23	83.70
	91 21	90.53	May-2005	5.60	85.61
	91 21	90.53	Δυσ-2005	7 51	83 70
	91 21	90.53	Dec-2005	6.43	84 78
	91 21	90.53	May-2006	6.10	85.11
	91.21	90.53	Sen-2006	6.83	84 38
	91.21	90.53	Nov-2006	6.36	84.85
	91 21	90.53	Apr-2007	5 39	85.82
	91.21	90.53	Διισ-2007	6 79	84.42
	91 21	90.53	Oct-2007	6.98	84.23
	91 21	90.53	Apr-2008	4 97	86.24
	91.21	90.53	Aug-2008	6.88	84.33
	91 21	90.53	Nov-2008	7 01	84 20
	91.21	90.53	Apr-2009	5.78	85.43
	91.21	90.53	Aug-2009	6.82	84.39
	91 21	90.53	Oct-2009	7 21	84.00
	91.21	90.53	May-2010	6.20	85.01
	91.21	90.53	Sep-2010	7.01	84.20
	91.21	90.53	Nov-2010	6.41	84.80
	91.21	90.53	May-2011	5.63	85.58
	91.21	90.53	Sep-2011	7.29	83.92
	91.21	90.53	May-2012	6.31	84.90
	91.21	90.53	Nov-2012	7.26	83.95
	91.21	90.53	May-2013	5.43	85.78
	91.21	90.53	Aug-2013	6.63	84.58
	91.21	90.53	Nov-2013	6.99	84.22
	91.21	90.53	Mav-2014	5.53	85.68
	91.21	90.53	Aug-2014	6.84	84.37
	91.21	90.53	May-2015	6.13	85.08
	91.21	90.53	, Sep-2016	6.93	84.28
	91.21	90.53	Dec-2016	6.78	84.43
	91.21	90.53	May-2017	4.86	86.35
	91.21	90.53	Dec-2017	6.76	84.45
	91.21	90.53	Jun-2018	6.40	84.81
	91.21	90.53	Dec-2018	7.12	84.09
	91.21	90.53	Jul-2019	6.45	84.76
	91.21	90.53	Nov-2019	7.44	83.77
	91.21	90.53	May-2020	6.02	85.19
	91.21	90.53	Oct-2020	7.07	84.14

Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation
	(mASL)	(mASL)		Top of Pipe (m)	(mASL)
	91.21	90.53	Apr-2021	5.60	85.61
	91.21	90.53	Nov-2021	6.99	84.22
	91.21	90.53	Apr-2022	5.87	85.34
	91.21	90.53	Dec-2022	7.02	84.19
	91.21	90.53	May-2023	5.97	85.24
	91.21	90.53	Oct-2023	7.42	83.79
	91.21	90.53	Apr-2024	6.35	84.86
	91.21	90.53	Dec-2024	6.86	84.35
BH 3	86.47	85.69	Aug-2004	DRY	<81.07
	86.47	85.69	Sep-2004	DRY	<81.07
	86.47	85.69	May-2005	4.11	82.36
	86.47	85.69	Aug-2005	DRY	<81.07
	86.47	85.69	Dec-2005	DRY	<81.07
	86.47	85.69	May-2006	4.33	82.14
	86.47	85.69	Sep-2006	5.30	81.17
	86.47	85.69	Nov-2006	DRY	<81.07
	86.47	85.69	Apr-2007	4.13	82.34
	86.47	85.69	Aug-2007	5.21	81.26
	86.47	85.69	Oct-2007	DRY	<81.07
	86.47	85.69	Apr-2008	3.61	82.86
	86.47	85.69	Aug-2008	5.25	81.22
	86.47	85.69	Nov-2008	DRY	<81.07
	86.47	85.69	Apr-2009	4.28	82.19
	86.47	85.69	Aug-2009	DRY	<81.07
	86.47	85.69	Oct-2009	DRY	<81.07
	86.47	85.69	May-2010	4.68	81.79
	86.47	85.69	Sep-2010	DRY	<81.07
	86.47	85.69	Nov-2010	5.00	81.47
	86.47	85.69	May-2011	4.06	82.41
	86.47	85.69	Sep-2011	DRY	<81.07
	86.47	85.69	May-2012	4.65	81.82
	86.47	85.69	Nov-2012	DRY	<81.07
	86.47	85.69	May-2013	4.00	82.47
	86.47	85.69	Aug-2013	4.85	81.62
	86.47	85.69	Nov-2013	5.35	81.12
	86.47	85.69	May-2014	4.10	82.37
	86.47	85.69	Aug-2014	5.18	81.29
	86.47	85.69	May-2015	4.63	81.84
	86.47	85.69	Sep-2016	5.26	81.21
	86.47	85.69	Dec-2016	5.23	81.24
	86.47	85.69	May-2017	3.28	83.19
	86.47	85.69	Dec-2017	5.09	81.38
	86.47	85.69	Jun-2018	4.64	81.83
	86.47	85.69	Dec-2018	DRY	<81.07
	86.47	85.69	Jul-2019	4.62	81.85

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)	
	86.47	85.69	Nov-2019	DRY	<81.07	
	86.47	85.69	May-2020	4.31	82.16	
	86.47	85.69	Oct-2020	DRY	<81.07	
	86.47	85.69	Apr-2021	4.34	82.13	
	86.47	85.69	Nov-2021	5.31	81.16	
	86.47	85.69	Apr-2022	4.50	81.97	
	86.47	85.69	Dec-2022	DRY	<81.07	
	86.47	85.69	May-2023	4.22	82.25	
	86.47	85.69	Oct-2023	DRY	<81.07	
	86.47	85.69	Apr-2024	4.87	81.60	
	86.47	85.69	Dec-2024	5.15	81.32	
BH 4	84.58	83.87	May-2013	2.42	82.16	Installed May 2, 2013
	84.58	83.87	Aug-2013	2.97	81.61	
	84.58	83.87	Nov-2013	dry	<81.44	
	84.58	83.87	May-2014	2.51	82.07	
	84.58	83.87	Aug-2014	DRY	<81.44	
	84.58	83.87	May-2015	2.82	81.76	
	84.58	83.87	Sep-2016	DRY	<81.44	
	84.58	83.87	Dec-2016	DRY	<81.44	
	84.58	83.87	May-2017	1.97	82.61	
	84.58	83.87	Dec-2017	DRY	<81.44	

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)	
	84.58	83.87	Jun-2018	2.82	81.76	
	84.58	83.87	Dec-2018	DRY	<81.44	
	84.58	83.87	Jul-2019	2.80	81.78	
	84.58	83.87	Nov-2019	DRY	<81.44	
	84.58	83.87	May-2020	2.63	81.95	
	84.58	83.87	Oct-2020	DRY	<81.44	
	84.58	83.87	Apr-2021	2.67	81.91	
	84.58	83.87	Nov-2021	DRY	<81.44	
	84.58	83.87	Apr-2022	2.75	81.83	
	84.58	83.87	Dec-2022	DRY	<81.44	
	84.58	83.87	May-2023	2.98	81.83	
	84.58	83.87	Oct-2023	DRY	<81.44	
	84.58	83.87	Apr-2024	DRY	<81.44	
	84.58	83.87	Dec-2024	DRY	<81.45	
BH 5	84.72	83.72	May-2013	2.00	82.72	Installed May 2, 2013
	84.72	83.72	Aug-2013	2.53	82.19	
	84.72	83.72	Nov-2013	2.90	81.82	
	84.72	83.72	May-2014	2.03	82.69	
	84.72	83.72	Aug-2014	2.76	81.96	
	84.72	83.72	May-2015	2.36	82.36	
	84.72	83.72	Sep-2016	2.88	81.84	

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)	
	84.72	83.72	Dec-2016	2.80	81.92	
	84.72	83.72	May-2017	1.73	82.99	
	84.72	83.72	Dec-2017	2.70	82.02	
	84.72	83.72	Jun-2018	2.33	82.39	
	84.72	83.72	Dec-2018	3.03	81.69	
	84.72	83.72	Jul-2019	2.28	82.44	
	84.72	83.72	Nov-2019	2.92	81.80	
	84.72	83.72	May-2020	2.10	82.62	
	84.72	83.72	Oct-2020	2.96	81.76	
	84.72	83.72	Apr-2021	2.21	82.51	
	84.72	83.72	Nov-2021	2.89	81.83	
	84.72	83.72	Apr-2022	2.25	82.47	
	84.72	83.72	Dec-2022	3.01	81.71	
	84.72	83.72	May-2023	2.07	82.65	
	84.72	83.72	Oct-2023	DRY	<81.59	
	84.72	83.72	Apr-2024	2.46	82.26	
	84.72	83.72	Dec-2024	2.74	81.98	
BH 6	84.03	83.08	May-2013	1.25	82.78	Installed May 2, 2013
	84.03	83.08	Aug-2013	1.86	82.17	-
	84.03	83.08	Nov-2013	2.29	81.74	
	84.03	83.08	May-2014	1.34	82.69	

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)
	84.03	83.08	Aug-2014	2.13	81.90
	84.03	83.08	May-2015	1.70	82.33
	84.03	83.08	, Sep-2016	2.23	81.80
	84.03	83.08	Dec-2016	2.19	81.84
	84.03	83.08	May-2017	1.05	82.98
	84.03	83.08	Dec-2017	2.07	81.96
	84.03	83.08	Jun-2018	1.64	82.39
	84.03	83.08	Dec-2018	2.45	81.58
	84.03	83.08	Jul-2019	1.61	82.42
	84.03	83.08	Nov-2019	2.31	81.72
	84.03	83.08	May-2020	1.39	82.64
	84.03	83.08	Oct-2020	2.35	81.68
	84.03	83.08	Apr-2021	1.56	82.47
	84.03	83.08	Nov-2021	2.27	81.76
	84.03	83.08	Apr-2022	1.59	82.44
	84.03	83.08	Dec-2022	2.39	81.64
	84.03	83.08	May-2023	1.38	82.65
	84.03	83.08	Oct-2023	2.54	81.49
	84.03	83.08	Apr-2024	1.82	82.21
	84.03	83.08	Dec-2024	2.12	81.91
MP1	86.21	84.95	lun-2000	2.26	83.95
	86.21	84.95	Aug-2000	1.83	84.38
	86.21	84.95	Jun-2001	1.04	85.17
	86.21	84.95	Aug-2001	DRY	<83.69
	86.21	84.95	Nov-2001	DRY	<83.69
	86.21	84.95	Oct-2002	DRY	<83.69
	86.21	84.95	Jun-2003	0.74	85.47
	86.21	84.95	Aug-2003	1.51	84.70
	86.21	84.95	Nov-2003	DRY	<83.69
	86.21	84.95	Apr-2004	0.29	85.92
	86.21	84.95	Aug-2004	DRY	<83.69
	86.21	84.95	Sep-2004	DRY	<83.69
	86.21	84.95	May-2005	-0.60	86.81
	86.21	84.95	Aug-2005	DRY	<83.69
	86.21	84.95	Dec-2005	DRY	<83.69
	86.21	84.95	May-2006	0.70	85.51
	86.21	84.95	Sep-2006	1.82	84.39
	86.21	84.95	Nov-2006	1.83	84.38
	86.21	84.95	Apr-2007	0.50	85.71
	86.21	84.95	Aug-2007	1.79	84.42
	86.21	84.95	Oct-2007	DRY	<83.69
	86.21	84.95	Apr-2008	-0.34	86.55
	86.21	84.95	Aug-2008	1.81	84.40
	86.21	84.95	Nov-2008	1.84	84.37
	86.21	84.95	Apr-2009	0.02	86.19
	86.21	84.95	Aug-2009	1.79	84.42
	86.21	84.95	Oct-2009	DRY	<83.69
	86.21	84.95	May-2010	0.86	85.35
	86.21	84.95	Sep-2010	1.80	84.41
	86.21	84.95	Nov-2010	1.81	84.40
	86.21	84.95	May-2011	0.09	86.12
	86.21	84.95	Sep-2011	DRY	<83.69
	86.21	84.95	May-2012	1.00	85.21
	86.21	84.95	Nov-2012	DRY	<83.69
	86.21	84.95	May-2013	Over Top of Pipe	>86.21

Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation	
	(mASL)	(mASL)		Top of Pipe (m)	(mASL)	
	86.21	84.95	Aug-2013	1.38	84.83	
	86.21	84.95	Nov-2013	DRY	<83.69	
	86.21	84.95	May-2014	0.18	86.03	
	86.21	84.95	Aug-2014	1.69	84.52	
	86.21	84.95	May-2015	0.89	<83.69	
	86.21	84.95	Sep-2016	DRY	86.21	
	86.21	84.95	Dec-2016	1.83	84.38	Frozen @ 1.83
	86.21	84.95	May-2017	Over Top of Pipe	>86.21	
	86.21	84.95	Dec-2017	1.56	84.65	
	86.21	84.95	Jun-2018	1.05	85.16	
	86.21	84.95	Dec-2018	0.62	85.59	Frozen @ 0.62
	86.21	84.95	Jui-2019	1.05	85.16	
	86.21	84.95	Nov-2019	DRY	86.21	
	86.21	84.95	Niay-2020	0.37	85.84	
	86.21	84.95	Oct-2020	Dry	<83.69	
	86.21	84.95	Apr-2021	0.53	85.68	
	86.21	84.95	NOV-2021	1.82	84.39	
	86.21	84.95	Apr-2022	0.67	85.54	
	86.21	84.95	Dec-2022	DRY	<83.69	
	80.21	84.95	IVIAy-2023	0.23	85.98	
	86.21	84.95	Oct-2023	DRY	<83.69	
	86.21	84.95	Apr-2024	1.41	84.80	
	80.21	84.95	Dec-2024	1.81	84.40	
MP1	86.21	84.95	lun-2000	0.95	85.26	
(pond level)	86.21	84.95	lun-2001	1.07	85.14	
(1	86.21	84.95	Aug-2001	DRY	<84.95	
	86.21	84.95	Nov-2001	DRY	<84.95	
	86.21	84.95	Oct-2002	DRY	<84.95	
	86.21	84.95	Jun-2003	0.64	85.57	
	86.21	84.95	Aug-2003	DRY	<84.95	
	86.21	84.95	Nov-2003	DRY	<84.95	
	86.21	84.95	Apr-2004	0.27	85.94	
	86.21	84.95	Aug-2004	DRY	<84.95	
	86.21	84.95	Sep-2004	DRY	<84.95	
	86.21	84.95	May-2005	-0.60	86.81	
	86.21	84.95	Aug-2005	DRY	<84.95	
	86.21	84.95	Dec-2005	DRY	<84.95	
	86.21	84.95	May-2006	0.72	85.49	
	86.21	84.95	Sep-2006	DRY	<84.95	
	86.21	84.95	Nov-2006	DRY	<84.95	
	86.21	84.95	Apr-2007	0.52	85.69	
	86.21	84.95	Aug-2007	DRY	<84.95	
	86.21	84.95	Oct-2007	DRY	<84.95	
	86.21	84.95	Apr-2008	-0.34	86.55	
	86.21	84.95	Aug-2008	DRY	<84.95	
	86.21	84.95	Nov-2008	DRY	<84.95	
	86.21	84.95	Apr-2009	0.22	85.99	
	86.21	84.95	Aug-2009	DRY	<84.95	
	86.21	84.95	Oct-2009	DRY	<84.95	
	86.21	84.95	May-2010	0.89	85.32	
	86.21	84.95	Sep-2010	DRY	<84.95	
	86.21	84.95	Nov-2010	DRY	<84.95	
	86.21	84.95	May-2011	0.08	86.13	
	86.21	84.95	Sep-2011	DRY	<84.95	

Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation
	(mASL)	(mASL)		Top of Pipe (m)	(mASL)
	86.21	84.95	May-2012	1.01	85.20
	86.21	84.95	Nov-2012	DRY	<84.95
	86.21	84.95	May-2013	Over Top of Pipe	>86.21
	86.21	84.95	Aug-2013	DRY	<84.95
	86.21	84.95	Nov-2013	DRY	<84.95
	86.21	84.95	May-2014	0.18	86.03
	86.21	84.95	Aug-2014	DRY	<84.95
	86.21	84.95	May-2015	0.90	85.31
	86.21	84.95	Sep-2016	DRY	<84.95
	86.21	84.95	Dec-2016	DRY	<84.95
	86.21	84.95	May-2017	Over Top of Pipe	>86.21
	86.21	84.95	Dec-2017	DRY	<84.95
	86.21	84.95	Jun-2018	1.05	85.16
	86.21	84.95	Dec-2018	DRY	<84.95
	86.21	84.95	Jul-2019	1.03	85.18
	86.21	84.95	Nov-2019	DRY	<84.95
	86.21	84.95	May-2020	0.25	85.96
	86.21	84.95	Oct-2020	DRY	<84.95
	86.21	84.95	Apr-2021	0.51	85.70
	86.21	84.95	Nov-2021	DRY	<84.95
	86.21	84.95	Apr-2022	0.67	85.54
	86.21	84.95	Dec-2022	DRY	<84.95
	86.21	84.95	May-2023	0.30	85.54
	86.21	84.95	Oct-2023	DRY	<84.95
	86.21	84.95	Apr-2024	DRY	<84.95
	86.21	84.95	Dec-2024	DRY	<84.96
MDO	94 21	o2 77	lup 2000	1.05	92 16
IVIPZ	84.21	83.22	Jun-2000	1.05	83.10
	84.21	83.22 93.33	Aug-2000	1.59	82.02
	04.21	03.22	Jun-2001	1.47	82.74
	84.21	83.22	Nov-2001	2.12	82.09
	84.21	03.22 92.22	Oct 2002	2.03	82.18
	84.21	83.22	lun-2003	1 31	82.99
	84 21	83.22	Διισ-2003	1.51	82.56
	84 21	83.22	Nov-2003	2.05	81.99
	84 21	83.22	Apr-2004	1 15	83.06
	84 21	83.22	Δμσ-2004	2.06	82.15
	84.21	83.22	Sen-2004	2.00	81 92
	84.21	83.22	May-2005	0.92	83.29
	84.21	83.22	Aug-2005	2.29	81.92
	84.21	83.22	Dec-2005	1.92	82.29
	84.21	83.22	May-2006	1.18	83.03
	84.21	83.22	Sep-2006	1.90	82.31
	84.21	83.22	Nov-2006	1.73	82.48
	84.21	83.22	Apr-2007	1.18	83.03
	84.21	83.22	Aug-2007	1.90	82.31
	84.21	83.22	Oct-2007	2.05	82.16
	84.21	83.22	Apr-2008	0.90	83.31
	84.21	83.22	Aug-2008	1.95	82.26
	84.21	83.22	Nov-2008	1.95	82.26
	84.21	83.22	Apr-2009	1.10	83.11
	84.21	83.22	Aug-2009	1.91	82.30
	84.21	83.22	Oct-2009	2.16	82.05
	84.21	83.22	May-2010	1.49	82.72
	84.21	83.22	Sep-2010	2.08	82.13

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)
	84.21	83.22	Nov-2010	1.71	82.50
	84.21	83.22	May-2011	1.01	83.20
	84.21	83.22	Sep-2011	2.19	82.02
	84.21	83.22	May-2012	1.45	82.76
	84.21	83.22	, Nov-2012	2.04	82.17
	84.21	83.22	May-2013	1.01	83.20
	84.21	83.22	, Aug-2013	1.64	82.57
	84.21	83.22	Nov-2013	1.96	82.25
	84.21	83.22	Mav-2014	1.06	83.15
	84.21	83.22	, Aug-2014	1.85	82.36
	84.21	83.22	May-2015	1.48	82.73
	84.21	83.22	, Sep-2016	1.98	82.23
	84.21	83.22	Dec-2016	1.90	82.31
	84.21	83.22	May-2017	0.84	83.37
	84.21	83.22	Dec-2017	1.79	82.42
	84.21	83.22	Jun-2018	1.41	82.80
	84.21	83.22	Dec-2018	1.51	82.70
	84.21	83.22	Jul-2019	1.34	82.87
	84.21	83.22	Nov-2019	1.98	82.23
	84.21	83.22	May-2020	1.11	83.10
	84.21	83.22	, Oct-2020	1.90	82.31
	84.21	83.22	Apr-2021	1.29	82.92
	84.21	83.22	Nov-2021	1.94	82.27
	84.21	83.22	Apr-2022	1.35	82.86
	84.21	83.22	Dec-2022	2.05	82.16
	84.21	83.22	May-2023	1.02	83.19
	84.21	83.22	, Oct-2023	2.13	82.08
	84.21	83.22	Apr-2024	1.60	82.61
	84.21	83.22	Dec-2024	1.82	82.39
MD2	84 21	83.33	lun-2000	0.95	83.26
lvir 2	84.21	83.22	Aug-2000	0.95	<pre>// 23.20</pre>
(surface	84.21	83.22	Aug-2000		~83.22
water level)	84.21	83.22	Aug-2001		<83.22
	84.21	83.22	Nov-2001		<83.22
	84.21	83.22	Oct-2001	DRY	<83.22
	84.21	83.22	lun-2003	DRY	<83.22
	84.21	83.22	Aug-2003	DRY	<83.22
	84.21	83.22	Nov-2003	DRY	<83.22
	84.21	83.22	Apr-2004	DRY	<83.22
	84.21	83.22	Δυσ-2004	DRY	<83.22
	84.21	83.22	Sen-2004	DRY	<83.22
	84.21	83.22	May-2005	DRY	<83.22
	84.21	83.22	Aug-2005	DRY	<83.22
	84.21	83.22	Dec-2005	DRY	<83.22
	84.21	83.22	May-2006	DRY	<83.22
	84,21	83.22	Sen-2006	DRY	<83.22
	84,21	83.22	Nov-2006	DRY	<83.22
	84,21	83.22	Apr-2007	DRY	<83.22
	84 21	83.22	Διισ-2007	DRY	<83.22
	84,21	83.22	Oct-2007	DRY	<83.22
	84.21	83.22	Apr-2002	DRV	<82.22
	84,21	83.22	Αμσ-2008	DRY	<83.22
	84.21	83.22	Nov-2008	DRY	<83.22
	~ ··	JU			

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)
	84.21	83.22	Apr-2009	DRY	<83.22
	84.21	83.22	Aug-2009	DRY	<83.22
	84.21	83.22	Oct-2009	DRY	<83.22
	84.21	83.22	May-2010	DRY	<83.22
	84.21	83.22	Sep-2010	DRY	<83.22
	84.21	83.22	Nov-2010	DRY	<83.22
	84.21	83.22	May-2011	DRY	<83.22
	84.21	83.22	Sep-2011	DRY	<83.22
	84.21	83.22	May-2012	DRY	<83.22
	84.21	83.22	Nov-2012	DRY	<83.22
	84.21	83.22	May-2013	DRY	<83.22
	84.21	83.22	Aug-2013	DRY	<83.22
	84.21	83.22	Nov-2013	DRY	<83.22
	84.21	83.22	May-2014	DRY	<83.22
	84.21	83.22	Aug-2014	DRY	<83.22
	84.21	83.22	May-2015	DRY	<83.22
	84.21	83.22	Sep-2016	DRY	<83.22
	84.21	83.22	Dec-2016	DRY	<83.22
	84.21	83.22	May-2017	0.91	83.30
	84.21	83.22	Dec-2017	DRY	<83.22
	84.21	83.22	Jun-2018	DRY	<83.22
	84.21	83.22	Dec-2018	DRY	<83.22
	84.21	83.22	Jul-2019	DRY	<83.22
	84.21	83.22	Nov-2019	DRY	<83.22
	84.21	83.22	Apr-21	DRY	<83.22
	84.21	83.22	Nov-21	DRY	<83.22
	84.21	83.22	Apr-2022	DRY	<83.22
	84.21	83.22	Dec-2022	DRY	<83.22
	84.21	83.22	Mav-2023	DRY	<83.23
	84.21	83.22	Oct-2023	DRY	<83.24
	84.21	83.22	Apr-2024	DRY	<83.24
	84.21	83.22	Dec-2024	DRY	<83.25
MD3	83.02	82.07	May-2001	2 34	80.68
IVIT 5	82.02	82.07	lup 2001	0.42	82.60
	83.02	82.07	Jun-2001	1.02	82.00
	83.02	82.07	Aug-2001	1.02	82.00
	82.91	82.07	Oct 2002	1 1 2	01.57 01.70
	82.91	82.07	Uct-2002	1.15	01.70
	82.91	82.07	Jun-2003	0.20	82.71
	82.91	82.07	Aug-2003	0.50	02.35
	82.91	82.07	NOV-2003	1.13	81.78
	82.91	82.07	Apr-2004	0.05	82.80
	82.91	82.07	Aug-2004	1.09	81.82
	82.91	82.07	Sep-2004	1.18	81.73
	82.91	82.07	May-2005	-0.20	83.11
	82.91	82.07	Aug-2005	1.18	81.73
	82.91	82.07	Dec-2005	0.86	82.05
	82.91	82.07	May-2006	0.40	> 82.91
	82.91	82.07	Sep-2006	0.43	82.48
	82.91	82.07	Nov-2006	0.50	82.41
	82.91	82.07	Apr-2007	0.11	82.80
	82.91	82.07	Aug-2007	0.22	82.69
	82.91	82.07	Oct-2007	0.93	81.98
	82.91	82.07	Apr-2008	-0.02	82.93
	82.91	82.07	Aug-2008	0.20	82.71

Table E1: Groundwater Elevations North Algona Landfill

(mASL) Top of Pipe (m) (mASL) 82.91 82.07 Avr-2008 0.87 82.04 82.91 82.07 Apr-2009 0.03 82.88 82.91 82.07 Apr-2009 0.03 82.88 82.91 82.07 May-2010 0.99 81.92 82.91 82.07 May-2010 0.99 81.92 82.91 82.07 May-2011 0.99 81.92 82.91 82.07 May-2011 0.01 82.91 82.91 82.07 May-2012 0.96 81.95 82.91 82.07 May-2012 0.96 81.95 82.91 82.07 May-2012 0.96 81.95 82.91 82.07 May-2013 0.01 82.99 82.91 82.07 May-2014 0.06 82.10 82.91 82.07 May-2015 0.01 82.10 82.91 82.07 May-2016 0.31 82.10 82.91	Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation	
82.91 82.07 Nov-2008 0.87 82.04 82.91 82.07 Apr-2009 0.03 82.88 82.91 82.07 Aug-2009 0.03 82.88 82.91 82.07 Aug-2009 0.14 81.87 82.91 82.07 May-2010 0.53 82.32 82.91 82.07 May-2010 0.62 82.29 82.91 82.07 May-2011 0.61 81.95 82.91 82.07 May-2012 0.31 82.60 82.91 82.07 May-2013 0.01 82.92 82.91 82.07 May-2014 0.06 82.23 82.91 82.07 May-2013 0.01 82.92 82.91 82.07 May-2014 0.03 82.88 82.91 82.07 May-2014 0.03 82.88 82.91 82.07 May-2017 Over Top of Pipe 82.91 82.91 82.07 May-2017 Over Top of Pipe 8		(mASL)	(mASL)		Top of Pipe (m)	(mASL)	
22.91 82.07 Apr.2009 0.03 82.88 82.91 82.07 Aug.2009 0.81 82.10 82.91 82.07 Gr.2009 0.81 82.10 82.91 82.07 May-2010 0.39 82.52 82.91 82.07 May-2010 0.62 82.29 82.91 82.07 May-2010 0.62 82.29 82.91 82.07 May-2011 Over Top of Pipe >82.91 82.91 82.07 May-2012 0.31 82.60 82.91 82.07 May-2013 0.01 82.92 82.91 82.07 May-2013 0.01 82.92 82.91 82.07 May-2013 0.03 82.88 82.91 82.07 May-2014 0.03 82.88 82.91 82.07 May-2015 0ver Top of Pipe \$2.91 82.91 82.07 Dec-2016 0.81 82.10 82.91 82.07 Dec-2017 0.73 8		82 01	82.07	Nov-2008	0.87	82.04	
Display Display <thdisplay< th=""> <t< td=""><td></td><td>82.91</td><td>82.07</td><td>Δnr-2009</td><td>0.07</td><td>82.04</td><td></td></t<></thdisplay<>		82.91	82.07	Δnr-2009	0.07	82.04	
Aug Construction Construction Construction 82.91 82.07 Ort 22009 1044 81.87 82.91 82.07 May-2010 0.39 82.52 82.91 82.07 May-2010 0.62 82.39 82.91 82.07 May-2011 Over Top of Pipe >82.91 82.91 82.07 May-2012 0.31 82.60 82.91 82.07 May-2013 -0.01 82.92 82.91 82.07 May-2013 -0.01 82.92 82.91 82.07 May-2014 0.03 82.88 82.91 82.07 May-2014 0.03 82.88 82.91 82.07 May-2014 0.66 82.25 82.91 82.07 May-2015 0.02 82.81 82.91 82.07 May-2017 0.66 82.291 82.91 82.07 May-2017 0.73 82.16 82.91 82.07 May-2020 0.66 82.81		82.91	82.07	Δμσ-2009	0.05	82.00	
82.91 82.07 May-2010 0.39 82.52 82.91 82.07 Sep-2010 0.99 81.92 82.91 82.07 May-2010 0.62 82.93 82.91 82.07 May-2011 0.62 82.93 82.91 82.07 May-2012 0.31 82.60 82.91 82.07 May-2012 0.96 81.95 82.91 82.07 May-2013 0.01 82.92 82.91 82.07 May-2014 0.03 82.81 82.91 82.07 May-2014 0.06 82.89 82.91 82.07 May-2014 0.03 82.88 82.91 82.07 May-2014 0.03 82.88 82.91 82.07 May-2017 0.73 82.18 82.91 82.07 May-2017 0.73 82.18 82.91 82.07 May-2017 0.73 82.18 82.91 82.07 May-2010 0.75 82.16		82.91	82.07	Oct-2009	1 04	81.87	
NP3 82.91 82.07 Nov-2010 0.62 82.29 82.91 82.07 Nov-2010 0.62 82.29 82.91 82.07 May-2011 Over Top of Pipe >82.91 82.91 82.07 May-2011 0.96 81.95 82.91 82.07 May-2012 0.96 81.95 82.91 82.07 May-2013 0.01 82.90 82.91 82.07 May-2014 0.66 82.91 82.91 82.07 May-2014 0.66 82.28 82.91 82.07 May-2014 0.66 82.28 82.91 82.07 May-2015 Over Top of Pipe >82.91 82.91 82.07 May-2017 Over Top of Pipe 82.91 82.91 <t< td=""><td></td><td>82.91</td><td>82.07</td><td>May-2010</td><td>0.39</td><td>82 52</td><td></td></t<>		82.91	82.07	May-2010	0.39	82 52	
B2.91 B2.07 Mov-2010 Over Top of Pipe > 82.91 82.91 82.07 May-2011 Over Top of Pipe > 82.91 82.91 82.07 May-2012 0.31 82.60 82.91 82.07 May-2013 -0.01 82.92 82.91 82.07 May-2013 -0.01 82.92 82.91 82.07 May-2013 0.01 82.90 82.91 82.07 May-2014 0.66 82.25 82.91 82.07 May-2017 Over Top of Pipe > 82.91 82.91 82.07 May-2017 Over Top of Pipe > 82.91 82.91 82.07 May-2017 Over Top of Pipe > 82.91 82.91 82.07 Mov-2019 0.75 82.16 82.91 82.07 M		82.91	82.07	Sen-2010	0.99	81 92	
B2.51 B2.07 May-201 Over Top of Pipe > 82.51 82.51 82.07 Sep-2011 1.10 81.81 82.51 82.07 May-2012 0.96 81.95 82.91 82.07 May-2013 0.01 82.92 82.91 82.07 May-2013 0.01 82.90 82.91 82.07 May-2014 0.06 82.81 82.91 82.07 May-2014 0.06 82.81 82.91 82.07 May-2015 Over Top of Pipe >82.91 82.91 82.07 Dec-2016 0.03 82.88 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Dec-2017 0.73 82.16 82.91 82.07 May-2010 0.06 82.89 82.91 82.07 May-2010 0.30 82.61 82.91 82.07 May-2010 0.37 <td< td=""><td></td><td>82.91</td><td>82.07</td><td>Nov-2010</td><td>0.62</td><td>82.29</td><td></td></td<>		82.91	82.07	Nov-2010	0.62	82.29	
B2 91 B2 07 Sep 201 L 1.0 B1.81 B2 91 B2.07 May-2012 0.31 B2.60 B2 91 B2.07 Nov-2012 0.36 B1.95 B2 91 B2.07 May-2013 -0.01 B2.92 B2 91 B2.07 May-2013 0.06 B1.95 B2 91 B2.07 May-2014 0.06 B2.88 B2 91 B2.07 May-2014 0.06 B2.88 B2 91 B2.07 May-2014 0.06 B2.81 B2 91 B2.07 May-2014 0.06 B2.91 B2.91 B2.07 May-2015 Over Top of Pipe > 82.91 B2.91 B2.07 May-2017 Over Top of Pipe > 82.91 B2.91 B2.07 May-2019 0.75 B2.16 B2.91 B2.07 May-2020 D.06 82.85 B2.91 B2.07 May-2020 D.07 82.16 B2.91 B2.07 May-2021 0.33		82.91	82.07	May-2011	Over Top of Pipe	> 82.91	
Name Name <th< td=""><td></td><td>82.91</td><td>82.07</td><td>Sep-2011</td><td>1.10</td><td>81.81</td><td></td></th<>		82.91	82.07	Sep-2011	1.10	81.81	
82.91 82.07 Nov-202 0.96 81.95 82.91 82.07 May-2013 -0.01 82.92 82.91 82.07 May-2013 0.01 82.90 82.91 82.07 May-2014 0.06 82.25 82.91 82.07 May-2014 0.66 82.25 82.91 82.07 May-2015 Over Top of Pipe > 82.91 82.91 82.07 May-2015 Over Top of Pipe > 82.91 82.91 82.07 Dec-2016 0.81 82.10 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 Apr-2021 0.36 82.61 82.91 82.07 Apr-2021 0.36 <		82.91	82.07	May-2012	0.31	82.60	
B2.91 B2.07 May-2013 -0.01 B2.92 B2.91 B2.07 Aug-2013 0.01 B2.90 B2.91 B2.07 Nov-2013 0.86 B2.05 B2.91 B2.07 Aug-2014 0.03 B2.84 B2.91 B2.07 Aug-2014 0.66 B2.25 B2.91 B2.07 May-2015 Over Top of Pipe >82.91 B2.91 B2.07 May-2017 Over Top of Pipe >82.91 B2.91 B2.07 Dec-2016 0.03 B2.81 B2.91 B2.07 Dec-2017 0.73 B2.18 B2.91 B2.07 Dec-2018 1.02 81.89 B2.91 B2.07 Dec-2018 1.02 81.89 B2.91 B2.07 Nov-2019 0.75 82.16 B2.91 B2.07 Nay-2020 0.06 82.85 B2.91 B2.07 Nov-2021 0.98 81.93 B2.91 B2.07 Nov-2021 0.98 <t< td=""><td></td><td>82.91</td><td>82.07</td><td>Nov-2012</td><td>0.96</td><td>81.95</td><td></td></t<>		82.91	82.07	Nov-2012	0.96	81.95	
B2.91 B2.07 Aug.2013 O.01 B2.90 82.91 B2.07 Nov-2013 0.86 B2.91 82.91 B2.07 May-2014 0.03 B2.88 82.91 B2.07 May-2015 Over Top of Pipe B2.91 82.91 B2.07 Sep-2016 0.03 B2.88 82.91 B2.07 Dec-2016 0.81 B2.10 Frozen (82.91 B2.07 Dec-2017 0.73 82.81 B2.91 B2.07 Dec-2017 0.73 82.84 82.91 B2.07 Jul-2018 0.00 B2.91 B2.07 Jul-2019 0.27 82.64 82.91 B2.07 May-2020 0.06 B2.85 B2.91 B2.07 Nov-2019 0.75 B2.16 82.91 B2.07 May-2020 0.06 B2.85 B2.91 B2.07 May-2020 0.83 B2.91 82.91 B2.07 May-2021 0.30 B2.61 B2.91 B2.07 May-2023		82.91	82.07	May-2013	-0.01	82.92	
B2.91 B2.07 Nov-2013 0.366 B2.05 B2.91 B2.07 May-2014 0.03 B2.88 B2.91 B2.07 May-2014 0.66 B2.25 B2.91 B2.07 May-2015 Over Top of Pipe > 82.91 B2.91 B2.07 Dec-2016 0.81 B2.10 Frozen (1) B2.91 B2.07 Dec-2016 0.81 B2.10 Frozen (1) B2.91 B2.07 Dec-2017 0.73 B2.18 B2.91 B2.91 B2.07 Dec-2018 1.02 B1.89 B2.91 B2.07 Nov-2019 0.75 B2.16 B2.91 B2.07 Nov-2019 0.75 B2.16 B2.91 B2.07 May-2020 0.06 B2.85 B2.91 B2.07 May-2021 0.30 B2.61 B2.91 B2.07 May-2022 0.40 B2.81 B2.91 B2.07 May-2023 0.44 B2.47 B2.91 B2		82.91	82.07	Aug-2013	0.01	82.90	
B2.91 B2.07 May-2014 0.03 B2.81 B2.91 B2.07 Aug-2014 0.66 B2.25 B2.91 B2.07 May-2015 Over Top of Pipe > 82.91 B2.91 B2.07 Sep-2016 0.03 82.88 B2.91 B2.07 Dec-2016 0.81 B2.10 Frozen (B2.91 B2.07 Dec-2017 0.73 B2.91 B2.07 Duc-2018 1.02 81.89 B2.91 B2.07 Duc-2018 1.02 81.89 82.91 82.07 Nov-2019 0.75 82.16 B2.91 B2.07 May-2020 0.06 82.85 82.91 82.07 May-2021 0.30 82.61 B2.91 B2.07 May-2021 0.30 82.61 82.91 82.07 Apr-2021 0.30 82.81 B2.91 B2.07 Apr-2021 0.30 82.81 82.91 82.07 Apr-2021 0.33 81.83 B2.91 B2.07 Apr-2022		82.91	82.07	Nov-2013	0.86	82.05	
B2.91 B2.07 Aug.2014 0.66 B2.25 B2.91 B2.07 May.2015 Over Top of Pipe > 82.91 B2.91 B2.07 Dec-2016 0.81 B2.10 B2.91 B2.07 Dec-2016 0.81 B2.10 B2.91 B2.07 Dec-2016 0.81 B2.11 B2.91 B2.07 Dec-2017 0.73 B2.18 B2.91 B2.07 Dec-2018 1.00 B2.91 B2.91 B2.07 Dec-2018 1.02 B1.89 B2.91 B2.07 Nov-2019 0.75 B2.16 B2.91 B2.07 May-2020 0.06 B2.85 B2.91 B2.07 Apr-2021 0.30 B2.61 B2.91 B2.07 Apr-2021 0.30 B2.61 B2.91 B2.07 Apr-2022 Over Top of Pipe B2.91 B2.91 B2.07 Apr-2022 0.04 B2.81 B2.91 B2.07 Apr-2024 0.60 <td< td=""><td></td><td>82.91</td><td>82.07</td><td>May-2014</td><td>0.03</td><td>82.88</td><td></td></td<>		82.91	82.07	May-2014	0.03	82.88	
May 2015 Over Top of Pipe > 82.91 82.91 82.07 Sep-2016 0.03 82.88 82.91 82.07 Dec-2016 0.81 82.91 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Dec-2018 1.02 81.89 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 May-2021 0.98 81.93 82.91 82.07 May-2022 Over Top of Pipe 82.91 82.91 82.07 May-2023 Over Top of Pipe 82.91 82.91 82.07 May-2024 0.60 82.31 82.91 82.07 May-2021 0.97 82.54		82.91	82.07	Aug-2014	0.66	82.25	
MP3 82.91 82.07 Sep-2016 0.03 82.85 82.91 82.07 Dec-2016 0.81 82.10 Frozen (82.91 82.07 Dec-2017 0ver Top of Pipe > 82.91 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Dec-2018 1.02 81.89 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 Apr-2021 0.30 82.61 82.91 82.07 Apr-2022 Over Top of Pipe 82.91 82.91 82.07 Apr-2022 0.30 82.61 82.91 82.07 Apr-2022 0.33 81.88 82.91 82.07 Apr-2023 0.44 82.87 82.91 82.07		82.91	82.07	May-2015	Over Top of Pipe	> 82.91	
MP3 82.91 82.07 Dec-2016 0.81 82.10 Frozen (82.91 82.07 Dec-2017 0.ver Top of Pipe > 82.91 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Dec-2018 1.02 81.89 82.91 82.07 Dec-2018 1.02 81.89 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 May-2020 0.066 82.85 82.91 82.07 Apr-2021 0.30 82.61 82.91 82.07 Apr-2021 0.30 82.61 82.91 82.07 Apr-2022 0ver Top of Pipe 82.91 82.91 82.07 May-2023 0.44 82.87 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 <t< td=""><td></td><td>82.91</td><td>82.07</td><td>Sep-2016</td><td>0.03</td><td>82.88</td><td></td></t<>		82.91	82.07	Sep-2016	0.03	82.88	
MP3 82.91 82.07 May-2017 Over Top of Pipe > 82.91 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Jul-2019 0.27 82.64 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 May-2021 0.30 82.61 82.91 82.07 May-2021 0.30 82.61 82.91 82.07 May-2022 Over Top of Pipe 82.91 82.91 82.07 May-2023 Over Top of Pipe 82.91 82.91 82.07 May-2023 Over Top of Pipe 82.91 82.91 82.07 May-2021 0.60 82.31 82.91 82.07 May-2021 0.42 82.47 (surface 82.91 <td< td=""><td></td><td>82.91</td><td>82.07</td><td>Dec-2016</td><td>0.81</td><td>82.10</td><td>Frozen (</td></td<>		82.91	82.07	Dec-2016	0.81	82.10	Frozen (
MP3 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Dec-2017 0.73 82.18 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Dec-2018 1.02 81.89 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 Oct-2020 DRY <80.39		82.91	82.07	May-2017	Over Top of Pipe	> 82.91	
MP3 82.91 82.07 Jun-2018 0.00 82.91 82.91 82.07 Jun-2018 1.02 81.89 82.91 82.07 Jun-2019 0.27 82.64 82.91 82.07 Nov-2019 0.75 82.16 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 May-2021 0.30 82.61 82.91 82.07 Apr-2022 Over Top of Pipe 82.91 82.91 82.07 Apr-2022 Over Top of Pipe 82.91 82.91 82.07 May-2023 Over Top of Pipe 82.91 82.91 82.07 May-2023 Over Top of Pipe 82.91 82.91 82.07 Apr-2024 0.60 82.81 82.91 82.07 Apr-2024 0.60 82.81 82.91 82.07 Aug-2001 0.37 82.54 (surface 82.91 8		82.91	82.07	Dec-2017	0.73	82.18	
MP3 82.91 82.07 Dec.2018 1.02 81.89 MP3 82.91 82.07 Jul-2019 0.27 82.64 82.91 82.07 Nov-2019 0.75 82.64 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 Oct-2020 DRY <80.39		82.91	82.07	lun-2018	0.00	82.91	
MP3 82.91 82.07 May-2021 0.37 82.61 MP3 82.91 82.07 May-2020 0.06 82.85 MP3 82.91 82.07 May-2020 0.06 82.85 MP3 82.91 82.07 Apr-2021 0.30 82.61 82.91 82.07 Apr-2022 0.98 81.93 82.91 82.07 Apr-2022 0.98 81.93 82.91 82.07 Apr-2022 0.98 81.93 82.91 82.07 May-2023 0.04 82.91 82.91 82.07 May-2023 0.04 82.87 82.91 82.07 May-2024 0.60 82.31 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	Dec-2018	1.02	81.89	
MP3 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 Oct-2020 DRY <80.39		82.91	82.07	Jul-2019	0.27	82.64	
MP3 82.91 82.07 May-2020 0.06 82.85 82.91 82.07 Oct-2020 DRY <80.39		82.91	82.07	Nov-2019	0.75	82.16	
MP3 82.91 82.07 Oct-2020 DRY <80.39 82.91 82.07 Apr-2021 0.30 82.61 82.91 82.07 Nov-2021 0.98 81.93 82.91 82.07 Apr-2022 Over Top of Pipe 82.91 82.91 82.07 Apr-2022 Over Top of Pipe 82.91 82.91 82.07 Dec-2022 1.03 81.88 82.91 82.07 Oct-2023 0.04 82.87 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Dec-2024 0.83 82.08 water level) 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Nov-2001 DRY <82.07		82.91	82.07	May-2020	0.06	82.85	
MP3 82.91 82.07 May-2021 0.30 82.61 MP3 82.91 82.07 Nov-2021 0.98 81.93 MP3 82.91 82.07 Dec-2022 1.03 81.88 82.91 82.07 Dec-2022 1.03 81.88 82.91 82.07 Dec-2022 1.03 81.88 82.91 82.07 Dec-2023 0.04 82.87 82.91 82.07 Dec-2024 0.60 82.31 82.91 82.07 Dec-2024 0.60 82.31 82.91 82.07 Dec-2024 0.83 82.08 water level) 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	Oct-2020	DRY	<80.39	
AP3 82.91 82.07 Nov-2021 0.98 81.93 82.91 82.07 Apr-2022 Over Top of Pipe 82.91 82.91 82.07 Dec-2022 1.03 81.88 82.91 82.07 May-2023 Over Top of Pipe 82.91 82.91 82.07 Oct-2023 0.04 82.87 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Jun-2001 0.37 82.54 (surface 82.91 82.07 Jun-2001 0.42 82.07 water level) 82.91 82.07 Over 2001 DRY <82.07		82.91	82.07	Anr-2021	0.30	82.61	
MP3 82.91 82.07 Apr-2022 Over Top of Pipe 82.91 MP3 82.91 82.07 Dec-2023 0.04 82.87 82.91 82.07 Oct-2023 0.04 82.87 82.91 82.07 Oct-2023 0.04 82.87 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Dec-2024 0.83 82.08 MP3 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Nov-2001 DRY <82.07		82.91	82.07	Nov-2021	0.98	81.93	
MP3 82.91 82.07 May-2023 Over Top of Pipe 82.91 MP3 82.91 82.07 Over Top of Pipe 82.91 82.91 82.07 Oct-2023 0.04 82.87 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Dec-2024 0.83 82.08 MP3 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	Apr-2022	Over Top of Pipe	82.91	
MP3 82.91 82.07 May-2023 Over Top of Pipe 82.91 MP3 82.91 82.07 Oct-2023 0.04 82.87 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Dec-2024 0.83 82.08 MP3 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	Dec-2022	1.03	81.88	
MP3 82.91 82.07 Oct-2023 0.04 82.87 82.91 82.07 Apr-2024 0.60 82.31 82.91 82.07 Dec-2024 0.83 82.08 MP3 82.91 82.07 Jun-2001 0.37 82.54 (surface 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	May-2023	Over Top of Pipe	82.91	
MP3 82.91 82.07 Apr-2024 0.60 82.31 MP3 82.91 82.07 Dec-2024 0.83 82.08 MP3 82.91 82.07 Jun-2001 0.37 82.54 (surface 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	Oct-2023	0.04	82.87	
MP3 82.91 82.07 May-2001 0.37 82.54 (surface 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	Apr-2024	0.60	82.31	
MP3 82.91 82.07 May-2001 0.37 82.54 (surface 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Aug-2001 DRY <82.07		82.91	82.07	Dec-2024	0.83	82.08	
MP3 82.91 82.07 May-2001 0.37 82.54 (surface 82.91 82.07 Jun-2001 0.42 82.49 water level) 82.91 82.07 Aug-2001 DRY <82.07							
(surface82.9182.07Jun-20010.4282.49water level)82.9182.07Aug-2001DRY<82.07	MP3	82.91	82.07	May-2001	0.37	82.54	
water level) 82.91 82.07 Aug-2001 DRY <82.07 82.91 82.07 Nov-2001 DRY <82.07	(surface	82.91	82.07	Jun-2001	0.42	82.49	
82.91 82.07 Nov-2001 DRY <82.07	water level)	82.91	82.07	Aug-2001	DRY	<82.07	
82.91 82.07 Oct-2002 DRY <82.07		82.91	82.07	Nov-2001	DRY	<82.07	
82.91 82.07 Jun-2003 0.24 82.67 82.91 82.07 Aug-2003 0.60 82.31 82.91 82.07 Nov-2003 DRY <82.07		82.91	82.07	Oct-2002	DRY	<82.07	
82.91 82.07 Aug-2003 0.60 82.31 82.91 82.07 Nov-2003 DRY <82.07		82.91	82.07	Jun-2003	0.24	82.67	
82.91 82.07 Nov-2003 DRY <82.07		82.91	82.07	Aug-2003	0.60	82.31	
82.91 82.07 Apr-2004 0.06 82.85 82.91 82.07 Aug-2004 DRY <82.07		82.91	82.07	Nov-2003	DRY	<82.07	
82.91 82.07 Aug-2004 DRY <82.07		82.91	82.07	Apr-2004	0.06	82.85	
82.91 82.07 Sep-2004 DRY <82.07 82.91 82.07 May-2005 -0.20 83.11 82.91 82.07 Aug-2005 DRY <82.07		82.91	82.07	Aug-2004	DRY	<82.07	
82.91 82.07 May-2005 -0.20 83.11 82.91 82.07 Aug-2005 DRY <82.07		82.91	82.07	Sep-2004	DRY	<82.07	
82.91 82.07 Aug-2005 DRY <82.07		82.91	82.07	May-2005	-0.20	83.11	
82.91 82.07 Dec-2005 DRY <82.07 82.91 82.07 May-2006 Over Top of Pipe >82.91 82.91 82.07 Sop 2006 0.71 82.92		82.91	82.07	Aug-2005	DRY	<82.07	
82.91 82.07 May-2006 Over Top of Pipe > 82.91 82.91 82.07 Sop 2006 0.71 82.20		82.91	82.07	Dec-2005	DRY	<82.07	
82 Q1 82 07 Son 2006 0 71 82 20		82.91	82.07	May-2006	Over Top of Pipe	> 82.91	
62.51 62.07 Sep-2006 0.71 62.20		82.91	82.07	Sep-2006	0.71	82.20	

@ 0.81

Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation	
	(mASL)	(mASL)		Top of Pipe (m)	(mASL)	
	82.91	82.07	Nov-2006	0.67	82.24	
	82.91	82.07	Apr-2007	0.18	82.73	
	82.91	82.07	Apr-2008	-0.02	82.93	
	82.91	82.07	Aug-2008	DRY	<82.07	
	82.91	82.07	Nov-2008	DRY	<82.07	
	82.91	82.07	Apr-2009	0.03	82.88	
	82.91	82.07	Aug-2009	0.72	82.19	
	82.91	82.07	Oct-2009	DRY	<82.07	
	82.91	82.07	May-2010	0.40	82.51	
	82.91	82.07	Sep-2010	DRY	<82.07	
	82.91	82.07	Nov-2010	DRY	<82.07	
	82.91	82.07	May-2011	Over Top of Pipe	> 82.91	
	82.91	82.07	, Sep-2011	DRY	<82.07	
	82.91	82.07	Mav-2012	0.34	82.57	
	82.91	82.07	Nov-2012	0.70	82.21	
	82.91	82.07	May-2013	-0.01	82.92	
	82.91	82.07	Aug-2013	0.51	82 40	
	82.91	82.07	Nov-2013	DRY	<82.10	
	82.91	82.07	May-2014	0.03	82.88	
	82.91	82.07	Διισ-2014	0.65	82.00	
	82.91	82.07	May-2015	Over Top of Pipe	> 82.01	
	92.01	82.07	Sop 2015		~92.01	
	82.91 92.01	82.07	Doc 2016	0.91	<82.07 92.1	Erozon @ 0.81
	02.91	82.07	May 2017	0.01 Over Ten of Dine	02.1 > 92.01	1102en @ 0.01
	02.91 92.01	82.07	lup 2019		> 02.91	
	82.91	82.07	Jun-2018	0.32	82.0	F @ 0.00
	82.91	82.07	Dec-2018	0.69	82.2	F102en @ 0.69
	82.91	82.07	Jui-2019	0.29	82.6	
	82.91	82.07	Nov-2019	0.91	82.0	
	82.91	82.07	May-2020	0.00	82.91	
	82.91	82.07	Oct-2020	0.05	82.86	
	82.91	82.07	Apr-2021	0.33	82.58	
	82.91	82.07	Nov-2021	Dry	<82.07	
	82.91	82.07	Apr-2022	Over Top of Pipe	> 82.91	
	82.91	82.07	Dec-2022	Dry	<82.07	
	82.91	82.07	May-2023	Over Top of Pipe	> 82.91	
	82.91	82.07	Oct-2023	DRY	<82.07	
	82.91	82.07	Apr-2024	0.68	82.23	
	82.91	82.07	Dec-2024	Frozen	<82.07	
MP4	84.59	83.58	May-2001	2.47	82.12	
	84.59	83.58	Jun-2001	1.56	83.03	
	84.59	83.58	Aug-2001	2.24	82.35	
	84.56	83.58	Nov-2001	2.23	82.33	
	84.56	83.58	Oct-2002	2.53	82.03	
	84.56	83.58	Jun-2003	1.26	83.30	
	84.56	83.58	Aug-2003	1.73	82.83	
	84.56	83.58	Nov-2003	2.53	82.03	
	84.56	83.58	Apr-2004	0.99	83.57	
	84.56	83.58	Aug-2004	2.25	82.31	
	84.56	83.58	Sep-2004	2.50	82.06	
	84.56	83.58	May-2005	0.52	84.04	
	84.56	83.58	Aug-2005	2.50	82.06	
	84.56	83.58	Dec-2005	2.05	82.51	

Table E1: Groundwater Elevations

North Algona	a Landfill
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Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation
	(MASL)	(MASL)		Top of Pipe (m)	(MASL)
	84.56	83.58	May-2006	1.17	83.39
	84.56	83.58	Sep-2006	2.06	82.50
	84.56	83.58	Nov-2006	1.78	82.78
	84.56	83.58	Apr-2007	0.99	83.57
	84.56	83.58	Apr-2008	0.38	84.18
	84.56	83.58	Aug-2008	2.08	82.48
	84.56	83.58	Nov-2008	2.15	82.41
	84.56	83.58	Apr-2009	0.99	83.57
	84.56	83.58	Aug-2009	2.03	82.53
	84.56	83.58	Oct-2009	DRY	<81.65
	84.56	83.58	May-2010	1.53	83.03
	84.56	83.58	Sep-2010	2.27	82.29
	84.56	83.58	Nov-2010	1.82	82.74
	84.56	83.58	May-2011	0.75	83.81
	84.56	83.58	Sep-2011	2.40	82.16
	84.56	83.58	May-2012	1.48	83.08
	84.56	83.58	Nov-2012	2.34	82.22
	84.56	83.58	May-2013	0.07	84.49
	84.56	83.58	Aug-2013	1.71	82.85
	84.56	83.58	Nov-2013	DRY	<81.65
	84.56	83.58	May-2014	0.86	83.70
	84.56	83.58	Aug-2014	1.98	82.58
	84.56	83.58	May-2015	1.50	83.06
	84.56	83.58	Sep-2016	2.15	82.41
	84.56	83.58	Dec-2016	2.07	82.49
	84.56	83.58	May-2017	0.00	84.56
	84.56	83.58	Dec-2017	1.90	82.66
	84.56	83.58	Jun-2018	1.45	83.11
	84.56	83.58	Dec-2018	2.27	82.29
	84.56	83.58	Jul-2019	1.41	83.15
	84.56	83.58	NOV-2019	2.27	82.29
	84.50	83.58	Nay-2020	1.00	83.50
	04.30 94 EC	03.30	0ct-2020	2.10	02.50
	04.50 94.56	03.30	Apr-2021	1.14	03.4Z 92.46
	84.JU 94.EC	03.30	Apr 2022	2.10	82.40
	84.50	83.58	Apr-2022	2.25	82.27
	84.56	83.58	May-2022	0.92	83.64
	84 56	83 58	Oct-2023	DRY	84 56
	84 56	83 58	Apr-2024	1 63	82.93
	84.56	83.58	Dec-2024	2.50	82.06
	01.30	03.30	Dec 2021	2.50	02.00
MP5	84.00	83.05	May-2001	2.35	81.65
	84.00	83.05	Jun-2001	2.21	81.79
	84.00	83.05	Aug-2001	DRY	<81.07
	83.98	83.05	Nov-2001	DRY	<81.07
	83.98	83.05	Oct-2002	2.66	81.32
	83.98	83.05	Jun-2003	1.82	82.16
	83.98	83.05	Aug-2003	2.41	81.57
	83.98	83.05	Nov-2003	2.66	81.32
	83.98	83.05	Apr-2004	1.60	82.38
	83.98	83.05	Aug-2004	DRY	<81.07
	63.98	83.05	Sep-2004	DKY	<01.07

Monitor	Top of Pipe Elevation	Ground Elevation	Date	Water Depth From	Water elevation	
	(mASL)	(mASL)		Top of Pipe (m)	(mASL)	
	83.98	83.05	May-2005	1.25	82.73	
	83.98	83.05	Aug-2005	DRY	<81.07	
	83.98	83.05	Dec-2005	DRY	<81.07	
	83.98	83.05	May-2006	1.77	82.21	
	83.98	83.05	Sep-2006	DRY	<81.07	
	83.98	83.05	Nov-2006	2.42	81.56	
	83.98	83.05	Apr-2007	1.44	82.54	
	83.98	83.05	Apr-2008	0.80	83.18	
	83.98	83.05	Aug-2008	DRY	<81.07	
	83.98	83.05	Nov-2008	DRY	<81.07	
	83.98	83.05	Apr-2009	1.64	82.34	
	83.98	83.05	Aug-2009	DRY	<81.07	
	83.98	83.05	Oct-2009	DRY	<81.07	
	83.98	83.05	May-2010	2 15	81.83	
	83.98	83.05	Sen-2010	DRY	<81.07	
	83.98	83.05	Nov-2010	DRY	<81.07	
	83.98	83.05	May-2011	1 38	82.60	
	83.98	83.05	Sen-2011		<pre>// 02.00</pre>	
	92.09	82.05	May 2012	2 12	<01.07 01.05	
	03.90	83.05 83.05	Nov 2012	2.15	01.05 -01.07	
	03.90	83.05	NOV-2012	1.21	<01.07 82.67	
	83.98	83.05	May-2013	1.31	82.67	
	83.98	83.05	Aug-2013	2.35	81.63	
	83.98	83.05	NOV-2013	DRY	<81.07	
	83.98	83.05	May-2014	1.39	82.59	
	83.98	83.05	Aug-2014	2.41	81.57	
	83.98	83.05	May-2015	2.08	81.90	
	83.98	83.05	Sep-2016	DRY	<81.07	
	83.98	83.05	Dec-2016	DRY	<81.07	
	83.98	83.05	May-2017	0.43	83.55	
	83.98	83.05	Dec-2017	2.50	81.48	
	83.98	83.05	Jun-2018	2.12	81.86	
	83.98	83.05	Dec-2018	1.24	82.74	Frozen @ 0.1.24
	83.98	83.05	Jul-2019	2.08	81.90	
	83.98	83.05	Nov-2019	DRY	<81.07	
	83.98	83.05	May-2020	1.70	82.28	
	83.98	83.05	Oct-2020	DRY	<81.07	
	83.98	83.05	Apr-2021	1.66	82.32	
	83.98	83.05	Nov-2021	2.45	81.53	
	83.98	83.05	Apr-2022	1.89	82.09	
	83.98	83.05	Dec-2022	DRY	<81.07	
	83.98	83.05	May-2023	1.56	82.42	
	83.98	83.05	Oct-2023	DRY	<81.07	
	83.98	83.05	Apr-2024	2.30	81.68	
	83.98	83.05	Dec-2024	2.50	81.48	
		Bottom of Culvert		Water Depth		
SW1	79.91	76.21	Aug-2000	0.16	76.37	
	79.91	76.21	Jun-2001	No Flow	79.35	
	79.91	76.21	Aug-2001	DRY	<76.21	
	79.91	76.21	Nov-2001	0.02	76.23	
	79.91	76.21	Oct-2002	DRY	<76.21	
	79.91	76.21	Jun-2003	0.10	76.31	
	79.91	76.21	Apr-2004	not taken		
	79.91	76.21	Jun-2003	0.10	76.31	
	79.91	76.21	Mar-2005	Not Visible		
	79.91	76.21	May-2006	Not Visible		
	79,91	76.21	Apr-2007	not taken		
	79.91	76.21	Apr-2009	not taken		
	79 91	76.21	Δpr-2000	0.76	76 97	
	79 91	76 21	May-2009	0.15	76 36	
	, 5.51	/ 0.21	1110 2010	0.10	, 0.50	

Monitor	Top of Pipe Elevation (mASL)	Ground Elevation (mASL)	Date	Water Depth From Top of Pipe (m)	Water elevation (mASL)
	79.91	76.21	Sep-2010	0.76	76.97
	79.91	76.21	Nov-2010	not taken	76.21
	79.91	76.21	Apr-2022	0.23	76.44
	79.91	76.21	May-2023	0.07	76.28
	79.91	76.21	Oct-2023	not taken	
SW2	78.91	78.31	Aug-2000	Dry	<78.31
	78.91	78.31	Jun-2001	No Flow	78.34
	78.91	78.31	Aug-2001	DRY	<78.31
	78.91	78.31	Nov-2001	DRY	<78.31
	78.91	78.31	Oct-2002	DRY	<78.31
	78.91	78.31	Jun-2003	0.24	78.55
	78.91	78.31	Apr-2004	0.44	78.75
	78.91	78.31	Mar-2005	Not Visible	
	78.91	78.31	May-2006	0.43	78.74
	78.91	78.31	Apr-2007	0.46	78.77
	78.91	78.31	Apr-2008	0.33	78.58
	78.91	78.31	Apr-2009	0.10	78.81
	78.91	78.31	May-2010	0.22	78.69
	78.91	78.31	Sep-2010	0.10	78.81
	78.91	78.31	Nov-2010	not taken	78.91
	78.91	78.31	Apr-2022	not taken	
	78.91	78.31	May-2023	not taken	
	78.91	78.31	Oct-2023	not taken	

Note: Monitors and mini-piezometers re-surveyed by Jp2g, November 2001

Appendix F

Sampling Protocol

STANDARD SAMPLING PROTOCOL

The following is a description of the monitoring procedures and protocols used for groundwater and surface water monitoring for landfill sites.

Equipment Cleaning and Calibration

Regardless of matrix, prior to traveling to the site to be sampled, all equipment such as water level indicators and multi-parameter meters must be cleaned and calibrated as specified by the equipment manufacturer. Details of the cleaning and calibration should be recorded in the field notes.

GROUNDWATER Monitoring Well Assessment

provide an assessment of the status of all monitoring wells at the site;

note any changes to the well and/or protective casing and record the physical condition of the well; and

label all observation wells clearly and accurately on both the protective casing and well pipe.

Groundwater Monitoring

maintain and use an accurate, up-to-date list of all observation wells to be monitored;

check all field equipment for cleanliness; and

wear personnel protective equipment (i.e. gloves, protective glasses, splash guards) during all phases of work, and follow any appropriate health and safety plan procedures.

Gas Detection in Wells (Prior to Measuring Water Levels)

turn on gas meter and prepare for sampling atmospheric condition inside monitoring well;

remove protective casing cover and well cap avoiding introduction of foreign materials into the well;

immediately insert the probe attached to the gas meter into the well and wait for readings to stabilize;

record the measurement in the appropriate column on the field data sheet or field book.

Water Level Measurements (Prior to Purging)

always take water level measurements prior to purging or sampling;

do not move dedicated sampling devices such as the "Waterra" inertial pump prior to measuring the water level; reference the measurement from the same location each time (marked location or lowest point on pipe);

lower the tape/probe into the wells - record the depth to water when the indicator (audible/visual) shows the water level has been reached;

measure the water level twice by raising and lowering the tape/probe; and

record the measurement to the nearest cm (0.5 cm) in the appropriate column on the field data sheet or field book.

Well Purging (Prior to Sampling)

The purpose of purging is to remove the stagnant water from within a monitor (removal of all stagnant water) so that a representative water sample may be collected. The procedures for purging are as follows:

purge the well only after water levels have been confirmed;

lift the tubing off the bottom of the well and "pump" all stagnant water from the well into a graduated container such as a bucket, pail or cylinder so that the purged volume can be measured and recorded;

for low-yield wells, it is expected that either "no purge sampling techniques or low flow purging will be utilized (avoid purging well dry);

under normal circumstances purged water may be discarded on the ground, away from the well to avoid the potential of water seeping back into the well; and

allow a sufficient recovery period before sampling (not more than 48 hours).

Field Measurements

Field measurements are to be collected and recorded as outlined in the Certificate of Approval or the approved monitoring program.

Well Sampling

collect the water sample as soon as practical (not more than 48 hours) after purging starting at the least contaminated and proceeding to the most contaminated;

lift tubing and check valve off bottom of well to avoid introducing unnecessary sediment into the sample and transfer some representative sample water into a clean, well rinsed container to conduct measurements of field parameters;

lift the tubing and gently transfer a sample into a clean container and thoroughly mix to form a single representative sample;

transfer the sample into a pre-labelled sample bottle;

for samples that require filtering, attach the disposable filter onto the end of the tubing (a 0.45 micron membrane filter should be used);

attempt to keep sample agitation to a minimum during sample transfer;

store samples in a cooler, with ice packs to keep cool;

conduct field measurements (these typically include: temperature, pH and conductivity; and

transport samples to laboratory within the maximum hold time established by the laboratory (typically within a 48-hour period).

Volatile Organic Compound (VOC) Sampling

Volatile Organic Compounds (VOC) can be easily lost during sample collection, storage, and transportation. The following sampling and handling protocols are adhered to.

VOC samples are to be collected in special containers provided by the laboratory. These typically include: glass vials, preferably amber, with a minimum capacity of 20 ml and sealed with Septum tops;

vials must be filled just to overflowing in such a manner that no air bubbles pass through the vial as it is being filled (this is easier to accomplish by inserting a 4' length of $\frac{1}{4}$ " poly tubing into the existing wattera tubing and filling the vial from the $\frac{1}{4}$ " tubing);

vials must then be sealed with the cap so that no air bubbles are entrapped within it; the septum is placed with the Teflon side face down toward the inside of the bottle;

check for the presence of air bubbles by inverting the vial and tapping on hard surface; if air bubbles are present, discard the sample and re-sample;

all VOC samples must be preserved as specified by the laboratory (typically with 1 to 2 drops of Hydrochloric Acid (HCI)) and refrigerated or stored on ice until analysed; and

VOC samples should be submitted in duplicate.

Surface Water Sampling (General)

Surface water samples should be collected at the same designated location during each sample event (do not collect samples from any station which is frozen, stagnant or otherwise not representative of normal conditions).

if you must stand in the stream, position yourself downstream of the sample location to avoid contaminating the sample with sediment, debris, and other floating materials; all equipment must be thoroughly rinsed with distilled water at the beginning of each station to avoid cross-contamination;

wear gloves to handle the sample bottles;

fill all bottles using an unpreserved transfer bottle (to avoid overflowing pre-preserved bottles);

when sampling for dissolved metals, the sample must be filtered and placed in a separate metals bottle, while sampling for total metals, the sample is placed in a common bottle for metals that is provided by the laboratory;

label and store all samples in the same manner as for groundwater samples; and

conduct field measurements (these typically include: temperature, pH, conductivity, Dissolved Oxygen and Flow).

Flow Measurements (General)

Discharge flow measurements must be taken at designated stations.

QA/QC Water Samples

A field quality assurance and quality control program for all monitoring events will be established as follows:

where groundwater or surface water samples are taken, a field blank in which a set of sample bottles is filled with distilled water at a known site or monitoring station is submitted to the laboratory for analysis along with the samples;

where VOC samples are taken, a trip blank, in which 1 set of VOC vials are filled with distilled water (at the laboratory or office) prior to going to the field and accompanies the sample bottles until they are returned to the lab; and

duplicate of at least one sample set per sampling event or 1 duplicate for every 10 groundwater samples (do not identify the well number to the laboratory, but have it recorded in the field notes) use the sampling technique as for observation wells.

SAMPLING

Station Sampling Order

The stations will be sampled beginning with those wells exhibiting the lowest chemical concentrations and then moving on to wells with greater chemical concentrations.

Monitoring Periods

The monitoring periods are as recommended in either the annual report or the Certificate of Approval.

Analytical Parameters

Analysis will be as recommended in either the annual report or the Certificate of Approval.

Gas Detection of On-site Buildings

Gas detection in on-site buildings is to be included as part of regular monitoring.

Appendix G

Photographs



BH 1-I



BH 1-II



BH 2



BH 3



Berndt Road Waste Transfer Site

2024 Groundwater Monitoring Locations





BH 6



MP 1



MP 2



MP 3



Berndt Road Waste Transfer Site

2024 Groundwater Monitoring Locations





SW1



SW2



Berndt Road Waste Transfer Site

2024 Surface water Monitoring Locations

DATE	May-25
PROJECT	17-60411
FIGURE	2

Appendix H

Groundwater Quality Data

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				1	-1		
Date Sampled	ODWS (PWQO)	Aug-00	Jun-01	Oct-02	Aug-03	Aug-04	Aug-05
Parameters							
Fluoride	2.40				0.98	0.52	0.50
Chloride	250	4.0	4.0	5.0	4	6	5
N-NO2 (Nitrite)	1.00	< 0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3 (Nitrate)	10.00	< 0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate							
Sulphate	500	88	91	88	89	84	82
Calcium		69	61	62	65	58	60
Magnesium		25	20	25	24	23	22
Sodium	200	14	15	17	15	19	13
Potassium		3	2	3	4	3	3
Aluminum	0.1 (0.075)						
Barium	1.00				0.05	0.05	0.05
Beryllium *							
Boron	5 (0.2)	0.140	0.120	0.070	0.11	0.11	0.14
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)					531	545	511
Copper	1 (0.005)	< 0.01	<0.001	0.001	<0.001	0.001	<0.001
Iron	0.3 (0.3)	0.050	0.010	0.100	<0.01	<0.01	<0.03
Lead *	0.010						
Manganese	0.050	0.050	0.020	0.033	0.02	0.02	0.02
Molybdenum							
Nickel							
Phosphorus							
Silicon	/						
Silver	0.05 (0.0001)						
Strontium		3.700	3.950	4.640	4.70	4.07	3.87
Sulphur							
Thallium							
l Itanium							
	F (0,02)						
ZINC	5 (0.03)						
Hardness	80 - 100						
Alkalinity as CaCO ₃	30 - 500 (Note 1)	214	201	213	201	208	207
TKN		0.160	0.080	0.090	< 0.05	0.11	<0.05
N-NH3 (Ammonia)		0.030	<0.02	0.070	0.02	0.05	0.02
Organic Nitrogen	0.15	0.130	<0.080	0.020	< 0.05	0.060	
Phenols		0.014	0.001	<0.001	<0.001	<0.001	<0.001
BOD			_		_	_	-
	E00	5.0	<5	6.U 2C1	<5 245	<5 254	<5
	500	300	340	301	345	354	332
			0.90	0.96	0.99	0.93	0.91
Field Measured							
Water Temp $\binom{0}{C}$	15.0	16.2	12 5	70	12.0	12 1	11.0
water remp. (C)	13.0	420	12.5	7.9	12.0	12.1	11.0
conductivity (micros/cm)		420	532	510	493	934	509
אוי (אר מוונ <i>ג)</i>	(0.5-0.0) 0.0 - 0.0	7.33	7.90	0.00	7.99	0.05	7.58

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				1	-1		
Date Sampled	ODWS (PWQO)	Sep-06	Aug-07	Aug-08	Apr-09	May-10	May-10
Parameters			Ŭ	Ŭ			BH 4
							QA/QC
Fluoride	2.40	0.52	0.49	0.53	0.50	0.55	0.54
Chloride	250	8	7	4	6	6	7
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10	<0.01	<0.10	<0.10
N-NO3 (Nitrate)	10.00	0.150	<0.10	<0.10	<0.10	<0.10	<0.10
Phosphate							
Sulphate	500	85	84	84	81	85	84
Calcium		67	68	60	65	60	59
Magnesium		25	26	23	26	23	23
Sodium	200	16	16	14	16	15	15
Potassium		3	3	3	3.1	3	3
Aluminum	0.1 (0.075)						
Barium	1.00	0.05	0.06	0.05	0.05	0.05	0.05
Beryllium *							
Boron	5 (0.2)	0.13	0.13	0.13	0.12	0.12	0.12
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)	-					
Conductivity (microS/cm)		756	569	542		540	551
Copper	1 (0.005)	0.020	0.004	<0.001		<0.001	<0.001
Iron	0.3 (0.3)	<0.03	<0.03	<0.03		<0.03	0.040
Lead *	0.010						
Manganese	0.050	0.03	0.02	0.07	0.04	0.01	0.02
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium		4.30	4.26	4.27	4.10	4.49	4.46
Suppur							
Thailium							
Titanium							
Manadium							
Zinc	5 (0 02)						
Hardness	80 - 100						
Alkalinity as CaCO	30 E00 (Noto 1)	215	210	200	224	202	206
	30 - 300 (Note 1)	215	210	200	224	202	200
		< 0.05	0.34	0.30	<0.0F	<0.10	<0.10
N-NH3 (Ammonia)	0.15	0.03	< 0.02	0.05	<0.05	<0.02	<0.02
Dhanala	0.15	-0.001	<u><</u> 0.34	0.25	-0.001	<0.10	<0.10
Phenois		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BOD		-5	د ا	5.0	- 1	-5	<u>، ۲</u>
	500	274	270	252	255	251	259
Ion Balance	500	0.98	370	552	333	331	330
		0.90					
Field Measured							
Water Temp $\binom{0}{C}$	15.0	10.0	10.8	12.0	10 3	10 8	
Conductivity (microS/cm)	13.0	458	10.0 41Q	51/	577	525	
nH (nH units)	65-85(65-85)	6 69	7 04	7 34	8 00	8 10	
pri (pri dino)	0.5 0.5 (0.5-0.5)	0.05	7.04	,+	0.00	0.10	

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				1	-1		
Date Sampled	ODWS (PWQO)	May-11	May-12	May-12	May-13	May-13	May-14
Parameters				BH 4		BH 7	
				QA/QC		QA/QC	
Fluoride	2.40	0.53	0.53	0.53	0.49	0.50	0.50
Chloride	250	6	5	6	5	5	4
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10	<0.10	<0.10	< 0.10
N-NO3 (Nitrate)	10.00	<0.10	<0.10	<0.10	0.13	<0.10	< 0.10
Phosphate							
Sulphate	500	86	84	84	82	84	89
Calcium		60	57	56	60	60	64
Magnesium		23	21	21	27	27	23
Sodium	200	15	14	14	16	17	15
Potassium		3	3	3	3	3	3
Aluminum	0.1 (0.075)						
Barium	1.00	0.05	0.05	0.05	0.05	0.05	0.05
Beryllium *							< 0.0001
Boron	5 (0.2)	0.10	0.13	0.11	0.09	0.09	0.10
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		539	539	540	538	538	553
Copper	1 (0.005)	<0.001	<0.001	< 0.001	< 0.001	<0.001	< 0.002
Iron	0.3 (0.3)	0.070	< 0.03	< 0.03	<0.03	< 0.03	0.007
Lead *	0.010						
Manganese	0.050	0.03	0.04	0.02	0.03	0.03	0.01
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium		4.37	4.38	3.90	4.11	4.01	4.51
Sulphur							
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100						
Alkalinity as CaCO ₃	30 - 500 (Note 1)	204	202	203	200	199	189
TKN		0.12	<0.10	<0.10	<0.10	<0.10	< 0.05
N-NH3 (Ammonia)		< 0.02	< 0.02	< 0.02	0.03	0.04	< 0.01
Organic Nitrogen	0.15		<0.10	<0.10	<0.10	<0.10	< 0.05
Phenols		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
BOD							
COD		<5	<5	<5	<5	<5	< 5
TDS	500	350	350	351	350	350	313
Ion Balance							0.996
Field Measured							
Water Temp. (°C)	15.0	9.3	10.7		10.5		10.3
Conductivity (microS/cm)		390	465		522		
pH (pH units)	6.5 - 8.5 (6 5-8 5)	7.40	8.0		79		8.20
F (b., a.,)			0.0				0.20

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				1	-1		
Date Sampled	ODWS (PWQO)	May-15	Sep-16	May-17	Jun-18	Jul-19	May-20
Parameters							
Fluoride	2.40	0.45	0.5	< 0.1	< 0.1	0.11	0.12
Chloride	250	4.92	5.3	52.4	43.7	83	72
N-NO2 (Nitrite)	1.00	<0.05	0.2	< 0.05	< 0.05	<0.10	< 0.10
N-NO3 (Nitrate)	10.00	<0.05	0.1	1.89	2.09	2.93	3.6
Phosphate							
Sulphate	500	84.5	88	56	55	64	60
Calcium		59.8	61	155	130	157	141
Magnesium		22.9	24.1	53	43.4	48	44
Sodium	200	14.3	16.4	42.2	38.2	35	36
Potassium		3.11	2.9	5.4	5.4	6	6
Aluminum	0.1 (0.075)						
Barium	1.00	0.048	0.048	0.21	0.188	0.23	0.23
Beryllium *							
Boron	5 (0.2)	0.105	0.11	0.208	0.17	0.16	0.19
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)			521	1140	917	1030	1130
Copper	1 (0.005)	< 0.003	< 0.002	0.005	< 0.002	0.001	0.001
Iron	0.3 (0.3)	<0.010	< 0.005	0.008	< 0.005	<0.03	< 0.03
Lead *	0.010						
Manganese	0.050	0.018	0.011	0.035	0.017	0.02	0.02
Molybdenum							
NICKEI							
Phosphorus							
Silicon	0.05 (0.0001)						
Sliver	0.05 (0.0001)	2.02	4.22	2.00	2.20	1.02	2
Subhur		3.83	4.22	3.08	2.28	1.82	2
Sulphur							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100		252	606	503	590	533
Alkalinity as CaCO-	30 - 500 (Note 1)	105	206	476	373	503	458
	50 - 500 (Note 1)	-0.10	200	470	0.1	0.25	430
NNN NH2 (Ammonia)		<0.10	0.42	0.56	0.1	0.55	0.271
	0.15	< 0.02	< 0.01	< 0.01	0.02	0.025	0.014
Phenols	0.15	< 0.10	< 0.001	0.003	< 0.001	<0.001	< 0.001
BOD		0.001	0.001	0.005	0.001	0.001	0.001
COD		<5	< 5	18	< 5	<5	7
TDS	500	300	323	650	540	670	734
Ion Balance	300	550	525	0.00		070	, 34
Field Measured							
Water Temp. (°C)	15.0	9.7	11.9	8.5	9.1	8.9	8.5
Conductivity (microS/cm)		574	567	1125	638	1224	1035
pH (pH units)	6.5 - 8.5 (6.5-8.5)	8.00	7.7	7.0	9.1	7.0	7.1
1. (1 .							

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				1	-1	
Date Sampled	ODWS (PWQO)	Apr-21	Apr-22	Jun-23	Apr-24	
Parameters						
Fluoride	2.40	0.14	0.16	0.26	0.25	
Chloride	250	59	53	75	43	
N-NO2 (Nitrite)	1.00	<0.50	<0.10	<0.10	<0.10	
N-NO3 (Nitrate)	10.00	2.01	1.35	1.44	0.65	
Phosphate						
Sulphate	500	48	45	65	58	
Calcium		128	131	132	121	
Magnesium		41	40	46	40	
Sodium	200	37	37	34	32	
Potassium		6	6	5	5	
Aluminum	0.1 (0.075)					
Barium	1.00	0.19	0.2		0.15	
Beryllium *						
Boron	5 (0.2)	0.15	0.16	0.16	0.16	
Cadmium *	0.005					
Chromium	0.050					
Cobalt	(0.0009)					
Conductivity (microS/cm)		1010	1000	987	889	
Copper	1 (0.005)	0.003	0.001	0.004	0.001	
Iron	0.3 (0.3)	0.03	< 0.03	< 0.03	< 0.03	
Lead *	0.010					
Manganese	0.050	0.02	0.01	0.02	0.01	
Molybdenum						
Nickel						
Phosphorus						
Silicon						
Silver	0.05 (0.0001)					
Strontium		2.14	1.75	3.01	2.37	
Sulphur						
Thallium						
Tin						
Titanium						
Vanadium						
Zinc	5 (0.03)					
Hardness	80 - 100					
Alkalinity as $CaCO_3$	30 - 500 (Note 1)	438	462	430	389	
TKN		0.338	0.246	0.366	0.306	
N-NH3 (Ammonia)		<0.010	<0.010	<0.020	0.165	
Organic Nitrogen	0.15					
Phenols		<0.001	<0.001	< 0.001	<0.001	
BOD						
COD		<5	<5	<5	<5	
TDS	500	656	650	642	578	
Ion Balance						
Field Measured						
Water Temp. (°C)	15.0	9.4	9.0	9.5	8.3	
Conductivity (microS/cm)		1019	978	1140	1020	
pH (pH units)	6.5 - 8.5 (6.5-8.5)	6.7	6.8	7.7	7.5	
1 W /						

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				1	-11		
Date Sampled	ODWS (PWQO)	Aug-00	Jun-01	Oct-02	Aug-03	Aug-04	Aug-05
Parameters							
Fluoride	2.40				0.31	0.12	0.13
Chloride	250	84	83	63	79	69	69
N-NO2 (Nitrite)	1.00	< 0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3 (Nitrate)	10.00	2.08	3.88	3.76	4.95	2.14	2.22
Phosphate							
Sulphate	500	119	143	100	124	72	77
Calcium		169	216	169	200	136	154
Magnesium		57	47	44	51	39	41
Sodium	200	36	33	41	53	40	47
Potassium		8	6	7	9	7	8
Aluminum	0.1 (0.075)						
Barium	1.00				0.160	0.130	0.200
Beryllium *							
Boron	5 (0.2)	0.30	0.23	0.26	0.32	0.23	0.35
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		0.04			1340	1151	1190
Copper	1 (0.005)	< 0.01	0.002	0.003	0.004	0.022	0.180
Iron	0.3 (0.3)	< 0.01	<0.01	<0.01	0.010	<0.01	5.230
Lead *	0.010	4.00	0.40	0.00	.0.005	.0.01	0.70
Mahabaa	0.050	1.82	0.18	0.09	<0.005	<0.01	0.72
Nickol							
Deschorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium	0.03 (0.0001)	0 505	0.461	0 331	0 369	0 3 2 8	0.436
Sulphur		0.505	0.401	0.551	0.505	0.520	0.430
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100						
Alkalinity as CaCO ₃	30 - 500 (Note 1)	563	554	507	504	477	522
TKN		0.56	0.44	0.46	0.36		0.33
N-NH3 (Ammonia)		0.20	<0.02	0.06	0.07	0.09	0.08
Organic Nitrogen	0.15	0.36	< 0.44	0.40	0.29	0.40	0.25
Phenols		0.004	<0.001	<0.001	<0.001	<0.001	<0.001
BOD							
COD		13	5	12	9	<5	<5
TDS	500	808	968	800	871	748	774
Ion Balance			0.97	0.98	1.10	0.91	0.94
Field Measured							
Water Temp. (°C)	15.0	15.8	14.7	11.1	14.4	10.4	13.0
Conductivity (microS/cm)		1010	1454	1231	1272	433	1123
pH (pH units)	6.5 - 8.5 (6.5-8.5)	6.98	7.06	7.06	7.55	7.22	6.92

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->		1-11						
Date Sampled	ODWS (PWQO)	Sep-06	Aug-07	Aug-08	Apr-09	Mav-10	Mav-11	
Parameters								
Fluoride	2.40	<0.10	<0.10	<0.10	<0.1	<0.10	<0.10	
Chloride	250	85	78	64	120	107	71	
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10	0.37	<0.10	0.16	
N-NO3 (Nitrate)	10.00	4.07	1.74	2.560	8.10	7.60	4.00	
Phosphate								
Sulphate	500	68	70	62	130	126	90	
Calcium		160	176	154	220	206	182	
Magnesium		42	47	41	62	56	50	
Sodium	200	46	52	48	71	55	64	
Potassium		8	11	12	15	13	15	
Aluminum	0.1 (0.075)							
Barium	1.00	0.140	0.18	0.180	0.28	0.230	0.330	
Beryllium *								
Boron	5 (0.2)	0.25	0.25	0.31	0.36	0.32	0.43	
Cadmium *	0.005							
Chromium	0.050							
Cobalt	(0.0009)							
Conductivity (microS/cm)		1250	1310	1280		1560	1500	
Copper	1 (0.005)	0.004	0.004	0.003	0.003	0.004	0.005	
Iron	0.3 (0.3)	< 0.03	< 0.03	< 0.03	<0.10	0.110	0.060	
Lead *	0.010							
Manganese	0.050	< 0.01	< 0.01	0.06	0.04	0.02	0.20	
Molybdenum								
Nickel								
Phosphorus								
Silicon								
Silver	0.05 (0.0001)							
Strontium		0.347	0.403	0.392	0.520	0.516	0.504	
Sulphur								
Thallium								
Tin								
Titanium								
Vanadium								
Zinc	5 (0.03)							
Hardness	80 - 100							
Alkalinity as CaCO ₃	30 - 500 (Note 1)	482	543	549	588	569	643	
TKN	. ,	0.21	0.45	0.51		0.20	1.96	
N-NH3 (Ammonia)		<0.02	0.04	0.06	0.46	0.19	0.14	
Organic Nitrogen	0.15	< 0.21	0.41	0.45		0.01	1.82	
Phenols		< 0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
BOD								
COD		<5	<5	18	18	18	20	
TDS	500	813	852	832	1020	1010	975	
Ion Balance		0.99						
Field Measured								
Water Temp. (°C)	15.0	14.2	13.1	14.1	7.5	8.9	8.2	
Conductivity (microS/cm)		988	1004	1130	1660	1504	966	
pH (pH units)	6.5 - 8.5 (6 5-8 5)	5.86	6.66	6.80	6.90	6.90	6.80	
Pri (pri dines)	0.0 0.0 (0.0 0.0)	5.00	0.00	0.00	0.50	0.50	0.00	

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->		1-11					
Date Sampled	ODWS (PWQO)	May-12	May-13	May-14	May-15	Sep-16	May-17
Parameters							,
Fluoride	2.40	<0.10	<0.10	< 0.10	<0.25	< 0.1	< 0.1
Chloride	250	70	91	111	78.9	59.2	79
N-NO2 (Nitrite)	1.00	<0.10	<0.10	< 0.10	<0.25	< 0.1	< 0.05
N-NO3 (Nitrate)	10.00	4.61	6.27	8.00	7.72	2.2	1.96
Phosphate							
Sulphate	500	84	77	52	57.8	42	35
Calcium		153	183	161	161	133	183
Magnesium		44	54	40	44	36.8	44.4
Sodium	200	47	77	77	47	47.3	85.8
Potassium		11	18	13	12	14.5	21.2
Aluminum	0.1 (0.075)						
Barium	1.00	0.21	0.290	0.224	0.206	0.187	0.354
Beryllium *				< 0.0001			
Boron	5 (0.2)	0.31	0.32	0.21	0.183	0.176	0.411
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		1400	1510			1060	1410
Copper	1 (0.005)	0.004	0.005	0.003	<0.003	< 0.002	0.007
Iron	0.3 (0.3)	<0.03	<0.03	0.065	<0.010	< 0.005	0.006
Lead *	0.010						
Manganese	0.050	0.02	0.02	0.01	0.002	< 0.001	0.034
Molybdenum							
Nickel							
Phosphorus							
Silicon	/>						
Silver	0.05 (0.0001)						0 5 0 0
Strontium		0.399	0.465	0.424	0.378	0.361	0.503
Sulphur							
I hallium							
Venedium							
Zine	F (0.02)						
Zilit	3 (0.03)					400	640
	30 - 100	507	<u> </u>	102	540	405	640
	30 - 500 (Note 1)	597	606	492	519	484	610
IKN		0.34	2.07	0.74	0.25	0.25	5.46
N-NH3 (Ammonia)	0.45	0.09	1.62	< 0.01	<0.02	< 0.01	4.38
Organic Nitrogen	0.15	0.25	0.45	<u>< 0.74</u>	<u>< 0.25</u>	. 0. 001	0.005
Phenois		<0.001	<0.001	< 0.001	<0.001	< 0.001	0.005
BOD		-	12			7	26
	500	5	13	< 5	<5	622	20
IDS	500	910	982	786	720	032	814
				0.909			
Field Measured							
Water Temp $\binom{0}{C}$	15.0	9.7	87	67	75	1/1	7 2
vvalet remp. (C)	13.0	3.7	0.7	1200	1205	114.1	1.5
conductivity (micros/cm)		1210	1202	7 00	1395	£ 90	1414
pri (pri units)	(5.5-5.0) 5.5	0.0	0.90	7.00	7.10	0.60	0.7

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->		1-11					
Date Sampled	ODWS (PWQO)	Jun-18	Jul-19	May-20	Apr-21	Apr-22	Jun-23
Parameters							
Fluoride	2.40	< 0.1	<0.10	< 0.10	<0.10	<0.10	<0.10
Chloride	250	73.6	85	146	76	112	108
N-NO2 (Nitrite)	1.00	0.05	<0.10	0.13	<0.5	<0.10	<0.10
N-NO3 (Nitrate)	10.00	5.42	3.55	5.47	7.23	6.21	3.66
Phosphate							
Sulphate	500	53	51	58	40	43	47
Calcium		176	161	193	186	193	179
Magnesium		44.5	39	45	46	48	41
Sodium	200	52.4	55	68	52	43	81
Potassium		16.7	20	24	16	14	24
Aluminum	0.1 (0.075)						
Barium	1.00	0.272	0.28	0.43	0.29	0.27	
Beryllium *					0.01		0.5-
Boron	5 (0.2)	0.204	0.23	0.31	0.24	0.19	0.35
	0.005						
Chromium	0.050						
Cobalt	(0.0009)	1200	1000	1570	1220	1 4 0 0	1200
Conductivity (micros/cm)	1 (0.005)	1200	1080	1570	1330	1400	1390
Copper	1 (0.005)	< 0.002	0.006	0.016	0.007	0.002	0.006
Iron	0.3 (0.3)	< 0.005	<0.03	3.84	0.03	0.03	<0.03
Ledu ·	0.010	0.002	<0.01	0.52	<0.01	<0.01	<0.01
Molybdenum	0.050	0.002	<0.01	0.55	<0.01	<0.01	<0.01
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium	0.00 (0.0001)	0.409	0.437	0.584	0.511	0.53	0.506
Sulphur		0.105	0.137	0.501	0.511	0.55	0.500
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100	623	563	667			
Alkalinity as CaCO ₃	30 - 500 (Note 1)	499	538	590	593	550	622
ТКМ		0.4	2.45	3.63	0.523	0.351	5.78
N-NH3 (Ammonia)		0.05	1.8	3.26	0.035	<0.010	5.34
Organic Nitrogen	0.15						
Phenols		< 0.001	< 0.001	< 0.001	<0.001	<0.001	<0.001
BOD							
COD		8	<5	16	11	<5	10
TDS	500	715	702	1020	864	910	904
Ion Balance							
Field Measured							
Water Temp. (°C)	15.0	8.8	9.5	7.3	6.8	6.2	9.5
Conductivity (microS/cm)		803	1302	1484	1383	1368	1600
pH (pH units)	6.5 - 8.5 (6.5-8.5)	6.9	6.9	6.8	6.4	6.4	6.8
· ··· ·	· · · ·						

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

* Provincial Water Quality Objectives (PWQO) related to hardness
| Monitor Number -> | | | 1 | -11 | |
|---------------------------------|---------------------|--------|---|-----|--|
| Date Sampled | ODWS (PWQO) | Apr-24 | | | |
| <u>Parameters</u> | | | | | |
| | | | | | |
| Fluoride | 2.40 | <0.10 | | | |
| Chloride | 250 | 141 | | | |
| N-NO2 (Nitrite) | 1.00 | <0.10 | | | |
| N-NO3 (Nitrate) | 10.00 | 5.83 | | | |
| Phosphate | | | | | |
| Sulphate | 500 | 28 | | | |
| Calcium | | 168 | | | |
| Magnesium | | 40 | | | |
| Sodium | 200 | 54 | | | |
| Potassium | /> | 14 | | | |
| Aluminum | 0.1 (0.075) | | | | |
| Barium | 1.00 | 0.2 | | | |
| Beryllium * | 5 (0.0) | | | | |
| Boron | 5 (0.2) | 0.14 | | | |
| | 0.005 | | | | |
| Chromium | 0.050 | | | | |
| Cobalt | (0.0009) | 1220 | | | |
| Conductivity (micros/cm) | 1 (0.005) | 1220 | | | |
| Copper | 1 (0.005) | 0.002 | | | |
| | 0.3 (0.3) | <0.03 | | | |
| Ledu · | 0.010 | -0.01 | | | |
| Molybdonum | 0.030 | <0.01 | | | |
| Nickol | | | | | |
| Phosphorus | | | | | |
| Silicon | | | | | |
| Silver | 0.05 (0.0001) | | | | |
| Strontium | 0.05 (0.0001) | 0.38 | | | |
| Sulphur | | 0.50 | | | |
| Thallium | | | | | |
| Tin | | | | | |
| Titanium | | | | | |
| Vanadium | | | | | |
| Zinc | 5 (0.03) | | | | |
| Hardness | 80 - 100 | | | | |
| Alkalinity as CaCO ₂ | 30 - 500 (Note 1) | 425 | | | |
| TKN | | 0.375 | | | |
| N-NH3 (Ammonia) | | 0.245 | | | |
| Organic Nitrogen | 0.15 | 012.10 | | | |
| Phenols | | <0.001 | | | |
| BOD | | | | | |
| COD | | <5 | | | |
| TDS | 500 | 793 | | | |
| Ion Balance | | | | | |
| | | | | | |
| Field Measured | | | | | |
| Water Temp. (°C) | 15.0 | 6.6 | | | |
| Conductivity (microS/cm) | | 1370 | | | |
| pH (pH units) | 6.5 - 8.5 (6.5-8.5) | 7.4 | | | |
| | | | | | |

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				BH	1-2		
Date Sampled	ODWS (PWQO)	Aug-04	Aug-05	Sep-06	Aug-07	Aug-08	Apr-09
Parameters							
Fluoride	2.40	0.39	0.16	<0.10	<0.10	<0.10	<0.10
Chloride	250		66	62	39	39	35
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3 (Nitrate)	10.00	< 0.1	0.39	0.38	0.47	0.27	0.40
Phosphate							
Sulphate	500	56	45	43	39	42	33
Calcium		95	118	115	95	97	86
Magnesium		38	30	28	22	24	20
Sodium	200	16	19	20	23	18	24
Potassium		7	3	2	3	2	2
Aluminum	0.1 (0.075)						
Barium	1.00	0.130	0.150	0.160	0.130	0.150	0.097
Beryllium *							
Boron	5 (0.2)	0.04	0.02	0.01	< 0.01	< 0.01	< 0.01
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		869	778	855	713	743	
Copper	1 (0.005)	0.002	0.012	0.003	0.003	0.003	<0.001
Iron	0.3 (0.3)	0.020	0.410	< 0.03	< 0.03	< 0.03	< 0.1
Lead *	0.010						
Manganese	0.050	1.14	0.20	0.04	< 0.01	0.05	0.02
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium		0.408	0.268	0.341	0.300	0.316	0.250
Sulphur							
Thallium							
lin Tite si use							
l Itanium							
Zine	F (0.03)						
ZIIIC	5 (0.03)						
	80 - 100	200	205	247	204	200	250
	30 - 500 (Note 1)	286	295	317	284	300	258
TKN		0.50	0.05	0.09	0.13	0.11	0.05
N-NH3 (Ammonia)	0.45	<1.5	0.02	<0.02	<0.02	0.02	<0.05
Organic Nitrogen	0.15	< 0.50	0.03	.0.001	<u><</u> 0.13	.0.001	.0.001
Phenois		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
BOD						12	12
	500	<5	<5	<5	<5 462	13	12
IDS	300	0.02	1.06	1.00	405	405	410
		0.92	1.00	1.00			
Field Measured							
Matar Tamp (°C)	15.0	14 5	15.2	10 5	10.0	12.0	7.2
water remp. (C)	15.0	14.5	15.2	10.5	10.9	12.0	1.3
conductivity (micros/cm)		09U	772	689	549	558 7 20	005
אוי (אר מוונ <i>ג)</i>	(0.5-0.0) 0.0 - 0.0	7.10	7.55	0.23	1.22	1.20	7.00

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				Bŀ	1-2		
Date Sampled	ODWS (PWQO)	May-10	May-11	May-12	May-13	May-14	May-15
Parameters							
Fluoride	2.40	<0.10	<0.10	<0.10	<0.10	0.10	<0.10
Chloride	250	51	29	40	35	34	71.2
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10	<0.10	< 0.10	<0.10
N-NO3 (Nitrate)	10.00	0.47	0.10	0.12	0.15	0.30	0.31
Phosphate							
Sulphate	500	41	30	39	29	31	39.3
Calcium		95	77	71	84	83	81.7
Magnesium		21	18	15	23	19	22.7
Sodium	200	23	19	20	18	20	24.5
Potassium		2	1	1	2	2	1.91
Aluminum	0.1 (0.075)						
Barium	1.00	0.110	0.100	0.100	0.090	0.089	0.120
Beryllium *						< 0.0001	
Boron	5 (0.2)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.005	< 0.01
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		718	616	662	635		
Copper	1 (0.005)	0.003	0.004	0.003	0.003	0.004	<0.003
Iron	0.3 (0.3)	0.090	0.120	0.040	0.050	0.100	< 0.01
Lead *	0.010						
Manganese	0.050	0.02	0.02	< 0.01	0.01	0.01	< 0.002
Molybdenum							
Nickel							
Phosphorus							
Silicon	0.05 (0.0001)						
Sliver	0.05 (0.0001)	0.210	0.225	0.205	0.240	0.055	0.077
Subhur		0.310	0.235	0.265	0.240	0.255	0.277
Suprior							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100						
Alkalinity as CaCO	20 500 (Note 1)	262	264	261	257	224	269
	30 - 300 (Note 1)	205	204	<0.10	2010	234	<0.10
NNN NH2 (Ammonia)		<0.10	<0.02	<0.10	<0.10	0.22	<0.10
	0.15	<0.02	<0.02	<0.02	<0.02	< 0.01	< 0.02
Phenols	0.15	<0.10	<0.012	<0.10	<0.10	< 0.001	< 0.10
BOD		0.001	\$0.001	0.001	\$0.001	0.001	0.001
COD		10	15	<5	<5	8	<5
TDS	500	467	400	430	413	331	424
Ion Balance						0.96	
Field Measured							
Water Temp. (°C)	15.0	8.3	6.7	9.0	7.3	6.1	8.7
Conductivity (microS/cm)	-	691	450	582	634	553	835
pH (pH units)	6.5 - 8.5 (6.5-8.5)	7.70	7.40	7.4	7.4	7.30	8.10
1 NF							

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				Bŀ	1-2		
Date Sampled	ODWS (PWQO)	May-15	Sep-16	Sep-16	May-17	May-17	Jun-18
Parameters		QA/QC		QA/QC		QA/QC	
				.,			
Fluoride	2.40	<0.10	0.1	0.1	< 0.1	< 0.1	< 0.1
Chloride	250	71.6	64.4	63.2	31.9	32.1	56.1
N-NO2 (Nitrite)	1.00	<0.10	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05
N-NO3 (Nitrate)	10.00	0.30	0.2	0.1	0.12	0.17	0.08
Phosphate							
Sulphate	500	39.5	46	45	18	18	27
Calcium		82.3	105	104	81.7	81.5	88.6
Magnesium		22.1	25.6	25.5	19.6	19.5	20.6
Sodium	200	24.9	26.6	26.4	15.6	15.6	26.5
Potassium		1.78	1.6	1.6	1.3	1.3	1.4
Aluminum	0.1 (0.075)						
Barium	1.00	0.119	0.15	0.148	0.097	0.096	0.106
Bervllium *							
Boron	5 (0.2)	< 0.01	0.006	0.007	< 0.005	< 0.005	< 0.005
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)			752	758	536	535	695
Copper	1 (0.005)	<0.003	< 0.002	0.002	0.004	0.002	< 0.002
Iron	0.3 (0.3)	< 0.01	< 0.005	< 0.005	0.133	0.087	0.007
Lead *	0.010						
Manganese	0.050	0.004	0.004	0.004	0.017	0.011	0.001
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium		0.280	0.322	0.316	0.229	0.228	0.256
Sulphur							
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100		368	365	285	284	306
Alkalinity as CaCO ₃	30 - 500 (Note 1)	265	315	298	213	211	260
TKN		<0.10	0.21	0.3	0.19	0.21	0.1
N-NH3 (Ammonia)		0.03	< 0.01	< 0.01	< 0.01	< 0.01	0.03
Organic Nitrogen	0.15	< 0.10					
Phenols	-	<0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
BOD							
COD		<5	46	28	11	6	9
TDS	500	408	459	446	296	294	376
Ion Balance							
Field Measured							
Water Temp. (°C)	15.0		11.1		6.3		6.8
Conductivity (microS/cm)			841		558		534
pH (pH units)	6.5 - 8.5 (6.5-8.5)		7.70		7.1		6.9

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				Bŀ	1-2		
Date Sampled	ODWS (PWQO)	Jun-18	Jul-19	Jul-19	May-20	May-20	Apr-21
Parameters		QA/QC		QA/QC		QA/QC	
Fluoride	2.40	< 0.1	<0.10	<0.10	< 0.10	< 0.10	0.14
Chloride	250	56.1	89	89	63	65	48
N-NO2 (Nitrite)	1.00	< 0.05	<0.10	<0.10	< 0.10	< 0.10	<0.10
N-NO3 (Nitrate)	10.00	0.08	<0.10	<0.10	0.16	< 0.10	0.21
Phosphate							
Sulphate	500	27	27	27	26	27	25
Calcium		102	100	99	92	91	91
Magnesium		22.8	23	22	20	20	21
Sodium	200	28.3	24	28	24	25	30
Potassium		1.6	2	2	2	2	2
Aluminum	0.1 (0.075)						
Barium	1.00	0.127	0.12	0.12	0.11	0.12	0.12
Beryllium *							
Boron	5 (0.2)	0.008	<0.01	<0.01	< 0.01	< 0.01	<0.01
Cadmium *	0.005						
Chromium	0.050						
	(0.0009)	605					606
Conductivity (microS/cm)		695	664	664	451	/00	696
Copper	1 (0.005)	< 0.002	0.001	<0.001	0.002	0.002	0.006
Iron	0.3 (0.3)	< 0.005	<0.03	<0.03	< 0.03	< 0.03	0.04
Lead *	0.010	0.001	.0.01	.0.01	. 0. 01	. 0. 01	.0.01
Manganese	0.050	0.001	<0.01	<0.01	< 0.01	< 0.01	<0.01
Niekel							
Nickel Desenhorus							
Filicon							
Silicon	0.05 (0.0001)						
Strontium	0.03 (0.0001)	0.279	0.20	0.20	0.274	0.276	0.27
Sulphur		0.278	0.25	0.25	0.274	0.270	0.27
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100	349	344	338	312	310	
Alkalinity as CaCO ₂	30 - 500 (Note 1)	256	240	240	261	262	288
TKN		0.1	<0.15	<0.15	0.365	0 14	0.209
N-NH3 (Ammonia)		0.03	<0.010	<0.010	< 0.010	0.012	<0.010
Organic Nitrogen	0.15	0.00			0.010	0.011	
Phenols		< 0.001	< 0.001	<0.001	< 0.001	< 0.001	< 0.001
BOD							
COD		< 5	< 5	< 5	< 5	15	<5
TDS	500	391	432	432	451	455	452
Ion Balance							
Field Measured							
Water Temp. (°C)	15.0		7.7	7.7	7		6.7
Conductivity (microS/cm)			792	792	667		717
pH (pH units)	6.5 - 8.5 (6.5-8.5)		7	7	6.8		5.8

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				Bŀ	1-2	
Date Sampled	ODWS (PWQO)	Apr-22	Jun-23	Apr-24	Median	
Parameters						
Fluoride	2.40	<0.10	<0.10	<0.10		
Chloride	250	63	72	89	56	
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10		
N-NO3 (Nitrate)	10.00	0.36	0.34	0.43	0.20	
Phosphate						
Sulphate	500	27	29	33	31	
Calcium		103	96	123	-	
Magnesium		22	22	27		
Sodium	200	34	29	38	24	
Potassium		2	2	2		
Aluminum	0.1 (0.075)					
Barium	1.00	0.13		0.14		
Bervllium *				-		
Boron	5 (0.2)	<0.01	< 0.01	< 0.01	< 0.01	
Cadmium *	0.005					
Chromium	0.050					
Cobalt	(0.0009)					
Conductivity (microS/cm)		780	688	895		
Copper	1 (0.005)	0.011	0.003	0.001		
Iron	0.3 (0.3)	0.34	< 0.03	< 0.03	< 0.03	
Lead *	0.010					
Manganese	0.050	0.06	< 0.01	< 0.01	0.010	
Molybdenum						
Nickel						
Phosphorus						
Silicon						
Silver	0.05 (0.0001)					
Strontium		0.306	0.268	0.325		
Sulphur						
Thallium						
Tin						
Titanium						
Vanadium						
Zinc	5 (0.03)					
Hardness	80 - 100					
Alkalinity as CaCO ₃	30 - 500 (Note 1)	306	273	314		
TKN		0.306	0.278	0.297		
N-NH3 (Ammonia)		0.011	<0.020	0.24		
Organic Nitrogen	0.15			-		
Phenols		<0.001	<0.001	< 0.001		
BOD						
COD		<5	<5	18		
TDS	500	910	447	562	439	
Ion Balance						
Field Measured						
Water Temp. (°C)	15.0	6.7	8.3	7.5		
Conductivity (microS/cm)		775	800	1000		
pH (pH units)	6.5 - 8.5 (6.5-8.5)	6.5	7	7.8		
1. /1		2.0				

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				BF	I-3		
Date Sampled	ODWS (PWQO)	Aug-04	Aug-05	Sep-06	Apr-09	Mav-10	Mav-11
Parameters							
Fluoride	2.40	no water	no water	no water	0.10	<0.10	<0.10
Chloride	250				19	8	17
N-NO2 (Nitrite)	1.00				<0.01	<0.10	<0.10
N-NO3 (Nitrate)	10.00				0.70	0.30	<0.34
Phosphate							
Sulphate	500				77	26	37
Calcium					120	99	108
Magnesium					48	29	35
Sodium	200				21	7	21
Potassium					3.1	2.0	2
Aluminum	0.1 (0.075)						
Barium	1.00				0.03	0.15	0.13
Beryllium *							
Boron	5 (0.2)				0.18	0.08	0.13
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)						677	819
Copper	1 (0.005)				0.001	0.006	0.003
Iron	0.3 (0.3)				0.300	<0.03	0.050
Lead *	0.010						
Manganese	0.050				0.08	0.02	0.02
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium					0.960	0.283	0.339
Sulphur							
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100						
Alkalinity as CaCO ₃	30 - 500 (Note 1)				443	352	408
TKN						<0.10	0.53
N-NH3 (Ammonia)					<0.05	<0.02	<0.02
Organic Nitrogen	0.15					<0.10	<u><</u> 0.53
Phenols					<0.001	<0.001	<0.001
BOD							
COD					60	73	15
TDS	500				620	440	532
Ion Balance							
Field Measured							
Water Temp. (°C)	15.0				7.7	8.5	7.3
Conductivity (microS/cm)					944	660	596
pH (pH units)	6.5 - 8.5 (6.5-8.5)				7.40	7.30	7.40

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				Bł	1-3		
Date Sampled	ODWS (PWQO)	May-12	May-13	May-14	May-14	May-15	Sep-16
Parameters					BH 7		
					QA/QC		
Fluoride	2.40	<0.10	<0.10	0.10	0.10	<0.05	no water
Chloride	250	15	5	7	8	3.81	
N-NO2 (Nitrite)	1.00	<0.10	<0.10	< 0.10	< 0.10	<0.05	
N-NO3 (Nitrate)	10.00	<0.89	0.50	0.80	0.80	0.89	
Phosphate							
Sulphate	500	29	20	26	24	23.1	
Calcium		91	71	82	82	85.8	
Magnesium		28	27	25	25	25.4	
Sodium	200	8	14	16	16	9.21	
Potassium		1	2	2	2	1.83	
Aluminum	0.1 (0.075)						
Barium	1.00	0.150	0.08	0.09	0.10	0.106	
Beryllium *				< 0.0001	< 0.0001		
Boron	5 (0.2)	0.15	0.07	0.07	0.07	0.067	
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		776	556	548		653	
Copper	1 (0.005)	0.002	0.001	< 0.002	< 0.002	< 0.003	
Iron	0.3 (0.3)	< 0.03	< 0.03	< 0.005	< 0.005	<0.010	
Lead *	0.010						
Manganese	0.050	0.01	0.01	0.00	0.00	0.002	
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium		0.307	0.203	0.228	0.227	0.204	
Sulphur							
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100						
Alkalinity as CaCO ₃	30 - 500 (Note 1)	393	280	291	293	319	
TKN		0.12	<0.10	0.09	0.12	<0.10	
N-NH3 (Ammonia)		<0.02	0.03	< 0.01	< 0.01	<0.02	
Organic Nitrogen	0.15	<u><</u> 0.12	<0.10	<u><</u> 0.09	<u><</u> 0.12		
Phenols		< 0.001	<0.001	< 0.001	< 0.001	< 0.001	
BOD							
COD		8	<5	< 5	7	<5	
TDS	500	504	361	337	331	348	
Ion Balance				0.958	0.963		
Field Measured							
Water Temp. (°C)	15.0	9.3	7.1	6.6		9.3	
Conductivity (microS/cm)		637	552	548		653	
pH (pH units)	6.5 - 8.5 (6.5-8.5)	7.3	7.40	7.70		7.70	

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				Bŀ	1-3		
Date Sampled	ODWS (PWQO)	May-17	Jun-18	Jul-19	May-20	Apr-21	Apr-21
Parameters							QA/QC
Fluoride	2.40	< 0.1	< 0.1	<0.10	< 0.10	<0.10	<0.10
Chloride	250	13.2	12.4	16	14	5	5
N-NO2 (Nitrite)	1.00	< 0.05	< 0.05	<0.10	< 0.10	<0.10	<0.10
N-NO3 (Nitrate)	10.00	0.32	2.31	0.580	1.860	0.780	0.790
Phosphate							
Sulphate	500	32	26	46	51	26.000	25.000
Calcium		162	91.6	123	124	86	85
Magnesium		51.3	36.9	35	36	26	26
Sodium	200	18.3	14.6	12	13	14	15
Potassium		2.8	2.4	2	3	2	2
Aluminum	0.1 (0.075)						
Barium	1.00	0.212	0.138	0.16	0.22	0.09	0.09
Beryllium *							
Boron	5 (0.2)	0.421	0.113	0.14	0.2	0.12	0.12
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		991	793	700	852.000	593.000	595.000
Copper	1 (0.005)	0.007	< 0.002	0.002	0.019	<0.001	0.003
Iron	0.3 (0.3)	0.016	< 0.005	<0.03	3.770	<0.03	<0.03
Lead *	0.010						
Manganese	0.050	0.002	< 0.001	<0.01	0.65	<0.01	<0.01
Molybdenum							
Nickel							
Phosphorus							
Silicon	/>						
Silver	0.05 (0.0001)						
Strontium		0.432	0.287	0.347	2.200	0.236	0.235
Sulphur							
I nallium Ti-							
lin Tite si use							
Itanium							
Zinc	F (0.03)						
Zilic	S (0.03)	617	201	451	150		
	30 - 100	510	304	404	438	205	202
	30 - 500 (Note 1)	516	394	404	418	305	303
		0.6	0.2	0.38	0.39	0.195	0.408
N-NH3 (Ammonia)	0.15	< 0.01	0.01	<0.010	< 0.010	<0.010	<0.01
Organic Nitrogen	0.15	0.000	10.001	10.001	10.001	10.001	10.001
Phenois		0.002	< 0.001	<0.001	< 0.001	<0.001	<0.001
BOD		20	C	د ا	0	ک ۲	<u>، ۲</u>
	500	30	0 421		9	<> 20E	<5 207
IDS	500	569	421	455	554	202	507
Field Measured							
$\frac{1}{1}$	15.0	61	8 .2	Q 1	7 1	70	
Conductivity (micros (cm)	13.0	1004	0.Z	0.1	7.1 01E	612	
nH (nH units)	65-85/6595	7.0	5/Z 7 1	700	7 00	6 30	
pri (pri dinita)	0.0-0.0 (0.0-0.0)	7.0	/.1	7.20	7.00	0.30	

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				Bŀ	1-3	
Date Sampled	ODWS (PWQO)	Apr-22	Apr-22	Jun-23	Apr-24	
Parameters			QA/QC			
Fluoride	2.40	<0.10	<0.10	<0.10	<0.10	
Chloride	250	7	8	15	1	
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10	<0.10	
N-NO3 (Nitrate)	10.00	0.92	0.77	1.620	0.220	
Phosphate						
Sulphate	500	26	26	48	115	
Calcium		91	94	121	109	
Magnesium		28	27	36	33	
Sodium	200	12	10	9	8	
Potassium		2	2	3	2	
Aluminum	0.1 (0.075)					
Barium	1.00	0.1	0.1		0.06	
Beryllium *						
Boron	5 (0.2)	0.11	0.11	0.17	0.1	
Cadmium *	0.005					
Chromium	0.050					
Cobalt	(0.0009)					
Conductivity (microS/cm)		650	639	748	674.000	
Copper	1 (0.005)	<0.001	0.002	0.003	0.002	
Iron	0.3 (0.3)	<0.03	<0.03	<0.03	<0.03	
Lead *	0.010					
Manganese	0.050	<0.01	<0.01	<0.01	<0.01	
Molybdenum						
Nickel						
Phosphorus						
Silicon						
Silver	0.05 (0.0001)					
Strontium		0.244	0.249	0.304	0.242	
Sulphur						
Thallium						
Tin						
Titanium						
Vanadium						
Zinc	5 (0.03)					
Hardness	80 - 100					
Alkalinity as CaCO ₃	30 - 500 (Note 1)	347	349	409	269.00	
TKN		0.342	0.441	0.35	0.376	
N-NH3 (Ammonia)		0.16	0.026	<0.020	0.078	
Organic Nitrogen	0.15					
Phenols		<0.001	<0.001	<0.001	<0.001	
BOD						
COD		<5	<5	18	8.00	
	500	422	415	486	438.00	
Ion Balance						
Field Measured						
Water Temp. (°C)	15.0	6.8	6.8	8.2	7.5	
Conductivity (microS/cm)		641	641	890	790	
pH (pH units)	6.5 - 8.5 (6.5-8.5)	7.1	7.1	7.00	7.50	

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				Bŀ	1-4		
Date Sampled	ODWS (PWQO)	May-13	May-14	May-15	Sep-16	May-17	Jun-18
Parameters							
Fluoride	2.40	<0.10	< 0.10	<0.05	no water	< 0.1	< 0.1
Chloride	250	7	2	1.20		1.8	1.70
N-NO2 (Nitrite)	1.00	<0.10	< 0.10	<0.05		< 0.05	< 0.05
N-NO3 (Nitrate)	10.00	<0.10	0.40	0.32		1.39	< 0.05
Phosphate							
Sulphate	500	14	9	11.6		3	5
Calcium		34	21	25.1		16	26
Magnesium		11	5	7.32		5.17	6.51
Sodium	200	10	4	3.38		1.7	2
Potassium		2	2	1.86		1.4	2.2
Aluminum	0.1 (0.075)						
Barium	1.00	0.07	0.06	0.068		0.058	0.08
Beryllium *			< 0.0001				
Boron	5 (0.2)	0.03	0.02	0.028		0.022	0.027
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		286				154	169
Copper	1 (0.005)	0.001	< 0.002	<0.003		0.003	< 0.002
Iron	0.3 (0.3)	<0.03	< 0.005	<0.010		< 0.005	< 0.005
Lead *	0.010						
Manganese	0.050	0.08	0.02	0.008		0.003	0.009
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium		0.098	0.069	0.072		0.07	0.074
Sulphur							
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100					84	92.000
Alkalinity as CaCO ₃	30 - 500 (Note 1)	124	68	91		66	80
TKN		0.52	0.16	0.16		0.3	0.10
N-NH3 (Ammonia)		0.06	< 0.01	<0.02		< 0.01	0.02
Organic Nitrogen	0.15		<u><</u> 0.16	<u><</u> 0.16			
Phenols		<0.001	< 0.001	<0.001		< 0.001	< 0.001
BOD							
COD		27	< 5	<5		< 5	7
TDS	500	186	85	114		68.8	91
Ion Balance			0.957	0.957			
Field Measured							
Water Temp. (°C)	15.0	6.5	5.2	9.0		6.0	10.2
Conductivity (microS/cm)		277	146	218		152	139
pH (pH units)	6.5 - 8.5 (6.5-8.5)	6.80	7.30	7.40		6.10	6.9

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				BF	I-4		
Date Sampled	ODWS (PWQO)	Jul-19	May-20	Apr-21	Apr-22	Jun-23	Apr-24
Parameters							
Fluoride	2.40	no sample	no sample	no sample	<0.10	no sample	Dry
Chloride	250				<1		
N-NO2 (Nitrite)	1.00				<0.10		
N-NO3 (Nitrate)	10.00				<0.10		
Phosphate							
Sulphate	500				7		
Calcium					20		
Magnesium					5		
Sodium	200				2		
Potassium					1		
Aluminum	0.1 (0.075)						
Barium	1.00				0.05		
Bervllium *							
Boron	5 (0.2)				0.02		
Cadmium *	0.005				0.01		
Chromium	0.050						
Cobalt	(0,0009)						
Conductivity (microS/cm)	(0.0000)				133		
Conner	1 (0 005)				<0.001		
Iron	0.3(0.3)				<0.001		
Lead *	0.010				10.05		
Manganese	0.050				<0.01		
Molybdenum	0.050				0.01		
Nickel							
Phosphorus							
Silicon							
Silvor	0.05 (0.0001)						
Strontium	0.03 (0.0001)				0.064		
Sulphur					0.004		
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0 02)						
Hardness	3 (0.03) 80 - 100						
	30 - 100				70		
	30 - 500 (Note 1)				/8		
IKN					0.18		
N-NH3 (Ammonia)	0.45				0.055		
Organic Nitrogen	0.15						
Phenois					<0.001		
BOD					_		
	500				<5		
	500				86		
Ion Balance							
51 1 1 A 4							
	45.5						
Water Temp. (°C)	15.0				6.3		
Conductivity (microS/cm)					148		
pH (pH units)	6.5 - 8.5 (6.5-8.5)				6.5		
		1					

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->		BH-5						
Date Sampled	ODWS (PWQO)	May-13	May-14	May-15	Sep-16	May-17	Jun-18	
Parameters								
Fluoride	2.40	<0.10	0.10	<0.10	0.1	< 0.1	< 0.1	
Chloride	250	68	50	51.8	22.8	107	17.1	
N-NO2 (Nitrite)	1.00	<0.10	< 0.10	<0.10	< 0.1	< 0.05	< 0.05	
N-NO3 (Nitrate)	10.00	1.84	1.4	0.84	1	4.19	2.14	
Phosphate								
Sulphate	500	29	24	18.9	29	34	18	
Calcium		131	106	86.4	105	171	97.1	
Magnesium		41	28	24.2	28.5	46.6	24.9	
Sodium	200	17	15	11.8	22.2	29.4	23.6	
Potassium		3	3	2.52	3.2	3.2	3	
Aluminum	0.1 (0.075)							
Barium	1.00	0.17	0.15	0.151	0.202	0.293	0.181	
Beryllium *			< 0.0001					
Boron	5 (0.2)	0.04	0.03	0.036	0.066	0.073	0.054	
Cadmium *	0.005							
Chromium	0.050							
Cobalt	(0.0009)							
Conductivity (microS/cm)		978	685	762	748	1140	631	
Copper	1 (0.005)	<0.001	< 0.002	<0.003	< 0.002	0.004	< 0.002	
Iron	0.3 (0.3)	<0.03	< 0.005	<0.010	< 0.005	0.006	< 0.005	
Lead *	0.010							
Manganese	0.050	0.01	0.003	0.003	< 0.001	< 0.001	0.001	
Molybdenum								
Nickel								
Phosphorus								
Silicon								
Silver	0.05 (0.0001)	0.050	0.004	0.044	0.045	0.474	0.04	
Strontium		0.359	0.304	0.244	0.315	0.474	0.24	
Suppur								
Tin								
Titanium								
Manadium								
Zinc	5 (0 02)							
Hardness	80 - 100				281	618	345	
Alkalinity as CaCO	30 = 100	204	204	270	200	207	204	
	30 - 300 (Note 1)	594	504	270	500	597	294	
		1.01	0.99	0.24	0.09	0.55	0.4	
N-NH3 (Ammonia)	0.15	0.06	< 0.01	<0.02	< 0.01	< 0.01	0.01	
Dhanala	0.15	0.95	<u>< 0.99</u>	<0.001	< 0.001	0.001	< 0.001	
Phenois		<0.001	< 0.001	<0.001	< 0.001	0.001	< 0.001	
COD		225	27	<f< td=""><td>7</td><td>14</td><td>e</td></f<>	7	14	e	
	500	626	57	270	119	14 620	260	
Ion Balance	500	030	415	370	440	030	300	
			0.307					
Field Measured								
Water Temp. (°C)	15.0	7.0	5.8	7.5	13.5	6.2	8.7	
Conductivity (microS/cm)		981	685	762	824	1161	486	
pH (pH units)	6.5 - 8.5 (6 5-8 5)	7.30	7.50	7.60	7.10	70	7.2	
F /b								

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

17-60411

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->		ВН-5					
Date Sampled	ODWS (PWQO)	Jul-19	May-20	Apr-21	Apr-22	Jun-23	Apr-24
Parameters							
Fluoride	2.40	<0.10	< 0.10	<0.10	<0.10	<0.10	<0.10
Chloride	250	59	100	82	134	124	28
N-NO2 (Nitrite)	1.00	<0.10	< 0.10	<0.10	<0.10	<0.10	<0.10
N-NO3 (Nitrate)	10.00	2.69	4.62	0.57	0.22	2.83	0.11
Phosphate							
Sulphate	500	35	31	18	15	32	23
Calcium		141	141	111	134	157	98
Magnesium		35	37	30	35	42	26
Sodium	200	30	25	25	24	34	24
Potassium		3	4	3	3	4	3
Aluminum	0.1 (0.075)						
Barium	1.00	0.26	0.27	0.21	0.24		0.15
Beryllium *							
Boron	5 (0.2)	0.07	0.08	0.06	0.04	0.06	0.04
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		850	1060	827	999	1110	677
Copper	1 (0.005)	0.001	0.003	0.005	<0.001	0.003	0.001
Iron	0.3 (0.3)	<0.03	0.4	<0.03	<0.03	<0.03	<0.03
Lead *	0.010						
Manganese	0.050	<0.01	0.07	<0.01	<0.01	<0.01	<0.01
Molybdenum							
Nickel							
Phosphorus							
Silicon	0.05 (0.0001)						
Sliver	0.05 (0.0001)	0 272	0.200	0.21	0.270	0 422	0.228
Sulahur		0.373	0.396	0.31	0.379	0.422	0.238
Sulphur							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	3 (0.03) 80 - 100	496	504.00				
Alkalinity as CaCO.	30 - 500 (Note 1)	/137	38/1.00	305 000	307	128	316
	30 - 300 (Note 1)	437	0.246	0 100	0.196	420	0.219
NNN NH2 (Ammonia)		0.55 <0.010	0.240	<0.190	0.180 <0.010	0.401 <0.020	0.518
Organic Nitrogon	0.15	<0.010	0.017	<0.010	<0.010	<0.020	0.044
Phenols	0.15	<0.001	< 0.001	<0.001	<0.001	<0.001	<0.001
BOD		<0.001	< 0.001	<0.001	<0.001	<0.001	<0.001
COD		6	7	~5	~5	9	11
TDS	500	552	689	538	649	722	440
Ion Balance	500	552	005	550	045	0.95	440
						0.55	
Field Measured							
Water Temp. (°C)	15.0	9.1	7.1	5.3	5.3	10.5	3.6
Conductivity (microS/cm)		1038	1007	877	1010	1250	790
pH (pH units)	6.5 - 8.5 (6.5-8.5)	7.1	7.3	7	6.8	7.2	7.6
1. (J.,)							

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				BF	1-6		
Date Sampled	ODWS (PWQO)	May-13	May-14	May-15	Sep-16	May-17	Jun-18
Parameters					•		
Fluoride	2.40	<0.10	0.10	<0.05	0.1	< 0.1	< 0.1
Chloride	250	16	7	9.89	13.4	55.2	10.7
N-NO2 (Nitrite)	1.00	<0.10	< 0.10	<0.05	< 0.1	< 0.05	< 0.05
N-NO3 (Nitrate)	10.00	0.66	0.40	0.48	0.6	3.62	1.13
Phosphate							
Sulphate	500	22	20	19.8	21	25	17
Calcium		87	75	77.1	91.6	130	93.2
Magnesium		28	21	20.2	24.8	37.2	24.7
Sodium	200	5	5	4.48	6.6	7.1	7.6
Potassium		3	2	2.21	2.7	2.4	2.5
Aluminum	0.1 (0.075)						
Barium	1.00	0.11	0.09	0.103	0.141	0.177	0.142
Beryllium *			< 0.0001				
Boron	5 (0.2)	0.01	0.01	0.016	0.028	0.016	0.028
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		620			606	830	557
Copper	1 (0.005)	<0.001	< 0.002	<0.003	< 0.002	0.004	< 0.002
Iron	0.3 (0.3)	<0.03	0.133	0.056	< 0.005	0.021	0.066
Lead *	0.010						
Manganese	0.050	0.04	0.31	0.129	0.085	0.039	0.21
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium		0.234	0.221	0.201	0.274	0.365	0.239
Sulphur							
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100				331	478	335
Alkalinity as CaCO ₃	30 - 500 (Note 1)	294	240	257	306	312	267
TKN		0.40	0.12	<0.10	0.18	0.25	0.2
N-NH3 (Ammonia)		0.06	0.02	<0.02	< 0.01	< 0.01	0.02
Organic Nitrogen	0.15	0.34	0.10				
Phenols		<0.001	< 0.001	<0.001	< 0.001	< 0.001	< 0.001
BOD							
COD		20	< 5	<5	< 5	6	5
TDS	500	403	276	290	346	444	316
Ion Balance			0.950				
Field Measured							
Water Temp. (°C)	15.0	7.7	6.0	7.5	13.5	6.4	8.7
Conductivity (microS/cm)		618	467	592	659	822	486
pH (pH units)	6.5 - 8.5 (6.5-8.5)	7.30	7.60	7.70	7.20	7.10	7.2

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Table H1: Groundwater Quality DataNorth Algona Landfill Monitoring

Monitor Number ->				BF	I-6		
Date Sampled	ODWS (PWOO)	lul-19	May-20	Anr-21	Anr-22	lun-23	Apr-24
Parameters		501 25		7101 22	7101 22	5411 25	Apr 24
<u>- a.a</u>							
Fluoride	2.40	no sample	no sample	no sample	<0.10	<0.10	<0.10
Chloride	250				62	66	10
N-NO2 (Nitrite)	1.00				<0.10	<0.10	<0.10
N-NO3 (Nitrate)	10.00				0.38	1.54	<0.10
Phosphate							
Sulphate	500				12	20	15
Calcium					97	113	82
Magnesium					25	30	22
Sodium	200				5	7	6
Potassium					2	3	2
Aluminum	0.1 (0.075)				_	-	_
Barium	1.00				0.13		0.1
Bervllium *							
Boron	5 (0.2)				0.02	0.02	0.02
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)	()				672	736	511
Copper	1 (0.005)				< 0.001	0.003	< 0.001
Iron	0.3 (0.3)				0.05	< 0.03	< 0.03
Lead *	0.010						
Manganese	0.050				0.05	<0.01	<0.01
Molybdenum							
Nickel							
Phosphorus							
Silicon							
Silver	0.05 (0.0001)						
Strontium					0.266	0.318	0.197
Sulphur							
Thallium							
Tin							
Titanium							
Vanadium							
Zinc	5 (0.03)						
Hardness	80 - 100						
Alkalinity as CaCO ₃	30 - 500 (Note 1)				260	319	257
TKN					0.275	0.264	0.326
N-NH3 (Ammonia)					0.013	<0.020	0.057
Organic Nitrogen	0.15						
Phenols					<0.001	<0.001	<0.001
BOD							
COD					<5	<5	<5
TDS	500				437	478	332
Ion Balance							
Field Measured							
Water Temp. (°C)	15.0				5.1	9.3	5.6
Conductivity (microS/cm)					680	860	600
pH (pH units)	6.5 - 8.5 (6.5-8.5)				6,9	7.3	7.6
I. (I					- 10		

Notes:

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->				P۱	V1		
Date Sampled	ODWS (PWQO)	Nov-03	Sep-11	May-12	May-13	May-14	
Parameters							
Fluoride	2.40	0.240	<0.10	0.10	<0.10	0.1	
Chloride	250	150	86	68	65	85.3	
N-NO2 (Nitrite)	1.00	<0.10	<0.10	<0.10	<0.10	< 0.10	
N-NO3 (Nitrate)	10.00	2.08	0.76	1.02	2.19	2.4	
Phosphate							
Sulphate	500	76	77	67	60	66	
Calcium		168	128	101	113	111	
Magnesium		29	21	18	23	18.9	
Sodium	200	40	40	33	42	37.2	
Potassium		5	2	2	2	2	
Aluminum	0.1 (0.075)						
Barium	1.00	0.27	0.230	0.21	0.19	0.174	
Beryllium *						< 0.0001	
Boron	5 (0.2)	0.02	0.01	<0.01	<0.01	< 0.005	
Cadmium *	0.005						
Chromium	0.050						
Cobalt	(0.0009)						
Conductivity (microS/cm)		1160	945	857	856	857	
Copper	1 (0.005)	0.026	0.024	0.022	0.008	0.008	
Iron	0.3 (0.3)	0.100	<0.03	<0.03	<0.03	< 0.005	
Lead *	0.010						
Manganese	0.050	<0.01	<0.01	<0.01	<0.01	< 0.001	
Molybdenum							
Nickel							
Phosphorus							
Silicon	/>						
Silver	0.05 (0.0001)						
Strontium		0.449	0.333	0.279	0.296	0.307	
Sulphur							
Thallium							
lin Titanium							
Nenedium							
Zinc	E (0.02)						
Zilic	3 (0.03)						
Alkalinity as CaCO	30 - 100	205	200	20.9	209	241	
Airaililly as CaCU3	30 - 500 (NOte 1)	305	309	298	298	241	
		0.17	<0.10	<0.10	0.17	< 0.05	
N-NH3 (Ammonia)	0.15	< 0.02	<0.02	<0.02	<0.02	< 0.01	
Dhanala	0.15	<u><0.001</u>	<0.10	<0.10	<u><</u> 0.17	< 0.05	
Phenois		<0.001	<0.001	<0.001	<0.001		
		0.0	5.0	~5	~5	~ 5	
TDS	500	5.0 754	5.0 614	 557	 556	ς σ 477	
Ion Balance	500	10	014	100	550	+// 1	
		1.0				Ţ	
Field Measured							
Water Temp. (°C)	15.0	8.6	15.8	12.8	8.6	6.4	
Conductivity (microS/cm)		1180	931	743	848	760	
pH (pH units)	6.5 - 8.5 (6.5-8.5)	6,90	7.30	7.2	7.6	7.7	
1. (1)		2.00					

All values reported in mg/L unless otherwise noted

Shaded values exceed ODWS (Ontario Drinking Water Standards, August 2000) or PWQO

 $^{\star}\,$ Provincial Water Quality Objectives (PWQO) related to hardness

Monitor Number ->						BH	‡1-II		
Date Sampled	UNITS	ТҮРЕ	LIMIT	Aug-03	Nov-03	Aug-04	Sep-04	Aug-05	Dec-05
PARAMETERS		[[•		
VOLATILE ORGANIC COMPOUNDS									
1, 1, 1, 2-tetrachloroethane	ug/l			<0.6	<0.6	<0.6	<0.6	<0.6	<0.5
1,1,1-trichloroethane	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 1, 2, 2-tetrachloroethane	ug/l			<0.6	<0.6	<0.6	<0.6	<0.6	<0.5
1,1,2-trichloroethane	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 1-dichloroethane	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 1-dichloroethylene	ug/l	MAC	14	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1, 2-dibromoethane	ug/l			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1, 2-dichlorobenzene	ug/l	MAC	200	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 2-dichloroethane	ug/l	IMAC	5	<0.7	<0.5	<0.5	<0.5	<0.5	<0.5
1, 2-dichloropropane	ug/l			<0.7	<0.7	<0.7	<0.7	<0.7	<0.5
1, 3, 5-trimethylbenzene	ug/l			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,3-dichlorobenzene	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,4-dichlorobenzene	ug/l	MAC	5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Acetone (2-Propanone)	ug/l								
Benzene	ug/l	MAC	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	ug/l			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Bromoform	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Bromomethane	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
c-1, 2-Dichloroethylene	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
c-1,3-Dichloropropylene	ug/l			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon Tetrachloride	ug/l	MAC	2	<0.9	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l								
Chloroethane	ug/l			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	ug/l			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	ug/l			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Dichloromethane	ug/l	MAC	50	<0.4	<0.4	<4.0	<4.0	<4.0	<4.0
Ethylbenzene	ug/l	AO	2.40	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylene Dibromide	ug/l								
Methyl Isobutyl Ketone	ug/l								
Methyl Ethyll Ketone (2-Butanone)	ug/l								
Methyl y-butyl ether (MTBE)	ug/l								
m/p-xylene	ug/l			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chlorobenzene	ug/l	MAC	80	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
o-xylene	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylene (Total)	ug/l								
Styrene	ug/I			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
I-1, 2-Dichloroethylene	ug/I			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
t-1,3-Dichloropropylene	ug/I	MAG	20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tetrachioroethylene	ug/I	MAC	30	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
l oluene	ug/I	MAC	24	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichlereflueremethere	ug/I	IVIAC	5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Vinul Chlorida	ug/i	MAG	1	<0.5	<0.5	<0.5	<0.5	< 0.5	< 0.5
	ug/i	MAC	1	<0.5	<0.2	۲0.2	۲0.2	<0.Z	<0.2
1 2 dichloroothane d4	0/			00	101	07	100	00	114
romofluorobonzono	70 0/			99	102	97	100	90	114
Toluono-d8	70 0/			00 00	94	97	90 100	۵L ۱۵۱	90 105
i oluelle-uo	/0			98	39	99	100	101	102

Notes:

All values reported in ug/L unless otherwise noted

ODWS = Ontario Drinking Water Standards (August 2000)

Monitor Number ->						BH #	¥1-II		
Date Sampled	UNITS	ТҮРЕ	LIMIT	Sep-06	Nov-06	Aug-07	Oct-07	Aug-08	Nov-08
PARAMETERS									
VOLATILE ORGANIC COMPOUNDS									
1, 1, 1, 2-tetrachloroethane	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,1-trichloroethane	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 1, 2, 2-tetrachloroethane	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1,1,2-trichloroethane	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 1-dichloroethane	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 1-dichloroethylene	ug/l	MAC	14	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1, 2-dibromoethane	ug/l			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
1, 2-dichlorobenzene	ug/l	MAC	200	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1, 2-dichloroethane	ug/l	IMAC	5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1, 2-dichloropropane	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
1, 3, 5-trimethylbenzene	ug/l			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,3-dichlorobenzene	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
1,4-dichlorobenzene	ug/l	MAC	5	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Acetone (2-Propanone)	ug/l								
Benzene	ug/l	MAC	1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bromodichloromethane	ug/l			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Bromoform	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Bromomethane	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
c-1, 2-Dichloroethylene	ug/l			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
c-1,3-Dichloropropylene	ug/l			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Carbon Tetrachloride	ug/l	MAC	2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorobenzene	ug/l								
Chloroethane	ug/l			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloroform	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloromethane	ug/l			<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Dibromochloromethane	ug/l			<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Dichloromethane	ug/l	MAC	50	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Ethylbenzene	ug/I	AO	2.40	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylene Dibromide	ug/I								
Methyl Isobutyl Ketone	ug/I								
Methyl Ethyl Relone (2-Bulanone)	ug/i								
m/n wylone	ug/i			<1.0	<1.0	~1.0	<1.0	<1.0	<1.0
Chlorobonzono	ug/i	MAC	80	<1.0	<1.0	<1.0	<0.2	<0.2	<0.2
	ug/i	MAC	80	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Vylone (Total)	ug/i			\U.J	<u.j< td=""><td><0.J</td><td>\U.J</td><td>\U.J</td><td>\0.5</td></u.j<>	<0.J	\U.J	\U.J	\ 0.5
Styrene	ug/i			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
T-1 2-Dichloroethylene	ug/i			<0.5	<0.5	<0.5	<0.5	<0.0	<0.5
t-1 3-Dichloropropylene	ug/i			<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Tetrachloroethylene	ug/i	MAC	30	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	ug/1	MAC	24	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethylene	uø/i	MAC	5	<0.5 <0 3	<0.J	<0.5 <0.3	<0.5 <0 3	<0.5 <0 3	<0.5 <0 3
Trichlorofluoromethane	uø/i	inac		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5 <0.5
Vinyl Chloride	ug/1	MAC	1	<0.2	<0.3	<0.2	<0.2	<0.2	<0.5
VOC SURROGATES	~ <u>6</u> / '	iiiAe	-	-0.2	~0.2	-0.2	-0.2	-0.2	NU.2
1. 2-dichloroethane-d4	%			100	105	106	99	117	100
Bromofluorobenzene	%			107	99	106	105	112	112
Toluene-d8	%			96	98	102	106	90	104
				50	50	102	200	50	

Notes:

All values reported in ug/L unless otherwise noted

ODWS = Ontario Drinking Water Standards (August 2000)

Monitor Number ->				BH #1-II					
Date Sampled	UNITS	ТҮРЕ	LIMIT	Apr-09	Oct-09	May-10	May-11		
PARAMETERS									
VOLATILE ORGANIC COMPOUNDS									
1, 1, 1, 2-tetrachloroethane	ug/l			<0.1	<0.1	<0.5	<0.5		
1,1,1-trichloroethane	ug/l			<0.1	<0.1	<0.4	<0.4		
1, 1, 2, 2-tetrachloroethane	ug/l			<0.2	<0.2	<0.5	<0.5		
1,1,2-trichloroethane	ug/l			<0.2	<0.2	<0.4	<0.4		
1, 1-dichloroethane	ug/l			<0.1	<0.1	<0.4	<0.4		
1, 1-dichloroethylene	ug/l	MAC	14	<0.1	<0.1	<0.5	<0.5		
1, 2-dibromoethane	ug/l					<1.0	<1.0		
1, 2-dichlorobenzene	ug/l	MAC	200	<0.2	<0.2	<0.4	<0.4		
1, 2-dichloroethane	ug/l	IMAC	5	<0.2	<0.2	<0.5	<0.5		
1, 2-dichloropropane	ug/l			<0.1	<0.1	<0.5	<0.5		
1, 3, 5-trimethylbenzene	ug/l					<0.3	<0.3		
1,3-dichlorobenzene	ug/l			<0.2	<0.2	<0.4	<0.4		
1,4-dichlorobenzene	ug/l	MAC	5	0.2	<0.2	<0.4	<0.4		
Acetone (2-Propanone)	ug/l			<10	<10				
Benzene	ug/l	MAC	1	<0.1	<0.1	<0.5	<0.5		
Bromodichloromethane	ug/l			<0.1	<0.1	<0.3	<0.3		
Bromoform	ug/l			<0.2	<0.2	<0.4	<0.4		
Bromomethane	ug/l			<0.5	<0.5	<0.5	<0.5		
c-1, 2-Dichloroethylene	ug/l			<0.1	<0.1	<0.4	<0.4		
c-1,3-Dichloropropylene	ug/l			<0.2	<0.2	<0.2	<0.2		
Carbon Tetrachloride	ug/l	MAC	2	<0.1	<0.1	<0.5	<0.5		
Chlorobenzene	ug/l			<0.1	<0.1				
Chloroethane	ug/l			.0.1	.0.4	<1.0	<1.0		
Chloroform	ug/l			<0.1	<0.1	<0.5	<0.5		
Chloromethane	ug/l			.0.0	.0.0	<1.0	<1.0		
Dibromochloromethane	ug/l		50	<0.2	<0.2	<0.3	<0.3		
Dichloromethane	ug/I	MAC	50	2.9	<0.5	<4.0	<4.0		
Ethylbenzene	ug/i	AU	2.40	<0.1	<0.1	<0.5	<0.5		
Ethylene Dibromide	ug/i			<0.2	<0.2				
Methyl Isobutyl Ketone	ug/i			<5 <5	<5 <5				
Methyl Ethyl Relone (2-Bulanone)	ug/i			<>> <0.2	<>>				
	ug/i			<0.2 0.2	<0.2	~1.0	<1.0		
Chlorobonzono	ug/i	MAC	80	0.2 <0.1	<0.1	<1.0	<1.0		
o-vylene	ug/i	MAC	80	<0.1	<0.1	<0.2	<0.2		
Vylene (Total)	ug/i			<0.1 0.2	<0.1	<0.J	<0.5		
Styrene	ug/i			<0.2	<0.1	<0.5	<0.5		
T-1 2-Dichloroethylene	ug/i			<0.2	<0.2	<0.5	<0.5		
t-1 3-Dichloropropylene	ug/i			<0.1	<0.1	<0.4	<0.4		
Tetrachloroethylene	ug/i	MAC	30	<0.2	<0.2	<0.2	<0.2		
Toluene	ug/1	MAC	24	0.1	<0.1	<0.5	<0.5		
Trichloroethylene	ug/I	MAC	5	<0.1	<0.1	<0.3	<0.3		
Trichlorofluoromethane	ug/I		5	-0.1	-0.1	<0.5	<0.5		
Vinyl Chloride	ug/I	MAC	1	0.2	<0.2	<0.2	<0.2		
VOC SURROGATES	~6/ '		-	0.2	-0.2	-0.2	-0.2		
1. 2-dichloroethane-d4	%			99	108	87	113		
Bromofluorobenzene	%			100	113	95	115		
Toluene-d8	%			103	85	104	101		
				-00	25	-01	-01		

Notes:

All values reported in ug/L unless otherwise noted

ODWS = Ontario Drinking Water Standards (August 2000)

Monitor Number ->						BH	#3	
Date Sampled	UNITS	ТҮРЕ	LIMIT	Apr-09	May-10	May-11		
PARAMETERS								
VOLATILE ORGANIC COMPOUNDS								
1, 1, 1, 2-tetrachloroethane	ug/l			<0.1	<0.5	<1		
1,1,1-trichloroethane	ug/l			<0.1	<0.4	<0.8		
1, 1, 2, 2-tetrachloroethane	ug/l			<0.2	<0.5	<1		
1,1,2-trichloroethane	ug/l			<0.2	<0.4	<0.8		
1, 1-dichloroethane	ug/l			<0.1	<0.4	<0.8		
1, 1-dichloroethylene	ug/l	MAC	14	<0.1	<0.5	<1		
1, 2-dibromoethane	ug/l				<1.0	<2.0		
1, 2-dichlorobenzene	ug/l	MAC	200	<0.2	<0.4	<0.8		
1, 2-dichloroethane	ug/l	IMAC	5	<0.2	<0.5	<1		
1, 2-dichloropropane	ug/l			<0.1	<0.5	<1		
1, 3, 5-trimethylbenzene	ug/l				<0.3	<0.6		
1,3-dichlorobenzene	ug/l			<0.2	<0.4	<0.8		
1,4-dichlorobenzene	ug/l	MAC	5	<0.2	<0.4	<0.8		
Acetone (2-Propanone)	ug/l			<10				
Benzene	ug/l	MAC	1	<0.1	<0.5	<1		
Bromodichloromethane	ug/l			<0.1	<0.3	<0.6		
Bromotorm	ug/l			<0.2	<0.4	<0.8		
Bromomethane	ug/l			<0.5	<0.5	<1		
c-1, 2-Dichloroethylene	ug/l			<0.1	<0.4	<0.8		
c-1,3-Dichloropropylene	ug/l		2	<0.2	<0.2	<0.4		
Carbon Tetrachloride	ug/l	MAC	2	<0.1	<0.5	<1		
Chloropenzene	ug/i			<0.1	-1.0	<2.0		
Chloroform	ug/i			<0.1	<1.0	<2.0		
Chloromothano	ug/i			<0.1	<0.5	<2.0		
Dibromochloromothano	ug/i			<0.2	<0.2	<2.0		
Dichloromethane	ug/i	MAC	50	0.2	<0.3	<0.0		
Ethylbenzene	ug/i		2 40	<0.000	<0.5	<0.0		
Ethylene Dibromide	ug/1	AO	2.40	<0.1	\0.5	1		
Methyl Isobutyl Ketone	ug/1			<5				
Methyl Ethyll Ketone (2-Butanone)	ug/l			<5				
Methyl v-butyl ether (MTBE)	ug/l			<0.2				
m/p-xvlene	ug/l			0.300	<1.0	<2.0		
Chlorobenzene	ug/l	MAC	80	<0.1	<0.2	<0.4		
o-xylene	ug/l			0.10	<0.5	<1		
Xylene (Total)	ug/l			0.40		<1.5		
Styrene	ug/l			<0.2	<0.5	<1		
T-1, 2-Dichloroethylene	ug/l			<0.1	<0.4	<0.8		
t-1,3-Dichloropropylene	ug/l			<0.2	<0.2	<0.4		
Tetrachloroethylene	ug/l	MAC	30	0.10	<0.3	<0.6		
Toluene	ug/l	MAC	24	0.60	<0.5	<1		
Trichloroethylene	ug/l	MAC	5	<0.1	<0.3	<0.6		
Trichlorofluoromethane	ug/l				<0.5	<1		
Vinyl Chloride	ug/l	MAC	1	<0.2	<0.2	<0.4		
VOC SURROGATES								
1, 2-dichloroethane-d4	%			99	89	109		
Bromofluorobenzene	%			102	100	108		
Toluene-d8	%			102	108	102		

Notes:

All values reported in ug/L unless otherwise noted

ODWS = Ontario Drinking Water Standards (August 2000)

Monitor Number ->					Trip I	Blank	
Date Sampled	UNITS	ТҮРЕ	LIMIT	May-11			
PARAMETERS							
VOLATILE ORGANIC COMPOUNDS							
1, 1, 1, 2-tetrachloroethane	ug/l			<0.5			
1,1,1-trichloroethane	ug/l			<0.4			
1, 1, 2, 2-tetrachloroethane	ug/l			<0.5			
1,1,2-trichloroethane	ug/l			<0.4			
1, 1-dichloroethane	ug/l			<0.4			
1, 1-dichloroethylene	ug/l	MAC	14	<0.5			
1, 2-dibromoethane	ug/l			<1.0			
1, 2-dichlorobenzene	ug/l	MAC	200	<0.4			
1, 2-dichloroethane	ug/l	IMAC	5	<0.5			
1, 2-dichloropropane	ug/l			<0.5			
1, 3, 5-trimethylbenzene	ug/l			<0.3			
1,3-dichlorobenzene	ug/l			<0.4			
1,4-dichlorobenzene	ug/l	MAC	5	<0.4			
Acetone (2-Propanone)	ug/l						
Benzene	ug/l	MAC	1	<0.5			
Bromodichloromethane	ug/l			<0.3			
Bromoform	ug/l			<0.4			
Bromomethane	ug/l			<0.5			
c-1, 2-Dichloroethylene	ug/l			<0.4			
c-1,3-Dichloropropylene	ug/l			<0.2			
Carbon Tetrachloride	ug/l	MAC	2	<0.5			
Chlorobenzene	ug/l						
Chloroethane	ug/l			<1.0			
Chloroform	ug/l			<0.5			
Chloromethane	ug/l			<1.0			
Dibromochloromethane	ug/l			<0.3			
Dichloromethane	ug/l	MAC	50	<4.0			
Ethylbenzene	ug/l	AO	2.40	<0.5			
Ethylene Dibromide	ug/l						
Methyl Isobutyl Ketone	ug/l						
Methyl Ethyll Ketone (2-Butanone)	ug/l						
Methyl y-butyl ether (MTBE)	ug/l						
m/p-xylene	ug/l			<1.0			
Chlorobenzene	ug/l	MAC	80	<0.2			
o-xylene	ug/l			<0.5			
xylene (Total)	ug/l			<1.5			
Styrene	ug/l			<0.5			
T-1, 2-Dichloroethylene	ug/l			<0.4			
t-1,3-Dichloropropylene	ug/l		20	<0.2			
letrachloroethylene	ug/l	MAC	30	<0.3			
i oluene	ug/I	MAC	24	<0.5			
	ug/I	MAC	5	<0.3			
I richlorofluoromethane	ug/l			<0.5			
Vinyi Chloride	ug/I	MAC	1	<0.2			
VOC SURROGATES							
1, 2-dichloroethane-d4	%			114			
Bromofluorobenzene	%			114			
i oluene-as	%			100			

Notes:

All values reported in ug/L unless otherwise noted

ODWS = Ontario Drinking Water Standards (August 2000)

North Algona Landfill Monitoring Groundwater QA/QC Relative Percent Difference Calculatic

Monitor Number		BH 2	BH 2	
Devementer		Amr 24	DUP #1	BDD
Parameter	0DWS/0G	Apr-24	Apr-24	RPD
Fluoride	2.40	<0.10	<0.10	NC
Chionde	250	89	90	1.12%
N-NO2 (Nitrate)	1.00	<0.10	<0.10	NC 2.20%
N-NO3 (Nitrate)	10.00	0.43	0.44	2.30%
Bromide				
Phosphate	500	22	22	0.00%
Suprate	500	33	33	0.00%
		123	122	0.82%
Magnesium		27	27	0.00%
Sodium	200	38	38	0.00%
Potassium	200	2	2	0.00%
Aluminum	0.400			0.000/
Barium	0.100	0.14	0.14	0.00%
Beryllium *	1.00			
Boron		<0.01	<0.01	NC
Cadmium *	5.00			
Chromium	0.005			
Cobalt	0.050			
Conductivity (microS/cm)		865	873	0.92%
Copper	1.00	0.001	0.002	NC
Iron	0.300	<0.03	<0.03	NC
Lead *	0.010			
Manganese	0.050	<0.01	<0.01	NC
Molybdenum				
Nickel				
Phosphorus				
Silicon	6.5 - 8.5			
Silver				
Strontium	0.050	0.325	0.321	1.24%
Sulphur				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc				
Hardness	5.00			
Alkalinity as CaCO ₃	80 - 100	314	313	0.32%
TKN	30 - 500	0.297	0.341	13.79%
N-NH3 (Ammonia)		0.24	0.041	141.64%
Organic Nitrogen		0.2 .	0.0.1	
Phenols	0.15	<0.001	<0.001	NC
BOD	0.10			
COD	1/5	18	<5	NC
TDS	5	562	567	0.89%
Ion Balance	5	552	557	0.0070
Average RPD				11.64%
NC = Not calculated				0,,,

RDP greater than 25% RDP greater than 50%

Appendix I

Surface Water Quality Data

Parameter	Unit	PWQO			SW 1		
			May-05	May-06	Apr-07	Apr-08	Apr-22
General Chemistry							
Alkalinity (Total as CaCO3)	mg/l	500	163	152	110	96	168
Ammonia, unionized (Field)	mg/l	0.02	0.00132	0.04597	0.00018	0.00008	0.00000
Ammonia Nitrogen	mg/l		0.04	0.54	<0.02	<0.02	0.041
Biologic Oxygen Demand, Five Day	mg/l		<1	<1	<1	<1	<1
Chemical Oxygen Demand	mg/l		11	37	21	31	20
Chloride	mg/l		38	37	13	10	28
Ph (lab)	mg/l	6.5-8.5					7.51
ion balance	mg/l		1.10	0.96	0	0	0.98
Dissolved Organic Carbon	mg/l						
Conductivity (lab)	uS/cm		462	418	273	254	311
Hardness, Calcium Carbonate	mg/l						169
Nitrate as N	mg/l		<0.10	<0.10	<0.10	<0.10	<0.10
Nitrite as N	mg/l		<0.10	<0.10	<0.10	<0.10	< 0.10
Nitrogen, Organic	mg/l		0.30	0.14	< 0.45	< 0.27	0.37
Nitrogen, Total Kjeldahl	mg/l		0.34	0.6	0.45	0.27	0.411
	mg/l		0.180	<0.10	<0.10	<0.10	<0.10
Phosphate	mg/l						
Phosphorus, Iotal	mg/l	0.03	0.10	0.04	0.01	0.03	0.04
Sulphate	mg/l		19	15	11	13	6
Total Dissolved Solids	mg/l		300	272	177	165	202
Total Suspended Solids	mg/l						
Metals		.					
Aluminum, dissolved	mg/l	0.1					< 0.01
Asenic	mg/l	0.005					<0.001
Barium	mg/l		0.08	0.07	0.06	0.05	0.07
Beryllium	mg/i	0.011					
Boron	mg/i	0.01	0.010	0.01	<0.01	<0.01	0.01
	mg/i	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
	mg/i		61	49	31	30	48
Chromium	mg/i	1					
Copper	mg/i	0.005	<0.001	<0.001	<0.001	0.001	<0.10
lion	mg/i	0.3	0.030	0.04	0.05	<0.03	<0.03
Magnaoium	mg/l	5					
Magnesian	mg/l	0.9	1/	15 <0.01	9	0.03	12
Marcury dissolved	mg/l	0.0	<0.01	<0.01	0.04	0.03	0.02
Molybdonum	mg/l	0.2 40					
Nickel	mg/l	40 25					
Potassium	mg/l	25	2	1	2	2	2
Sodium	mg/l		2 16	15	2	2	2 17
Strontium	mg/l	0.2	0 167	0 1/18	0 106	, 0.096	0 147
Vanadium	mg/l	6	0.107				
Zinc	mg/l	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
Phonole	iiig/i	0.00	10.01	(0.01	0.01	\$0.01	(0.01
Phenolics Total Recoverable	ma/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Field Measured	<u>9</u> /1	0.001	~0.001	-0.001	.0.001	V0.001	-0.001
Water Temp. (oC)			6.6	9.7	7.1	8.1	4
pH (pH units)			8.38	8.71	7.8	7.42	5.9
Conductivity (microS/cm)			423	169	238	216	412
Dissolved Oxygen			5.26	1.18	5.18	5.75	7.4
Flow (L/Sec)			19	15	25	56	1.61
., ,	1		10				

Parameter	Unit	PWQO	VQ0 SW 1			
			Jun-23	Apr-24		
General Chemistry						
Alkalinity (Total as CaCO3)	mg/l	500	197	92		
Ammonia, unionized (Field)	mg/l	0.02	0.00003	0.0002		
Ammonia Nitrogen	mg/l		<0.020	0.046		
Biologic Oxygen Demand, Five Day	mg/l		<1	1		
Chemical Oxygen Demand	mg/l		27	21		
Chloride	mg/l		19	3		
Ph (lab)	mg/l	6.5-8.5	7.56	7.06		
ion balance	mg/l		1.02			
Dissolved Organic Carbon	mg/l					
Conductivity (lab)	uS/cm		319	196		
Hardness, Calcium Carbonate	mg/l		204	127		
Nitrate as N	mg/l		<0.10	<0.10		
Nitrite as N	mg/l		<0.10	<0.10		
Nitrogen, Organic	mg/l		<0.38			
Nitrogen, Total Kjeldahl	mg/l		0.38	0.633		
Floride	mg/l		<0.10	<0.10		
Phosphate	mg/l					
Phosphorus, Total	mg/l	0.03	0.012	0.015		
Sulphate	mg/l		7	23		
Total Dissolved Solids	mg/l		207	127		
Total Suspended Solids	mg/l					
Metals						
Aluminum, dissolved	mg/l	0.1	<0.01	0.01		
Asenic	mg/l	0.005	<0.001	<0.001		
Barium	mg/l		0.08	0.03		
Beryllium	mg/l	0.011				
Boron	mg/l	0.01	0.010	<0.01		
Cadmium	mg/l	0.0002	<0.0001	<0.0001		
Calcium	mg/l		57	36		
Chromium	mg/l	1				
Copper	mg/l	0.005	<0.001	<0.001		
Iron	mg/l	0.3	0.040	<0.03		
Lead	mg/l	5				
Magnesium	mg/l		15	9		
Manganese	mg/l	0.9	0.030	0.02		
Mercury, dissolved	mg/l	0.2				
Molybdenum	mg/l	40				
Nickel	mg/l	25				
Potassium	mg/l		1	2		
Sodium	mg/l		14	3		
	mg/i	0.2	0.176	0.112		
	mg/i	6				
	mg/i	0.03	<0.01	<0.01		
Phonolical Total Depayarable	mc/l	0.004	10.001	~0.001		
	mg/i	0.001	<0.001	<0.001		
Field Measured			47.0	0		
vvaler Temp. (oC)			17.0	9		
			6.6U	7.5		
			490	290		
			0.10	9.5		
riuw (L/Sec)			6.53			

Parameter	Unit	PWQO			SW 2		
			May-05	May-06	Apr-07	Apr-08	Apr-22
General Chemistry							
Alkalinity (Total as CaCO3)	mg/l	500	123	124	148	113	144
Ammonia, unionized (Field)	mg/l	0.02	0.00054	0.00120	0.00010	0.00006	0.00001
Ammonia Nitrogen	mg/l		<0.02	0.07	0.02	0.02	0.034
Biologic Oxygen Demand, Five Day	mg/l		<1	<1	<1	<1	<1
Chemical Oxygen Demand	mg/l		<5	12	13	16	<5
Chloride	mg/l		16	8	9	7	3
Ph (lab)	mg/l	6.5-8.5					7.13
ion balance	mg/l		1.08	0.95	0	0	0.93
Dissolved Organic Carbon	mg/l						
Conductivity (lab)	uS/cm		341	303	353	308	230
Hardness, Calcium Carbonate	mg/l						141
Nitrate as N	mg/l		0.12	<0.10	0.15	0.18	<0.10
Nitrite as N	mg/l		<0.10	<0.10	<0.10	<0.10	<0.10
Nitrogen, Organic	mg/l		< 0.19	0.12	0.29	0.14	0.249
Nitrogen, Total Kjeldahl	mg/l		0.19	0.19	0.31	0.16	0.283
Floride	mg/l		0.18	<0.10	<0.10	<0.10	<0.10
Phosphate	mg/l						
Phosphorus, Total	mg/l	0.03	0.03	0.01	0.07	0.02	0.021
Sulphate	mg/l		26	21	20	27	12
Total Dissolved Solids	mg/l		222	197	229	200	150
Total Suspended Solids	mg/l						
Metals							
Aluminum, dissolved	mg/l	0.1					<0.01
Asenic	mg/l	0.005	<0.003	<0.004	<0.005	<0.006	<0.001
Barium	mg/l		0.04	0.04	0.04	0.04	0.04
Beryllium	mg/l	0.011					
Boron	mg/l	0.01	<0.01	0.02	<0.01	<0.01	<0.01
Cadmium	mg/l	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Calcium	mg/l		47	39	43	38	40
Chromium	mg/l	1					
Copper	mg/l	0.005	0.002	<0.001	<0.001	<0.001	<0.10
Iron	mg/l	0.3	0.04	<0.03	<0.03	<0.03	<0.03
Lead	mg/l	5					
Magnesium	mg/l		13	10	12	10	10
Manganese	mg/l	0.9	<0.01	<0.01	<0.01	<0.01	< 0.01
Mercury, dissolved	mg/l	0.2					
Molybdenum	mg/l	40					
Nickel	mg/l	25					
Potassium	mg/l		1	1	1	1	1
Sodium	mg/l		7	4	7	6	3
Strontium	mg/l	0.2	0.17	0.154	0.171	0.144	0.15
Vanadium	mg/l	6					
Zinc	mg/l	0.03	0.02	0.01	<0.01	<0.01	<0.01
Phenols							
Phenolics, Total Recoverable	mg/l	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Field Measured							
Water Temp. (oC)			7.7	9.8	12.2	9.6	4.1
pH (pH units)			8.25	7.98	7.36	7.19	6.5
Conductivity (microS/cm)			300	240	304	278	285
Dissolved Oxygen			7.55	2.11	4.15	5.12	4.4
Flow (L/Sec)			3.8	11.0	6	6	No flow

Parameter	Unit	PW/OO			SW 2	
Falameter	Onit	FWQO				
			Jun-23	Jun-23	Apr-24	
	ma er /l	500	120	Dup#1	107	
Ammonia unionized (Field)	mg/l	0.02	139	140	127	
Ammonia, unionized (Field)	mg/i mg/l	0.02	0.00005	0.00004	0.0002	
Richard Dyugan Domand, Five Day	mg/l		0.044	0.054	0.050	
Chemical Oxygen Demand	mg/l		<1	<1	5 20	
Chlorida	mg/l		11	5 11	50 10	
Chionde Dh (lah)	mg/l	65-85	7 20	7.26	15	
ion balance	mg/l	0.0-0.0	7.29	7.20	1.07	
Dissolved Organic Carbon	mg/l		0.93	0.55	1.00	
Conductivity (Jab)	uS/cm		220	228	2/17	
Hardness Calcium Carbonate	ma/l		111	1/18	247	
Nitrate as N	mg/l		20 10	248 20.10	20 10	
Nitrite as N	mg/l		<0.10	<0.10	<0.10	
Nitrogen Organic	mg/l		<0.10 0.197	<0.10 0.224	<0.10	
Nitrogen, Organic	mg/l		0.137	0.224	0 792	
	mg/l		0.241	0.258	0.765 <0.10	
Phosphate	mg/l		<0.10	<0.10	<0.10	
Phosphorus Total	mg/l	0.03			0.010	
Sulphoto	mg/l	0.00	12	12	0.019	
Suprate	mg/l		1/0	1/2	5 161	
Total Suspended Solids	mg/l		149	140	101	
	mg/i					
Metals	ma/l	0.1	<0.01	<0.01	<0.01	
	mg/l	0.005	<0.01	<0.01	<0.01	
Asenic	mg/l	0.005	<0.001	<0.001	0.001	
Bandin Bandlium	mg/l		0.04	0.04	0.05	
Boron	mg/l	0.01	<0.01		0.01	
Cadmium	mg/l	0.01	<0.01	<0.01	<0.01	
Calcium	mg/l	0.0002	<0.0001 //1	<0.0001 //1	<0.0001 /0	
Chromium	mg/l	1	41	41	40	
Copper	mg/l	0.005	<0.001	<0.001	 <0.001	
Iron	mg/l	0.000	<0.001	0.001	0.001	
Lead	mg/l	5	<0.05	0.05	0.05	
Magnesium	mg/l	5	10		10	
Magnesium	mg/l	0.9	10	0.02	20 01	
Manganese Marcury, dissolved	mg/l	0.0	0.02	0.02	~0.01	
Molybdenum	mg/l	<u> </u>				
Nickel	mg/l	25				
Potassium	mg/l	20	1	1	3	
Sodium	mg/l		5	8	11	
Strontium	mg/l	0.2	0 145	0 144	0 104	
Vanadium	mg/l	6	0.145			
Zinc	mg/l	0.03	<0.01	<0.01	<0.01	
Phenols	····9/'	0.00	-0.01	.0.01	.0.01	
Phenolics, Total Recoverable	ma/l	0.001	<0.001	<0 001	<0 001	
Field Measured	ing/i	0.001	V0.001	V0.001	V0.001	
Water Temp (oC)			12.0		65	
nH (nH unite)			67		0.5 7 E	
Conductivity (microS/cm)			0.7		200	
Dissolved Oxvaen			77		20U	
Flow (I /Sec)			No flow		0.5	
			NOTION			

Appendix J

Lab Reports

Certificate of Analysis

Environment Testing

Client:	Jp2g Consultants Inc.
	12 International Dr.
	Pembroke, ON
	K8A 6W5
Attention:	Mr. Nick Weston
PO#:	
Invoice to:	Jp2g Consultants Inc. (Pembroke)

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 Report Number:
 1997592

 Date Submitted:
 2023-05-30

 Date Reported:
 2023-06-06

 Project:
 17-6041 Berndt Road

 COC #:
 219571

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Hardness as CaCO3			
Ion Balance			
TDS (COND - CALC)			

Guideline = PWQO - Ontario

* = Guideline Exceedence

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Certificate of Analysis

Environment Testing

Client: Attention: PO#:	Jp2g Consultants Inc. 12 International Dr. Pembroke, ON K8A 6W5 Mr. Nick Weston		Report Number: Date Submitted: Date Reported: Project: COC #:	3006695 2024-04-17 2024-04-24 17-6041H Berndt Rd 913931
Invoice to:	Jp2g Consultants Inc. (Pembroke)	Page 1 of 7		

Dear Nick Weston:

🛟 eurofins

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Emma-Dawn Ferguson 2024.04.24 14:07:04 -04'00'

APPROVAL:

Emma-Dawn Ferguson, Chemist

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise indicated.

Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at: <u>https://directory.cala.ca/</u>.

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Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) is accredited by the Ontario Ministry of Agriculture, Food, and Rural Affairs for specific tests in agricultural soils.

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline values listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official provincial or federal guideline as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.



Client:	Jp2g Consultants Inc.
	12 International Dr.
	Pembroke, ON
	K8A 6W5
Attention: PO#:	Mr. Nick Weston
nvoice to:	Jp2g Consultants Inc. (Pembroke)

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Report Number:	3006695
Date Submitted:	2024-04-17
Date Reported:	2024-04-24
Project:	17-6041H Berndt Rd
COC #:	913931

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1724248 GW 2024-04-16 BH-2	1724249 GW 2024-04-16 BH1-2	1724250 GW 2024-04-16 BH1-1	1724251 GW 2024-04-16 BH-3
Group	Analyte	MRL	Units	Guideline				
Anions	Cl	1	mg/L	AO 250	89	141	43	1
	F	0.10	mg/L	MAC 1.5	<0.10	<0.10	0.25	<0.10
	N-NO2	0.10	mg/L	MAC 1.0	<0.10	<0.10	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	0.43	5.83	0.65	0.22
	SO4	1	mg/L	AO 500	33	28	58	115
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 30-500	314	425	389	269
	COD	5	mg/L		18	<5	<5	8
	Conductivity	5	uS/cm		865	1220	889	674
	Phenols	0.001	mg/L		<0.001	<0.001	<0.001	<0.001
	TDS (COND - CALC)	1	mg/L	AO 500	562*	793*	578*	438
Metals	В	0.01	mg/L	IMAC 5.0	<0.01	0.14	0.16	0.10
	Ва	0.01	mg/L	MAC 1.0	0.14	0.20	0.15	0.06
	Са	1	mg/L		123	168	121	109
	Cu	0.001	mg/L	AO 1	0.001	0.002	0.001	0.002
	Fe	0.03	mg/L	AO 0.3	<0.03	<0.03	<0.03	<0.03
	К	1	mg/L		2	14	5	2
	Mg	1	mg/L		27	40	40	33
	Mn	0.01	mg/L	AO 0.05	<0.01	<0.01	0.01	<0.01
	Na	1	mg/L	AO 200	38	54	32	8
	Sr	0.001	mg/L		0.325	0.380	2.37	0.242
Nutrients	N-NH3	0.020	mg/L		0.240	0.245	0.165	0.078
	Total Kjeldahl Nitrogen	0.100	mg/L		0.297	0.375	0.306	0.376

Guideline = ODWSOG

* = Guideline Exceedence

Results relate only to the parameters tested on the samples submitted. Methods references and/or additional QA/QC information available on request. MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client:	Jp2g Consultants Inc.
	12 International Dr.
	Pembroke, ON
	K8A 6W5
Attention: PO#:	Mr. Nick Weston
nvoice to:	Jp2g Consultants Inc. (Pembroke)

🛟 eurofins

Report Number:	3006695
Date Submitted:	2024-04-17
Date Reported:	2024-04-24
Project:	17-6041H Berndt Rd
COC #:	913931

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1724252 GW 2024-04-16 BH-5	1724253 GW 2024-04-16 BH-6	1724254 GW 2024-04-16 Dup#1
Group	Analyte	MRL	Units	Guideline			
Anions	CI	1	mg/L	AO 250	28	10	90
	F	0.10	mg/L	MAC 1.5	<0.10	<0.10	<0.10
	N-NO2	0.10	mg/L	MAC 1.0	<0.10	<0.10	<0.10
	N-NO3	0.10	mg/L	MAC 10.0	0.11	0.25	0.44
	SO4	1	mg/L	AO 500	23	15	33
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 30-500	316	257	313
	COD	5	mg/L		11	<5	<5
	Conductivity	5	uS/cm		677	511	873
	Phenols	0.001	mg/L		<0.001	<0.001	<0.001
	TDS (COND - CALC)	1	mg/L	AO 500	440	332	567*
Metals	В	0.01	mg/L	IMAC 5.0	0.04	0.02	<0.01
	Ва	0.01	mg/L	MAC 1.0	0.15	0.10	0.14
	Ca	1	mg/L		98	82	122
	Cu	0.001	mg/L	AO 1	0.001	<0.001	0.002
	Fe	0.03	mg/L	AO 0.3	<0.03	<0.03	<0.03
	К	1	mg/L		3	2	2
	Mg	1	mg/L		26	22	27
	Mn	0.01	mg/L	AO 0.05	<0.01	<0.01	<0.01
	Na	1	mg/L	AO 200	24	6	38
	Sr	0.001	mg/L		0.238	0.197	0.321
Nutrients	N-NH3	0.020	mg/L		0.044	0.057	0.041
	Total Kjeldahl Nitrogen	0.100	mg/L		0.318	0.326	0.341

Guideline = ODWSOG

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Client:	Jp2g Consultants Inc.
	12 International Dr.
	Pembroke, ON
	K8A 6W5
Attention:	Mr. Nick Weston
PO#:	
Invoice to:	Jp2g Consultants Inc. (Pembroke)

🛟 eurofins

Report Number: 3006695 Date Submitted: 2024-04-17 Date Reported: 2024-04-24 Project: COC #: 913931

17-6041H Berndt Rd

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No458740Analysis/Extraction Date20MethodEPA 200.8	124-04-19 Ana	lyst AaN	
Boron (total)	<0.01 mg/L	96	80-120
Barium	<0.01 mg/L	87	80-120
Copper	<0.001 mg/L	95	80-120
Iron	<0.03 mg/L	91	80-120
Manganese	<0.01 mg/L	90	80-120
Strontium	<0.001 mg/L	90	80-120
Run No458819Analysis/Extraction Date20MethodEPA 350.1	24-04-22 Ana	lyst SKH	
N-NH3	<0.020 mg/L	105	80-120
Run No458820Analysis/Extraction Date20MethodEPA 351.2	124-04-22 Ana	lyst SKH	
Total Kjeldahl Nitrogen	<0.100 mg/L	8	70-130
Run No 458821 Analysis/Extraction Date 20 Method SM2320,2510,4500H/F	24-04-22 Ana	lyst AsA	
Alkalinity (CaCO3)	<5 mg/L	98	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	102	90-110

Guideline = ODWSOG

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Client:	Jp2g Consultants Inc.
	12 International Dr.
	Pembroke, ON
	K8A 6W5
Attention: PO#:	Mr. Nick Weston
Invoice to:	Jp2g Consultants Inc. (Pembroke)

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Report Number: 3006695 Date Submitted: 2024-04-17 Date Reported: 2024-04-24 Project: COC #: 913931

17-6041H Berndt Rd

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 458832 Analysis/Extraction Date 20)24-04-23 Ana	lyst IP	
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	101	90-110
N-NO3	<0.10 mg/L	103	90-110
SO4	<1 mg/L	100	90-110
Run No458850Analysis/Extraction Date20MethodC SM5220D)24-04-24 A na	lyst AET	
COD	<5 mg/L	94	80-120
Run No 458858 Analysis/Extraction Date 2024-04-23 Analyst Z S Method M SM3120B-3500C			
Calcium	<1 mg/L	103	90-110
Potassium	<1 mg/L	98	87-113
Magnesium	<1 mg/L	99	76-124
Sodium	<1 mg/L	96	82-118
Run No 458869 Analysis/Extraction Date 2024-04-23 Analyst IP Method SM5530D/EPA420.2 <td< td=""></td<>			
Phenols	<0.001 mg/L	110	50-120

Guideline = ODWSOG

* = Guideline Exceedence

Results relate only to the parameters tested on the samples submitted. Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client:	Jp2g Consultants Inc.
	12 International Dr.
	Pembroke, ON
	K8A 6W5
Attention: PO#:	Mr. Nick Weston
Invoice to:	Jp2g Consultants Inc. (Pembroke)

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 Report Number:
 3006695

 Date Submitted:
 2024-04-17

 Date Reported:
 2024-04-24

 Project:
 17-6041H Berndt Rd

 COC #:
 913931

QC Summary

Analyte	Blank	QC % Rec	QC Limits
Run No 458890 Analysis/Extraction Date 20	124-04-24 A na	llyst IP	
	<1 mm/l	100	00.110
Chloride	<1 mg/L	100	90-110
N-NO3	<0.10 mg/L	105	90-110
SO4	<1 mg/L	100	90-110
Run No458895Analysis/Extraction Date20MethodC SM2540	124-04-24 Ana	ilyst AET	
TDS (COND - CALC)			
Run No 458932 Analysis/Extraction Date 20 Method M SM3120B-3500C)24-04-24 Ana	llyst ZS	
Calcium	<1 mg/L	103	90-110
Magnesium	<1 mg/L	98	76-124

Guideline = ODWSOG

* = Guideline Exceedence

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Environment Testing

Client:	Jp2g Consultants Inc.
	12 International Dr.
	Pembroke, ON
	K8A 6W5
Attention:	Mr. Nick Weston
PO#:	
Invoice to:	Jp2g Consultants Inc. (Pembroke)

Report Number: Date Submitted: 2024-04-17 Date Reported: 2024-04-24 Project: COC #: 913931

3006695 17-6041H Berndt Rd

Sample Comment Summary

Sample ID: 1724249 BH1-2 Sediment not included in TKN analysis. Sample ID: 1724251 BH-3 Sediment not included in TKN analysis. Sample ID: 1724252 BH-5 Sediment not included in TKN analysis. Sample ID: 1724254 Dup#1 Sediment not included in TKN analysis.

Guideline = ODWSOG

* = Guideline Exceedence

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Environment Testing

Client: Attention: PO#:	Jp2g Consultants Inc. 12 International Dr. Pembroke, ON K8A 6W5 Mr. Nick Weston		Report Number: Date Submitted: Date Reported: Project: COC #:	3006696 2024-04-17 2024-04-24 17-6041H 913932
Invoice to:	Jp2g Consultants Inc. (Pembroke)	Page 1 of 7		

Dear Nick Weston:

🛟 eurofins

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Emma-Dawn Ferguson 2024.04.24 15:26:37 -04'00'

APPROVAL:

Emma-Dawn Ferguson, Chemist

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Environment Testing

Client:	Jp2g Consultants Inc.	Report Number:	3006696
	12 International Dr.	Date Submitted:	2024-04-17
	Pembroke, ON	Date Reported:	2024-04-24
	K8A 6W5	Project:	17-6041H
Attention:	Mr. Nick Weston	COC #:	913932
PO#:			
Invoice to:	Jp2g Consultants Inc. (Pembroke)		

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1724255 SURF W 2024-04-16 SW2	1724256 SURF W 2024-04-16 SW1
Group	Analyte	MRL	Units	Guideline		
Anions	CI	1	mg/L		19	3
	F	0.10	mg/L		<0.10	<0.10
	N-NO2	0.10	mg/L		<0.10	<0.10
	N-NO3	0.10	mg/L		<0.10	<0.10
	SO4	1	mg/L		5	23
General Chemistry	Alkalinity as CaCO3	5	mg/L		127	92
	BOD5	1	mg/L		3	1
	COD	5	mg/L		38	21
	Conductivity	5	uS/cm		247	196
	рН	1.00		6.5-8.5	7.67	7.06
	Phenols	0.001	mg/L	PWQO 0.001	<0.001	<0.001
	TDS (COND - CALC)	1	mg/L		161	127
Hardness	Hardness as CaCO3	1	mg/L		141	127
Indices/Calc	Ion Balance	0.01			1.06	N/A-LC
Metals	AI	0.01	mg/L	IPWQO 0.075	<0.01	0.01
	As	0.001	mg/L	PWQO 0.100	<0.001	<0.001
	В	0.01	mg/L	IPWQO 0.200	0.01	<0.01
	Ва	0.01	mg/L		0.05	0.03
	Са	1	mg/L		40	36
	Cd	0.0001	mg/L	PWQO 0.0002	<0.0001	<0.0001
	Cu	0.001	mg/L	PWQO 0.005	<0.001	<0.001
	Fe	0.03	mg/L	PWQO 0.30	0.03	<0.03
	К	1	mg/L		3	2
	Mg	1	mg/L		10	9
	Mn	0.01	mg/L		<0.01	0.02

Guideline = PWQO - Ontario

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* = Guideline Exceedence

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Environment Testing

Client:	Jp2g Consultants Inc.	Report Number:	3006696
	12 International Dr.	Date Submitted:	2024-04-17
	Pembroke, ON	Date Reported:	2024-04-24
	K8A 6W5	Project:	17-6041H
Attention:	Mr. Nick Weston	COC #:	913932
PO#:			
Invoice to:	Jp2g Consultants Inc. (Pembroke)		

				Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1724255 SURF W 2024-04-16 SW2	1724256 SURF W 2024-04-16 SW1
Group	Analyte	MRL	Units	Guideline		
Metals	Na	1	mg/L		11	3
	P	0.002	mg/L	IPWQO 0.01	0.019*	0.015*
	Sr	0.001	mg/L		0.104	0.112
	Zn	0.01	mg/L	PWQO 0.030	<0.01	<0 <u>.</u> 01
Nutrients	N-NH3	0.020	mg/L		0.056	0.046
	Total Kjeldahl Nitrogen	0.100	mg/L		0.783	0.633

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Project:	17-6041H
COC #:	913932

QC Summary

Analyte		Blank	QC % Rec	QC Limits
Run No 458712 Method SM 5210B	Analysis/Extraction Date 20	24-04-23 Ana	ilyst AET	
BOD5		<1 mg/L	79	75-125
Run No 458740 Method EPA 200.8	Analysis/Extraction Date 20	124-04-19 Ana	ilyst AaN	
Aluminum		<0.01 mg/L	110	80-120
Arsenic		<0.001 mg/L	93	80-120
Boron (total)		<0.01 mg/L	96	80-120
Barium		<0.01 mg/L	87	80-120
Cadmium		<0.0001 mg/L	90	80-120
Copper		<0.001 mg/L	95	80-120
Iron		<0.03 mg/L	91	80-120
Manganese		<0.01 mg/L	90	80-120
Р		<0.002 mg/L	101	80-120
Strontium		<0.001 mg/L	90	80-120
Zinc		<0.01 mg/L	94	80-120
Run No 458819 Method EPA 350.1	Analysis/Extraction Date 20)24-04-22 Ana	ilyst SKH	

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Project:	17-6041H
COC #:	913932

QC Summary

Analyte	Blank	QC % Rec	QC Limits
N-NH3	<0.020 mg/L	105	80-120
Run No458820Analysis/Extraction Date20MethodEPA 351.2)24-04-22 A na	lyst SKH	
Total Kjeldahl Nitrogen	<0.100 mg/L	8	70-130
Run No 458821 Analysis/Extraction Date 20)24-04-22 Ana	ilyst AsA	
Method SM2320,2510,4500H/F			
Alkalinity (CaCO3)	<5 mg/L	98	90-110
Conductivity	<5 uS/cm	99	90-110
F	<0.10 mg/L	102	90-110
рН		100	90-110
Run No 458832 Analysis/Extraction Date 20	024-04-23 Ana	ilyst IP	
Method SM 4110	· .		
Chloride	<1 mg/L	100	90-110
N-NO2	<0.10 mg/L	101	90-110
N-NO3	<0.10 mg/L	103	90-110
SO4	<1 mg/L	100	90-110
Run No458850Analysis/Extraction Date20MethodC SM5220D)24-04-24 Ana	l yst AET	·
COD	<5 mg/L	94	80-120

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Environment Testing

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Project:	17-6041H	
COC #:	913932	

QC Summary

Analyte	Blank	QC % Rec	QC Limits			
Run No 458858 Analysis/Extraction Date 20	24-04-23 Ana	lyst ZS				
Method M SM3120B-3500C						
Calcium	<1 mg/L	103	90-110			
Potassium	<1 mg/L	98	87-113			
Magnesium	<1 mg/L	99	76-124			
Sodium	<1 mg/L	96	82-118			
Run No458869Analysis/Extraction Date20MethodSM5530D/EPA420.2	24-04-23 Ana	llyst IP				
Phenols	<0.001 mg/L	110	50-120			
Run No458895Analysis/Extraction Date20MethodC SM2340B	24-04-24 Ana	llyst AET				
Hardness as CaCO3						
Ion Balance						
TDS (COND - CALC)						
Run No458932Analysis/Extraction Date20MethodM SM3120B-3500C	24-04-24 Ana	llyst ZS				
Calcium	<1 mg/L	103	90-110			
Magnesium	<1 mg/L	98	76-124			

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COC #:	913932

QC Summary

Analyte	Blank	QC % Rec	QC Limits			
Run No 458933 Analysis/Extraction Date 2024-04-24 Analyst Z S Method C SM2340B <t< th=""></t<>						
Hardness as CaCO3						
Ion Balance						
TDS (COND - CALC)						

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