



**2019 ANNUAL GROUNDWATER MONITORING REPORT
PROVIDENCE BAY WASTE DISPOSAL SITE
PROVIDENCE BAY, ONTARIO**

Submitted to:

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TABLE OF CONTENTS

SECTION	PAGE
1.0 INTRODUCTION.....	1
1.1 Site Location.....	1
1.2 Ownership and Key Personnel.....	1
1.3 Description and Development of the Site.....	2
1.3.1 Site Capacity.....	2
1.4 Monitoring and Reporting Program Objectives and Requirements.....	3
1.5 Assumptions and Limitations.....	3
2.0 PHYSICAL SETTING.....	4
2.1 Geology and Hydrogeology.....	4
3.0 DESCRIPTION OF MONITORING PROGRAM.....	4
3.1 Monitoring Locations.....	4
3.2 Monitoring Frequency.....	7
3.3 Field and Laboratory Parameters and Analysis.....	7
3.4 Monitoring Procedures and Methods.....	7
3.5 Quality Assurance for Sampling and Analysis.....	7
4.0 MONITORING RESULTS.....	8
4.1 Historical Data.....	8
4.2 Data Quality Evaluation.....	8
4.3 Groundwater Flow Monitoring.....	8
4.4 Groundwater Quality Monitoring.....	9
4.4.1 Background Water Quality.....	9
4.4.2 Crossgradient Water Quality.....	9
4.4.3 On-Site Downgradient Water Quality.....	10
4.4.4 Downgradient Property Boundary Water Quality.....	10
4.4.5 Groundwater Field Parameter Measurements.....	11
4.4.6 Residential Well Monitoring.....	12
5.0 ASSESSMENT, INTERPRETATION AND DISCUSSION.....	13
5.1 Groundwater Plume Delineation.....	13
5.2 Groundwater Trend Analysis.....	13
5.3 Guideline B-7 Calculations.....	15
5.4 Adequacy of the Monitoring Program.....	16
6.0 CONCLUSIONS.....	16
7.0 RECOMMENDATIONS.....	17
8.0 CLOSURE.....	18

TABLES

Table 1:	Monitoring Locations On-Site	5
Table 2:	Groundwater Monitoring Well Construction Details.....	6
Table 3:	September 2019 Groundwater Field Parameter Measurements.....	12

FIGURES

Figure 1	Site Location Map
Figure 2	Site Plan
Figure 3	2019 Topographical Survey
Figure 4	Inferred Groundwater Contours – September 2019
Figure 5	Inferred Chloride Contour Plan – September 2019
Figure 6	Inferred Chloride Section – September 2019

APPENDICES

Appendix A	Certificate of Approval No. A550702
Appendix B	Borehole Logs
Appendix C	Groundwater Elevations
Appendix D	2019 Laboratory Analytical Reports
Appendix E	Summary of Groundwater Geochemical Analyses
Appendix F	Groundwater Elevation and Chemistry Trend Analysis
Appendix G	Photographic Inventory of Groundwater Monitoring Locations
Appendix H	Guideline B-7 Calculations
Appendix I	Monitoring and Screening Checklist

1.0 INTRODUCTION

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), was retained by The Municipality of Central Manitoulin (the Municipality) to prepare the 2019 annual groundwater monitoring report for the Providence Bay Waste Disposal Site (the Site). The following report provides a detailed evaluation and summary of the 2019 monitoring data and was completed to constitute the 2019 Annual Monitoring Report. This document also includes a review of the available groundwater flow and geochemical data, as well as an evaluation of the groundwater quality with respect to Ministry of the Environment, Conservation and Parks (MECP) Guideline B-7.

1.1 Site Location

The Site is located at 4077 Government Road, approximately one kilometre (km) southeast of the village of Providence Bay, Ontario, and approximately 500 metres (m) east of Lake Huron, as presented on Figure 1. The legal description of the Site is part Lot 3, Concession 13, former Township of Carnarvon, District of Manitoulin. The Universal Transverse Mercator (UTM) coordinates of the Site are 401859 Easting and 5056873 Northing, Zone 17, relative to the North American Datum (NAD) 83 (collected via handheld Global Positioning System (GPS), accuracy +/- 5 m).

1.2 Ownership and Key Personnel

Contact information for the Site contact representative and the Competent Environmental Practitioner (CEP) for groundwater is outlined below.

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1.3 Description and Development of the Site

The landfill is currently active, and operates under Environmental Compliance Approval (ECA) No. A550702, issued 18 March 1980 and amended 21 September 2016, attached as Appendix A. The Site accepts commercial and domestic wastes, specifically solid non-hazardous municipal waste, and services the Municipality of Central Manitoulin, with an estimated 1,900 residents (Gamsby and Mannerow Limited (GM), 2014). The Site is approved for a 4.1 hectare (ha) fill area, however, there is no maximum approved capacity of the Site. The recently amended ECA specifies that the Site is authorized for the continued filling of waste until 30 July 2019, or until a new Design and Operations Plan or Closure Plan is approved by the Director for the Site, whichever occurs first; however, approval was received from the MECP during 2019 to extend this deadline to 30 June 2020. The adjacent property immediately northwest of the Site is also owned by the Municipality, legally described as Part 1, Concession 13, on Registered Plan 31R 2056 (GM, 2014). A site plan is provided as Figure 2.

No operations problems were encountered at the Site in 2019, and no complaints were received. There were no areas of excavation at the Site during 2019. With the exception of grinding of wood material, no Site works were undertaken during 2019 and none are currently planned for 2020.

1.3.1 Site Capacity

Landfilling activity in 2019 was located on the southwest edge of the fill area, as presented on Figure 2. It is expected that waste deposition in 2020 will be in the same general area. As weigh scales are not in place at the Site, mass and therefore volume estimates of incoming waste is not tracked. Capacity assessments are completed annually, however, based on annual topographical surveys, which offer a more accurate volume estimate than incoming volumes of uncompacted waste.

A topographical survey was undertaken 2 October 2019, in order to assess the annual change in waste volume at the Site, and is presented on Figure 3. A total volume of existing waste of approximately 42,356 cubic metres (m³) was measured during completion of the 2019 survey, including both waste and cover material. The previous topographical survey undertaken at the Site was completed on 17 September 2018, at which time a total volume of waste and cover material of approximately 41,255 m³ was measured. An annual deposition rate of approximately 1,145 m³ has therefore been calculated for the calendar year. The annual deposition rate has decreased as compared to previous years, potentially as a result of a diversion pilot project started in mid-2017. The project was designed to divert 40 compacted cubic meters a week of waste to the Dodge landfill site in Espanola.

Although no maximum allowable capacity is stated in the Site's ECA, a theoretical maximum capacity of 107,895 m³ was calculated by Cambium Inc., based on MECP approved design requirements, as part of historical Design and Operations Plan development. Based on this theoretical capacity, the Site has an estimated remaining capacity of approximately 65,539 m³, as of October 2019. Assuming an annual deposition rate of 1,145 m³, this equates to an estimated remaining life expectancy of approximately 57 years.

1.4 Monitoring and Reporting Program Objectives and Requirements

Historical Site investigations completed by others resulted in the instrumentation of the Site with a variety of groundwater monitoring wells and identification of adjacent residential water well monitoring locations. The current groundwater monitoring program is comprised of 18 groundwater monitoring wells (OW-1, OW-2, OW-3A, OW-3B, OW-4 through OW-11, OW-12A/B, OW-13A/B and OW-14A/B) and two off-Site residential water wells (Irving and Paquet). Monitoring wells OW-1 through OW-8 were installed by Waters Environmental Geosciences Ltd.; OW-1 through OW-5 in April 2002 and OW-6 through OW-8 in December 2003. OW-9 through OW-11 were installed by Amec Foster Wheeler¹ in August 2014. Well nests OW-12A/B, OW-13A/B and OW-14A/B were installed by Amec Foster Wheeler in July 2017. The locations of all groundwater monitoring wells are presented on Figure 2.

1.5 Assumptions and Limitations

Wood's limitation of liability and scope of work is as follows:

1. The work performed in this report was carried out in accordance with the Terms and Conditions made part of our contract. The conclusions presented herein are based solely upon the scope of services and time and budgetary limitations described in our contract.
2. The report has been prepared in accordance with generally accepted environmental study and/or engineering practices. No other warranties, either expressed or implied, are made as to the professional services provided under the terms of our contract and included in this report.
3. The services performed and outlined in this report were based, in part, upon a previously installed monitoring network, established by others and approved by the applicable regulatory agencies. Our opinion cannot be extended to portions of the Site which were unavailable for direct observations, reasonably beyond the control of Wood.
4. The objective of this report was to present a hydrological assessment for the Providence Bay Waste Disposal Site (the Site) for submission to the Ministry of the Environment, Conservation and Parks (MECP) in support of ongoing operations at the Site, and potentially future Site.
5. The Site history interpreted herein relies on information supplied by others, such as local, provincial and federal agencies, as well as Site personnel. No attempt has been made to independently verify the accuracy of such information, unless specifically noted in our report.
6. Our interpretations relating to the landfill-derived leachate plume at the Site are described in this report. Where testing was performed, it was executed in accordance with our contract for these services. It should be noted that other compounds or materials not tested for may be present in the Site environment.

¹ Amec Foster Wheeler was purchased by John Wood Group PLC (Wood) and is now a subsidiary of the group known as Wood Environment & Infrastructure Solutions.

7. The conclusions of this report are based, in part, on the information provided by others. The possibility remains that unexpected environmental conditions may be encountered at the Site in locations not specifically investigated. Should such an event occur, Wood must be notified in order that we may determine if modifications to our conclusions are necessary.
8. The utilization of Wood's services during future monitoring at the Site will allow Wood to observe compliance with the conclusions and recommendations contained herein. It will also provide for changes as necessary to suit field conditions as they are encountered.
9. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Wood accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

2.0 PHYSICAL SETTING

2.1 Geology and Hydrogeology

The subsurface soil conditions in the vicinity of the Site are comprised of shallow overburden overlying limestone/dolostone and shale (GM, 2014). The bedrock encountered beneath the Site is described as grey/brown dolomitic limestone (GM, 2014). Groundwater flow is thought to be predominantly in the upper, more highly fractured bedrock unit, which is reported to be underlain by more competent, less fractured, dolostone bedrock (GM, 2014). The hydraulic conductivity and linear groundwater flow velocity likely decreases with depth as a result. Borehole logs depicting the soil and monitoring well construction details for monitoring wells are provided in Appendix B.

Static water levels were recorded by Wood at each of the wells during the September 2019 groundwater monitoring event. Appendix C presents the groundwater elevations measured during the 2019 groundwater monitoring event. Figure 4 presents the inferred groundwater elevation contours and groundwater flow directions for the September 2019 monitoring event. In general, the recorded static groundwater levels indicate localized groundwater flow across the Site to the north and northwest in the immediate vicinity of the waste deposits. The overall groundwater flow direction is inferred to be away from the Site towards the west and northwest, ultimately discharging to Lake Huron, which is situated approximately 500 m downgradient of the Site.

3.0 DESCRIPTION OF MONITORING PROGRAM

3.1 Monitoring Locations

All groundwater monitoring locations are illustrated on Figure 2. Detailed locations are provided in Table 1. Monitoring well elevations for top of casing are provided in Appendix C.

Table 1: Monitoring Locations On-Site

Monitoring Location	Easting Zone 17 NAD 83	Northing Zone 17 NAD 83	Collection Method	Accuracy	Collection Personnel	Date Collected
OW-1	401860	5056683	Handheld GPS	+/- 5 m	Trained Amec Foster Wheeler field crew	24 September 2015
OW-2	401790	5056836				
OW-3A/B	401767	5056727				
OW-4	401763	5056674				
OW-5	401735	5056770				
OW-6	401649	5056865				
OW-7	401676	5056698				
OW-8	401954	5056866				
OW-9	401633	5056783				
OW-10	401839	5056881				
OW-11	401731	5056882				
OW-12A/B	401619	5056825				25 July 2017
OW-13A/B	401738	5056741				
OW-14A/B	401722	5056634				

Table 2 presents a summary of the construction details and respective on-Site positions of the groundwater monitoring wells. All construction details for wells installed in 2002 and 2003 are based on borehole logs prepared by Waters Environmental Geosciences Ltd. (Appendix B). According to the groundwater elevation data collected to date, OW-8 is located upgradient of the Site, and is therefore representative of background (i.e., non-impacted) water quality conditions, allowing a detailed evaluation of the Site to be undertaken with respect to MECP Guideline B-7. OW-1 and well nest OW-14A/B are located crossgradient from the fill area. All remaining wells are situated at various distances and in various directions downgradient of the waste deposits, and are considered representative of the landfill leachate impacts. The downgradient property boundaries are represented by OW-6, OW-7, OW-9, OW-10, OW-11, OW-12A/B and OW-13A/B, as presented on Figure 2.

Table 2: Groundwater Monitoring Well Construction Details

Well ID	Condition	Total Depth (mbgs) ¹	Screened Interval (mbgs)	Unit Screened	On-Site Position
OW-1	Good	13.34	8.4 - 13.34	Bedrock	Crossgradient
OW-2	Good	13.28	8.3 - 13.28	Bedrock	Downgradient
OW-3A	Good	11.98	8.1 - 11.98	Bedrock	Downgradient
OW-3B	Good	19.40	Not available	Bedrock	Downgradient
OW-4	Good	12.13	7.6 - 12.13	Bedrock	Downgradient
OW-5	Good	13.31	8.2 - 13.31	Bedrock	Downgradient
OW-6	Good	13.36	8.3 - 13.36	Bedrock	Downgradient
OW-7	Good	13.33	8.3 - 13.33	Bedrock	Downgradient
OW-8	Good	13.20	8.3 - 13.20	Bedrock	Upgradient (background)
OW-9	Good	15.65	12.65 - 15.65	Bedrock	Downgradient
OW-10	Good	14.47	11.47 - 14.47	Bedrock	Downgradient
OW-11	Good	14.62	13.12 - 14.62	Bedrock	Downgradient
OW-12A	Good	13.4	11.9 - 13.4	Bedrock	Downgradient
OW-12B	Good	17.1	14.1 - 17.1	Bedrock	Downgradient
OW-13A	Good	5.5	4.0 - 5.5	Bedrock	Downgradient
OW-13B	Good	11.0	8.0 - 11.0	Bedrock	Downgradient
OW-14A	Good	6.9	5.4 - 6.9	Bedrock	Crossgradient
OW-14B	Good	11.6	8.6 - 11.6	Bedrock	Crossgradient

Notes:

(1) mbgs indicates m below ground surface.

3.2 Monitoring Frequency

Groundwater is sampled by Wood once annually, during the fall. The annual monitoring event occurred on 5-6 September 2019.

3.3 Field and Laboratory Parameters and Analysis

Geochemical analyses for general chemistry, metals, select volatiles and nitrogen cycle parameters were completed on all samples collected. A detailed list of laboratory parameters is included in Appendix D. Field parameters comprise static water level measurements, temperature, pH, conductivity and dissolved solids. All field equipment is maintained and calibrated appropriately prior to each use.

3.4 Monitoring Procedures and Methods

Monitoring and sample collection followed typical industry standard practices. Each groundwater monitoring well is purged prior to sampling to obtain samples representative of the formation water. Dedicated well instrumentation (Waterra Tube and foot valve system) is used to obtain water samples from the groundwater monitoring wells, and samples are immediately transferred to laboratory-prepared sample vials and bottles. Samples identified for heavy metals analysis are field-filtered using a single use 0.45 µm filter unit, and the remaining samples are preserved following standard laboratory protocols as established in the MECP "*Guidance on Sampling for Use at Contaminated Sites in Ontario*" (revised December 1996) and the above-noted SOP.

Samples are submitted under chain of custody, in a temperature controlled setting (i.e., in a cooler, on ice) to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory sub-contractor, AGAT Laboratories (AGAT), in Mississauga for analysis. The analytical results are subsequently forwarded to Wood. Laboratory analytical reports for 2019 are provided in Appendix D. The 2019 groundwater monitoring data were reviewed by comparison to the current MECP Ontario Drinking Water Standards (ODWS).

3.5 Quality Assurance for Sampling and Analysis

Wood uses recognized industry standards, including the Canadian Council of Ministers of the Environment (CCME) *Subsurface Assessment Handbook for Contaminated Sites* and MECP's manual *Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario* for conducting environmental assessments. For quality assurance, all work is supervised and internally reviewed by senior staff members.

Field sampling equipment decontamination is completed in accordance with accepted protocols. As a minimum, sampling equipment is washed with detergent solution and rinsed with distilled water between sampling. Decontamination procedures are undertaken to prevent any cross-contamination between monitoring locations and sampling sites. Screening instruments are calibrated prior to each use.

As a minimum, for every ten groundwater samples collected, one field duplicate sample is collected and included in the laboratory submission for analysis. Two field duplicate samples

were collected during the 2019 annual monitoring event. Samples were submitted to a CALA accredited laboratory that is MECP certified for the analysis of drinking water samples. Laboratory blanks and duplicates were used to ensure sample integrity. Relative Percent Differences (RPDs) were calculated and discussed where applicable. Samples were placed in appropriate sample containers provided by the laboratory and preserved (as required based on type of analysis) until delivered (shipped by courier or hand delivered) to the laboratory for analysis. A chain of custody form accompanied samples at all points of handling.

4.0 MONITORING RESULTS

4.1 Historical Data

Historical data for groundwater dating back to 2002 are provided in Appendix E.

4.2 Data Quality Evaluation

The analytical laboratory employed to perform the laboratory analyses (AGAT) is accredited by the Standards Council of Canada/Canadian Association for Laboratory Accreditation in accordance with ISO/IEC 17025:1999 – “*General Requirements for the Competence of Testing and Calibration Laboratories*” for the tested parameters and has met the standards for proficiency testing developed by the Standards Council of Canada for parameters set out in the Soil, Ground Water and Sediment Standards.

Sample analysis dates provided on the laboratory analytical reports issued by AGAT indicate that all sample analyses were performed within the required sample/extract hold times, as indicated by the dates presented in columns for each sample parameter on the analytical report. The laboratory minimum detection limits were reported to be at or lower than the required MECP reporting detection limits for the parameters analyzed. A comparison of the internal laboratory duplicate samples indicates that all samples and the respective duplicates are within acceptable limits.

As a quality control measure, groundwater duplicate samples were collected during the annual sampling event. All duplicate data are provided in Appendix D and summarized in Appendix E. The groundwater duplicate samples were collected from OW-13B and OW-10, and identified as PB DUP1 and PB DUP2, respectively. When compared to concentrations reported in the original samples, duplicate water quality data reported that all parameters were within an acceptable range with respect to relative percent difference (i.e., the industry standard of less than 50%) and are therefore interpreted to indicate no sampling or laboratory biases during 2019.

4.3 Groundwater Flow Monitoring

As discussed in Section 2.1, the recorded static groundwater levels indicate groundwater flow across the Site towards the north and northwest. Static groundwater levels are presented in Appendix C; inferred groundwater flow directions for the September 2019 groundwater monitoring event are illustrated on Figure 4.

In addition to the current groundwater elevation data, previous groundwater elevations were reviewed in order to identify any trends or inconsistencies in the data. Overall, the reported static groundwater elevations are consistent with those recorded during previous sampling efforts. The available groundwater elevation data indicate relatively stable elevations over time, particularly since 2006. It is noted that the groundwater elevations recorded in monitoring wells OW-9 and OW-11 during the 2014 monitoring event may not be representative of actual groundwater conditions at these locations, as wells were developed following measurement of static water levels during that sampling event. A time-elevation graph is presented in Appendix F for all monitoring wells from 2002 to 2019.

4.4 Groundwater Quality Monitoring

Samples were collected from all 18 groundwater monitoring wells during the September 2019 annual monitoring event. Data summary tables are provided in Appendix E. A photographic inventory of monitoring wells is provided in Appendix G.

4.4.1 Background Water Quality

Background water quality in upgradient monitoring well OW-8 is characterized by high concentrations of dissolved organic carbon (DOC), moderate concentrations of alkalinity and total dissolved solids (TDS), and low concentrations of chloride, sulphate and most metals parameters, when compared to the ODWS. An ODWS exceedance was quantified for DOC, indicated by a bold entry in the associated data table provided in Appendix E. In accordance with Guideline B-7, these concentrations are considered to be representative of Site-specific background water quality in the aquifer intersected by the well screen.

It is also noted that groundwater quality in the area is reported to be highly mineralized, with a noticeable sulphur odour; it has been concluded during previous investigations completed by others that this is the result of naturally occurring elevated concentrations of sulphate, iron, TDS and DOC, which are typical of limestone/dolostone bedrock groundwater systems (GM BluePlan Engineering, 2014). These parameters are therefore interpreted to be poor landfill indicator parameters for this site, as elevated concentrations are not necessarily indicative of a landfill-derived impact to groundwater quality.

4.4.2 Crossgradient Water Quality

Groundwater quality in OW-1, situated east and crossgradient of the fill area, is characterized by elevated concentrations of most parameters, as compared to background monitor OW-8. Recently installed well nest OW-14, situated southwest of the active fill area, exhibits differing water quality in the shallow and deep aquifers. Groundwater quality in OW-14A, the shallow installation, is characterized by elevated concentrations of most landfill indicator parameters, and exhibits water quality similar to OW-1, with the exception of manganese, which is consistently elevated in OW-14A. Water quality in deep monitoring well OW-14B is characterized by slightly elevated concentrations of barium, boron, potassium and sodium, in comparison to background well OW-8; however, concentrations of most parameters are similar to, or lower than, background.

4.4.3 On-Site Downgradient Water Quality

Monitoring wells OW-4, OW-3A/B, OW-5 and OW-2 monitor groundwater quality immediately downgradient of the fill area and the various waste segregation areas on-Site.

OW-4 is situated immediately west of the active fill area; groundwater quality at this location is characterized by slightly elevated concentrations of barium, boron and potassium, when compared to background water quality, and concentrations of DOC lower than those reported at background monitoring well OW-8. Concentrations of parameters including alkalinity, chloride and TDS were quantified at levels similar to background conditions.

Well nest OW-3A/B is located northwest of the active fill area, and is situated mid-Site. The shallow and deep aquifers are monitored at this location by OW-3A and OW-3B, respectively, and report differing water quality. Water quality in shallow downgradient well OW-3A is characterized by elevated concentrations of most parameters analyzed, as compared to background. Groundwater quality in the deep aquifer at this location, in OW-3B, is characterized by low concentrations of alkalinity and DOC, and elevated concentrations of chloride, TDS, barium, boron and sodium, as compared to water quality in OW-8.

Groundwater quality in OW-5, situated northwest of well nest OW-3 and downgradient of Site activities, is characterized by elevated concentrations of landfill indicator parameters, with the exception of DOC, which was quantified at a concentration lower than background. It is noted that concentrations of indicator parameters were lower at this location during 2019 than during recent historical events, potentially indicating a decreasing landfill-derived impact in OW-5.

OW-2 is situated downgradient of Site activities to the north. Groundwater quality at this location is characterized by elevated concentrations of chloride, barium and boron, and low concentrations of alkalinity and DOC, as compared to water quality in background monitoring well OW-8.

4.4.4 Downgradient Property Boundary Water Quality

As discussed above, downgradient property boundaries are represented by monitoring wells OW-7, OW-9, OW12-A/B and OW-13A/B to the west of the Site, OW-6 to the northwest of the Site, and OW-10 and OW-11 to the north of the Site, as illustrated on Figure 2. It is noted that OW-7 is located on property not currently owned by the Municipality.

Groundwater quality in OW-7, situated west of the fill area, is characterized by elevated TDS, boron and sodium, as compared to background, and low concentrations of alkalinity and DOC.

Recently installed well nest OW-13 is situated northwest of the fill area, east of the west property boundary, and indicates a potential site-derived impact to groundwater quality in both wells, with a more defined impact apparent in the shallow installation, OW-13A. Concentrations of all landfill indicator parameters are elevated in OW-13A, in comparison to background water quality. Elevated concentrations of landfill indicator parameters also characterize water quality in OW-13B, but at concentrations lower than those quantified in the shallow installation.

OW-9, located west of the Site and at the west property boundary line, demonstrates water quality characterized by low concentrations of alkalinity and DOC, and elevated concentrations of barium, boron and sodium, as compared to background monitoring well OW-8.

Recently installed well nest OW-12 is situated along the western property boundary of the Site north of OW-9, and reports slightly higher concentrations of indicator parameters in OW-12B, the deeper of the two installations, as compared to OW-12A. Groundwater quality in shallow installation OW-12A is characterized by elevated concentrations of barium, boron, manganese and sodium, and low concentrations of alkalinity, chloride, DOC and TDS, as compared to background. Water quality in the deeper installation, OW-12B, is characterized by elevated concentrations of chloride, TDS, barium, boron, potassium and sodium, in comparison to water quality at background monitor OW-8. Toluene was quantified at detectable concentrations in both OW-12A and OW-12B.

During an historical monitoring event conducted in October 2017, additional parameters were analyzed at OW-12B in order to confirm a potential presence of petroleum hydrocarbons (PHCs) in groundwater initially observed during a supplemental sampling event in May 2017, which was conducted as part of a separate hydrogeological investigation. Detectable levels of PHCs were quantified in October 2017, as shown in the associated data summary table presented in Appendix E, resulting in the recommendation to continue with the analysis of these extra parameters at this monitoring well during future monitoring events. An insufficient volume of water and slow recovery prevented the collection of additional samples during the two 2018 sampling events, one of which was supplemental. Obtaining a sufficient sample volume at OW-12B is an ongoing challenge and collection of extra sample volume is not realistic at this well on an ongoing basis. Based on the available data, the source of the PHCs quantified in 2017 is unknown at this time; however, they are not interpreted to be derived from the waste deposition area and could potentially be the result of off-Site sources, unrelated to landfill activity. It is noted that PHCs are sometimes present naturally on Manitoulin Island and are not always indicative of contamination to groundwater from anthropogenic sources.

OW-6 is located in the northwest corner of the Municipality-owned property, and immediately west of the Municipal Works building. Groundwater quality at this location is characterized by concentrations of most parameters at levels similar to or lower than background, with the exception of boron, which is elevated in comparison to water quality in OW-8.

The north property boundary of the Site is monitored by wells OW-10 and OW-11. Water quality in OW-10 is characterized by slightly elevated concentrations of most analytical parameters in comparison to background water quality in OW-8, with the exception of DOC, which is lower than background. Water quality in OW-11, situated at the north property boundary to the west of OW-10, is characterized by low alkalinity and DOC, and elevated concentrations of barium, boron, manganese and sodium, in comparison to background water quality in OW-8.

4.4.5 Groundwater Field Parameter Measurements

Field parameters were measured at all monitoring wells at the time of sampling and are presented in Table 3.

Table 3: September 2019 Groundwater Field Parameter Measurements

Well ID	Temperature (°C)	pH	Conductivity (mS/cm)	Dissolved Solids (mg/L)
OW-1	9.7	7.23	633	316
OW-2	10.0	7.81	367	183
OW-3A	10.1	7.32	579	284
OW-3B	13.3	7.90	595	297
OW-4	12.0	7.70	592	296
OW-5	10.7	7.50	577	288
OW-6	10.1	7.62	399	200
OW-7	Insufficient volume			
OW-8	9.8	7.22	334	167
OW-9	11.1	7.47	387	193
OW-10	10.2	7.33	516	258
OW-11	12.7	7.80	379	160
OW-12A	9.9	7.78	10	5
OW-12B	14.3	7.77	628	314
OW-13A	13.2	7.11	1261	630
OW-13B	10.9	7.41	617	308
OW-14A	11.7	8.06	631	315
OW-14B	8.8	7.56	332	166

4.4.6 Residential Well Monitoring

Two residential wells are integrated into the Site annual monitoring program. Samples were obtained at both the Irving and Paquet residences in September 2019. The results of the 2019 residential well sampling are summarized and compared to the ODWS, with any exceedances identified by bold entries (Appendix E). As shown on Figure 2, both residential monitoring locations are situated west, and therefore downgradient, of the Site.

Water quality in the Irving residential water well is characterized by concentrations of all parameters at levels similar to, or lower than, background, with the exceptions of TDS and boron, which are marginally elevated in comparison to OW-8. These parameter concentrations are not interpreted to be landfill-related and are likely representative of the natural range of fluctuation of these parameters in the vicinity of the Site. The only parameters exceeding the ODWS at this location during the September 2019 monitoring event were microbial parameters, unrelated to the landfill (Appendix E).

Groundwater quality in the Paquet residential water well is characterized by concentrations of all parameters analyzed at levels similar to background. A high TDS concentration, exceeding the ODWS, was quantified at this location during 2019, but is interpreted to be anomalous, as it is substantially elevated in comparison to the remainder of the historical monitoring record. The TDS concentration at this residential water well should be confirmed during the next regularly scheduled monitoring event, to be undertaken in the fall of 2020.

In summary, a review of the 2019 geochemical data from the neighbouring residential water supply wells indicates that these locations are not currently experiencing evidence of a landfill-derived impact.

5.0 ASSESSMENT, INTERPRETATION AND DISCUSSION

5.1 Groundwater Plume Delineation

The horizontal delineation of the groundwater plume emanating from the landfill fill area was inferred based on the geographical distribution of chloride, which is interpreted to be an effective landfill indicator parameter. The distribution of chloride concentrations across the Site was illustrated by contours inferred from the September 2019 monitoring data, which are presented on Figure 5. The contours observed for chloride are interpreted to be aligned with the inferred groundwater contours at the Site (Figure 4). Contours indicate more elevated concentrations of chloride at monitoring locations immediately downgradient of the fill area, with a gradual decrease in concentration towards the north and west of the fill area. At the north boundary of the Site and along the south side of Government Road, chloride concentrations are not uniform and differ slightly from the groundwater elevation contours. This could potentially be the result of an impact related to road salt, which may be occurring in OW-10. The inferred chloride concentration contours suggest that the landfill-derived impacts are contained to within a distance of approximately 200 m to the north and west of the fill area.

For the purpose of the delineation of the vertical groundwater plume, a section of the subsurface along the predominant direction of groundwater flow at the Site (i.e., northwest), was selected in order to evaluate the pattern of chloride concentrations for the September 2019 monitoring event. The selected section is shown on Figure 6 and includes 11 monitoring wells, of which three are multi-level monitoring well nests. The inferred vertical concentration contours for chloride suggest attenuation of this parameter with depth at monitoring locations downgradient of OW-5. The nested wells indicate that chloride concentrations are more elevated in the shallow installation at OW-13, while the opposite is true at well nest OW-12, where the deeper of the two installations quantifies the higher chloride concentration. This pattern suggests that landfill impacts are shallow nearest the fill area, and deeper with distance as the plume migrates downgradient. Concentrations of chloride are attenuated with depth in the direction of groundwater flow, with impacts deepening as the plume migrates in a downgradient direction.

5.2 Groundwater Trend Analysis

The current and previous groundwater elevation and water quality data were reviewed with the objective of identifying any apparent trends or inconsistencies in the monitoring record. With respect to the groundwater elevations, the available data indicate relatively stable elevations

over time (Appendix F), particularly since 2006. Groundwater elevations recorded in monitoring wells OW-9 and OW-11 during the 2014 monitoring event appear to be the result of drilling effects and incomplete water level recovery following drilling at these two locations and are not likely representative of actual groundwater elevations. The same is likely true for OW-12B in August 2017, although too few data points are available at this time to confirm this interpretation.

A series of time-concentration graphs were developed for several select typical groundwater landfill indicator parameters (including alkalinity, barium, boron, chloride, DOC, sulphate and TDS) for all monitoring wells from 2002 to 2019. These time-concentration graphs are presented in Appendix F. Although results for wells OW-9 through OW-11, installed in 2014, and well nests OW-12 through OW-14, installed in 2017, have been included in the appended charts, trends cannot be discussed for these monitoring locations until additional data have been compiled. It is noted, however, that the results for OW-9 and OW-11 for the initial monitoring event in 2014 appear to be unrepresentative of actual groundwater conditions in these wells as most parameters are elevated in comparison to the concentrations quantified at these locations since 2014. The same interpretation may be true for the initial sampling events completed at OW-12B, however, too few data points are available for this well to confirm at this time.

The available data generally indicate stable concentrations of landfill indicator parameters throughout the monitoring record. No significant increasing or decreasing trends are apparent for any of the parameters graphed. Landfill indicator parameters may be increasing over time in OW-3A, however additional data points are required in order to confirm this increasing trend. Various anomalous results have been quantified throughout the monitoring record, including alkalinity and sulphate in OW-2 during June 2002, barium in OW-6 and OW-3B during March 2004 and November 2010, respectively, and chloride, DOC and TDS at various locations prior to 2005. In addition, the Paquet residential water well quantified an anomalous TDS concentration during 2019.

Unique water quality characteristics are evident in OW-3B, specifically with respect to boron concentrations, which are consistently higher than those reported at the remainder of the monitoring well network. Similarly, a distinct groundwater quality is apparent in OW-5, indicative of a landfill-derived impact to groundwater, as illustrated by the elevated concentrations of landfill indicator parameters such as alkalinity, chloride and TDS reported at this location, as compared to background and non-impacted downgradient wells. In comparison, the Irving and Paquet residential water wells report similar and stable water quality throughout the historical monitoring record.

As previously discussed, elevated sulphate is reported to be naturally occurring in the vicinity of the Site as a result of the highly mineralized bedrock groundwater system (GM BluePlan Engineering, 2014). Sulphate concentrations are variable across the monitoring network, regardless of proximity to waste deposits. These results are consistent throughout the historical monitoring record, as illustrated by the sulphate trend chart. Sulphate has therefore been considered an inappropriate landfill indicator parameter, as it is not possible to distinguish naturally occurring concentrations from those that could potentially be landfill-derived.

5.3 Guideline B-7 Calculations

In September 1986, a policy was introduced by the MECP to assist in the evaluation of groundwater impacts, especially for the case of landfill and/or lagoon operations. The guideline was entitled “The Incorporation of the Reasonable Use Concept into MECP Groundwater Management Activities” and is now referred to as Guideline B-7 (formerly Policy 15-08). Simply stated, the guideline sets groundwater contaminant discharge criteria for landfills and/or lagoons that may impair local water quality; the criteria are based on maintaining the protection of groundwater resources on the adjacent lands or properties.

The contaminant discharge criteria, which represent the maximum acceptable levels of contaminants that should not be exceeded, are established using a simple mathematical relationship that incorporates background (existing) water quality and the highest provincial water quality standards for the adjacent land use. Under Guideline B-7, water quality impacts will not be allowed to exceed the maximum calculated discharge criteria at the Site property boundaries.

In order to apply Guideline B-7, the appropriate resource use of the adjacent properties must be selected. For the Providence Bay Waste Disposal Site, the highest end use for groundwater on the adjacent properties is for drinking water purposes, for which the ODWS - Table 1 through Table 4 have been established. The purpose of the ODWS is to protect public health through the provision of safe drinking water. Water intended for human consumption shall not contain unsafe concentrations of toxic chemicals (health related parameters). Health related standards are established for parameters that, when present above a certain concentration, have known or suspected adverse health effects. At the same time, water should also be aesthetically acceptable. Colour, odour and turbidity are parameters that, when controlled, result in water that is clear, colourless and without objectionable or unpleasant taste or odour (non-health related parameters). In addition, operational guidelines have been established for non-health related parameters that need to be controlled to ensure efficient and effective treatment and distribution of the water. As well, Guideline B-7 requires the identification of background water quality conditions in the underlying aquifer.

In order to establish the background geochemical profile (from OW-8), the geometric mean of the valid concentrations of each applicable ODWS parameter is calculated, and the resultant values are applied along with the ODWS, to complete a Guideline B-7 analysis for all of the on-Site groundwater monitoring wells for various landfill indicator parameters. Appendix H presents the Guideline B-7 calculations for the fall 2019 monitoring results that have been developed using all valid background analytical data observed in OW-8.

It should be noted that these Guideline B-7 values are much lower (i.e., more stringent) than the ODWS, and a well-by-well comparison of the performance of each of the parameters at all of the downgradient groundwater monitoring wells is also presented in Appendix H for the 2019 monitoring events. By the present assessment, wells OW-1, OW-13A, OW-13B and OW-14A exhibit non-compliance with Guideline B-7 during the fall 2019 monitoring event. The exceedances are indicated by bold and shaded entries in the table provided in Appendix H. In the event that the background concentration of a parameter exceeds the ODWS, the background level is considered the maximum allowable concentration not to be exceeded. This is the case for DOC during the 2019 monitoring event.

Comparing concentrations observed in the groundwater monitoring wells during the 2019 sampling event to the maximum allowable concentration (MAC) (Appendix H), four non-health related parameter exceedances are noted. Alkalinity, DOC, sulphate and TDS exceeded the MAC in OW-13A. TDS also exceeded the MAC in OW-1, OW-13B and OW-14A, at levels not substantially elevated above the allowable limit. As previously discussed, sulphate is not interpreted to be an appropriate indicator parameter for the Site, as it is naturally elevated in the bedrock aquifer in the area. Similarly, DOC is elevated at background and is therefore not an ideal indicator of landfill-derived impacts.

In summary, the monitoring record indicates that a measurable water quality impact is occurring crossgradient and downgradient of the waste deposits in select monitoring wells. Crossgradient impacts in OW-1 and OW-14A are considered marginal and are not necessarily landfill-derived, but rather are potentially the result of background water quality conditions, especially given the hydraulic positioning of OW-1 in comparison to the waste deposits. Impacts quantified in downgradient well nest OW-13 for alkalinity and TDS are interpreted to be Site-derived. It is important to note, however, that although this well nest is situated at the west property boundary, the northwesterly flow of groundwater in this area allows for additional on-Site attenuation downgradient of these wells in the western portion of Municipality-owned land. Confirmation of these results through additional, regularly scheduled sampling in 2020 is recommended.

A preliminary contaminant attenuation zone (CAZ) was calculated by Wood as part of a groundwater assessment completed in December 2018 (Wood, 2018). It was estimated at that time based on the available data that the required CAZ was 241 m surrounding the fill area. Based on this estimated CAZ radius and the results of the 2019 Guideline B-7 assessment discussed above, the Site is currently in compliance, as no wells outside of the 241 m radius have quantified exceedances of the Guideline B-7 MACs during the current annual monitoring program.

It should be noted that the well nest at the OW-13 location is located within the CAZ distance, and is on the municipal property line. As such, it is possible that the private lands immediately adjacent to this location (i.e., immediately west) do not comply with B-7, which warrants further evaluation of the required additional CAZ area in this corner of the municipal property boundaries. Additional monitoring wells would be needed to verify the CAZ requirements.

5.4 Adequacy of the Monitoring Program

It is Wood's opinion that the current groundwater monitoring program is adequate with respect to the characterization of Site conditions, the evaluation of Site performance and the assessment of Site compliance. The Monitoring and Screening Checklist is provided in Appendix I.

6.0 CONCLUSIONS

Based on the results of the current (2019) monitoring program, the following conclusions have been made:

1. Groundwater movement at the Site was determined by static groundwater level measurements recorded at each of the monitoring wells as being directed away from the Site towards the north and west.
2. The current monitoring record indicates a landfill-derived impact to groundwater quality in the shallow aquifer in monitoring wells downgradient of the waste fill area. Water quality conditions in recently installed OW-12B, the deeper of the two installations at this well nest, indicate a potential impact to groundwater quality; however, water quality in this well is not fully understood at this time, given the small data set available to date. It is noted that detectable concentrations of PHC parameters have been quantified in OW-12B during historical sampling events, however it is possible that the PHC presence at this location may be naturally occurring.
3. The inferred chloride concentration contours suggest that the landfill-derived impacts are contained to within an approximate distance of 200 m to the north and west of the fill area and are attenuated with depth in the direction of groundwater flow, with impacts deepening as the plume migrates in a downgradient direction.
4. Groundwater quality at the Site is stable over time at all monitoring locations, including residential water wells downgradient of the Site. The data indicate a potential increasing trend in concentrations of landfill indicator parameters in OW-3A, however additional samples are required in order to confirm this trend.
5. Alkalinity, DOC, sulphate and TDS, all non-health related parameters, exceeded the MACs, as calculated using Guideline B-7. DOC and sulphate are not interpreted to be appropriate landfill indicator parameters for this Site. The exceedances in crossgradient wells OW-1 and OW-14A are marginal and are not necessarily landfill-derived. The exceedances in downgradient wells OW-13A and OW-13B, however, are interpreted to be indicative of a landfill-derived impact to groundwater quality. It is noted that the flow of groundwater in the vicinity of well nest OW-13 is to the northwest, which allows for additional downgradient attenuation on the western portion of the Municipality-owned property.
6. Based on the previously estimated CAZ, discussed in the 2018 hydrogeology report, a radius of 241 m downgradient of the fill pile is needed to meet Guideline B-7. Adequate downgradient attenuation appears to be available northwest of the fill pile, in the direction of groundwater movement, and downgradient wells beyond 241 m currently comply with B-7; however, the CAZ may need to be expanded slightly west of the OW-13 nest, which will require further evaluation.

7.0 RECOMMENDATIONS

The following recommendations should be considered for inclusion in next year's monitoring program:

1. The Municipality should continue with the current frequency of groundwater monitoring, so that variations for certain parameters could be documented and understood.
2. Groundwater elevations at all existing monitoring wells should continue to be measured during the annual groundwater sampling round to further confirm groundwater flow directions.

3. The compliance of land immediately adjacent to well nest OW-13 should be evaluated though the installation of additional monitoring wells, in order to verify the CAZ estimates developed in the 2018 hydrogeology study (Wood, 2018).

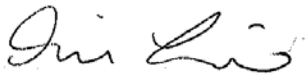
8.0 CLOSURE

This report has been prepared for the exclusive use of the Municipality for specific application to this Site. The annual monitoring report was prepared in accordance with the verbal and written requests from the Municipality and generally accepted assessment practices, restricting the investigations to the assessment of the environmental compliance associated with the Site. No other warranty, expressed or implied is made.

Respectfully Submitted,

**Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited**

Prepared by:



Emily Lemieux, B.Sc.
Environmental Scientist

Reviewed by:

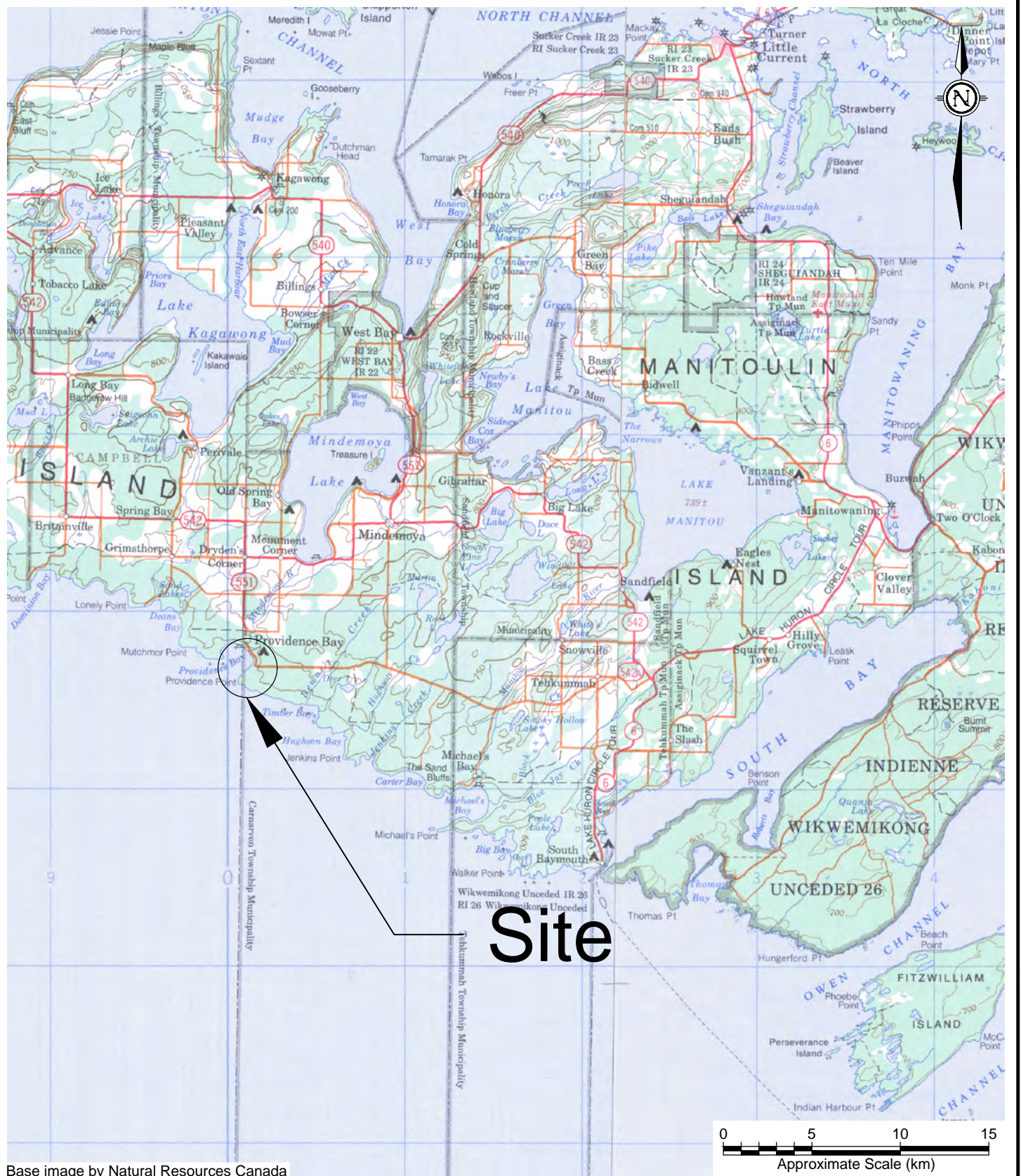


Brian Grant, P.Eng.
Hydrogeologist
Water Resources Engineer

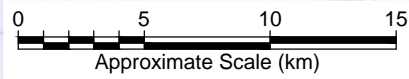
9.0 REFERENCES

Gamsby and Mannerow Limited. Annual Monitoring Report (2013), Providence Bay Landfill Site, Certificate of Approval No. A550702, the Municipality of Central Manitoulin. February 2014.

Wood Environment & Infrastructure Solutions. Groundwater Assessment Report, Providence Bay Waste Disposal Site, Providence Bay, Ontario. December 2018.








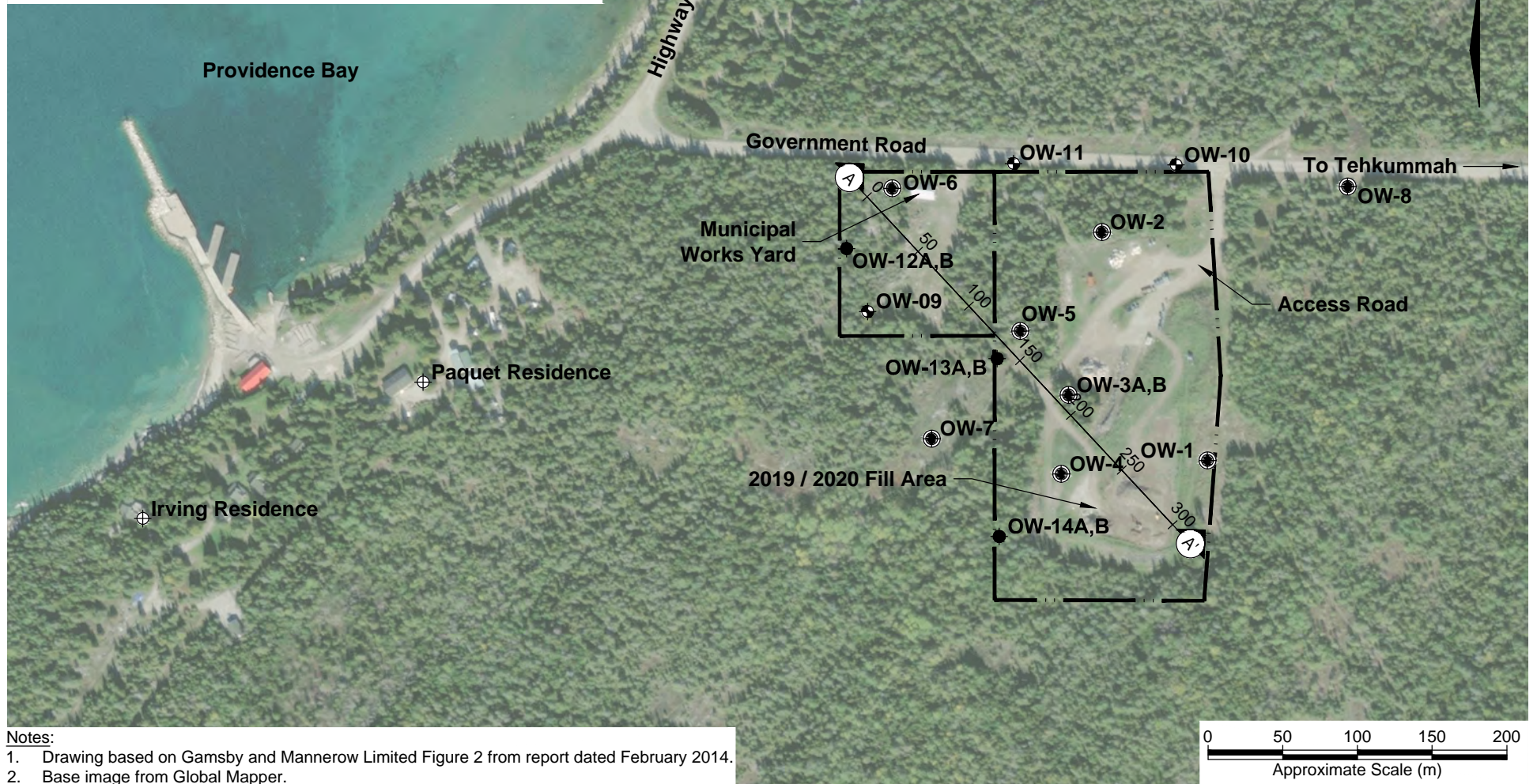
Base image by Natural Resources Canada





Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632						Municipality of Central Manitowlin	
PROJECT 2019 Annual Groundwater Monitoring Report Providence Bay Waste Disposal Site, Providence Bay, Ontario				DWN BY: KKJ		CHK'D BY: BRG	
TITLE Site Location Map				REV. NO.: 1		DATE: December 2019 PROJECT NO: TY1410143 FIGURE NO: 1	

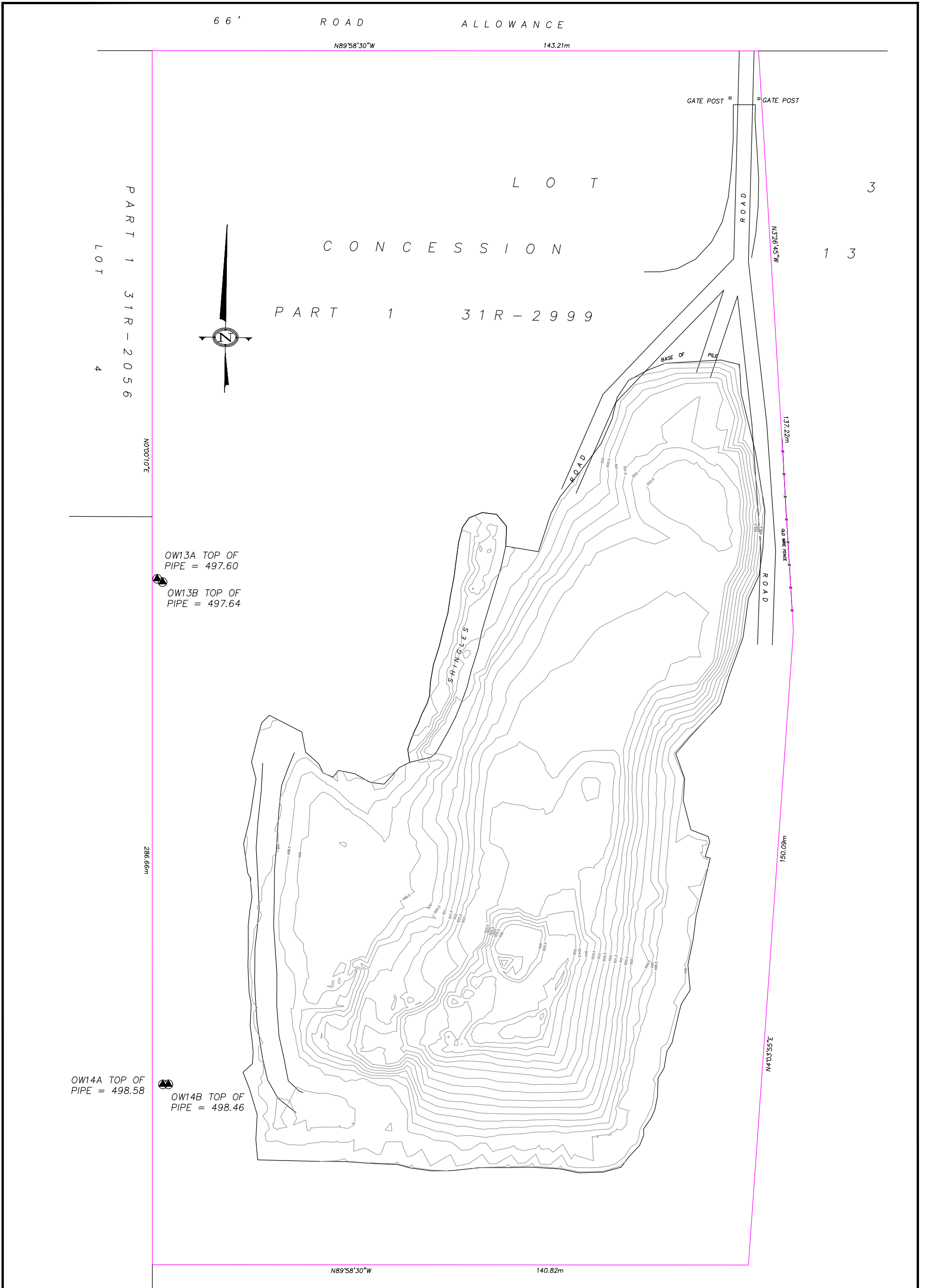
Legend:

-  Approximate Property Line
-  Monitoring Well (Waters Environmental Geosciences Ltd. 2002 & 2003)
-  Monitoring Well (Wood 2014)
-  Monitoring Well (Wood 2017)
-  Residential Well





Notes:
 1. Drawing based on Gamsby and Mannerow Limited Figure 2 from report dated February 2014.
 2. Base image from Global Mapper.

	Municipality of Central Manitoulin	DWN BY:	PROJECT	REV. NO.:
		KKJ	2019 Annual Groundwater Monitoring Report Providence Bay Waste Disposal Site Providence Bay, Ontario	1
Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632		CHK'D BY:	TITLE	DATE:
		BRG	Site Plan	December 2019
		SCALE:		PROJECT NO.:
		as shown		TY1410143
				FIGURE NO.:
				2

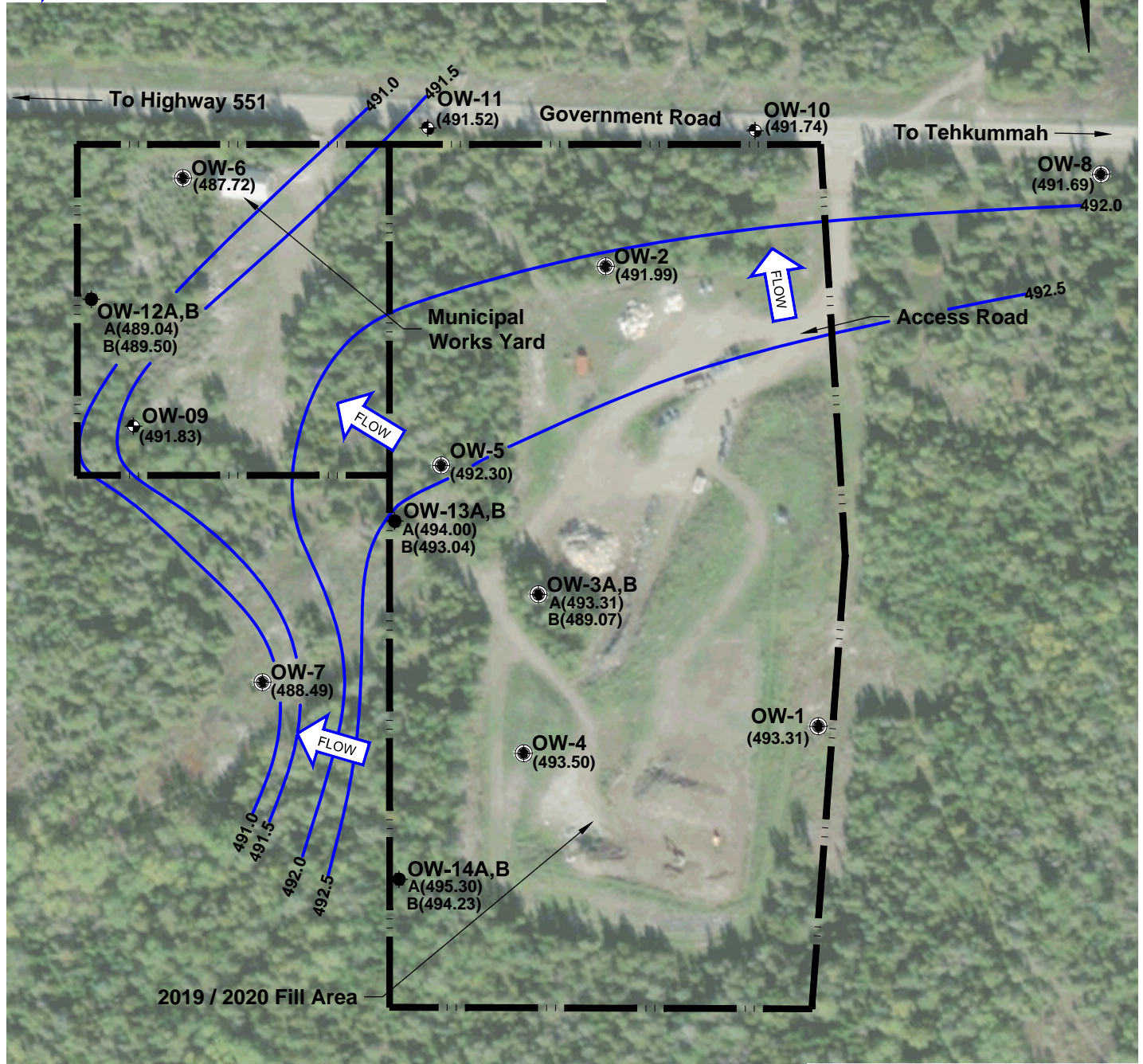


Notes:
 Survey taken on 2 October 2019 provided by Keatley Surveying Ltd.

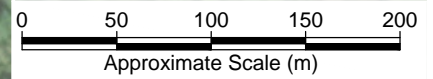
	Municipality of Central Manitoulin	DWN BY:	PROJECT 2019 Annual Groundwater Monitoring Report Providence Bay Waste Disposal Site Providence Bay, Ontario	REV. NO.:	1
		KKJ		DATE:	December 2019
Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632		CHK'D BY:	TITLE 2019 Topographical Survey	PROJECT NO.:	TY1410143
		BRG		SCALE:	FIGURE NO.:
		as shown			

Legend:

- Approximate Property Line
- Monitoring Well (Waters Environmental Geosciences Ltd. 2002 & 2003)
- ⊕ Monitoring Well (Wood 2014)
- Monitoring Well (Wood 2017)
- (487.47) Groundwater Elevations (m)
- Inferred Groundwater Contours (m)
- Inferred Groundwater Flow Direction



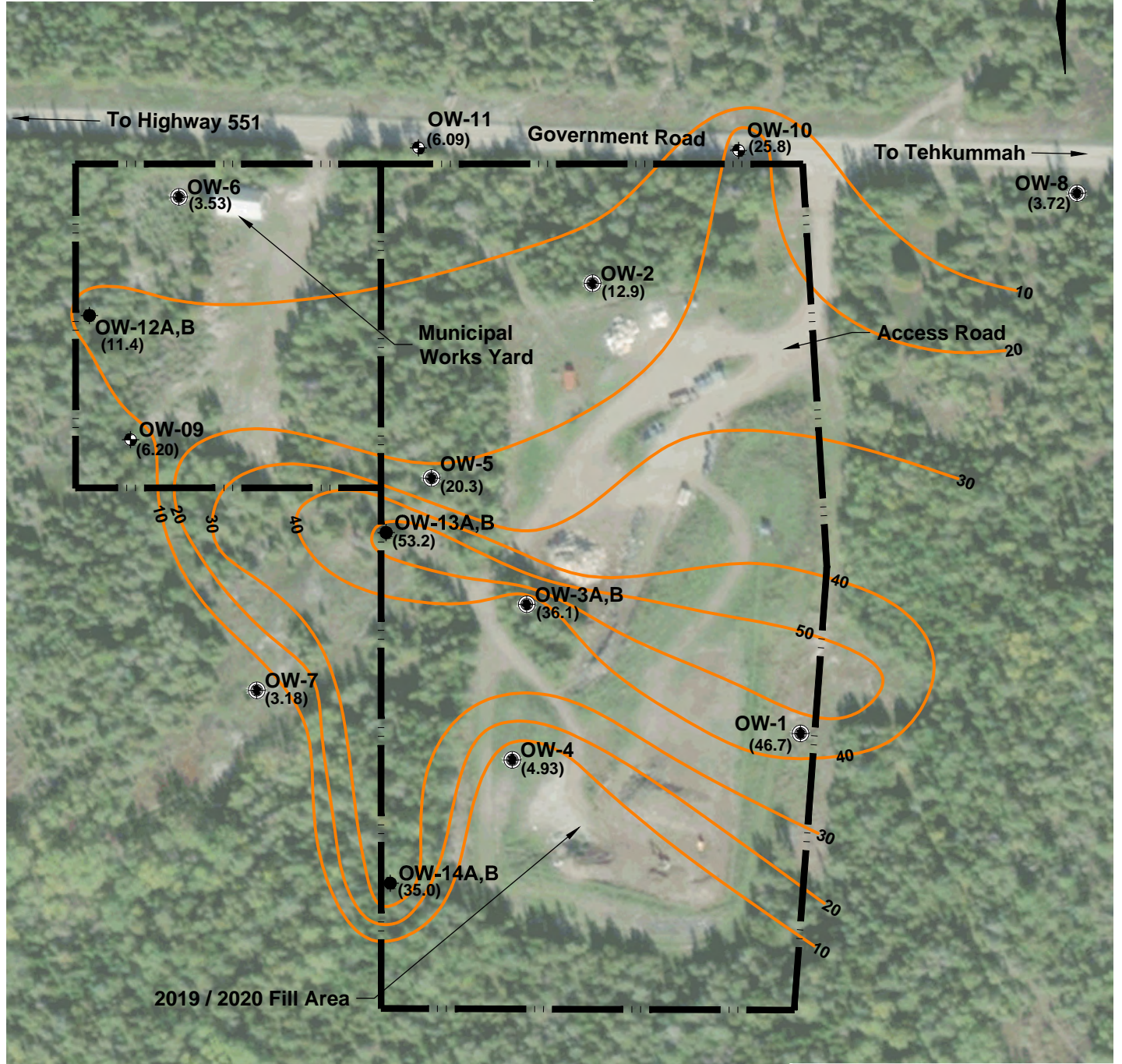
- Notes:**
1. Drawing based on Gamsby and Mannerow Limited Figure 2 from report dated February 2014.
 2. Base image from Global Mapper.



Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632			Municipality of Central Manitoulin
PROJECT 2019 Annual Groundwater Monitoring Report Providence Bay Waste Disposal Site, Providence Bay, Ontario	DWN BY: KKJ	CHK'D BY: BRG	DATE: December 2019 PROJECT NO: TY1410143
TITLE Inferred Groundwater Contours - September 2019	REV. NO.: 1	SCALE: as shown	FIGURE NO: 4

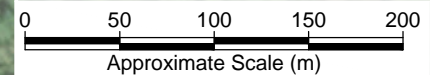
Legend:

- Approximate Property Line
- Monitoring Well (Waters Environmental Geosciences Ltd. 2002 & 2003)
- ⊕ Monitoring Well (Wood 2014)
- Monitoring Well (Wood 2017)
- (487.47) Chloride Concentrations (mg/L)
- Inferred Chloride Contours



Notes:

1. Drawing based on Gamsby and Mannerow Limited Figure 2 from report dated February 2014.
2. Base image from Global Mapper.

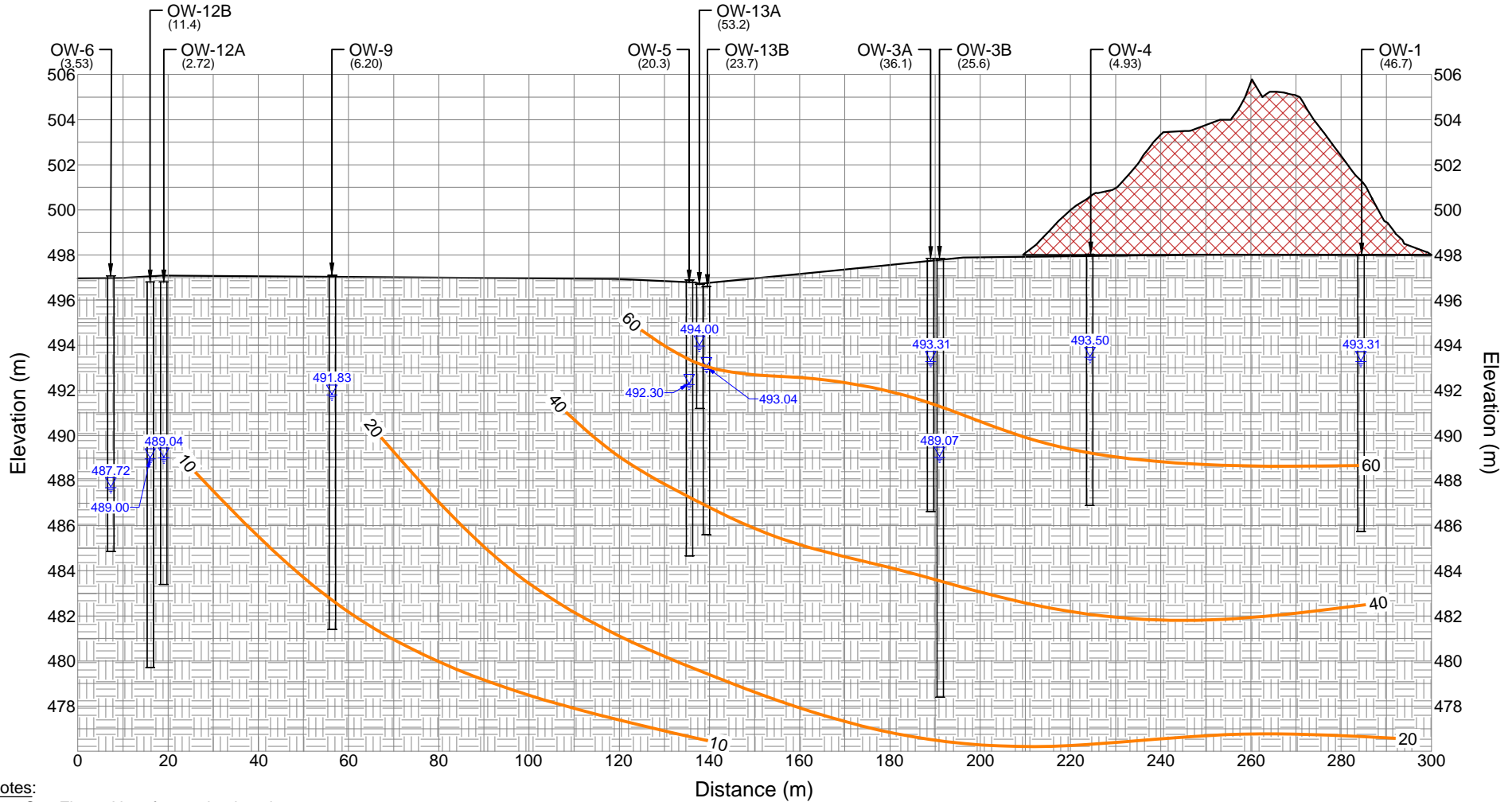


Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632			Municipality of Central Manitoulin
PROJECT 2019 Annual Groundwater Monitoring Report Providence Bay Waste Disposal Site, Providence Bay, Ontario	DWN BY: KKJ	CHK'D BY: BRG	DATE: December 2019 PROJECT NO.: TY1410143
TITLE Inferred Chloride Contour Plan - September 2019	REV. NO.: 1	SCALE: as shown	FIGURE NO.: 5



Legend:
 — Ground Surface Profile
 ∇ Measured Groundwater Elevation

Concentrations:
 (#) Chloride Concentrations (mg/L)
 — Interpolated Chloride Concentration Contour (mg/L)

Stratigraphy:
 [Cross-hatch] Waste
 [Grid] Bedrock



- Notes:**
1. See Figure No.2 for section location.
 2. Vertical exaggeration factor of five (5) shown.
 3. Ground surface generated from borehole data and survey taken on 17 September 2018 provided by Keatley Surveying Ltd.

	Municipality of Central Manitoulin	DWN BY:	PROJECT 2019 Annual Groundwater Monitoring Report Providence Bay Waste Disposal Site Providence Bay, Ontario	REV. NO.:	1
		CHK'D BY:		DATE:	December 2019
Wood Environment & Infrastructure Solutions 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632		SCALE:	TITLE	PROJECT NO.:	TY1410143
		as shown	Inferred Chloride Section - September 2019	FIGURE NO.:	6

The Municipality of Central Manitoulin
2019 Annual Groundwater Monitoring Report
Providence Bay Waste Disposal Site
Providence Bay, Ontario
December 2019



APPENDIX A
CERTIFICATE OF APPROVAL
NO. A550702

The Corporation of the Municipality of Central Manitoulin
6020 Highway 542 PO Box 187, Mindemoya
Central Manitoulin, Ontario
P0P 1S0

Site Location: Providence Bay Landfill
Geographic Township of Carnarvon
Lot Part 3, Concession 13
Central Manitoulin Township, District of Manitoulin

*You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19
(Environmental Protection Act) for approval of:*

the use and operation of a 4.1 hectare landfilling site and waste transfer station

For the purpose of this environmental compliance approval, the following definitions apply:

"Act" and "EPA" means Environmental Protection Act, R.S.O. 1990, c. E. 19, as amended;

"Approval" means this Environmental Compliance Approval and any Schedules to it, including the application and supporting documentation listed in Schedule "A";

"Blue box material" means municipal waste that consists solely of waste in one or more of the categories set out in Schedule 1 of the Ontario Regulation 101/94;

"Contaminant Attenuation Zone" or "CAZ" means the 1.2 hectare municipal works yard and property, as shown in figure 3 of the Design and Operations Plan, item 2 of Schedule "A";

"Director" means any Ministry employee pursuant to section 20.3 of Part II.1 of the Act;

"District Manager" means the District Manager of the local district office of the Ministry in which the Site is geographically located;

"Leaf and Yard Waste" includes waste consisting of natural Christmas trees and other plant materials but not tree limbs or other woody materials in excess of seven (7) centimetres in diameter;

"Ministry" means the Ontario Ministry of the Environment and Climate Change;

"Municipal Hazardous or Special Waste", "MHSW" or "HHW" means municipal hazardous waste or municipal special waste as defined by Ontario Regulation 542/06 made under the Waste Diversion Act 2002;

"OCC" means old corrugated cardboard;

"Operator" means any person, other than the Owner's employees, authorized by the Owner as having the charge, management or control of any aspect of the site, and includes its successors or assigns;

"Owner" means any person that is responsible for the establishment or operation of the Site being approved by this

CONTENT COPY OF ORIGINAL

Approval, and includes Corporation of the Municipality of Central Manitoulin, its successors and assigns;

"OWRA" means the Ontario Water Resources Act, R.S.O. 1990, c. O-40, as amended from time to time;

"PA" means the Pesticides Act, R.S.O. 1990, c. P-11, as amend from time to time;

"Provincial Officer" means any person designated in writing by the Minister as a provincial officer pursuant to section 5 of the OWRA or section 5 of the Act or section 17 of PA;

"Putrescible waste" means waste that decomposes such as food waste;

"Reg. 347" means Regulation 347, R.R.O. 1990, made under the Act, as amended from time to time;

"Regional Director" means the Regional Director of the local Regional Office of the Ministry in which the Site is located;

"Residual waste" means waste that is destined for final disposal;

"Site" means the entire waste disposal site including the landfilling area and transfer station located at Part Lot 3, Concession 13, Central Manitoulin Township, District of Manitoulin, as shown on figure 3 of the Design and Operations plan, item 2 of Schedule "A";

"Trained Personnel" means personnel knowledgeable in the following through instruction and/or practice:

- a. relevant waste management legislation, regulations and guidelines;
- b. major environmental concerns pertaining to the waste to be handled;
- c. occupational health and safety concerns pertaining to the processes and wastes to be handled;
- d. management procedures including the use and operation of equipment for the processes and wastes to be handled;
- e. emergency response procedures;
- f. specific written procedures for the control of nuisance conditions;
- g. specific written procedures for refusal of unacceptable waste loads; and
- h. the requirements of this Approval.

"Waste Electrical and Electronic Equipment" or "WEEE" means devices listed in Schedules 1 through 7 of Ontario Regulation 393/04.

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

TERMS AND CONDITIONS

1. GENERAL

Compliance

(1) The Owner shall ensure compliance with all the conditions of this Approval and shall ensure that any person authorized to carry out work on or operate any aspect of the Site is notified of this Approval and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.

(2) Any person authorized to carry out work on or operate any aspect of the Site shall comply with the conditions of this Approval.

(3) The Site shall be operated and maintained, and the management and disposal of all waste shall be carried out, in accordance with the EPA, Reg. 347 and the conditions of this Approval . At no time shall the discharge of a contaminant

that causes or is likely to cause an adverse effect be permitted.

In Accordance

(4) Except as otherwise provided for in this Approval, the Site shall be operated and maintained in accordance with the applications for this Approval, and the supporting documentation listed in Schedule "A".

Interpretation

(5) Where there is a conflict between a provision of any document, including the application, referred to in this Approval, and the conditions of this Approval, the conditions in this Approval shall take precedence.

(6) Where there is a conflict between the application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the Ministry approved the amendment.

(7) Where there is a conflict between any two documents listed in Schedule "A", other than the application, the document bearing the most recent date shall take precedence.

(8) The conditions of this Approval are severable. If any condition of this Approval, or the application of any condition of this Approval to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this Approval shall not be affected thereby.

Other Legal Obligations

(9) The issuance of, and compliance with, this Approval does not:

(a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or

(b) limit in any way the authority of the Ministry to require certain steps be taken or to require the Owner to furnish any further information related to compliance with this Approval.

(10) The Owner shall ensure that:

(a) all equipment discharging to air operating at the Site are approved under Section 9 of the Act; and

(b) all direct effluent discharges from this Site, including stormwater run-off, are managed in accordance with appropriate Municipal, Provincial and/or Federal Legislation, Regulations and By-laws.

Adverse Effect

(11) The Owner shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the Site, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.

(12) Despite an Owner, Operator or any other person fulfilling any obligations imposed by this Approval, the person remains responsible for any contravention of any other condition of this Approval or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Owner

(13) The Owner shall notify the Director, in writing, and forward a copy of the notification to the District Manager, within 30 days of the occurrence of any changes in the following information:

(a) change of Owner or Operator of the Site, or both;

(b) change of address of the current Owner, or address of the new Owner;

(c) change of partners where the Owner or Operator is or at any time becomes a partnership, and a copy of the most

recent declaration filed under the Business Names Act, 1991 shall be included in the notification to the Director;
(d) any change of name of the corporation where the Operator 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. Reg. 182, Chapter C-39, R.R.O. 1990, as amended), filed under the Corporations Information Act shall be included in the notification to the Director.

(14) 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 and sufficient financial assurance is deposited with the Ministry to ensure that these conditions will be carried out.

(15) In the event of any change in ownership of the Site, other than change to a successor municipality, the Owner shall notify the successor of, and provide the successor with a copy of this Approval, and the Owner shall provide a copy of the notification to the District Manager and the Director.

Registration on Title Requirement

(16) Prior to dealing with the property in any way, the Owner shall provide a copy of this Approval and any amendments, to any person who will acquire an interest in the property as a result of the dealing.

(17) (a) If not completed previously, within thirty (30) calendar days from the date of issuance of this Approval, the Owner shall submit to the Director a completed Certificate of Requirement which shall include:

- (i) a plan of survey prepared, signed and sealed by an Ontario Land Surveyor, which shows the area of the Site where waste has been or is to be deposited at the Site;
- (ii) proof of ownership of the Site;
- (iii) a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the Director, verifying the legal description provided in the Certificate of Requirement;
- (iv) the legal abstract of the property; and
- (v) any supporting documents including a registerable description of the Site.

(b) Within fifteen (15) calendar days of receiving a Certificate of Requirement authorized by the Director, the Owner shall:

- (i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
- (ii) submit to the Director written verification that the Certificate of Requirement has been registered on title.

Registration on Title Requirement - Contaminant Attenuation Zone

(18) If not completed previously, the Owner shall, within thirty (30) calendar days from the date of issuance of this Approval, submit to the Director documents confirming that a contaminant attenuation zone (CAZ) has been established, in either fee simple or by way of a groundwater easement.

(a) If rights are obtained in fee simple, the Owner shall provide:

- (i) documentation evidencing ownership of the CAZ obtained in compliance with O.Reg. 232/98, as amended;
- (ii) a completed Certificate of Requirement and supporting documents containing a registerable description of the CAZ; and
- (iii) a letter signed by a member of the Law Society of Upper Canada; or other qualified legal practitioner acceptable to the Director, verifying the legal description of the CAZ.

(b) Within fifteen (15) calendar days of receiving a Certificate of Requirement signed or authorized by the Director, the Owner shall:

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- (i) register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and
- (ii) submit to the Director a written verification that the Certificate of Requirement has been registered on title.

(c) If rights are obtained by way of a groundwater easement, the Owner shall:

- (i) provide a copy of the easement agreement;
- (ii) provide a plan of survey signed and sealed by an Ontario Land Surveyor for the CAZ;
- (ii) submit proof of registration on title of the groundwater easement to the Director;

(d) The Owner shall not amend or remove or consent to the removal of the easement or CAZ from title without the prior written consent of the Director.

Inspections

(19) No person shall hinder or obstruct a Provincial Officer from carrying out any and all inspections authorized by the Act, the OWRA or the PA, of any place to which this Approval relates, and without limiting the foregoing:

- (a) to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this Approval are kept;
- (b) to have access to, inspect, and copy any records required to be kept by the conditions of this Approval;
- (c) to inspect the Site, related equipment and appurtenances;
- (d) to inspect the practices, procedures or operations required by the conditions of this Approval; and
- (e) to sample and monitor for the purposes of assessing compliance with the terms and conditions of this Approval or the Act, the OWRA or the PA.

Information and Record Retention

(20) Any information relating to this Approval 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.

(21) Any information requested, by the Ministry, concerning the Site and its operation under this Approval, including but not limited to any records required to be kept by this Approval shall be provided to the Ministry, upon request, in a timely manner.

(22) The receipt of any information by the Ministry or the failure of the Ministry to prosecute any person or to require any person to take any action, under this Approval or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

- (a) an approval, waiver, or justification by the Ministry of any act or omission of any person that contravenes any term or condition of this Approval or any statute, regulation or other legal requirement; or
- (b) acceptance by the Ministry of the information's completeness or accuracy.

(23) All records and monitoring data required by the conditions of this Approval must be kept on the Owner's premises for a minimum period of two (2) years from the date of their creation.

2. SITE OPERATION

Service Area & Hours of Operation

(1) The Site is approved to accept waste from within the Municipality of Central Manitoulin.

(2) The hours of operation at the Site are: Seven days per week, from 7:00 am to 8:00 pm.

(3) a. The public waste drop off hours of the Site are established as:

Summer (Victoria Day to Labour Day, inclusive): Saturday and Sunday - 2:00 pm - 6:00 pm

Winter (Non-Summer Hours): Saturday - 1:00 pm -5:00 pm

b. With the prior written approval from the District Manager, the time periods may be revised.

Adverse Effect

(4) The Site shall be operated and maintained at all times including management and disposal of all waste, in accordance with the EPA, Regulation 347, and the conditions of this Approval. At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

Approved Waste Types

(5) The Site may accept solid non-hazardous waste as defined in Reg. 347 for landfilling.

(6) The Owner shall maintain a program to inspect waste to ensure that the waste received at the Site is of a type approved for acceptance under this Approval.

(7) The Owner shall ensure that all loads of waste are properly inspected by Trained Personnel prior to acceptance at the Site and that the waste vehicles are directed to the appropriate areas for disposal or transfer of the waste. The Owner shall notify the District Manager, in writing, of load rejections at the Site within one (1) week from their occurrence.

Design and Operations Plan

(8) The Owner shall operate the Site in accordance with the Design and Operations Plan dated December 13, 2013, item 2 of Schedule "A", with the exception of the following sections, which are excluded from this Approval:

- i. 5.7.1.2 Limits of Landfilling
- ii. 5.7.1.3 Base Contours
- iii. 5.7.1.4 Final Contours
- iv. 5.7.1.5 Landfilling Design Capacity
- v. 5.7.1.6 Site Life
- vi. 5.8 Site Phasing and Development

Waste Landfilling

(9) The Owner is authorized to continue filling waste at the Site until July 30, 2019, or until a new Design and Operations Plan or a Closure Plan is approved by the Director for the Site, whichever occurs earlier.

(10) The Owner shall ensure that landfilling is done using:

(a) maximum 4 horizontal to 1 vertical (4H:1V) side slopes;

(b) maximum 20H:1V top slopes;

(c) 4:1 volume ratio of waste to daily/intermediate cover; and

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(d) adequate buffer.

(11) No waste shall be received for disposal at the Site except during public waste drop off hours and while the Site is under the supervision of the Site attendant. During non-operating hours, the Site entrance gate shall be locked and secured against access by unauthorized persons.

(12) Waste shall be deposited in a manner that minimizes the exposure of the working face of the landfilling area and shall be compacted before cover material is applied.

(13) Scavenging and burning of waste at the landfill are prohibited.

(14) Disposal of asbestos waste in the landfill is hereby approved subject to the following conditions:

(a) During the transportation or unloading thereof, any asbestos waste that is loose or in a container that is punctured, broken or leaking shall be packaged, immediately on discovery, in a six-mil polyethylene bag;

(b) Where containers of asbestos waste are being unloaded, the unloading shall be carried out so that no loose asbestos or punctured, broken or leaking containers of asbestos waste are landfilled;

(c) Asbestos waste may be deposited only at locations in the Site that have been adapted for the purpose of receiving asbestos waste or are otherwise suitable for that purpose;

(d) Asbestos waste may be deposited at the Site only while the depositing is being supervised by the Operator of the Site or a person designated by the Operator for the purpose and the person supervising is not also operating machinery or the truck involved;

(e) Where asbestos waste is deposited, at least 125 centimetres of garbage or cover material must be placed forthwith over the deposited asbestos waste in such a manner that direct contact with compaction equipment or other equipment operating on the Site is avoided;

(f) Every person handling asbestos waste or containers of asbestos waste, supervising the unloading of asbestos waste in bulk or cleaning asbestos waste residues from containers, vehicles or equipment shall wear protective clothing and personal respiratory equipment while so doing;

(g) Protective clothing that has been or is suspected of having been in contact with asbestos waste shall be changed at the site of the exposure and either properly disposed of as asbestos waste or washed at the end of the working day;

(h) Disposable protective clothing shall not be reused; and

(i) Every person directly or indirectly involved in the transportation, handling or management of asbestos waste shall take all precautions necessary to prevent asbestos waste from becoming airborne.

Cover

(15) The Owner shall ensure that cover material shall be applied as follows:

(a) **Weekly Cover** - Weather permitting, deposited waste shall be covered with 15 centimetres of clean soil or approved alternative weekly cover, at a minimum of once per week, in a manner acceptable to the District Manager so that no waste is exposed to the atmosphere;

(b) **Intermediate Cover** - In areas where landfilling has been temporarily discontinued for six (6) months or more, a minimum thickness of 300 millimetre of soil cover or an approved thickness of alternative cover material shall be placed; and

(c) **Final Cover** - In areas where landfilling has been completed to final waste contours within twelve (12) months from reaching final waste contours, a minimum 600 millimetre thick layer of soil of medium permeability and 150 millimetres of top soil (vegetative cover) shall be placed. Fill areas shall be progressively completed and rehabilitated as landfill development reaches final contours.

Alternative Weekly Cover Materials

(16) The Owner is authorized to use the following materials as alternative weekly cover at the Site:

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- i. construction/demolition wastes, consisting of size-reduced concrete, brick, asphalt shingles & slabs, gypsum board, woodwaste (treated, stained, painted);
- ii. chipped brush and clean lumber, mixed with sand at a ratio of 1:1;
- iii. partially composted leaf and yard waste-mixed with sand at a ratio of 1:1;
- iv. flexible membranes (tarps, enviro cover systems); and
- v. contaminated (non-hazardous) soils

(17) Alternative cover material listed in Condition 2(16) shall not be used either for intermediate cover or final cover.

Signs

(18) A sign shall be installed and maintained at the main entrance/exit to the Site indicating, at a minimum, the following:

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

(19) The Owner shall install and maintain signs to direct vehicles to working face and waste diversion areas.

(20) The Owner shall provide signs at the transfer station informing users what materials are acceptable and directing users to appropriate storage areas.

Vermin, Vectors, Dust, Litter, Odour, Noise and Traffic

(21) The Site shall be operated and maintained such that the vermin, vectors, dust, litter, odour, noise and traffic do not create a nuisance.

Burning Waste Prohibited

(22) (a) Burning of waste at the Site is prohibited.

(b) Notwithstanding Condition 2 (22) (a) above, burning of segregated, clean wood and brush at the landfill may be carried out in strict compliance with the Ministry of the Environment Document titled "Guideline C-7, Burning at Landfill Sites" dated April 1994.

Temporary Storage of Construction & Demolition Waste

(23) The Owner shall store bulky items and construction and demolition waste for the purpose of grinding and/or chipping prior to landfilling and for the use of alternative weekly cover as follows:

- (a) individual stockpiles shall not exceed a volume of 2000 m³;
- (b) waste piles shall be separated from each other by a minimum of nine (9) metres;
- (c) an area around stockpiles of no less than 4.5 metres shall be kept free of vegetation; and
- (d) waste shall not be stored more than twelve (12) months.

3. WASTE TRANSFER STATION

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(1) Except as otherwise provided by these Conditions, the Transfer Station shall be operated in accordance with the Application for an ECA dated Dec. 15, 2013, and the supporting documentation, plans and specifications listed in Schedule "A".

(2) The Waste Transfer Station is approved for the types of waste and capacity as listed in the Table as follows:

Material	Storage Type	Storage Capacity (cubic metres)
Blue Box- commingled	9 bins	45
OCC and paper fibre	2 bins	10
WEEE	1 bin	15
Scrap Metal	1 bin	30
Tires	area	30
Organics - leaf & yard waste	area	30
Construction & demolition	area	50

(3) The following categories of waste shall not be accepted at the Waste Transfer Station:

- (a) Putrescible waste
- (b) Pathological waste;
- (c) PCBs;
- (d) Radioactive;
- (e) Explosive;
- (f) Ammunition; and
- (g) Asbestos

(4) The Owner shall ensure that all waste accepted for transfer shall be segregated either into bins with lids or doors, or in designated areas as defined by barriers. All bins and designated waste storage areas shall be clearly labelled.

(5) All storage containers/bins used to store waste and/or recyclable materials shall be maintained in good condition to prevent leakage. The Owner shall immediately remove from service any leaking container. Containers/bins used to store clean scrap metal may be equipped with drainage holes to permit the drainage of rainwater.

(6) The Owner shall ensure that all white goods received at the Waste Transfer Station have been drained of any refrigerants, and have the appropriate paperwork (current ODP card) demonstrating that the refrigerants have been removed. In the event the Owner accepts white goods that have not been drained, the Owner shall retain a certified technician to properly drain and tag the appliances on a quarterly basis.

(7) The Owner shall remove all materials from the Waste Transfer Station, and remove them off Site, at a minimum of once per year.

(8) In the event that waste cannot be removed from the Site and the storage capacities as approved in Condition 3(2) are reached, the Owner must cease accepting additional waste.

(9) In the event that unacceptable waste is discovered on the Site, that waste shall be immediately be disposed of in accordance with the Act and Reg. 347.

(10) The Owner shall ensure that the residual waste shall only be disposed of at a site for which an Approval has been issued by the Ministry or an appropriate government agency of another jurisdiction.

4. MHSW COLLECTION & TRANSFER EVENTS

(1) The Site may accept municipal hazardous or special waste (MHSW) collected only during annual MHSW collection events, from a residential source, carried to the Site by the generator, and limited to the following wastes:

- i. paints, stains
- ii. all battery types
- iii. propane tanks
- iv. medicines, pharmaceuticals
- v. fluorescent light tubes
- vi. personal electronic devices and cell phones
- vii. computers, monitors, printers, fax machines, ink-jet cartridges
- viii. oils, gasoline
- ix. cleaners, chemicals
- x. needles, syringes, lancets
- xi. pesticides, insecticides, herbicides
- xii. thermometers, thermostats
- xiii. televisions, DVD players and VCRs

(2) The Owner shall notify the District Manager in writing thirty (30) days in advance of MHSW collection event and receive written approval of the District Manager prior to commencing operations.

(3) The Owner shall ensure that all waste received as a result of the Municipal Hazardous and Special Waste Collection Day Program is transferred off-site within twenty-four (24) hours of when it was received.

(4) The Owner shall ensure that wastes which by reason of their type and/or quantity which are to be bulked and shipped off-site, shall be transported, processed, or disposed of, at facilities which are licensed for such transport, processing, or disposal, by the Ministry in accordance with Regulation 347 and the EPA.

(5) The Owner shall ensure that waste received during MHSW events shall be stored in the following manner:

- (a) all storage containers shall be clearly labelled indicating the type and nature of the household hazardous waste stored as required by applicable legislation;
- (b) liquid wastes shall be stored in secondary containment that is adequate to contain any spills or leaks or run-off;
- (c) fluorescent tubes and bulbs shall be stored in plastic tubes and/or crush proof boxes;
- (d) compressed gas cylinders shall be stored in cages in a manner which prevents cylinders from being knocked over or cylinder valves from breaking; and
- (e) incompatible types of waste shall be segregated during storage.

(6) The Owner shall ensure that all hazardous waste collected at the MHSW collection events shall be transported from the Site in accordance with the Act and Reg. 347, under an approved waste management system and disposed of at a waste disposal site certified to accept these types of wastes.

(7) The Owner or Operator shall submit a report to the District Manager within seven (7) days after the occurrence of the MHSW collection event. The report shall contain, as a minimum, the following information:

- (a) an estimate of the total tonnage received and shipped from the Site;
- (b) a summary of any complaints regarding the operation of the site and any measures taken to mitigate the complaints;
- and
- (c) a statement confirming the site has been cleaned and all waste material removed.

5. EMPLOYEE TRAINING

(1) A training plan for all employees that operate any aspect of the Site shall be developed and implemented by the Owner

or the Operator. Only Trained Personnel shall operate any aspect of the Site or carry out any activity required under this Approval.

6. COMPLAINTS RESPONSE PROCEDURE

- (1) 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 and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint;
 - (b) The Owner, upon notification of the complaint, shall initiate appropriate steps to determine possible causes of the complaint, 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 complete and retain on-site a report written within one (1) week 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 recurrence of similar incidents.

7. EMERGENCY RESPONSE

- (1) All Spills as defined in the EPA shall be immediately reported to the **Ministry's Spills Action Centre at 1-800-268-6060** and shall be recorded in the log book as to the nature of the emergency situation, and the action taken for clean-up, correction and prevention of future occurrences.
- (2) In addition, the Owner shall submit, to the District Manager a written report within three (3) business days of the emergency situation, outlining the nature of the incident, remedial measures taken, handling of waste generated as a result of the emergency situation and the measures taken to prevent future occurrences at the Site.
- (3) All wastes resulting from an emergency situation shall be managed and disposed of in accordance with O.Reg. 347.
- (4) All equipment and materials required to handle the emergency situations shall be:
- (a) kept on hand at all times that waste landfilling and/or handling is undertaken at the Site; and
 - (b) adequately maintained and kept in good repair.
- (5) The Owner shall ensure that the emergency response personnel are familiar with the use of such equipment and its location(s).

8. LANDFILL MONITORING

Landfill Gas

- (1) The Owner shall ensure that any buildings or structures at the Site contain adequate ventilation systems to relieve any possible landfill gas accumulation. Routine monitoring for explosive methane gas levels shall be conducted in all buildings or structures at the Site, especially enclosed structures which at times are occupied by people.

Compliance Limits

- (2) The Site shall be operated in such a way as to ensure compliance with the following:
- (a) Reasonable Use Guideline B-7 for the protection of the groundwater at the Site; and
 - (b) 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 or limits set by the Regional Director, for

the protection of the surface water at and off the Site.

Surface Water and Ground Water

(3) The Owner shall monitor surface water and ground water in accordance with Item 2 in Schedule "A".

(4) A certified Professional Geoscientist or Engineer possessing appropriate hydrogeologic training and experience shall execute or directly supervise the execution of the groundwater monitoring and reporting program.

Groundwater Investigation Plan

(5) Within three months of date of issue of this Approval, the Owner shall prepare either:

- i. a groundwater investigation plan for the Site, and submit a copy to the District Manager; or
- ii. a letter to the District Manager, stating intent to close the Site, and including: A timeframe for closure; and a timeframe for submission of a Closure Plan, to the Director for approval.

(6) if prepared, the groundwater investigation plan shall include:

- i. a statement of objective
- ii. monitoring well installation plan, with proposed well design (depths, screened depth)
- iii. proposed field methodology- drilling methods, sampling methods
- iv. a statement of the target investigation stratum
- v. well sampling and analytical program
- vi. schedule

(7) If the groundwater investigation plan is prepared, the Owner shall ensure that the plan is implemented, and that monitoring wells proposed in the plan are installed before July 30, 2017.

(8) (a) If the groundwater investigation plan is implemented, the Owner shall submit a finalized report on or before December 31, 2018.

(b) The Owner shall ensure that the report includes the findings and interpretation of the investigation, and a statement on the Owner's intended use or closure of the Site.

(9) The Owner shall submit either an updated Design and Operations Plan or a Closure Plan for the Site, to the Director, for Approval, on or before July 30, 2019

Groundwater Wells and Monitors

(10) The Owner shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, locked and protected from damage.

(11) Any groundwater monitoring wells included in the on-going monitoring program that are damaged shall be assessed, repaired, replaced or decommissioned by the Owner, as required.

(a) The Owner shall repair or replace any monitoring well which is destroyed or in any way made to be inoperable for sampling such that no more than one regular sampling event is missed.

(b) All monitoring wells which are no longer required as part of the groundwater monitoring program, and have been approved by the District Manager for abandonment, shall be decommissioned by the Owner, as required, in accordance with O.Reg. 903, that will prevent contamination through the abandoned well. A report on the decommissioning of the well shall be included in the Annual Report for the period during which the well was

decommissioned.

Changes to the Monitoring Plan

(12) The Owner may request to make changes to the monitoring program(s) to the District Manager in accordance with the recommendations of the annual report. The Owner shall make clear reference to the proposed changes in a separate letter that shall accompany the annual report.

(13) Within fourteen (14) days of receiving the written correspondence from the District Manager confirming that the District Manager is in agreement with the proposed changes to the environmental monitoring program, the Owner shall forward a letter identifying the proposed changes and a copy of the correspondences from the District Manager and all other correspondences and responses related to the changes to the monitoring program, to the Director requesting the Approval be amended to approve the proposed changes to the environmental monitoring plan prior to implementation.

(14) In the event any other changes to the environmental monitoring program are proposed outside of the recommendation of the annual report, the Owner shall follow current Ministry procedures for amending the Approval.

9. INSPECTIONS, RECORD KEEPING & REPORTING

Daily Log Book

(1) A daily log shall be maintained in written or electronic format and shall include the following information:

- (a) the type, date and time of arrival, hauler, and quantity (tonnes) of all waste and cover material received at the Site;
- (b) the area of the Site in which waste disposal operations are taking place;
- (c) a record of litter collection activities and the application of any dust suppressants;
- (d) a record of the daily inspections; and
- (e) a description of any out-of-service period of any control, treatment, disposal or monitoring facilities, the reasons for the loss of service, and action taken to restore and maintain service.

(2) Any information requested, by the Director or a Provincial Officer, concerning the Site and its operation under this Approval, including but not limited to any records required to be kept by this Approval shall be provided to the Ministry, upon request.

Daily Inspections and Log Book

(3) An inspection of the entire Site and all equipment on the Site shall be conducted each day the Site is in operation to ensure that: the Site is secure; that the operation of the Site is not causing any nuisances; that the operation of the Site is not causing any adverse effects on the environment and that the Site is being operated in compliance with this Approval. Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the Site if needed.

(4) A record of the inspections shall be kept in a daily log book that includes:

- (a) the name and signature of person that conducted the inspection;
- (b) the date and time of the inspection;
- (c) the list of any deficiencies discovered;
- (d) the recommendations for remedial action; and
- (e) the date, time and description of actions taken.

(5) A record shall be kept in the daily log book of all refusals of waste shipments, the reason(s) for refusal, and the origin

of the waste, if known.

Annual Report

(6) A written report on the development, operation and monitoring of the Site, shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the District Manager, by March 31st of the year following the period being reported upon.

(7) The Annual Report shall include but not be limited to the following information:

- (a) the results and an interpretive analysis of the results of all leachate, groundwater and surface water monitoring, including an assessment of the need to amend the monitoring programs;
- (b) site plans showing the existing contours of the Site; areas of landfilling operation during the reporting period; areas of intended operation during the next reporting period; areas of excavation during the reporting period; the progress of final cover, vegetative cover, and any intermediate cover application; facilities existing, added or removed during the reporting period; and site preparations and facilities planned for installation during the next reporting period;
- (c) calculations of the volume of waste, daily and intermediate cover, and final cover deposited or placed at the Site during the reporting period and a calculation of the total volume of Site capacity used during the reporting period;
- (d) a calculation of the remaining capacity of the Site and an estimate of the remaining Site life;
- (e) a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the Site;
- (f) a summary of any complaints received and the responses made;
- (g) a discussion of any operational problems encountered at the Site and corrective action taken;
- (h) any changes to the Design and Operations Plan, and the Closure Plan that have been approved by the Director since the last Annual Report;
- (i) a report on the status of all monitoring wells and a statement as to compliance with Ontario Regulation 903; and
- (j) any other information with respect to the Site which the Regional Director may require from time to time.

10. CLOSURE PLAN

(1) At least 2 years prior to the anticipated date of closure of this Site, or: prior to the deadline established in condition 8(9), the Owner shall submit to the Director for approval, with copies to the District Manager, a detailed Site closure plan pertaining to the termination of landfilling operations at this Site, post-closure inspection, maintenance and monitoring, and end use. The plan shall include but not be limited to the following information:

- (a) a plan showing Site appearance after closure;
- (b) a description of the proposed end use of the Site;
- (c) a description of the procedures for closure of the Site, including:
 - (i) advance notification of the public of the landfill closure;
 - (ii) posting of a sign at the Site entrance indicating the landfill is closed and identifying any alternative waste disposal arrangements;
 - (iii) completion, inspection and maintenance of the final cover and landscaping;
 - (iv) Site security;
 - (v) removal of unnecessary landfill-related structures, buildings and facilities;
 - (vi) final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas; and
 - (vii) a schedule indicating the time-period for implementing sub-conditions (i) to (vi) above;
- (d) descriptions of the procedures for post-closure care of the Site, including:
 - (i) operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;
 - (ii) record keeping and reporting; and

- (iii) complaint contact and response procedures;
- (e) an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas; and
- (f) an updated estimate of the contaminating lifespan of the Site, based on the results of the monitoring programs to date.

(2) The Site shall be closed in accordance with the closure plan as approved by the Director.

Schedule "A"

1. Environmental Compliance Approval Application, signed by Ruth Frawley, CAO/clerk, municipality of Central Manitoulin, dated 2013/12/15
2. Attachment 1, Design and Operations Plan, Providence Bay Waste Disposal Site, by Cambium Inc., dated December 16, 2013.
3. Letter dated April 10, 2014, to Ranjani Munasinghe, Senior Waste Engineer, MOECC, from David Bucholtz, Senior Project Manager, Cambium Inc., RE: Clarification and Revision - Design and Operations Plan, Providence Bay Waste Disposal Site, Municipality of Central Manitoulin, District of Manitoulin
4. Letter dated July 7, 2015, to Lynda Mulcahy, Senior Review Engineer, MOECC, from David Bucholtz, Senior Project Manager, Cambium Inc., RE: Response to Review Comments, Application for ECA, Providence Bay Waste Disposal Site, MOECC ref. no. 0123-9ESKYB.

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

1. GENERAL

The reason for Conditions 1(1), (2), (3), (5), (6), (7), (8), (9), (10), (11), (12), (21), (22) and (23) is to clarify the legal rights and responsibilities of the Owner and Operator under this Approval.

The reasons for Condition 1(4) are to ensure that the Site is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.

The reasons for Condition 1(13) is to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the Director is informed of any changes.

The reasons for Condition 1(14) are to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this Approval.

The reason for Condition 1(15) is to ensure that the successor is aware of its legal responsibilities.

The reasons for Condition 1(16), (17) and (18) are that the Part II.1 Director is an individual with authority pursuant to Section 197 of the Environmental Protection Act to require registration on title and provide any person with an interest in property before dealing with the property in any way to give a copy of the Approval to any person who will acquire an interest in the property as a result of the dealing.

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The reason for Condition 1(19) is to ensure that appropriate Ministry staff has ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Approval. This Condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the Act, the OWRA, the PA, the NMA and the SDWA.

Condition 1 (20) has been included in order to clarify what information may be subject to the Freedom of Information Act.

2. SITE OPERATION

The reasons for Condition 2(1), 2(2) and 2(3) are to ensure that users of the Site are fully aware of important information and restrictions related to Site operations and access under this Approval.

The reasons for Conditions 2(4), 2(5), 2(6), 2(7) and 2 (21) are to ensure that the Site is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.

The reasons for Condition 2(8) are to clarify which activities are currently approved for the Site. Portions of the Design and Operation report (related to design) are not approved.

The reason for Conditions 2(9) is to ensure that the Owner makes decisions about the Site within a specified timeframe, and communicates this to the Ministry.

The reason for Condition 2(10), and 2(12) is to ensure landfilling is done using a standard, acceptable approach.

The reasons for Condition 2(11) are to ensure that the Site is supervised by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person and to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no site attendant is on duty.

The reasons for Condition 2(13) and 2(22) are open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance effects, and the potential fire hazard and to make sure burning of brush and wood are carried out in accordance with Ministry guidelines.

The reason for Condition 2(14) is to ensure that the handling and disposal of asbestos is carried out in a manner that is safe for persons and protective of the environment.

The reasons for Conditions 2(15), 2(16) and 2(17) are to ensure that cover is used to control potential nuisance effects, to facilitate vehicle access on the Site, and to ensure an acceptable site appearance is maintained. Approved alternative cover materials are listed. The proper closure of a landfill site requires the application of a final cover which is aesthetically pleasing, controls infiltration, and is suitable for the end use planned for the Site.

The reason for Conditions 2(18), (19) and (20) is to ensure that users of the Site are fully aware of important information and restrictions related to Site operations and access under this Approval.

The reason for condition 2(23) is to clarify the storage limits and approved procedures for construction & demolition waste.

3. WASTE TRANSFER STATION

Condition 3 is included to ensure that the recyclable materials are stored in their temporary storage location and transferred off-site in a manner as to minimize a likelihood of an adverse effect or a hazard to the natural environment or any person.

4. MHSW COLLECTION & TRANSFER EVENTS

The reasons for the Condition 4 are to approve collection of household hazardous waste and to ensure that the wastes are managed in a manner that protects the environment and the health and safety of the public.

5. EMPLOYEE TRAINING

The reason for Condition 5 is to ensure that the Site is supervised and operated by properly trained staff in a manner which

does not result in a hazard or nuisance to the natural environment or any person.

6. COMPLAINTS RESPONSE PROCEDURE

The reason for Condition 6 is to ensure that any complaints regarding landfill operations at this Site are responded to in a timely and efficient manner.

7. EMERGENCY RESPONSE

Conditions 7(1) and 7(2) are included to ensure that emergency situations are reported to the Ministry to ensure public health and safety and environmental protection.

Conditions 7(3), 7(4) and 7(5) are included to ensure that emergency situations are handled in a manner to minimize the likelihood of an adverse effect and to ensure public health and safety and environmental protection.

8. LANDFILL MONITORING

Reasons for Condition 8(1) are to ensure that off-site migration of landfill gas is monitored and all buildings at the Site are free of any landfill gas accumulation, which due to a methane gas component may be explosive and thus create a danger to any persons at the Site.

Condition 8(2) is included to provide the groundwater and surface water limits to prevent water pollution at the Site.

Conditions 8(3) and 8(4) are included to require the Owner to demonstrate that the Site is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.

Conditions 8(5), 8(6), 8(7), 8(8) and 8(9) are included to clarify the requirements, and agreed-upon timelines for any further groundwater investigation work, to ensure that the Ministry has opportunity to review proposed workplan before implemented, and to review any results.

Conditions 8(10), 8(11), are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.

Conditions 8(12), 8(13) and 8(14) are included to streamline the approval of the changes to the monitoring plan.

9. INSPECTIONS, RECORD KEEPING & REPORTING

The reason for Conditions 9(1) and 9(2) is to ensure that accurate waste records are maintained to ensure compliance with the conditions in this Approval, the EPA and its regulations; and to ensure the information is made available to the Ministry upon request.

The reason for Conditions 9(3), 9(4) and 9(5) is to ensure that detailed records of Site inspections are recorded and maintained for inspection and information purposes.

The reasons for Conditions 9(6) and 9(7) are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.

10. CLOSURE PLAN

The reasons for Condition 10 are to ensure that final closure of the Site is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term protection of the health and safety of the public and the environment.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A550702 issued on March 18, 1980

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance 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.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

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

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the
Environmental Protection Act
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 21st day of September, 2016

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

LM/
c: District Manager, MOECC Sudbury
David Bucholtz, Cambium Inc., The Corporation of the Municipality of Central Manitoulin



Ontario

Ministry
of the
Environment

Provisional Certificate No. A 550702

PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE

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

Township of Carnarvon
Box 119
Mindemoya, Ontario
POP ISO

ENVIRONMENTAL APPROVALS BRANCH
RECEIVED

APR 1 1980

MUNICIPAL & PRIVATE
APPROVALS SECTION

for the use and operation of a 4.1 hectare landfilling site

all in accordance with the following plans and specifications:

Located: Part Lot 3, Concession 13
Township of Carnarvon
District of Manitoulin

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

and subject to the following conditions:

1. No operation shall be carried out at the site after sixty days from this condition becoming enforceable unless this Certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the site and a duplicate registered copy thereof has been returned by the applicant to the Director.



Dated this 18th day of March, 19 80.

Director, Section 39,
The Environmental Protection Act, 1971

The Municipality of Central Manitoulin
2019 Annual Groundwater Monitoring Report
Providence Bay Waste Disposal Site
Providence Bay, Ontario
December 2019



APPENDIX B
BOREHOLE LOGS

Borehole BH - 1		Figure 3		Waters Environmental Geosciences Ltd.			
Project Number 22-120		Date Started 14/04/2002	Date Completed 14/04/2002	Providence Bay Landfill			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%)
							20 40 60
	0.0	497.98 m		Bedrock, dolostone, grey brown			
	1.0						
	2.0						
	3.0						
	4.0						
	5.0						
	6.0						
	7.0						

(Continued onto Page 2)



NOTE : Stratigraphic boundaries are approximate, and In-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an Interpretation.
 Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery.
 Water level on 01/06/2002 recorded as 495.22 m (relative to identified datum).

Borehole BH - 1		Figure 3	Waters Environmental Geosciences Ltd.							
		Providence Bay Landfill								
Project Number 22-120		Date Started 14/04/2002	Date Completed 14/04/2002	Drawn by : PAR Checked by : PAR						
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%)			
							20	40	60	
	7.0			(Continued from Page 1)						
	8.0			Bedrock, dolostone, grey brown						
	9.0									
	10.0									
	11.0									
	12.0	485.74 m								
	13.0			Borehole Terminated , in dolostone bedrock at a depth of 12.24 m below grade.						
	14.0			NOTE: 1) Borehole BH-1 was advanced using 127 mm air rotary water well equipment. 2) Refer to the accompanying text for well construction details and an interpretation of the results.						

NOTE Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation.
 Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery.
 Water level on 01/06/2002 recorded as 405.22 m (relative to identified datum).

Borehole BH - 2		Figure 4	Waters Environmental Geosciences Ltd.				
Project Number 22-120		Date Started 14/04/2002	Date Completed 14/04/2002	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%)
							<div style="display: flex; justify-content: space-around; width: 100px;"> 20 40 60 </div>
	0.0	492.33 m		Bedrock, dolostone, grey brown			
	1.0						
	2.0						
	3.0						
	4.0						
	5.0						
	6.0						
	7.0						
(Continued onto Page 2)							
<p>NOTE: Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation.</p> <p>Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery.</p> <p>Water level on 01/08/2002 recorded as 493.37 m (relative to identified datum).</p>							

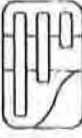






Borehole BH - 2		Figure 4		Waters Environmental Geosciences Ltd.				
Project Number 22-120		Date Started 14/04/2002	Date Completed 14/04/2002	Drawn by : PAR Checked by : PAR				
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60	
	7.0			(Continued from Page 1)				
	8.0			Bedrock, dolostone, grey brown				
	9.0							
	10.0							
	11.0							
	12.0	485.40 m						
	13.0			Borehole Terminated, in dolostone bedrock at a depth of 12.23 m below grade.				
	14.0			NOTE: 1) Borehole BH-2 was advanced using 127 mm air rotary water well equipment. 2) Refer to the accompanying text for well construction details and an interpretation of the results.				



NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an Interpretation.
Samples Indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery.
Water level on 01/06/2002 recorded as 493.37 m (relative to identified datum)

Borehole BH - 3a		Figure 5	Waters Environmental Geosciences Ltd.						
		Providence Bay Landfill							
Project Number 22-120		Date Started 13/04/2002	Date Completed 13/04/2002	Drawn by : PAR Checked by : PAR					
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%)		
							20	40	60
	0.0	497.85 m		Bedrock, dolostone, grey brown					
	1.0								
	2.0								
	3.0								
	4.0								
	5.0								
	6.0								
	7.0								
(Continued onto Page 2)									
NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 01/06/2002 recorded as 495.29 m (relative to identified datum).									
								Page 1 of 2	






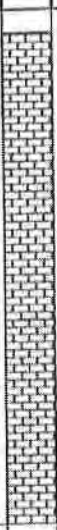
Borehole BH - 3a		Figure 5	Waters Environmental Geosciences Ltd.					
		Providence Bay Landfill						
Project Number 22-120		Date Started 13/04/2002	Date Completed 13/04/2002	Drawn by : PAR Checked by : PAR				
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60	
	7.0			(Continued from Page 1)				
	8.0			Bedrock, dolostone, grey brown				
	9.0							
	10.0							
	11.0	488.62 m						
	12.0							
	13.0			Borehole Terminated, in dolostone bedrock at a depth of 11.23 m below grade.				
	14.0							
<p>NOTE:</p> <p>1) Borehole BH-3a was advanced using 127 mm air rotary water well equipment.</p> <p>2) Refer to the accompanying text for well construction details and an interpretation of the results.</p>								
<p>NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation</p> <p>Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery</p> <p>Water level on 01/06/2002 recorded as 495.29 m (relative to identified datum)</p>							Page 2 of 2	

Borehole BH - 3b		Figure 6	Waters Environmental Geosciences Ltd.				
		Providence Bay Landfill					
Project Number 22-120		Date Started 13/04/2002	Date Completed 13/04/2002	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) <small>20 40 60</small>
	0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0	497.80 m		Bedrock, dolostone, grey brown			
(Continued onto Page 2)							
NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 01/06/2002 recorded as 486.98 m (relative to identified datum).							

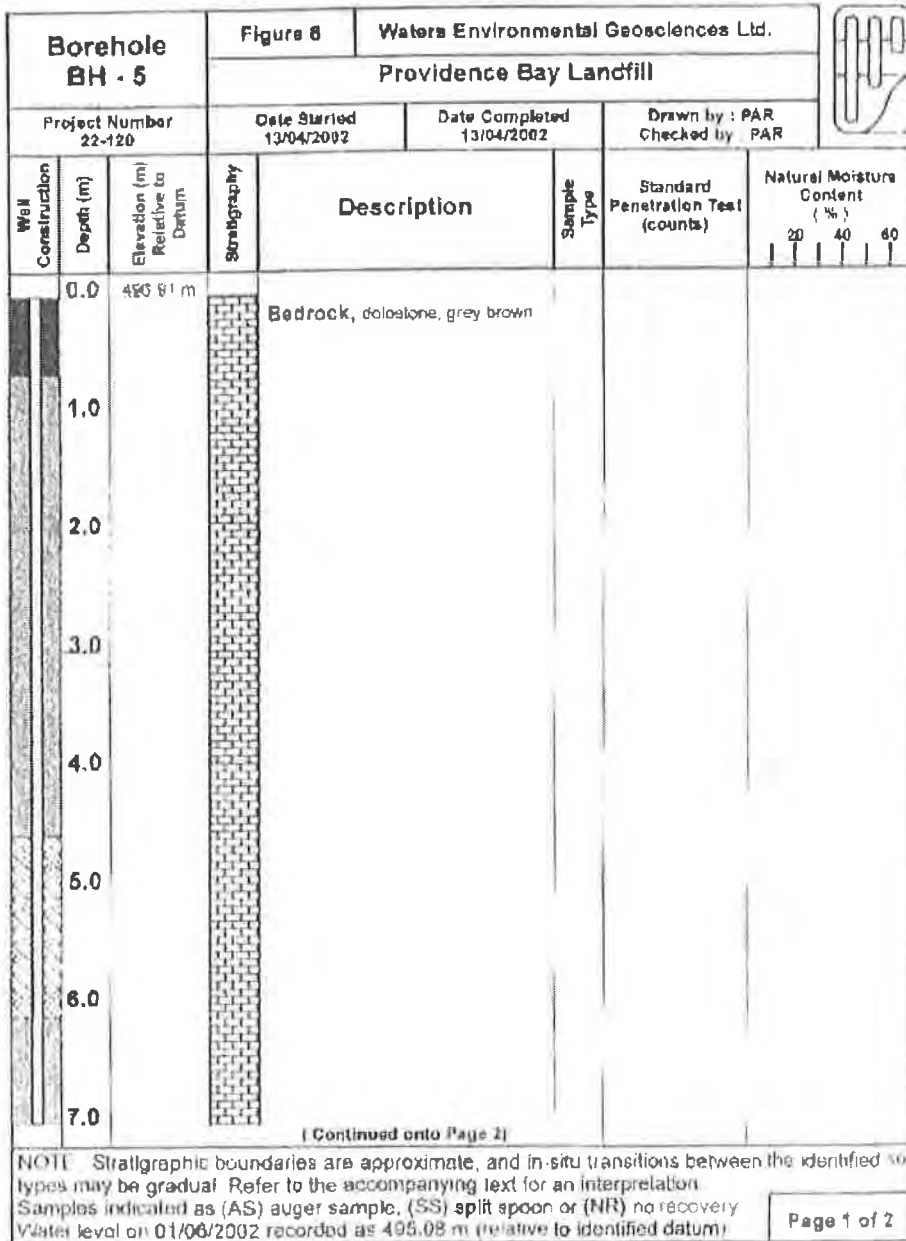
Borehole BH - 3b		Figure 6		Waters Environmental Geosciences Ltd.				
Providence Bay Landfill								
Project Number 22-120		Date Started 13/04/2002		Date Completed 13/04/2002		Drawn by : PAR Checked by : PAR		
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 80	
	7.0			(Continued from Page 1)				
	8.0			Bedrock, dolostone, grey brown				
	9.0							
	10.0							
	11.0							
	12.0							
	13.0							
	14.0					(Continued onto Page 3)		


NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation.
 Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery.
 Water level on 01/06/2002 recorded as 486.98 m (relative to identified datum).

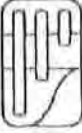

Borehole BH - 4		Figure 7	Waters Environmental Geosciences Ltd.				
		Providence Bay Landfill					
Project Number 22-120		Date Started 14/04/2002	Date Completed 14/04/2002	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	0.0	498.03 m		Bedrock, dolostone, grey brown			
	1.0						
	2.0						
	3.0						
	4.0						
	5.0						
	6.0						
	7.0						
(Continued onto Page 2)							
NOTE Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 01/06/2002 recorded as 495.39 m (relative to identified datum)							Page 1 of 2

Borehole BH - 4		Figure 7	Waters Environmental Geosciences Ltd.				
		Providence Bay Landfill					
Project Number 22-120		Date Started 14/04/2002	Date Completed 14/04/2002	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	7.0			(Continued from Page 1) Bedrock , dolostone, grey brown			
	8.0						
	9.0						
	10.0						
	11.0	485.89 m					
	12.0			Borehole Terminated , in dolostone bedrock at a depth of 11.14 m below grade.			
	13.0			NOTE: 1) Borehole BH-4 was advanced using 127 mm air rotary water well equipment. 2) Refer to the accompanying text for well construction details and an interpretation of the results.			
	14.0						

NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation.
Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery.
Water level on 01/06/2002 recorded as 495.39 m (relative to identified datum).



Borehole BH - 5		Figure 8	Waters Environmental Geosciences Ltd.				
		Providence Bay Landfill					
Project Number 22-120		Date Started 13/04/2002	Date Completed 13/04/2002	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	7.0			(Continued from Page 1) Bedrock, dolostone, grey brown			
	8.0						
	9.0						
	10.0						
	11.0						
	12.0	484.67 m					
	13.0			Borehole Terminated, in dolostone bedrock at a depth of 12.24 m below grade.			
	14.0			NOTE: 1) Borehole BH-5 was advanced using 127 mm air rotary water well equipment. 2) Refer to the accompanying text for well construction details and an interpretation of the results.			
<p>NOTE: Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 01/06/2002 recorded as 495.08 m (relative to identified datum)</p>							



Borehole BH - 6		Figure 2	Waters Environmental Geosciences Ltd.				
Project Number 23-132a		Date Started 15/12/2003	Date Completed 15/12/2003	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	0.0	497.08 m		Bedrock, dolostone, grey brown			
	1.0						
	2.0						
	3.0						
	4.0						
	5.0						
	6.0						
	7.0						

(Continued onto Page 2)

NOTE Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 22/09/2004 recorded as 488.85 m relative to identified datum.




Borehole BH - 6		Figure 2	Waters Environmental Geosciences Ltd.				
		Providence Bay Landfill					
Project Number 23-132a		Date Started 16/12/2003	Date Completed 16/12/2003	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	7.0			(Continued from Page 1) Bedrock, dolostone, grey brown			
	8.0						
	9.0						
	10.0						
	11.0						
	12.0	484.83 m					
	13.0			Borehole Terminated , in dolostone bedrock at a depth of 12.23 m below grade.			
	14.0			NOTE: 1) Borehole BH-6 was advanced using 127 mm air rotary water well equipment. 2) Refer to the accompanying text for well construction details and an interpretation of the results.			
NOTE: Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 22/09/2004 recorded as 486.85 m (relative to identified datum)							






Borehole BH - 7		Figure 3	Waters Environmental Geosciences Ltd.				
Project Number 23-132a		Date Started 16/12/2003	Date Completed 16/12/2003	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	0.0	496.44 m		Bedrock, dolostone, grey brown			
	1.0						
	2.0						
	3.0						
	4.0						
	5.0						
	6.0						
	7.0						

(Continued onto Page 2)

NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an Interpretation.
 Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery.
 Water level on 22/09/2004 recorded as 491.26 m (relative to identified datum)

Borehole BH - 7		Figure 3	Waters Environmental Geosciences Ltd.					
		Providence Bay Landfill						
Project Number 23-132a		Date Started 16/12/2003	Date Completed 16/12/2003	Drawn by : PAR Checked by : PAR				
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%)	
	7.0			(Continued from Page 1)				
				Bedrock, dolostone, grey brown				
	8.0							
	9.0							
	10.0							
	11.0							
	12.0	484.34 m						
	13.0			Borehole Terminated, in dolostone bedrock at a depth of 12.10 m below grade				
	14.0			NOTE: 1) Borehole BH-7 was advanced using 127 mm air rotary water well equipment. 2) Refer to the accompanying text for well construction details and an interpretation of the results.				
NOTE: Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 22/09/2004 recorded as 491.26 m (relative to identified datum).								

Borehole BH - 8		Figure 4		Waters Environmental Geosciences Ltd.			
Project Number 23-132a		Date Started 16/12/2003		Date Completed 16/12/2003			Drawn by : PAR Checked by : PAR
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	0.0	498.58 m		Bedrock, dolostone grey brown			
	1.0						
	2.0						
	3.0						
	4.0						
	5.0						
	6.0						
	7.0						
(Continued onto Page 2)							
<p>NOTE Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 22/08/2004 recorded as 491.58 m (relative to identified datum).</p>							

Borehole BH - 8		Figure 4	Waters Environmental Geosciences Ltd.				
		Providence Bay Landfill					
Project Number 23-132a		Date Started 16/12/2003	Date Completed 16/12/2003	Drawn by : PAR Checked by : PAR			
Well Construction	Depth (m)	Elevation (m) Relative to Datum	Stratigraphy	Description	Sample Type	Standard Penetration Test (counts)	Natural Moisture Content (%) 20 40 60
	7.0			(Continued from Page 1)			
	8.0			Bedrock, dolostone, grey brown			
	9.0						
	10.0						
	11.0						
	12.0						
	13.0	466.32 m		Borehole Terminated , in dolostone bedrock at a depth of 12.34 m below grade.			
	14.0			NOTE: 1) Borehole BH-8 was advanced using 127 mm air rotary water well equipment. 2) Refer to the accompanying text for well construction details and an interpretation of the results.			
<p>NOTE : Stratigraphic boundaries are approximate, and in-situ transitions between the identified soil types may be gradual. Refer to the accompanying text for an interpretation. Samples indicated as (AS) auger sample, (SS) split spoon or (NR) no recovery. Water level on 22/09/2004 recorded as 491.58 m (relative to identified datum).</p>							

RECORD OF MONITORING WELL No. **OW-09** Co-Ord. **0401645 E, 5056790 N**



Project Number: **TY141014** Drilling Location: **West Edge of Property** Logged by: **DL**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **KKJ**
 Project Name: **2014-2018 Landfill Monitoring & Reporting** Drilling Machine: **Truck Mounted Drill** Reviewed by: **TIM**
 Project Location: **Providence Bay Landfill, Manitoulin, Ontario** Date Started: **7 Aug 14** Date Completed: **7 Aug 14** Revision No.: **2, 21/10/14**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60		
Local Ground Surface Elevation: BEDROCK Paleozoic -aged (Middle Silurian) Annabel Formation dolostone rocks of the Southern Province					0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5				1 steel casing 1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
END OF BOREHOLE					15.7					

AMEC Environment & Infrastructure
 A Division of AMEC Americas Limited
 131 Fielding Road
 Lively, Ontario
 Canada P3Y 1L7
 Tel +1(705) 682-2632
 Fax +1(705) 682-2260
 www.amec.com

No freestanding groundwater measured in open borehole on completion of drilling. Open to full depth upon completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF MONITORING WELL No. **OW-10** Co-Ord. **0401859 E, 5056873 N**



Project Number: **TY141014** Drilling Location: **Landfill Entrance** Logged by: **DL**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **KKJ**
 Project Name: **2014-2018 Landfill Monitoring & Reporting** Drilling Machine: **Truck Mounted Drill** Reviewed by: **TIM**
 Project Location: **Providence Bay Landfill, Manitoulin, Ontario** Date Started: **6 Aug 14** Date Completed: **6 Aug 14** Revision No.: **2, 21/10/14**

Lithology Profile	SOIL SAMPLING				DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)			SPT 'N' Value	Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60		
Lithology Plot Local Ground Surface Elevation: BEDROCK Paleozoic -aged (Middle Silurian) Annabel Formation dolostone rocks of the Southern Province					0.5				1 steel casing 1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
					1.0					
					1.5					
					2.0					
					2.5					
					3.0					
					3.5					
					4.0					
					4.5					
					5.0					
					5.5					
					6.0					
					6.5					
					7.0					
				7.5						
				8.0						
				8.5						
				9.0						
				9.5						
				10.0						
				10.5						
				11.0						
				11.5						
				12.0						
				12.5						
				13.0						
				13.5						
				14.0						
END OF BOREHOLE		14.4								

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 www.amec.com

No freestanding groundwater measured in open borehole on completion of drilling. Open to full depth upon completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 160
Page: 1 of 1

RECORD OF MONITORING WELL No. OW-11 Co-Ord. 0401744 E, 5056880 N



Project Number: TY141014 Drilling Location: Approx. 120 m West of Entrance Logged by: DL
 Project Client: Municipality of Central Manitoulin Drilling Method: 150 mm Downhole Hammer Compiled by: KKJ
 Project Name: 2014-2018 Landfill Monitoring & Reporting Drilling Machine: Truck Mounted Drill Reviewed by: TIM
 Project Location: Providence Bay Landfill, Manitoulin, Ontario Date Started: 6 Aug 14 Date Completed: 6 Aug 14 Revision No.: 2, 21/10/14

LITHOLOGY PROFILE	SOIL SAMPLING				FIELD TESTING		LAB TESTING		INSTRUMENTATION INSTALLATION	COMMENTS
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Atterberg Limits W _p W L _c Plastic Liquid * Passing 75 µm (%) ○ Moisture Content (%)		
Lithology Plot Local Ground Surface Elevation: BEDROCK Paleozoic -aged (Middle Silurian) Annabel Formation dolostone rocks of the Southern Province					0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5				1 steel casing 1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand	
END OF BOREHOLE	14.6									

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 www.amec.com

No freestanding groundwater measured in open borehole on completion of drilling. Open to full depth upon completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 160

Page: 1 of 1

RECORD OF MONITORING WELL No. **OW-12A** Co-Ord. **0401619 E, 5056825 N**

Project Number: **TY1410142** Drilling Location: **West Edge of Property** Logged by: **CJS**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **MAT**
 Project Name: **Aquifer Instrumentation Plan - Providence Bay Waste Disposal Site** Drilling Machine: **Truck Mounted Drill** Reviewed by: **ESL**
 Project Location: **Manitoulin, Ontario** Date Started: **25 Jul 17** Date Completed: **25 Jul 17** Revision No.: **1, 02/11/17**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS	
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)			ELEVATION (m)
Lithology Plot Local Ground Surface Elevation: BEDROCK AT SURFACE Dolostone (Amabel Formation)					1 2 3 4 5 6 7 8 9 10 11 12 13		Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit * Passing 75 µm (%) ○ Moisture Content (%) 20 40 60 80	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
END OF BOREHOLE	13.4								



Groundwater depth on completion of drilling: 9.02 m.
 Open to full depth on completion.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present. Also, borehole information should be read in conjunction with the environmental report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
 Scale: 1 : 160
Page: 1 of 1

RECORD OF MONITORING WELL No. **OW-12B** Co-Ord. **0401619 E, 5056825 N**

Project Number: **TY1410142** Drilling Location: **West Edge of Property** Logged by: **CJS**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **MAT**
 Project Name: **Aquifer Instrumentation Plan - Providence Bay Waste Disposal Site** Drilling Machine: **Truck Mounted Drill** Reviewed by: **ESL**
 Project Location: **Manitoulin, Ontario** Date Started: **25 Jul 17** Date Completed: **25 Jul 17** Revision No.: **1, 02/11/17**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS		
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)			ELEVATION (m)	
Lithology Plot Local Ground Surface Elevation: BEDROCK AT SURFACE Dolostone (Amabel Formation)								Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit * Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
END OF BOREHOLE 17.1					17					



Groundwater depth on completion of drilling: 13.06 m.
 Open to full depth on completion.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present. Also, borehole information should be read in conjunction with the environmental report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

Scale: 1 : 160
 Page: 1 of 1

RECORD OF MONITORING WELL No. **OW-13A** Co-Ord. **0401738 E, 5056741 N**

Project Number: **TY1410142** Drilling Location: **Northwest of Active Fill Area** Logged by: **CJS**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **MAT**
 Project Name: **Aquifer Instrumentation Plan - Providence Bay Waste Disposal Site** Drilling Machine: **Truck Mounted Drill** Reviewed by: **ESL**
 Project Location: **Manitoulin, Ontario** Date Started: **24 Jul 17** Date Completed: **24 Jul 17** Revision No.: **1, 02/11/17**

Lithology Profile	SOIL SAMPLING		FIELD TESTING				INSTRUMENTATION INSTALLATION	COMMENTS		
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)			ELEVATION (m)	Penetration Testing
Local Ground Surface Elevation: BEDROCK AT SURFACE Dolostone (Amabel Formation)						1 2 3 4 5		Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit * Passing 75 µm (%) ○ Moisture Content (%) 20 40 60 80	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
END OF BOREHOLE	5.5									



Groundwater depth on completion of drilling: 2.30 m.
 Open to full depth on completion.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present. Also, borehole information should be read in conjunction with the environmental report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.
 Scale: 1 : 160
 Page: 1 of 1

RECORD OF MONITORING WELL No. **OW-13B** Co-Ord. **0401738 E, 5056741 N**

Project Number: **TY1410142** Drilling Location: **Northwest of Active Fill Area** Logged by: **CJS**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **MAT**
 Project Name: **Aquifer Instrumentation Plan - Providence Bay Waste Disposal Site** Drilling Machine: **Truck Mounted Drill** Reviewed by: **ESL**
 Project Location: **Manitoulin, Ontario** Date Started: **24 Jul 17** Date Completed: **24 Jul 17** Revision No.: **1, 02/11/17**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS	
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)			ELEVATION (m)
Lithology Plot Local Ground Surface Elevation: BEDROCK AT SURFACE Dolostone (Amabel Formation)					1 2 3 4 5 6 7 8 9 10		Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit * Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
END OF BOREHOLE	11.0								



Groundwater depth on completion of drilling: **2.89 m.**
 Open to full depth on completion.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present. Also, borehole information should be read in conjunction with the environmental report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.

RECORD OF MONITORING WELL No. **OW-14A** Co-Ord. **0401722 E, 5056634 N**

Project Number: **TY1410142** Drilling Location: **West Edge of Property** Logged by: **CJS**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **MAT**
 Project Name: **Aquifer Instrumentation Plan - Providence Bay Waste Disposal Site** Drilling Machine: **Truck Mounted Drill** Reviewed by: **ESL**
 Project Location: **Manitoulin, Ontario** Date Started: **24 Jul 17** Date Completed: **24 Jul 17** Revision No.: **1, 02/11/17**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS	
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)			ELEVATION (m)
Lithology Plot Local Ground Surface Elevation: BEDROCK AT SURFACE Dolostone (Amabel Formation)					1 2 3 4 5 6		Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit * Passing 75 µm (%) ○ Moisture Content (%) 20 40 60 80	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
END OF BOREHOLE	6.9								

RECORD OF MONITORING WELL No. **OW-14B** Co-Ord. **0401722 E, 5056634 N**

Project Number: **TY1410142** Drilling Location: **West Edge of Property** Logged by: **CJS**
 Project Client: **Municipality of Central Manitoulin** Drilling Method: **150 mm Downhole Hammer** Compiled by: **MAT**
 Project Name: **Aquifer Instrumentation Plan - Providence Bay Waste Disposal Site** Drilling Machine: **Truck Mounted Drill** Reviewed by: **ESL**
 Project Location: **Manitoulin, Ontario** Date Started: **24 Jul 17** Date Completed: **24 Jul 17** Revision No.: **1, 02/11/17**

Lithology Profile	SOIL SAMPLING				FIELD TESTING		INSTRUMENTATION INSTALLATION	COMMENTS	
	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)			ELEVATION (m)
Lithology Plot Local Ground Surface Elevation: BEDROCK AT SURFACE Dolostone (Amabel Formation)					1 2 3 4 5 6 7 8 9 10 11		Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12 Soil Vapour Reading △ parts per million (ppm) 100 200 300 400 ▲ Lower Explosive Limit * Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
END OF BOREHOLE	11.6								



Groundwater depth on completion of drilling: **3.05 m.**
 Open to full depth on completion.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present. Also, borehole information should be read in conjunction with the environmental report for which it was commissioned and the accompanying 'Explanation of Borehole Log'.



APPENDIX C
GROUNDWATER ELEVATIONS

Summary of Groundwater Elevations

Monitor No.	Measuring Point Elevation (masl) ¹	Elevation of Water (masl)																								
		Apr-02	Jun-02	Jul-02	May-03	Mar-04	Apr-04	Sep-04	Jul-05	Nov-05	Nov-06	Oct-07	Oct-08	Oct-09	Nov-10	Oct-11	Oct-12	Oct-13	Oct-14	Sep-15	Sep-16	Aug-17	Oct-17	May-18	Sep-18	Sep-19
OW-1	499.11	496.94	495.22	493.25	494.91	494.68	496.61	492.75	492.79	495.82	494.58	493.25	493.52	493.59	493.38	494.73	493.78	495.11	494.75	493.33	493.30		494.26		493.66	493.31
OW-2	498.71	496.86	493.37	491.29	493.31	493.28	489.85	491.69	491.57	495.20	493.24	492.00	492.29	492.34	492.13	493.81	492.59	494.09	494.02	491.84	491.84		493.21		492.60	491.99
OW-3A	498.83	496.94	495.29	493.22	494.85	494.72	496.59	492.54	492.66	495.77	494.56	493.55	493.31	493.56	493.41	494.81	493.78	495.20	494.87	493.12	493.08		494.22		493.57	493.31
OW-3B	498.88	485.19	486.98	481.18		492.25	481.82	485.21	488.07	485.85	489.15	489.69	488.18	487.93	487.94	489.56	486.20	485.48	486.56	485.76	488.26		490.76		486.21	489.07
OW-4	499.07	496.91	495.39	493.40	495.03	497.73	496.62	492.84	492.89	495.70	494.65	493.75	493.62	493.98	493.58	494.84	493.97	495.12	494.87	493.42	493.34		494.25		493.63	493.50
OW-5	498.07	496.60	495.08	494.11	494.98	495.10	496.21	493.44	493.51	495.40	493.73	492.73	493.01	493.45	492.85	493.79	493.23	495.12	493.90	492.38	492.31		493.62		492.80	492.30
OW-6	498.22					485.54	485.13	486.85	488.23	487.63	489.31	488.45	488.45	488.63	487.99	488.53	488.48	488.53	488.04	487.47	488.03		488.32		488.02	487.72
OW-7	497.77					495.17	487.69	491.26	491.13	490.68	492.61	490.75	490.68	490.17	488.37	489.25	489.20	487.99	487.84	487.46	489.13		490.41		489.60	488.49
OW-8	499.78					497.56	497.34	491.58	491.61	498.92	493.47	491.63	492.40	492.53	492.18	493.58	494.93	495.16	494.05	491.68	491.65		493.15		492.50	491.69
OW-9	497.95																		484.84	491.89	491.86		492.51		491.65	491.83
OW-10	499.17																		492.48	491.69	491.69		492.66		492.16	491.74
OW-11	497.94																		485.32	492.07	491.91		492.67		491.13	491.52
OW-12A	497.75																					488.87	489.45	489.28	489.18	489.04
OW-12B	497.70																					484.05	486.62	489.37	487.76	489.00
OW-13A	497.60																					493.90	494.81	494.76	494.57	494.00
OW-13B	497.64																					493.35	494.41	494.57	493.71	493.04
OW-14A	498.58																					496.02	496.52	496.86	495.48	495.30
OW-14B	498.46																					494.54	495.36	495.59	494.59	494.23

Notes:
 (1) masl - metres above sea level.

APPENDIX D

**2019 LABORATORY ANALYTICAL
REPORTS**

**CLIENT NAME: WOOD CANADA LTD.
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632**

ATTENTION TO: Emily Lemieux

PROJECT: Providence Bay GW

AGAT WORK ORDER: 19T515018

TRACE ORGANICS REVIEWED BY: Pinkal Patel, Report Reviewer

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Sep 18, 2019

PAGES (INCLUDING COVER): 15

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Volatile Organic Compounds in Water

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

		SAMPLE DESCRIPTION:		OW-1	OW-2	OW-3A	OW-3B	OW-4	OW-5	OW-6	OW-7
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06
Parameter	Unit	G / S	RDL	507085	507086	507087	507088	507089	507090	507091	507092
Vinyl Chloride	µg/L	1	0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
Benzene	µg/L	1	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L	60	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Methylene Chloride	µg/L		0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,4-Dichlorobenzene	µg/L	5	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Surrogate	Unit	Acceptable Limits									
Toluene-d8	% Recovery	50-140		118	113	112	113	114	113	115	112
4-Bromofluorobenzene	% Recovery	50-140		91	93	93	93	95	95	97	95
		SAMPLE DESCRIPTION:		OW-8	OW-9	OW-10	OW-11	OW-12A	OW-12B	OW-13A	OW-13B
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06	2019-09-06
Parameter	Unit	G / S	RDL	507093	507094	507095	507096	507097	507098	507099	507100
Vinyl Chloride	µg/L	1	0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
Benzene	µg/L	1	0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L	60	0.20	<0.20	<0.20	<0.20	<0.20	0.63	0.44	<0.20	<0.20
Methylene Chloride	µg/L		0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
1,4-Dichlorobenzene	µg/L	5	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Surrogate	Unit	Acceptable Limits									
Toluene-d8	% Recovery	50-140		111	112	114	113	113	104	115	114
4-Bromofluorobenzene	% Recovery	50-140		93	96	96	92	95	95	92	95

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Volatile Organic Compounds in Water

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Parameter	Unit	SAMPLE DESCRIPTION:		OW-14A	OW-14B	PB-DUP1	PB-DUP2
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2019-09-06	2019-09-06	2019-09-06	2019-09-06
		G / S	RDL	507101	507102	507103	507104
Vinyl Chloride	µg/L	1	0.17	<0.17	<0.17	<0.17	<0.17
Benzene	µg/L	1	0.20	<0.20	<0.20	<0.20	<0.20
Toluene	µg/L	60	0.20	<0.20	<0.20	<0.20	<0.20
Methylene Chloride	µg/L		0.3	<0.3	<0.3	<0.3	<0.3
1,4-Dichlorobenzene	µg/L	5	0.10	<0.10	<0.10	<0.10	<0.10
Surrogate	Unit	Acceptable Limits					
Toluene-d8	% Recovery	50-140		113	116	118	113
4-Bromofluorobenzene	% Recovery	50-140		94	93	94	95

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

507086-507104 Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
 1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

5835 COOPERS AVENUE
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<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Parameter	Unit	SAMPLE DESCRIPTION:		OW-1		OW-2		OW-3A		OW-3B	
		SAMPLE TYPE:		Water		Water		Water		Water	
		DATE SAMPLED:		2019-09-06		2019-09-06		2019-09-06		2019-09-06	
		G / S	RDL	507085	RDL	507086	RDL	507087	RDL	507088	
Electrical Conductivity	µS/cm		2	878	2	513	2	809	2	726	
pH	pH Units		NA	7.79	NA	7.85	NA	7.80	NA	7.72	
Total Dissolved Solids	mg/L		20	418	20	238	20	372	20	392	
Alkalinity (as CaCO3)	mg/L		5	350	5	185	5	351	5	199	
Chloride	mg/L		0.50	46.7	0.10	12.9	0.50	36.1	0.20	25.6	
Nitrate as N	mg/L	10.0	0.25	<0.25	0.05	<0.05	0.25	<0.25	0.10	0.73	
Nitrite as N	mg/L	1.0	0.25	<0.25	0.05	<0.05	0.25	<0.25	0.10	<0.10	
Sulphate	mg/L		0.50	49.4	0.10	63.1	0.50	29.2	0.20	139	
Ammonia as N	mg/L		0.02	0.85	0.02	0.18	0.02	0.21	0.02	0.10	
Total Phosphorus	mg/L		0.02	<0.02	0.02	0.05	0.02	0.03	0.02	0.08	
Total Kjeldahl Nitrogen	mg/L		0.10	1.47	0.10	0.62	0.10	0.76	0.10	1.14	
Chemical Oxygen Demand	mg/L		5	15	5	<5	5	12	5	<5	
Dissolved Organic Carbon	mg/L		0.5	7.2	0.5	2.0	0.5	5.9	0.5	3.2	
Phenols	mg/L		0.001	<0.001	0.001	<0.001	0.001	0.001	0.001	<0.001	
Calcium	mg/L		0.05	74.0	0.05	44.7	0.05	66.1	0.05	55.9	
Magnesium	mg/L		0.05	53.5	0.05	30.9	0.05	50.8	0.05	29.3	
Sodium	mg/L	20	0.05	24.0	0.05	9.55	0.05	23.4	0.05	29.9	
Potassium	mg/L		0.05	8.46	0.05	5.37	0.05	7.32	0.05	6.13	
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003	
Barium	mg/L	1	0.002	0.025	0.002	0.016	0.002	0.035	0.002	0.012	
Boron	mg/L	5	0.010	0.213	0.010	0.237	0.010	0.236	0.010	0.568	
Cadmium	mg/L	0.005	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003	
Copper	mg/L		0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003	
Iron	mg/L		0.010	0.109	0.010	<0.010	0.010	<0.010	0.010	<0.010	
Lead	mg/L	0.01	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	
Manganese	mg/L		0.002	0.005	0.002	0.023	0.002	0.003	0.002	0.010	
Mercury	mg/L	0.001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	
Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	0.007	0.005	<0.005	

Certified By:

Jris Veraestegui

Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

5835 COOPERS AVENUE
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CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Parameter	Unit	SAMPLE DESCRIPTION:		OW-4		OW-5		OW-6		OW-7	
		SAMPLE TYPE:		Water		Water		Water		Water	
		DATE SAMPLED:		2019-09-06		2019-09-06		2019-09-06		2019-09-06	
		G / S	RDL	507089	RDL	507090	RDL	507091	RDL	507092	
Electrical Conductivity	µS/cm		2	503	2	781	2	531	2	596	
pH	pH Units		NA	7.87	NA	7.86	NA	7.74	NA	7.87	
Total Dissolved Solids	mg/L		20	220	20	386	20	280	20	360	
Alkalinity (as CaCO3)	mg/L		5	235	5	273	5	173	5	189	
Chloride	mg/L		0.10	4.93	0.20	20.3	0.10	3.53	0.20	3.18	
Nitrate as N	mg/L	10.0	0.05	<0.05	0.10	<0.10	0.05	0.17	0.10	0.24	
Nitrite as N	mg/L	1.0	0.05	<0.05	0.10	<0.10	0.05	<0.05	0.10	<0.10	
Sulphate	mg/L		0.10	25.6	0.20	119	0.10	95.7	0.20	116	
Ammonia as N	mg/L		0.02	0.13	0.02	0.11	0.02	0.18	0.02	0.06	
Total Phosphorus	mg/L		0.02	0.08	0.02	0.36	0.02	0.03	0.02	0.42	
Total Kjeldahl Nitrogen	mg/L		0.10	1.14	0.10	1.23	0.10	0.82	0.10	4.53	
Chemical Oxygen Demand	mg/L		5	<5	5	<5	5	<5	5	11	
Dissolved Organic Carbon	mg/L		0.5	2.9	0.5	3.9	0.5	1.5	0.5	1.8	
Phenols	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	
Calcium	mg/L		0.05	44.1	0.05	69.2	0.05	51.1	0.05	48.7	
Magnesium	mg/L		0.05	33.2	0.05	43.7	0.05	31.2	0.05	31.4	
Sodium	mg/L	20	0.05	8.56	0.05	26.6	0.05	10.5	0.05	26.6	
Potassium	mg/L		0.05	5.48	0.05	7.39	0.05	5.30	0.05	5.80	
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	0.003	
Barium	mg/L	1	0.002	0.015	0.002	0.018	0.002	0.012	0.002	0.012	
Boron	mg/L	5	0.010	0.200	0.010	0.362	0.010	0.365	0.010	0.323	
Cadmium	mg/L	0.005	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003	
Copper	mg/L		0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003	
Iron	mg/L		0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010	
Lead	mg/L	0.01	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	
Manganese	mg/L		0.002	<0.002	0.002	0.007	0.002	0.012	0.002	0.011	
Mercury	mg/L	0.001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	
Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	<0.005	0.005	<0.005	

Certified By:

Jris Veraestegui

Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

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CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Parameter	Unit	SAMPLE DESCRIPTION:		OW-8		OW-9		OW-10		OW-11		OW-12A	
		SAMPLE TYPE:		Water		Water		Water		Water		Water	
		DATE SAMPLED:		2019-09-06		2019-09-06		2019-09-06		2019-09-06		2019-09-06	
		G / S	RDL	507093	507094	RDL	507095	RDL	507096	507097			
Electrical Conductivity	µS/cm		2	456	499	2	657	2	478	371			
pH	pH Units		NA	7.81	7.79	NA	7.80	NA	7.79	7.81			
Total Dissolved Solids	mg/L		20	226	250	20	340	20	242	162			
Alkalinity (as CaCO3)	mg/L		5	232	177	5	254	5	179	152			
Chloride	mg/L		0.10	3.72	6.20	0.20	25.8	0.10	6.09	2.72			
Nitrate as N	mg/L	10.0	0.05	<0.05	0.06	0.10	<0.10	0.05	<0.05	<0.05			
Nitrite as N	mg/L	1.0	0.05	<0.05	<0.05	0.10	<0.10	0.05	<0.05	<0.05			
Sulphate	mg/L		0.10	6.23	73.6	0.20	54.6	0.10	60.6	35.0			
Ammonia as N	mg/L		0.02	0.04	0.16	0.02	0.31	0.02	0.14	0.24			
Total Phosphorus	mg/L		0.02	0.61	0.02	0.02	0.03	0.02	0.06	0.02			
Total Kjeldahl Nitrogen	mg/L		0.10	2.30	0.39	0.10	0.68	0.10	0.64	0.53			
Chemical Oxygen Demand	mg/L		5	18	<5	5	<5	5	<5	<5			
Dissolved Organic Carbon	mg/L		0.5	6.0	2.2	0.5	4.6	0.5	2.7	2.6			
Phenols	mg/L		0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001			
Calcium	mg/L		0.05	49.3	44.6	0.05	62.7	0.05	45.0	33.6			
Magnesium	mg/L		0.05	30.0	28.3	0.05	37.0	0.05	26.2	20.8			
Sodium	mg/L	20	0.05	2.72	10.4	0.05	15.0	0.05	10.7	11.0			
Potassium	mg/L		0.05	0.95	5.25	0.05	6.26	0.05	5.33	4.66			
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003			
Barium	mg/L	1	0.002	0.005	0.022	0.002	0.050	0.002	0.019	0.031			
Boron	mg/L	5	0.010	0.028	0.311	0.010	0.237	0.010	0.436	0.449			
Cadmium	mg/L	0.005	0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001			
Chromium	mg/L	0.05	0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003			
Copper	mg/L		0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003			
Iron	mg/L		0.010	<0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010			
Lead	mg/L	0.01	0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001			
Manganese	mg/L		0.002	0.004	0.011	0.002	0.015	0.002	0.045	0.058			
Mercury	mg/L	0.001	0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001			
Zinc	mg/L		0.005	<0.005	<0.005	0.005	<0.005	0.005	<0.005	0.005			

Certified By:

Jris Veraestegui

Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

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CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Parameter	Unit	SAMPLE DESCRIPTION:		OW-12B		OW-13A		OW-13B		OW-14A		OW-14B	
		SAMPLE TYPE:		Water		Water		Water		Water		Water	
		DATE SAMPLED:		2019-09-06		2019-09-06		2019-09-06		2019-09-06		2019-09-06	
		G / S	RDL	507098	RDL	507099	RDL	507100	507101	RDL	507102		
Electrical Conductivity	µS/cm		2	611	2	1610	2	807	837	2	466		
pH	pH Units		NA	7.96	NA	7.66	NA	7.70	7.91	NA	7.77		
Total Dissolved Solids	mg/L		20	302	20	958	20	458	470	20	222		
Alkalinity (as CaCO3)	mg/L		5	225	5	581	5	308	362	5	224		
Chloride	mg/L		0.20	11.4	0.50	53.2	0.50	23.7	35.0	0.10	1.94		
Nitrate as N	mg/L	10.0	0.10	<0.10	0.25	<0.25	0.25	<0.25	<0.25	0.05	<0.05		
Nitrite as N	mg/L	1.0	0.10	<0.10	0.25	<0.25	0.25	<0.25	<0.25	0.05	<0.05		
Sulphate	mg/L		0.20	79.3	0.50	340	0.50	95.1	39.1	0.10	20.5		
Ammonia as N	mg/L		0.02	0.07	0.02	1.33	0.02	0.35	0.08	0.02	0.20		
Total Phosphorus	mg/L		0.02	0.06	0.02	<0.02	0.02	0.03	0.12	0.02	0.02		
Total Kjeldahl Nitrogen	mg/L		0.10	3.22	0.10	3.10	0.10	0.88	1.28	0.10	0.51		
Chemical Oxygen Demand	mg/L		5	21	5	35	5	11	18	5	<5		
Dissolved Organic Carbon	mg/L		0.5	3.0	0.5	18.2	0.5	6.4	7.7	0.5	2.9		
Phenols	mg/L		0.001	<0.001	0.001	0.002	0.001	0.001	0.001	0.001	<0.001		
Calcium	mg/L		0.05	52.3	0.25	209	0.05	75.5	79.3	0.05	40.4		
Magnesium	mg/L		0.05	38.9	0.25	77.6	0.05	49.3	55.3	0.05	30.1		
Sodium	mg/L	20	0.05	16.2	0.25	43.8	0.05	17.1	8.10	0.05	8.58		
Potassium	mg/L		0.05	9.98	0.25	21.4	0.05	8.33	4.91	0.05	5.09		
Arsenic	mg/L	0.025	0.003	0.003	0.003	0.004	0.003	<0.003	0.005	0.003	<0.003		
Barium	mg/L	1	0.002	0.028	0.002	0.092	0.002	0.040	0.048	0.002	0.023		
Boron	mg/L	5	0.010	0.496	0.010	0.498	0.010	0.302	0.119	0.010	0.192		
Cadmium	mg/L	0.005	0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001		
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003	0.003	<0.003		
Copper	mg/L		0.003	<0.003	0.003	<0.003	0.003	0.003	<0.003	0.003	<0.003		
Iron	mg/L		0.010	<0.010	0.010	0.071	0.010	<0.010	<0.010	0.010	<0.010		
Lead	mg/L	0.01	0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001		
Manganese	mg/L		0.002	0.017	0.002	0.123	0.002	0.017	0.132	0.002	0.014		
Mercury	mg/L	0.001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0001	<0.0001		
Zinc	mg/L		0.005	0.008	0.005	<0.005	0.005	0.009	<0.005	0.005	<0.005		

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

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<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Parameter	Unit	SAMPLE DESCRIPTION:		PB-DUP1		PB-DUP2	
		SAMPLE TYPE:		Water		Water	
		DATE SAMPLED:		2019-09-06		2019-09-06	
		G / S	RDL	507103	RDL	507104	
Electrical Conductivity	µS/cm		2	823	2	655	
pH	pH Units		NA	7.82	NA	7.90	
Total Dissolved Solids	mg/L		20	424	20	354	
Alkalinity (as CaCO ₃)	mg/L		5	313	5	253	
Chloride	mg/L		0.50	23.5	0.20	27.1	
Nitrate as N	mg/L	10.0	0.25	<0.25	0.10	<0.10	
Nitrite as N	mg/L	1.0	0.25	<0.25	0.10	<0.10	
Sulphate	mg/L		0.50	96.1	0.20	52.2	
Ammonia as N	mg/L		0.02	0.37	0.02	0.39	
Total Phosphorus	mg/L		0.02	0.03	0.02	0.03	
Total Kjeldahl Nitrogen	mg/L		0.10	0.86	0.10	0.80	
Chemical Oxygen Demand	mg/L		5	10	5	<5	
Dissolved Organic Carbon	mg/L		0.5	6.0	0.5	4.1	
Phenols	mg/L		0.001	<0.001	0.001	<0.001	
Calcium	mg/L		0.05	77.2	0.05	62.1	
Magnesium	mg/L		0.05	50.6	0.05	36.9	
Sodium	mg/L	20	0.05	17.6	0.05	15.5	
Potassium	mg/L		0.05	8.43	0.05	6.36	
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	
Barium	mg/L	1	0.002	0.040	0.002	0.049	
Boron	mg/L	5	0.010	0.278	0.010	0.226	
Cadmium	mg/L	0.005	0.001	<0.001	0.001	<0.001	
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	
Copper	mg/L		0.003	<0.003	0.003	<0.003	
Iron	mg/L		0.010	<0.010	0.010	<0.010	
Lead	mg/L	0.01	0.001	<0.001	0.001	<0.001	
Manganese	mg/L		0.002	0.017	0.002	0.014	
Mercury	mg/L	0.001	0.0001	<0.0001	0.0001	<0.0001	
Zinc	mg/L		0.005	<0.005	0.005	<0.005	

Certified By:

Jris Veraestegui



Certificate of Analysis

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

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CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
507085-507104 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.
Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Guideline Violation

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
507085	OW-1	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	24.0
507087	OW-3A	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	23.4
507088	OW-3B	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	29.9
507090	OW-5	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	26.6
507092	OW-7	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	26.6
507099	OW-13A	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	43.8

Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay GW
 SAMPLING SITE:

AGAT WORK ORDER: 19T515018
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Trace Organics Analysis


RPT Date: Sep 18, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	

Volatile Organic Compounds in Water

Vinyl Chloride	507104	507104	< 0.17	< 0.17	NA	< 0.17	103%	50%	140%	82%	50%	140%	85%	50%	140%
Benzene	507104	507104	< 0.20	< 0.20	NA	< 0.20	99%	50%	140%	79%	60%	130%	89%	50%	140%
Toluene	507104	507104	< 0.20	< 0.20	NA	< 0.20	110%	50%	140%	114%	60%	130%	95%	50%	140%
Methylene Chloride	507104	507104	< 0.30	< 0.30	NA	< 0.3	90%	60%	140%	103%	60%	140%	83%	60%	140%
1,4-Dichlorobenzene	507104	507104	< 0.10	< 0.10	NA	< 0.10	98%	50%	140%	102%	60%	130%	95%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
PROJECT: Providence Bay GW
SAMPLING SITE:

AGAT WORK ORDER: 19T515018
ATTENTION TO: Emily Lemieux
SAMPLED BY:

Water Analysis

RPT Date: Sep 18, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	

Inorganic Chemistry (Water)

Electrical Conductivity	506739		244	245	0.4%	< 2	99%	80%	120%						
pH	506739		7.92	7.83	1.1%	NA	100%	90%	110%						
Total Dissolved Solids	504148		9100	8830	3.0%	< 20	98%	80%	120%						
Alkalinity (as CaCO3)	506739		105	104	1.0%	< 5	99%	80%	120%						
Chloride	507085	507085	46.7	45.9	1.7%	< 0.10	98%	90%	110%	104%	90%	110%	107%	85%	115%
Nitrate as N	507085	507085	<0.25	<0.25	NA	< 0.05	92%	90%	110%	100%	90%	110%	106%	85%	115%
Nitrite as N	507085	507085	<0.25	<0.25	NA	< 0.05	NA	90%	110%	105%	90%	110%	111%	85%	115%
Sulphate	507085	507085	49.4	47.4	4.1%	< 0.10	94%	90%	110%	100%	90%	110%	106%	85%	115%
Ammonia as N	511973		<0.02	<0.02	NA	< 0.02	94%	90%	110%	107%	90%	110%	101%	70%	130%
Total Phosphorus	506861		<0.02	<0.02	NA	< 0.02	102%	80%	120%	97%	90%	110%	103%	70%	130%
Total Kjeldahl Nitrogen	507085	507085	1.47	1.47	0.0%	< 0.10	100%	80%	120%	104%	80%	120%	101%	70%	130%
Chemical Oxygen Demand	507085	507085	15	13	NA	< 5	95%	80%	120%	103%	90%	110%	99%	70%	130%
Dissolved Organic Carbon	506861		1.3	1.3	NA	< 0.5	104%	90%	110%	98%	90%	110%	88%	80%	120%
Phenols	506861		<0.001	<0.001	NA	< 0.001	98%	90%	110%	106%	90%	110%	105%	80%	120%
Calcium	507086	507086	44.7	46.0	2.9%	< 0.05	95%	90%	110%	95%	90%	110%	97%	70%	130%
Magnesium	507086	507086	30.9	31.7	2.6%	< 0.05	92%	90%	110%	93%	90%	110%	96%	70%	130%
Sodium	507086	507086	9.55	9.81	2.7%	< 0.05	95%	90%	110%	94%	90%	110%	96%	70%	130%
Potassium	507086	507086	5.37	5.52	2.8%	< 0.05	94%	90%	110%	93%	90%	110%	97%	70%	130%
Arsenic	507085	507085	<0.003	<0.003	NA	< 0.003	105%	90%	110%	104%	90%	110%	111%	70%	130%
Barium	507085	507085	0.025	0.024	4.1%	< 0.002	97%	90%	110%	95%	90%	110%	93%	70%	130%
Boron	507085	507085	0.213	0.231	8.1%	< 0.010	102%	90%	110%	98%	90%	110%	108%	70%	130%
Cadmium	507085	507085	<0.001	<0.001	NA	< 0.001	102%	90%	110%	100%	90%	110%	99%	70%	130%
Chromium	507085	507085	<0.003	<0.003	NA	< 0.003	101%	90%	110%	99%	90%	110%	102%	70%	130%
Copper	507085	507085	<0.003	<0.003	NA	< 0.003	100%	90%	110%	99%	90%	110%	94%	70%	130%
Iron	507085	507085	0.109	0.091	18.0%	< 0.010	97%	90%	110%	97%	90%	110%	103%	70%	130%
Lead	507085	507085	<0.001	<0.001	NA	< 0.001	101%	90%	110%	102%	90%	110%	96%	70%	130%
Manganese	507085	507085	0.005	0.005	NA	< 0.002	105%	90%	110%	101%	90%	110%	101%	70%	130%
Mercury	507085	507085	<0.0001	<0.0001	NA	< 0.0001	102%	90%	110%	102%	80%	120%	93%	80%	120%
Zinc	507085	507085	<0.005	<0.005	NA	< 0.005	103%	90%	110%	102%	90%	110%	103%	70%	130%

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: _____

Jris Verastegui

Method Summary

CLIENT NAME: WOOD CANADA LTD.

AGAT WORK ORDER: 19T515018

PROJECT: Providence Bay GW

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methylene Chloride	VOL 5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Water Analysis			
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO ₃)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Total Phosphorus	INOR-93-6057	QuikChem 10-115-01-3-A & SM 4500-P I	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6050	MOE ROPHEN-E 3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW 846 7470 & 245.1	CVAAS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

Laboratory Use Only

Work Order #: _____
Cooler Quantity: _____
Arrival Temperatures: _____
Custody Seal Intact: Yes No N/A
Notes: _____

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Emily Lemieux
Address: 131 Fielding Road
Lively, ON P3Y 1L7
Phone: 705-682-2632 Fax: 705-682-2260
Reports to be sent to:
1. Email: emily.lemieux@woodplc.com
2. Email: _____

Project Information:

Project: Providence Bay GW
Site Location: _____
Sampled By: _____
AGAT Quote #: 42882 PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes No
Company: _____
Contact: _____
Address: _____
Email: _____

Regulatory Requirements: No Regulatory Requirement

(Please check all applicable boxes)

Regulation 153/04 Sewer Use Regulation 558
Table Indicate One Sanitary CCME
 Ind/Com Storm Prov. Water Quality Objectives (PWQO)
 Res/Park Agriculture Other
Soil Texture (Check One) Region Indicate One
 Coarse MISA ODWS
 Fine MISA Indicate One

Is this submission for a Record of Site Condition?

Yes No

Report Guideline on Certificate of Analysis

Yes No

Sample Matrix Legend

B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Field Filtered - Metals, Hg, CrVI

O. Reg 153		Field Filtered - Metals, Hg, CrVI	Metals and Inorganics	Full Metals Scan	Regulation/Custom Metals	Nutrients: <input type="checkbox"/> TP <input type="checkbox"/> NH ₃ <input type="checkbox"/> TKN <input type="checkbox"/> NO ₃ <input type="checkbox"/> NO ₂ <input type="checkbox"/> NO ₃ +NO ₂	Volatiles: <input type="checkbox"/> VOC <input type="checkbox"/> BTEX <input type="checkbox"/> THM	PHCs F1 - F4	ABNs	PAHs	PCBs: <input type="checkbox"/> Total <input type="checkbox"/> Aroclors	Organochlorine Pesticides	TCLP: <input type="checkbox"/> M&I <input type="checkbox"/> VOCs <input type="checkbox"/> ABNs <input type="checkbox"/> B(a)P <input type="checkbox"/> PCBs	Sewer Use	Groundwater Column
<input type="checkbox"/> All Metals <input type="checkbox"/> 153 Metals (excl. Hydrides)	<input type="checkbox"/> Hydride Metals <input type="checkbox"/> 153 Metals (incl. Hydrides)														
OW-11	09/06/19	11 AM	9	Water											<input checked="" type="checkbox"/>
OW-12A	↓	↓	9	Water											<input checked="" type="checkbox"/>
OW-12B	↓	↓	9	Water	Partial sample.										<input checked="" type="checkbox"/>
OW-13A	↓	↓	9	Water											<input checked="" type="checkbox"/>
OW-13B	09/05/19	↓	9	Water											<input checked="" type="checkbox"/>
OW-14A	09/06/19	↓	9	Water											<input checked="" type="checkbox"/>
OW-14B	↓	↓	9	Water											<input checked="" type="checkbox"/>
PB-DUP1	↓	↓	9	Water											<input checked="" type="checkbox"/>
PB-DUP2	↓	↓	9	Water											<input checked="" type="checkbox"/>

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y/N
OW-11	09/06/19	11 AM	9	Water		Y
OW-12A	↓	↓	9	Water		Y
OW-12B	↓	↓	9	Water	Partial sample.	Y
OW-13A	↓	↓	9	Water		Y
OW-13B	09/05/19	↓	9	Water		Y
OW-14A	09/06/19	↓	9	Water		Y
OW-14B	↓	↓	9	Water		Y
PB-DUP1	↓	↓	9	Water		Y
PB-DUP2	↓	↓	9	Water		Y

Samples Relinquished By (Print Name and Sign): <u>Dominique Carchesne</u> <u>D. Carchesne</u>	Date: <u>09/06/19</u>	Time: <u>18:30</u>	Samples Received By (Print Name and Sign): <u>[Signature]</u>	Date: <u>19/9/19</u>	Time: <u>11:42</u>
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

CLIENT NAME: WOOD CANADA LTD.
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632

ATTENTION TO: Emily Lemieux

PROJECT: Providence Bay Presidential

AGAT WORK ORDER: 19T516194

MICROBIOLOGY ANALYSIS REVIEWED BY: Rocio Morales, Inorganics Lab Supervisor

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Supervisor

DATE REPORTED: Sep 19, 2019

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Certificate of Analysis

AGAT WORK ORDER: 19T516194

PROJECT: Providence Bay Residential

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Total Coliforms & E. Coli (Using MI Agar)

DATE RECEIVED: 2019-09-11

DATE REPORTED: 2019-09-19

		SAMPLE DESCRIPTION:		Irving
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2019-09-09
Parameter	Unit	G / S	RDL	515693
Escherichia coli	CFU/100mL		1	ND
Total Coliforms	CFU/100mL		1	15

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
 515693 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: _____





Certificate of Analysis

AGAT WORK ORDER: 19T516194

PROJECT: Providence Bay Residential

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Volatile Organic Compounds in Water

DATE RECEIVED: 2019-09-11

DATE REPORTED: 2019-09-19

		SAMPLE DESCRIPTION: Irving		
		SAMPLE TYPE: Water		
		DATE SAMPLED: 2019-09-09		
Parameter	Unit	G / S	RDL	515693
Vinyl Chloride	µg/L	1	0.17	<0.17
Methylene Chloride	µg/L		0.30	<0.30
Benzene	µg/L	1	0.20	<0.20
Toluene	µg/L	60	0.20	<0.20
1,4-Dichlorobenzene	µg/L	5	0.10	<0.10
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		113
4-Bromofluorobenzene	% Recovery	50-140		95

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 19T516194

PROJECT: Providence Bay Residential

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Comprehensive List for GW Parameters - Column 1

DATE RECEIVED: 2019-09-11

DATE REPORTED: 2019-09-19

Parameter	Unit	SAMPLE DESCRIPTION: Irving		
		G / S	RDL	515693
pH	pH Units		NA	7.91
Alkalinity (as CaCO3)	mg/L		5	195
Electrical Conductivity	uS/cm		2	554
Total Dissolved Solids	mg/L		20	378
Chloride	mg/L		0.10	4.87
Nitrate as N	mg/L	10.0	0.05	<0.05
Nitrite as N	mg/L	1.0	0.05	<0.05
Sulphate	mg/L		0.10	78.8
Ammonia as N	mg/L		0.02	0.16
Total Kjeldahl Nitrogen	mg/L		0.10	0.26
Total Phosphorus	mg/L		0.02	<0.02
Chemical Oxygen Demand	mg/L		5	<5
Dissolved Organic Carbon	mg/L		0.5	1.4
Phenols	mg/L		0.001	<0.001
Calcium	mg/L		0.05	56.6
Magnesium	mg/L		0.05	30.7
Sodium	mg/L	20	0.05	6.59
Potassium	mg/L		0.05	3.68
Arsenic	mg/L	0.025	0.003	<0.003
Barium	mg/L	1	0.002	0.017
Boron	mg/L	5	0.010	0.187
Cadmium	mg/L	0.005	0.002	<0.002
Chromium	mg/L	0.05	0.003	0.004
Copper	mg/L		0.003	<0.003
Iron	mg/L		0.010	<0.010
Lead	mg/L	0.01	0.001	<0.001
Manganese	mg/L		0.002	0.003
Mercury	mg/L	0.001	0.0001	<0.0001
Zinc	mg/L		0.005	0.010

Certified By:

Amayot Bhele




AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 19T516194

PROJECT: Providence Bay Residential

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Comprehensive List for GW Parameters - Column 1

DATE RECEIVED: 2019-09-11

DATE REPORTED: 2019-09-19

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Anayot Bhela

Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential
 SAMPLING SITE:

AGAT WORK ORDER: 19T516194
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Microbiology Analysis

RPT Date: Sep 19, 2019			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE				
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Coliforms & E. Coli (Using MI Agar)												
Escherichia coli	515693	515693	ND	ND	NA	< 1						
Total Coliforms	515693	515693	15	14	6.9%	< 1						

Comments: ND - Not Detected, NA - % RPD Not Applicable

Certified By: _____



Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential
 SAMPLING SITE:

AGAT WORK ORDER: 19T516194
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Trace Organics Analysis

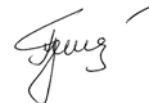
RPT Date: Sep 19, 2019			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Volatile Organic Compounds in Water

Vinyl Chloride	509936	< 0.17	< 0.17	NA	< 0.17	94%	50%	140%	105%	50%	140%	119%	50%	140%
Methylene Chloride	509936	< 0.30	< 0.30	NA	< 0.30	106%	50%	140%	99%	60%	130%	115%	50%	140%
Benzene	509936	< 0.20	< 0.20	NA	< 0.20	108%	50%	140%	104%	60%	130%	106%	50%	140%
Toluene	509936	< 0.20	< 0.20	NA	< 0.20	115%	50%	140%	91%	60%	130%	106%	50%	140%
1,4-Dichlorobenzene	509936	< 0.10	< 0.10	NA	< 0.10	117%	50%	140%	114%	60%	130%	90%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential
 SAMPLING SITE:

AGAT WORK ORDER: 19T516194
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Water Analysis															
RPT Date: Sep 19, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Comprehensive List for GW Parameters - Column 1

pH	513992		7.75	7.68	0.9%		100%	90%	110%	NA			NA	
Alkalinity (as CaCO3)	513992		342	340	0.6%	< 5	99%	80%	120%	NA			NA	
Electrical Conductivity	513992		2180	2190	0.5%	< 2	102%	80%	120%	NA			NA	
Total Dissolved Solids	510788		8350	8510	1.9%	< 20	98%	80%	120%	NA			NA	
Chloride	513992		456	448	1.8%	< 0.10	94%	90%	110%	110%	90%	110%	NA	85% 115%
Nitrate as N	513992		<0.5	<0.5	NA	< 0.05	100%	90%	110%	110%	90%	110%	106%	85% 115%
Nitrite as N	513992		<0.5	<0.5	NA	< 0.05	NA	90%	110%	108%	90%	110%	112%	85% 115%
Sulphate	513992		83.4	85.4	2.4%	< 0.10	94%	90%	110%	107%	90%	110%	101%	85% 115%
Ammonia as N	515693	515693	0.16	0.16	0.0%	< 0.02	92%	90%	110%	98%	90%	110%	96%	70% 130%
Total Kjeldahl Nitrogen	513155		0.34	0.28	NA	< 0.10	101%	80%	120%	104%	80%	120%	104%	70% 130%
Total Phosphorus	524151		<0.02	<0.02	NA	< 0.02	103%	80%	120%	99%	90%	110%	104%	70% 130%
Chemical Oxygen Demand	517178		7	8	NA	< 5	101%	90%	110%	94%	90%	110%	102%	70% 130%
Dissolved Organic Carbon	515693	515693	1.4	1.4	NA	< 0.5	96%	90%	110%	90%	90%	110%	87%	80% 120%
Phenols	507093		<0.001	<0.001	NA	< 0.001	102%	90%	110%	103%	90%	110%	105%	80% 120%
Calcium	511910		3.34	3.48	4.1%	< 0.05	97%	90%	110%	98%	90%	110%	101%	70% 130%
Magnesium	511910		1.05	1.09	3.7%	< 0.05	95%	90%	110%	95%	90%	110%	98%	70% 130%
Sodium	511910		4.05	4.12	1.7%	< 0.05	98%	90%	110%	99%	90%	110%	101%	70% 130%
Potassium	511910		0.45	0.49	8.5%	< 0.05	96%	90%	110%	96%	90%	110%	99%	70% 130%
Arsenic	517178		<0.015	<0.015	NA	< 0.003	102%	90%	110%	104%	90%	110%	103%	70% 130%
Barium	517178		0.025	0.027	7.7%	< 0.002	100%	90%	110%	101%	90%	110%	119%	70% 130%
Boron	517178		0.444	0.436	1.8%	< 0.010	109%	90%	110%	97%	90%	110%	109%	70% 130%
Cadmium	517178		<0.010	<0.010	NA	< 0.002	103%	90%	110%	103%	90%	110%	129%	70% 130%
Chromium	517178		<0.015	<0.015	NA	< 0.003	99%	90%	110%	104%	90%	110%	100%	70% 130%
Copper	517178		<0.015	<0.015	NA	< 0.003	103%	90%	110%	107%	90%	110%	97%	70% 130%
Iron	517178		<0.050	<0.050	NA	< 0.010	95%	90%	110%	105%	90%	110%	83%	70% 130%
Lead	517178		<0.005	<0.005	NA	< 0.001	94%	90%	110%	96%	90%	110%	104%	70% 130%
Manganese	517178		0.282	0.295	4.5%	< 0.002	100%	90%	110%	105%	90%	110%	92%	70% 130%
Mercury	524151		<0.0001	<0.0001	NA	< 0.0001	103%	90%	110%	98%	80%	120%	98%	80% 120%
Zinc	517178		0.027	0.033	20.0%	< 0.005	101%	90%	110%	108%	90%	110%	119%	70% 130%

Certified By:




Method Summary

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential
 SAMPLING SITE:

AGAT WORK ORDER: 19T516194
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration
Trace Organics Analysis			
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methylene Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Water Analysis			
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Total Phosphorus	INOR-93-6057	QuikChem 10-115-01-3-A & SM 4500-P I	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6050	MOE ROPHEN-E 3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW 846 7470 & 245.1	CVAAS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

CLIENT NAME: WOOD CANADA LTD.
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632

ATTENTION TO: Emily Lemieux

PROJECT: Providence Bay Residential GW

AGAT WORK ORDER: 19T515031

MICROBIOLOGY ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

TRACE ORGANICS REVIEWED BY: Pinkal Patel, Report Reviewer

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Sep 18, 2019

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



Certificate of Analysis

AGAT WORK ORDER: 19T515031

PROJECT: Providence Bay Residential GW

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Total Coliforms & E. Coli (Using MI Agar)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

		SAMPLE DESCRIPTION: Paquet	
		SAMPLE TYPE: Water	
		DATE SAMPLED: 2019-09-06	
Parameter	Unit	G / S	RDL
Escherichia coli	CFU/100mL	1	ND
Total Coliforms	CFU/100mL	1	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard
506861 ND - Not Detected.
The time from sample collection to initiation of analysis exceeded 48 hours.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T515031

PROJECT: Providence Bay Residential GW

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Volatile Organic Compounds in Water

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

		SAMPLE DESCRIPTION: Paquet		
		SAMPLE TYPE: Water		
		DATE SAMPLED: 2019-09-06		
Parameter	Unit	G / S	RDL	506861
Vinyl Chloride	µg/L	1	0.17	<0.17
Benzene	µg/L	1	0.20	<0.20
Toluene	µg/L	60	0.20	<0.20
Methylene Chloride	µg/L		0.3	<0.3
1,4-Dichlorobenzene	µg/L	5	0.10	<0.10
Surrogate	Unit	Acceptable Limits		
Toluene-d8	% Recovery	50-140		112
4-Bromofluorobenzene	% Recovery	50-140		96

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

506861 Xylenes total is a calculated parameter. The calculated value is the sum of m&p-Xylene + o-Xylene.
1,3-Dichloropropene total is a calculated parameter. The calculated value is the sum of Cis-1,3-Dichloropropene and Trans-1,3-Dichloropropene.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 19T515031

PROJECT: Providence Bay Residential GW

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: WOOD CANADA LTD.

ATTENTION TO: Emily Lemieux

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-07

DATE REPORTED: 2019-09-18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential GW
 SAMPLING SITE:

AGAT WORK ORDER: 19T515031
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Microbiology Analysis															
RPT Date: Sep 18, 2019			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE				
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Total Coliforms & E. Coli (Using MI Agar)														
Escherichia coli	510465		ND	ND	NA	< 1								
Total Coliforms	510465		NDOGT	NDOGT	NA	< 1								

Comments: ND - Not Detected, NA - % RPD Not Applicable
 NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth.

Certified By: Yris VeraStegui

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

Results relate only to the items tested. Results apply to samples as received.

Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential GW
 SAMPLING SITE:

AGAT WORK ORDER: 19T515031
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Trace Organics Analysis


RPT Date: Sep 18, 2019			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Volatile Organic Compounds in Water

Vinyl Chloride	509165	< 0.17	< 0.17	NA	< 0.17	105%	50%	140%	92%	50%	140%	106%	50%	140%
Benzene	509165	< 0.20	< 0.20	NA	< 0.20	107%	50%	140%	116%	60%	130%	109%	50%	140%
Toluene	509165	< 0.20	< 0.20	NA	< 0.20	97%	50%	140%	114%	60%	130%	106%	50%	140%
Methylene Chloride	509165	< 0.30	< 0.30	NA	< 0.3	90%	60%	140%	110%	60%	140%	119%	60%	140%
1,4-Dichlorobenzene	509165	< 0.10	< 0.10	NA	< 0.10	100%	50%	140%	100%	60%	130%	120%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Quality Assurance

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential GW
 SAMPLING SITE:

AGAT WORK ORDER: 19T515031
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

Water Analysis															
RPT Date: Sep 18, 2019			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE	
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Inorganic Chemistry (Water)														
Electrical Conductivity	506739		244	245	0.4%	< 2	99%	80%	120%					
pH	506739		7.92	7.83	1.1%	NA	100%	90%	110%					
Total Dissolved Solids	504148		9100	8830	2.9%	< 20	98%	80%	120%					
Alkalinity (as CaCO3)	506739		105	104	0.6%	< 5	99%	80%	120%					
Chloride	506861	506861	4.34	4.30	1.0%	< 0.10	90%	90%	110%	104%	90%	110%	106%	85% 115%
Nitrate as N	506861	506861	<0.05	<0.05	NA	< 0.05	95%	90%	110%	100%	90%	110%	107%	85% 115%
Nitrite as N	506861	506861	<0.05	<0.05	NA	< 0.05	NA	90%	110%	105%	90%	110%	106%	85% 115%
Sulphate	506861	506861	68.8	69.2	0.6%	< 0.10	94%	90%	110%	100%	90%	110%	92%	85% 115%
Ammonia as N	511973		<0.02	<0.02	NA	< 0.02	94%	90%	110%	107%	90%	110%	101%	70% 130%
Total Phosphorus	506861	506861	<0.02	<0.02	NA	< 0.02	102%	80%	120%	97%	90%	110%	103%	70% 130%
Total Kjeldahl Nitrogen	498640		0.55	0.48	12.0%	< 0.10	98%	80%	120%	97%	80%	120%	95%	70% 130%
Chemical Oxygen Demand	506861	506861	<5	<5	NA	< 5	103%	80%	120%	102%	90%	110%	95%	70% 130%
Dissolved Organic Carbon	506861	506861	1.3	1.3	NA	< 0.5	104%	90%	110%	98%	90%	110%	88%	80% 120%
Phenols	506861	506861	<0.001	<0.001	NA	< 0.001	98%	90%	110%	106%	90%	110%	105%	80% 120%
Calcium	511941		4.92	4.93	0.2%	< 0.05	93%	90%	110%	91%	90%	110%	93%	70% 130%
Magnesium	511941		0.88	0.89	1.1%	< 0.05	92%	90%	110%	97%	90%	110%	93%	70% 130%
Sodium	511941		0.72	0.72	0.0%	< 0.05	94%	90%	110%	94%	90%	110%	96%	70% 130%
Potassium	511941		0.27	0.26	3.8%	< 0.05	96%	90%	110%	93%	90%	110%	97%	70% 130%
Arsenic	503592		0.038	0.031	NA	< 0.003	98%	90%	110%	98%	90%	110%	103%	70% 130%
Barium	503592		0.053	0.052	1.0%	< 0.002	98%	90%	110%	100%	90%	110%	98%	70% 130%
Boron	503592		3.41	3.41	0.1%	< 0.010	103%	90%	110%	104%	90%	110%	98%	70% 130%
Cadmium	503592		<0.001	<0.001	NA	< 0.001	100%	90%	110%	106%	90%	110%	105%	70% 130%
Chromium	503592		<0.003	<0.003	NA	< 0.003	99%	90%	110%	99%	90%	110%	93%	70% 130%
Copper	503592		<0.003	<0.003	NA	< 0.003	100%	90%	110%	101%	90%	110%	84%	70% 130%
Iron	503592		0.978	0.983	0.5%	< 0.010	96%	90%	110%	104%	90%	110%	104%	70% 130%
Lead	503592		<0.001	<0.001	NA	< 0.001	98%	90%	110%	103%	90%	110%	90%	70% 130%
Manganese	503592		0.239	0.242	1.4%	< 0.002	103%	90%	110%	103%	90%	110%	93%	70% 130%
Mercury	506861	506861	<0.0001	<0.0001	NA	< 0.0001	103%	90%	110%	99%	80%	120%	95%	80% 120%
Zinc	503592		0.003	0.003	NA	< 0.005	99%	90%	110%	101%	90%	110%	98%	70% 130%

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: _____



Method Summary

CLIENT NAME: WOOD CANADA LTD.
 PROJECT: Providence Bay Residential GW
 SAMPLING SITE:

AGAT WORK ORDER: 19T515031
 ATTENTION TO: Emily Lemieux
 SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration
Trace Organics Analysis			
Vinyl Chloride	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Methylene Chloride	VOL 5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	EPA SW-846 5030C & 8260D	(P&T)GC/MS
Water Analysis			
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Total Phosphorus	INOR-93-6057	QuikChem 10-115-01-3-A & SM 4500-P I	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6050	MOE ROPHEN-E 3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW 846 7470 & 245.1	CVAAS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS



AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agallabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Report Information:

Company: Wood
Contact: Emily Lemieux
Address: 131 Fielding Road
Lively, ON P3Y 1L7
Phone: 705-682-2632 Fax: 705-682-2260
Reports to be sent to:
1. Email: emily.lemieux@woodplc.com
2. Email:

Regulatory Requirements: No Regulatory Requirement

(Please check all applicable boxes)

- Regulation 153/04 Sewer Use Regulation 558
- Table Indicate One
 Ind/Com Sanitary CCME
 Res/Park Storm Prov. Water Quality Objectives (PWQO)
 Agriculture Other
- Soil Texture (Check One) Region Indicate One
 Coarse MISA **ODWS**
 Fine Indicate One

Is this submission for a Record of Site Condition?

Yes No

Report Guideline on Certificate of Analysis

Yes No

Sample Matrix Legend

- B** Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Laboratory Use Only

Work Order #: **19TS15031**
Cooler Quantity: _____
Arrival Temperatures: **0.0 -0.8 1.6**
Custody Seal Intact: Yes No N/A
Notes: **enter**

Turnaround Time (TAT) Required:

Regular TAT 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
 3 Business Days 2 Business Days Next Business Day
OR Date Required (Rush Surcharges May Apply): _____

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: Providence Bay Residential GW
Site Location: _____
Sampled By: _____
AGAT Quote #: 42882 PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes No

Company: _____
Contact: _____
Address: _____
Email: _____

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Y/N	Field Filtered - Metals, Hg, CrVI	O. Reg 153	Metals and Inorganics	ORPs	Full Metals Scan	Regulation/Custom Metals	Nutrients	Volatiles	PHCs F1 - F4	ABNS	PAHs	PCBs: Total	Organochlorine Pesticides	TCLP: M&I	Sewer Use	Groundwater Column	E. coli and Total Colifor
Irving	09/06/19	10 AM	10	Water	No sample	1																	
Paquet	09/06/19	10 AM	10	Water		2																<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Samples Relinquished By (Print Name and Sign): Dominique Courchesne	Date: 09/06/19	Time: 18:30	Samples Received By (Print Name and Sign): [Signature]	Date: 09/07/2019	Time: 12:40
Samples Relinquished By (Print Name and Sign): [Signature]	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:

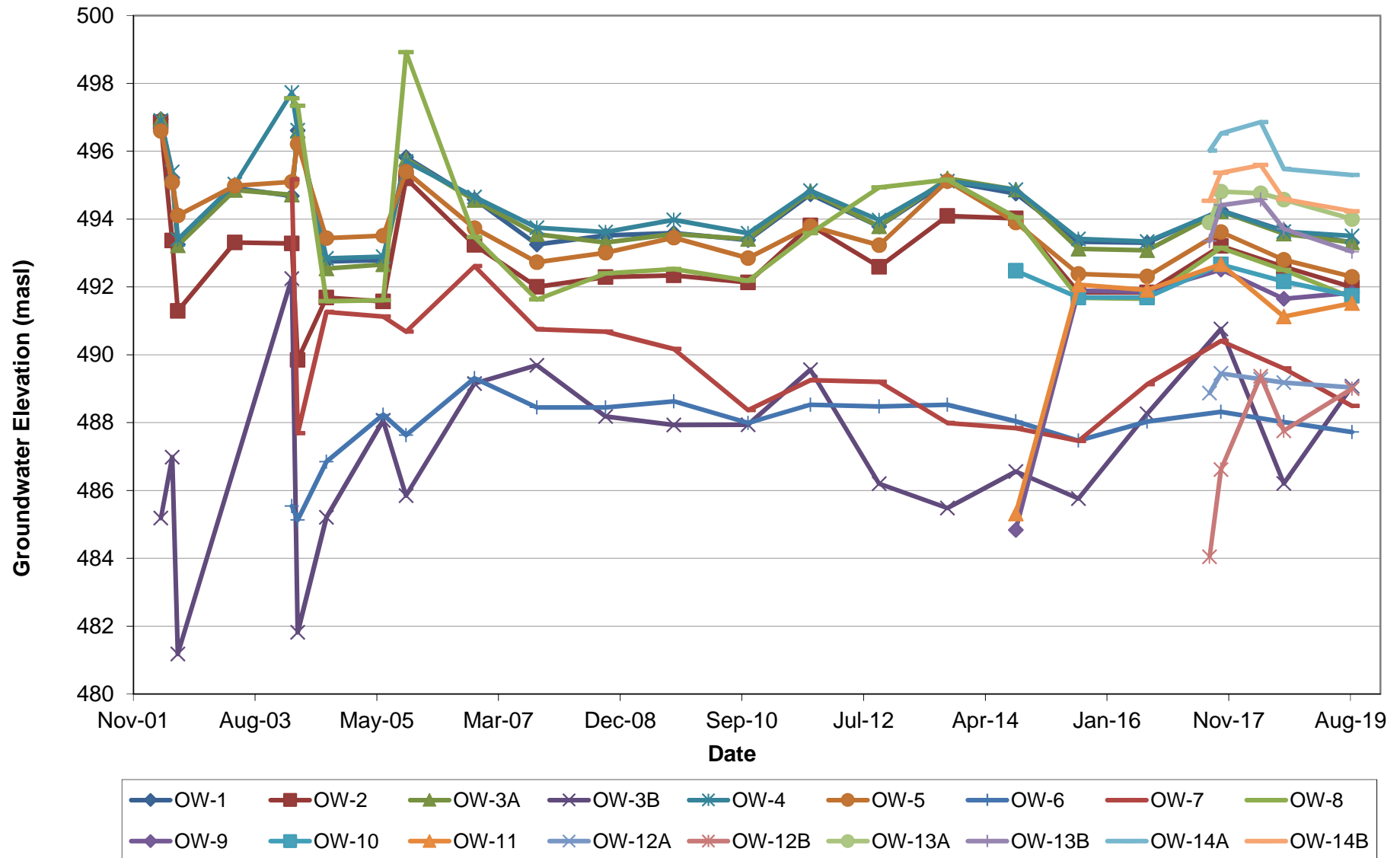
APPENDIX E

**SUMMARY OF GROUNDWATER
GEOCHEMICAL ANALYSES**

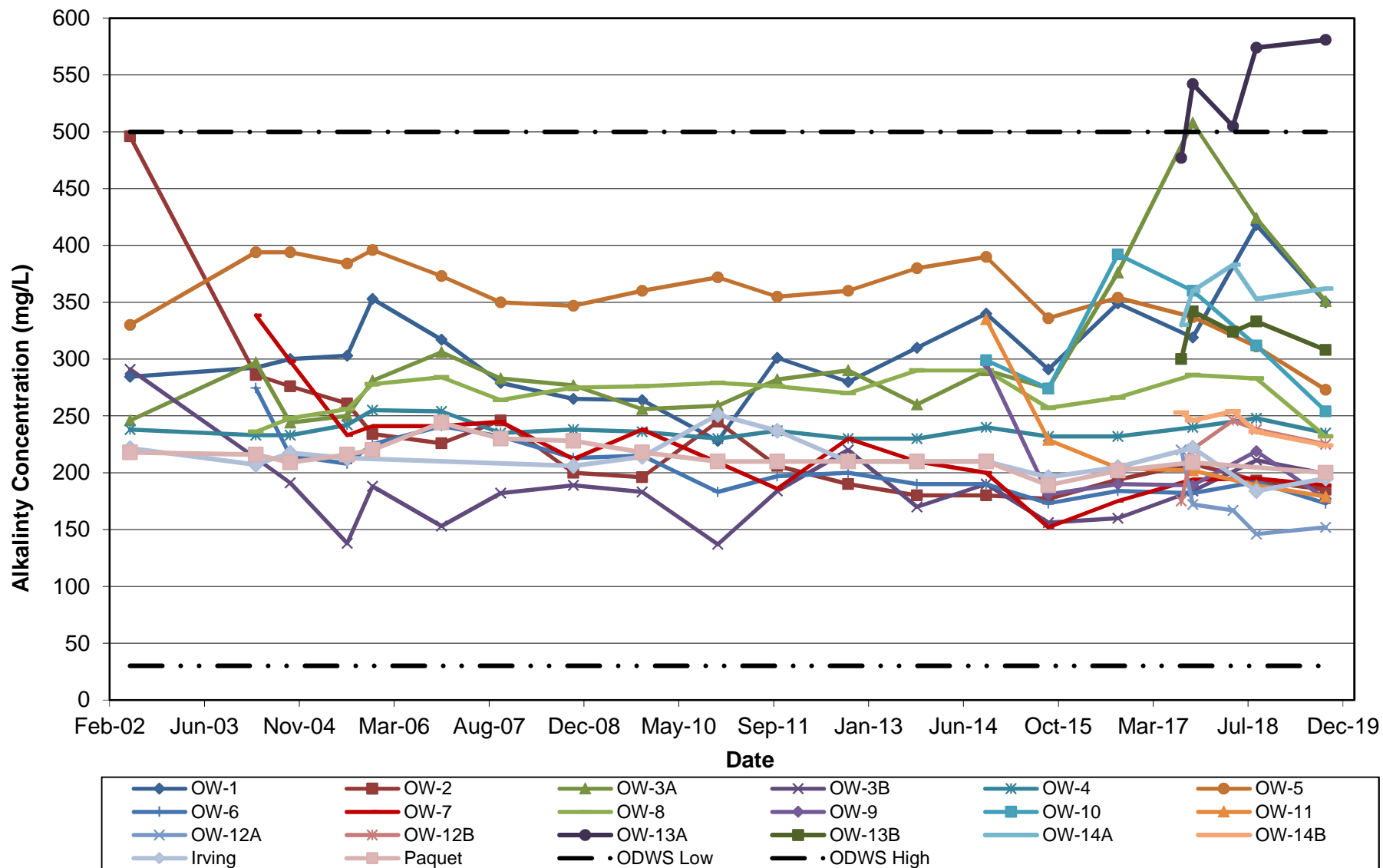
APPENDIX F

**GROUNDWATER ELEVATION AND
CHEMISTRY TREND ANALYSIS**

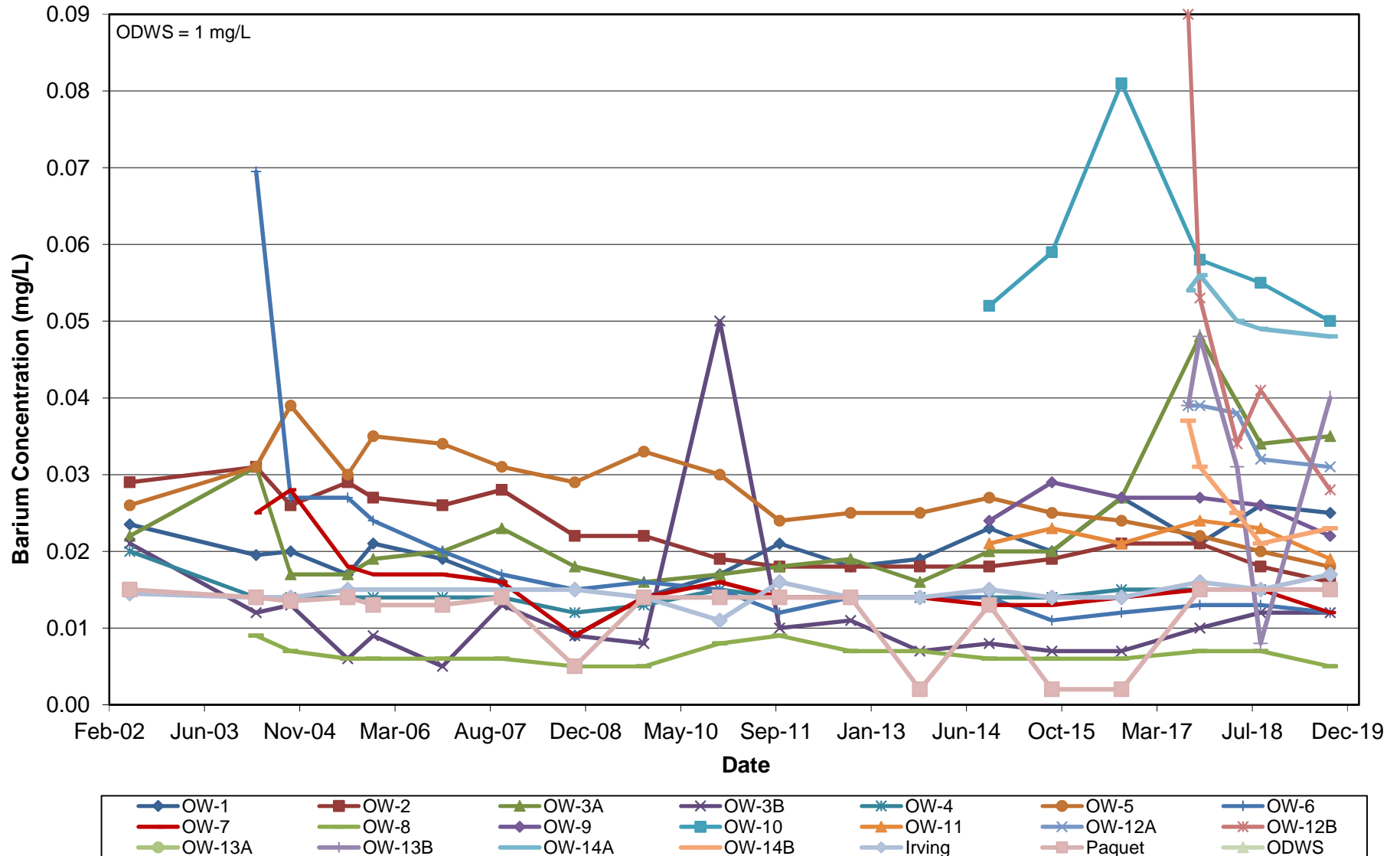
Groundwater Elevation Trend Analysis



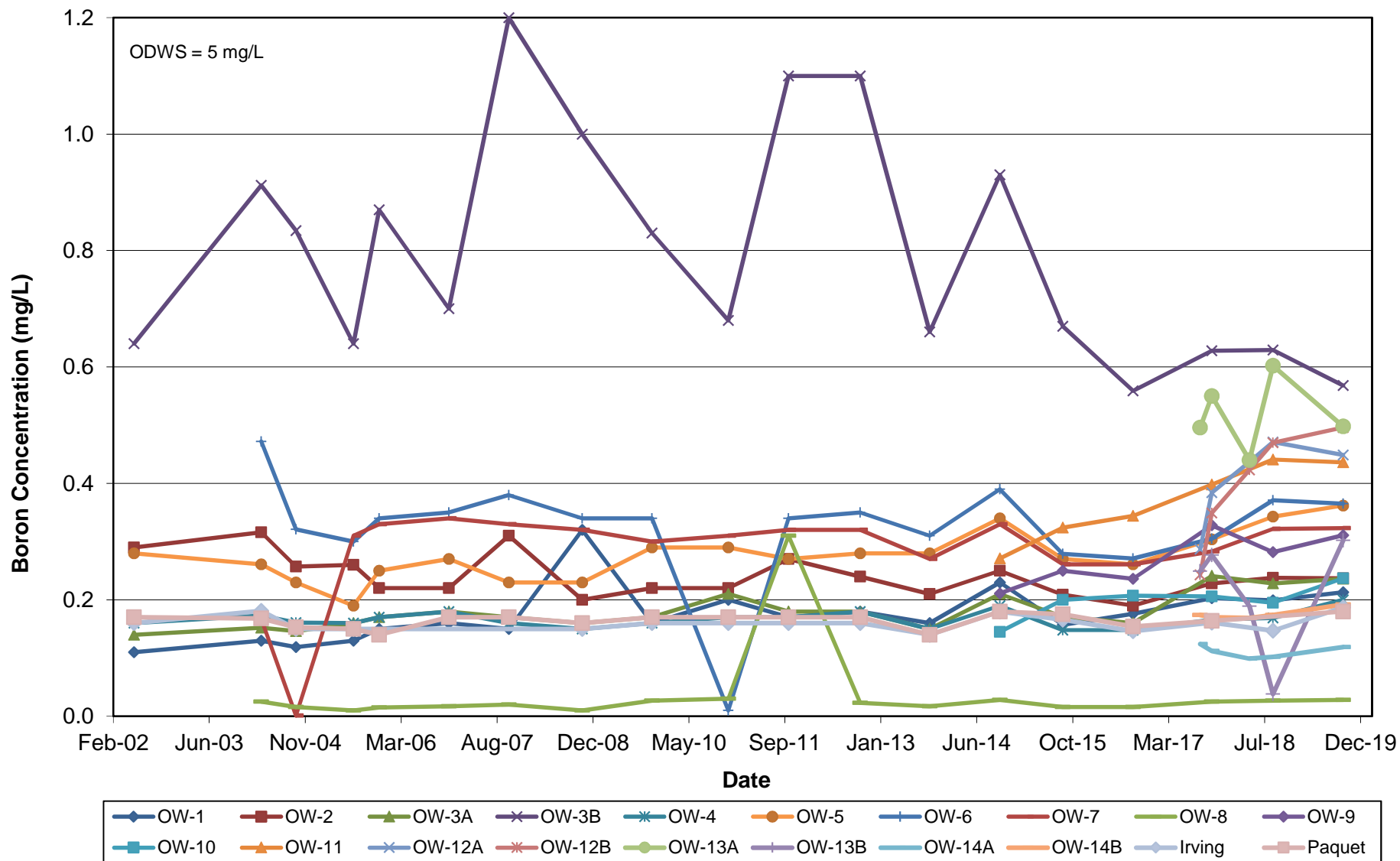
Alkalinity Trend Analysis - Groundwater



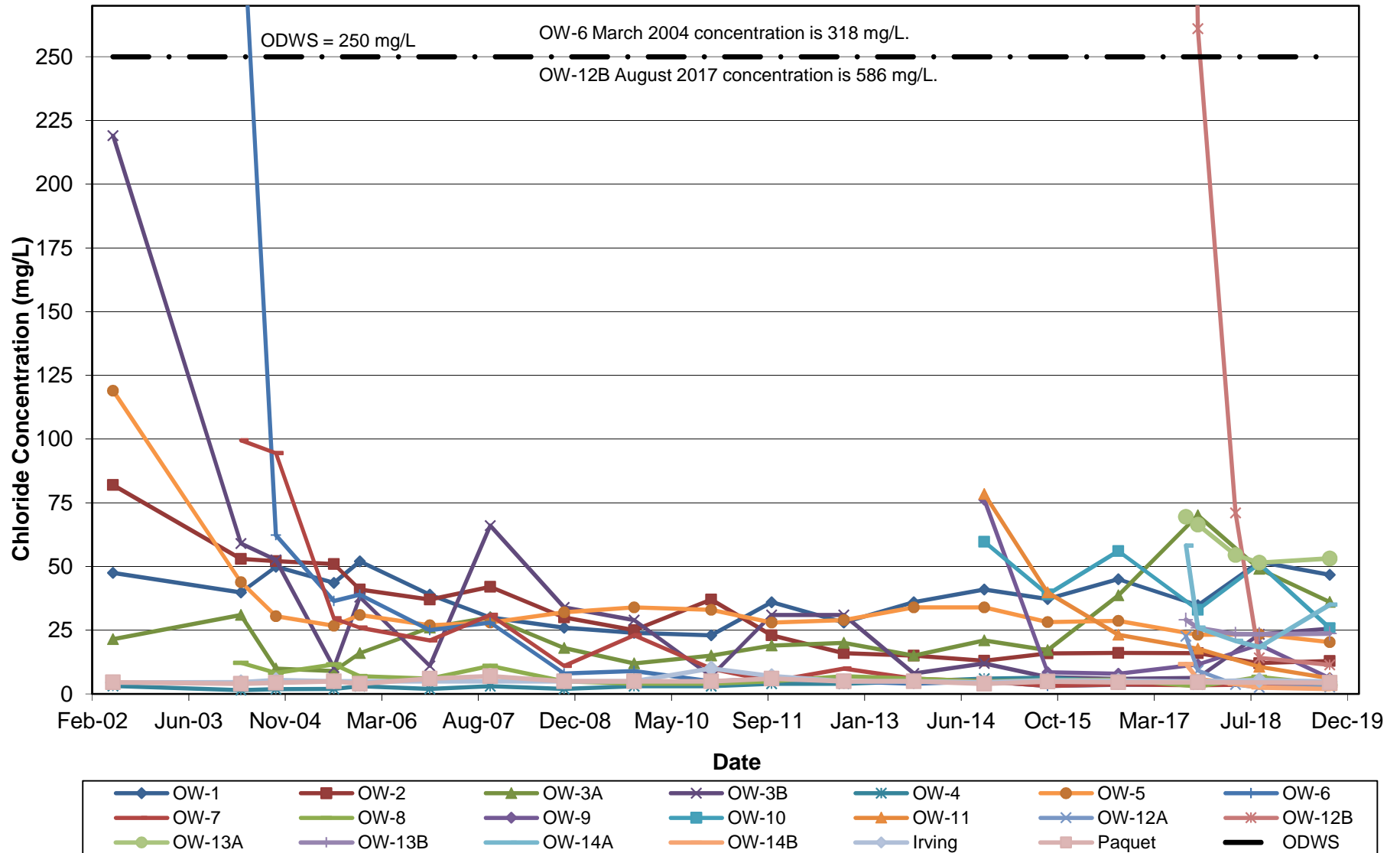
Barium Trend Analysis - Groundwater



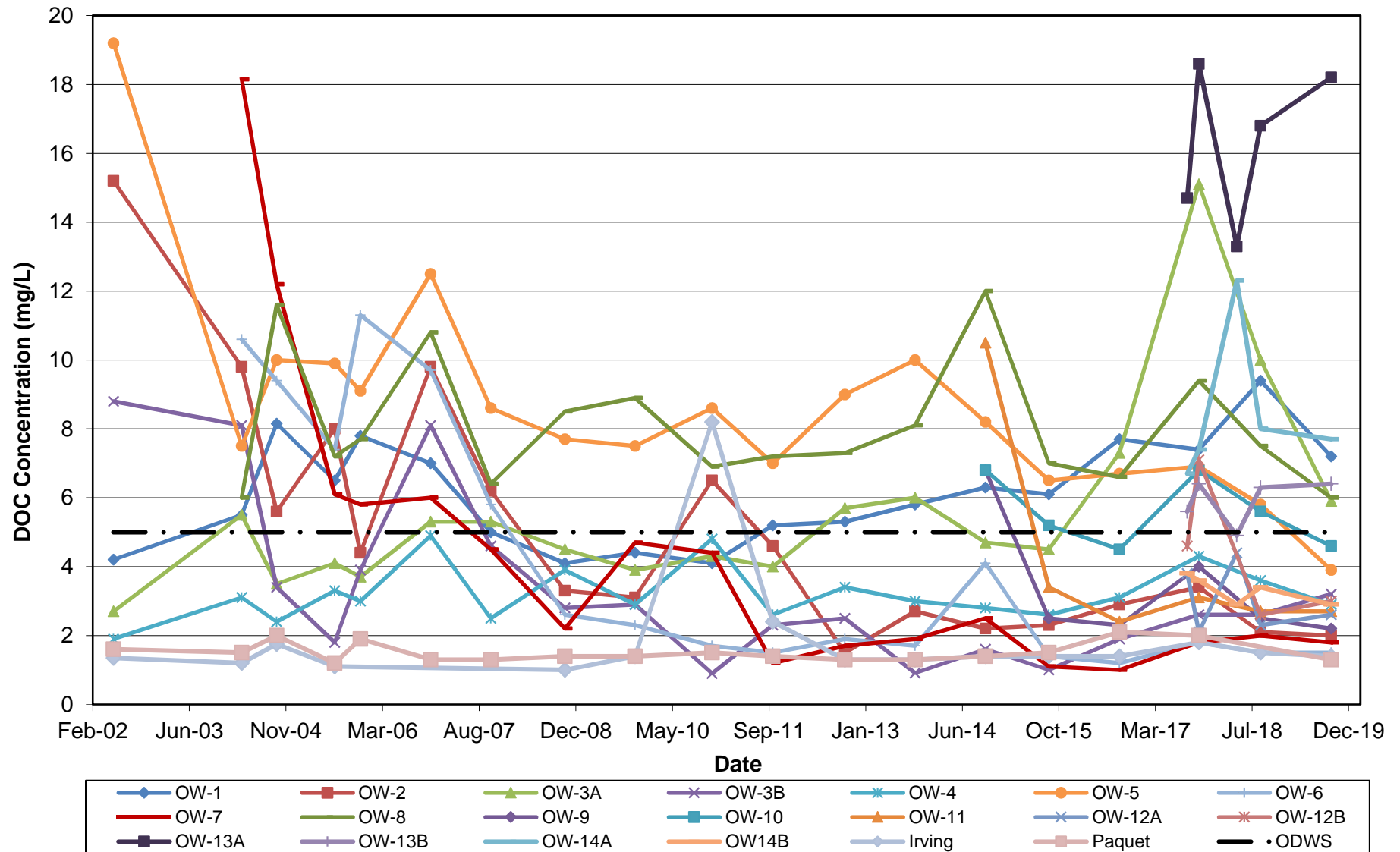
Boron Trend Analysis - Groundwater



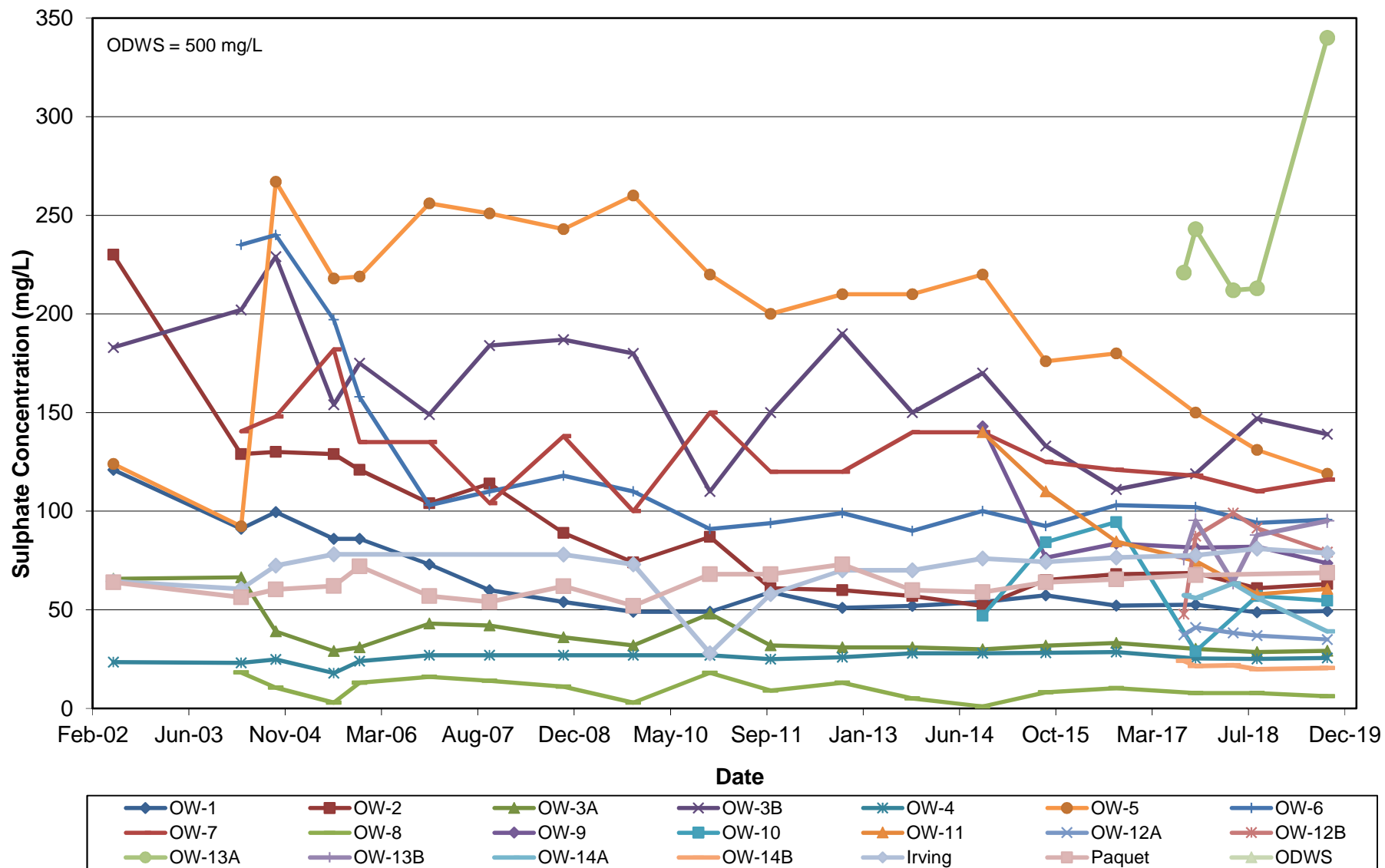
Chloride Trend Analysis - Groundwater



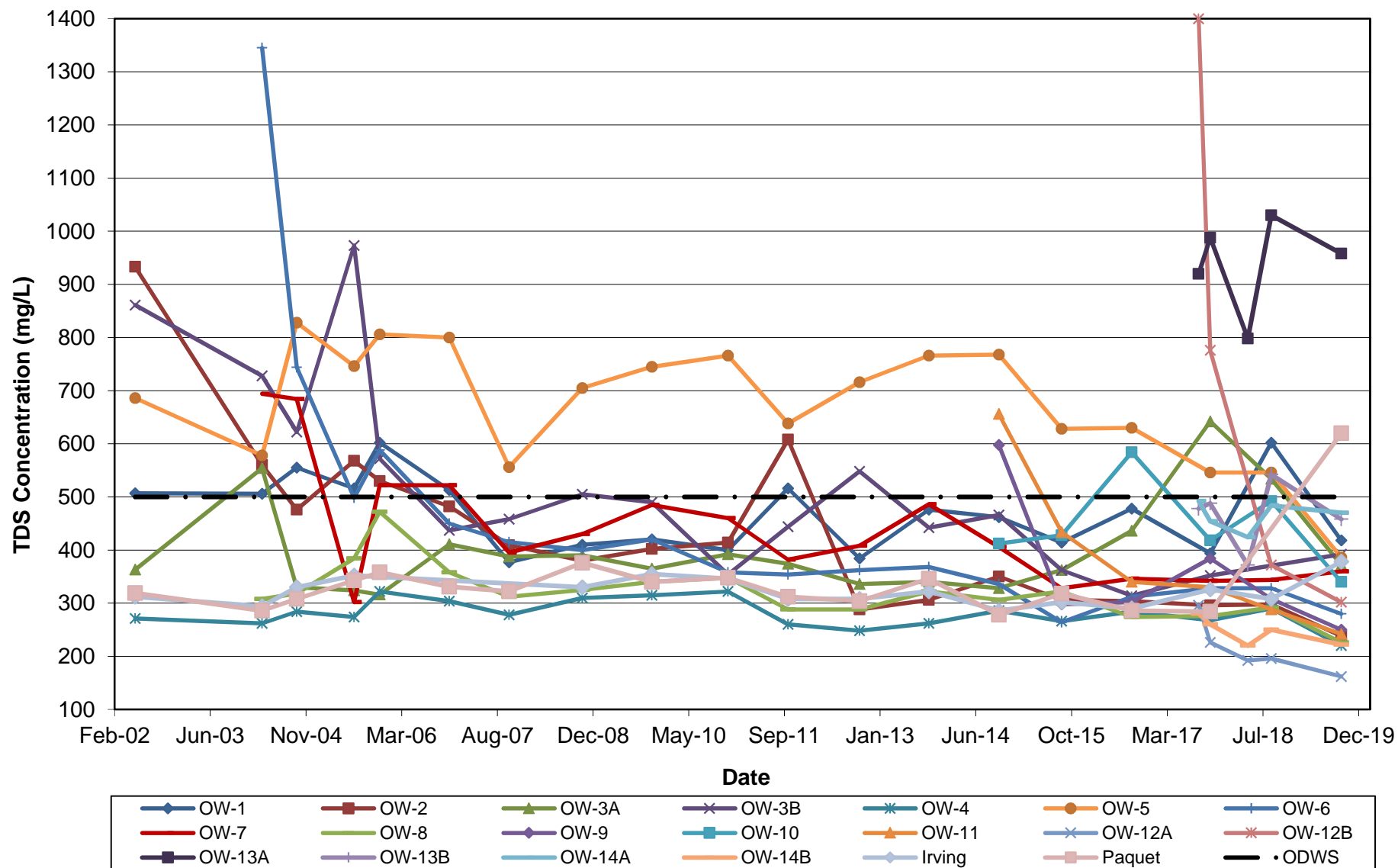
Dissolved Organic Carbon Trend Analysis - Groundwater



Sulphate Trend Analysis - Groundwater



Total Dissolved Solids Trend Analysis - Groundwater



APPENDIX G

**PHOTOGRAPHIC INVENTORY OF
GROUNDWATER MONITORING
LOCATIONS**



OW-1
2019



OW-1
2019



OW-2
2019



OW-2
2019



OW-3A
2019



OW-3B
2019



OW-3 Nest
2019



OW-4
2019



OW-4
2019



OW-5
2019



OW-5
2019



OW-6
2019



OW-6
2019



OW-7
2019



OW-7
2019



OW-8
2019





OW-9
2019



OW-10
2019



OW-11
2019



OW-11
2019



OW-12A
2019



OW-12B
2019



OW-12 Nest
2019



OW-13A
2019



OW-13B
2019



OW-13 Nest
2019



OW-14A
2019



OW-14B
2019



**OW-14 Nest
2019**



APPENDIX H
GUIDELINE B-7 CALCULATIONS

Reasonable Use Calculations (Guideline B-7)
 September 2019 Monitoring Event

Reasonable Use Calculation (Guideline B-7)				Downgradient Monitoring Wells																
Parameter	ODWS ⁽³⁾ C _r (mg/L)	Background Concentration C _b ⁽¹⁾ (mg/L)	Maximum Concentration C _m =C _b +x(C _r -C _b) (mg/L)	OW-1 (mg/L)	OW-2 (mg/L)	OW-3A (mg/L)	OW-3B (mg/L)	OW-4 (mg/L)	OW-5 (mg/L)	OW-6 (mg/L)	OW-7 (mg/L)	OW-9 (mg/L)	OW-10 (mg/L)	OW-11 (mg/L)	OW-12A (mg/L)	OW-12B (mg/L)	OW-13A (mg/L)	OW-13B (mg/L)	OW-14A (mg/L)	OW-14B (mg/L)
Health Related			x=0.25 ⁽²⁾																	
Barium	1	0.006	0.255	0.025	0.016	0.035	0.012	0.015	0.018	0.012	0.012	0.022	0.050	0.019	0.031	0.028	0.092	0.040	0.048	0.023
Boron	5	0.020	1.27	0.213	0.237	0.236	0.568	0.200	0.362	0.365	0.323	0.311	0.237	0.436	0.449	0.496	0.498	0.302	0.119	0.192
Nitrate	10	0.054	2.54	<0.25	<0.05	<0.25	0.73	<0.05	<0.10	0.17	0.24	0.06	<0.10	<0.05	<0.05	<0.10	<0.25	<0.25	<0.25	<0.05
Nitrite	1	0.013	0.26	<0.25	<0.05	<0.25	<0.10	<0.05	<0.10	<0.05	<0.10	<0.05	<0.10	<0.05	<0.05	<0.10	<0.25	<0.25	<0.25	<0.05
Non-Health Related			x=0.50 ⁽²⁾																	
Alkalinity	500	268.5	384	350	185	351	199	235	273	173	189	177	254	179	152	225	581	308	362	224
Chloride	250	5.99	128	46.7	12.9	36.1	25.6	4.93	20.3	3.53	3.18	6.20	25.8	6.09	2.72	11.4	53.2	23.7	35.0	1.94
DOC	5	7.89	7.89 ⁽⁴⁾	7.2	2.0	5.9	3.2	2.9	3.9	1.5	1.8	2.2	4.6	2.7	2.6	3.0	18.2	6.4	7.7	2.9
Sodium	200	3.82	101.9	24.0	9.55	23.4	29.9	8.56	26.6	10.5	26.6	10.4	15.0	10.7	11.0	16.2	43.8	17.1	8.10	8.58
Sulphate	500	7.72	254	49.4	63.1	29.2	139	25.6	119	95.7	116	73.6	54.6	60.6	35.0	79.3	340	95.1	39.1	20.5
TDS	500	316.3	408	418	238	372	392	220	386	280	360	250	340	242	162	302	958	458	470	222

Notes:

- (1) Average of valid sampling rounds at OW-8.
- (2) Defined according to Guideline B-7 (MECP, 1994).
- (3) ODWS - Ontario Drinking Water Standards (MECP, 2001).
- (4) Background exceeds the ODWS, therefore the maximum concentration has been set at background.
- (5) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.



APPENDIX I

**MONITORING AND 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

Monitoring Report and Site Information	
Waste Disposal Site Name	Providence Bay Waste Disposal Site
Location (e.g. street address, lot, concession)	4077 Government Road, part Lot 3, Concession 13, former Township of Carnarvon, District of Manitoulin
GPS Location (taken within the property boundary at front gate/ front entry)	401859 Easting and 5056873 Northing, Zone 17
Municipality	Central Manitoulin
Client and/or Site Owner	Municipality of Central Manitoulin
Monitoring Period (Year)	2019
This Monitoring Report is being submitted under the following:	
Certificate of Approval No.:	A550702
Director's Order No.:	
Provincial Officer's Order No.:	
Other:	

Report Submission Frequency	<input checked="" type="radio"/> Annual <input type="radio"/> Other	Specify (Type Here):
The site is:	<input checked="" type="radio"/> Active <input type="radio"/> Inactive <input type="radio"/> Closed	
If closed, specify C of A, control or authorizing document closure date:		
Has the nature of the operations at the site changed during this monitoring period?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
If yes, provide details:		
Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i. e. exceeded the LEL for methane)	<input type="radio"/> Yes <input checked="" type="radio"/> No	

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	<input checked="" type="radio"/> Yes <input type="radio"/> No	If no, list exceptions (Type Here):
2) All groundwater, leachate and WDS gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by Certificate(s) of Approval or other relevant authorizing/control document(s):	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Applicable	If no, list exceptions below or attach information.

Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
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 groundwater, leachate and WDS gas sampling and monitoring requirements have been established or defined outside of a ministry C of A, authorizing, or control document.	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable	
b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If no, list exceptions below or attach additional information.
Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
4) All field work for groundwater investigations was done in accordance with standard operating procedures 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):	<input checked="" type="radio"/> Yes <input type="radio"/> No	If no, specify (Type Here):

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

<p>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.</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>Based on the preliminary CAZ estimated during the 2018 groundwater assessment, the Site is currently in compliance, as no wells outside of the 241 m radius have quantified exceedances of the Guideline B-7 MACs during the current annual monitoring program. However, private land immediately adjacent to well nest OW-13 may not be in compliance, based on the estimated CAZ radius requirement.</p>	
<p>6) The site meets compliance and assessment criteria.</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p>	<p>Guideline B-7 exceedances were quantified for OW-1, OW-13A, OW-13B and OW-14. As above, these wells fall within the previously estimated CAZ of 241 m. Land adjacent to OW-13 wells may not be in compliance.</p>	
<p>7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>		
<p>1) Is one or more of the following risk reduction practices in place at the site:</p> <p>(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</p> <p>(b) There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or</p> <p>(c) The site meets the following two conditions (typically achieved after 15 years or longer of site operation):</p> <p><i>i.</i> The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and</p> <p><i>ii.</i> Seasonal and annual water levels and water quality fluctuations are well understood.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Note which practice(s):</p>	<p><input type="checkbox"/> (a)</p> <p><input type="checkbox"/> (b)</p> <p><input checked="" type="checkbox"/> (c)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here):</p>	

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

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

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

No changes to the monitoring program are recommended

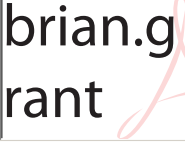

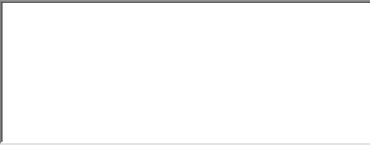
The following change(s) to the monitoring program is/are recommended:

Additional monitoring wells are recommended west of the OW-13 well nest to evaluate the need for additional CAZ land area.

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:	Brian Grant		
Seal:	Add Image		
Signature:		Date:	2-Dec-2019
CEP Contact Information:	Brian Grant, P.Eng.		
Company:	Wood Environment & Infrastructure Solutions		
Address:	131 Fielding Road, Lively, Ontario, P3Y 1L7		
Telephone No.:	705-682-2632 x 235	Fax No. :	705-682-2260
E-mail Address:	brian.grant@woodplc.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)	Lake Huron
Distance(s)	500 m west

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	<input checked="" type="radio"/> Yes <input type="radio"/> No	Former surface water monitoring program discontinued historically.
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the Certificate(s) of Approval or relevant authorizing/control document(s) (if applicable):	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not applicable (No C of A, authorizing / control document applies)	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

<p>3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry C of A or authorizing/control document.</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Applicable</p>		
<p>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:</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If no, specify below or provide details in an attachment.</p>	
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
<p>4) All field work for surface water investigations was done in accordance with standard operating procedures, 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):</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Former surface water monitoring program discontinued historically.</p>	

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):

- Yes
 No

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table below 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. C of A limit, PWQO, background	e.g. X% above PWQO
		Former surface water monitoring program discontinued historically.
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

If yes, specify (Type Here)

<p>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.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	<p>Former surface water monitoring program discontinued historically.</p>
<p>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)):</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input type="radio"/> Not Known</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If yes, provide details and whether remedial measures are necessary (Type Here)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes</p> <p><input type="radio"/> No</p> <p><input checked="" type="radio"/> Not Applicable</p>	<p>If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here)</p>

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

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

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

<p><input checked="" type="radio"/> No Changes to the monitoring program are recommended</p> <p><input type="radio"/> The following change(s) to the monitoring program is/are recommended:</p>	<p>Former surface water monitoring program discontinued historically.</p>
<p><input checked="" type="radio"/> No changes to the site design and operation are recommended</p> <p><input type="radio"/> The following change(s) to the site design and operation is/are recommended:</p>	<p>Type Here</p>

CEP Signature	brian.grant Digitally signed by brian.grant Date: 2019.12.02 17:06:42 -05'00'	
Relevant Discipline	Hydrogeologist	
Date:	2-Dec-2019	
CEP Contact Information:	Brian Grant	
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