2023 ANNUAL GROUNDWATER MONITORING REPORT

MINDEMOYA WASTE DISPOSAL SITE MINDEMOYA, ONTARIO

THE MUNICIPALITY OF CENTRAL MANITOULIN

PROJECT NO.: TY1410143
DATE: FEBRUARY 2, 2024

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February 2, 2024

Ms. Patricia Mader
The Municipality of Central Manitoulin
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Attention: Ms. Patricia Mader
Municipal Coordinator – Special Projects

Dear Madam:

Subject: 2023 ANNUAL GROUNDWATER MONITORING REPORT
MINDEMOYA WASTE DISPOSAL SITE
MINDEMOYA, ONTARIO

Please find enclosed one (1) electronic copy, in PDF format, of our Final report entitled *2023 ANNUAL GROUNDWATER MONITORING REPORT, MINDEMOYA WASTE DISPOSAL SITE, MINDEMOYA, ONTARIO*.

Yours sincerely,

WSP E&I Canada Limited

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1.0 INTRODUCTION

WSP E&I Canada Limited (WSP) was retained by The Municipality of Central Manitoulin (the Municipality) to prepare the 2023 annual groundwater monitoring report for the Mindemoya Waste Disposal Site (the Site). The following report provides a detailed evaluation and summary of the 2023 monitoring data and was completed to constitute the 2023 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 408 Elliot Road, northeast of Mindemoya, Ontario, east of the intersection of Hill Road and Elliot Road, as presented on Figure 1. The legal description of the Site is part Lot 27, Concession 2, Township of Carnarvon, Registered Plan No. 22, District of Manitoulin. The Universal Transverse Mercator (UTM) coordinates of the Site are 411220 Easting and 5067030 Northing, Zone 17, relative to the North American Datum (NAD) 83 (collected via handheld Global Positioning System (GPS), accuracy +/- 5 metres (m)). A Site plan including all monitoring locations, is presented on Figure 2.

1.2 OWNERSHIP AND KEY PERSONNEL

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

Site Contact Representative:

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1.3 DESCRIPTION AND DEVELOPMENT OF THE SITE

The Site was formerly operated under Provisional Certificate of Approval (C of A) No. A550701, issued 18 March 1980, which was replaced on 10 January 2019 with an amended Environmental Compliance Approval (ECA), provided in Appendix A. The Site is reported to have been in use, as a waste disposal site, prior to 1980 (Cambium Inc. (Cambium), 2013). Historically, the Site accepted domestic and commercial wastes; however, in the years nearing the Site closure in 2016, waste received at the Site consisted of only domestic waste originating from curbside pickup operations within the Municipality and the Site was not open for public drop-off. (Cambium, 2013). The ECA indicates an approved waste disposal area of 0.81 hectares (ha), but it does not specify a total Site area or a maximum approved capacity. The Site stopped accepting waste in June 2016 and has been graded to the final waste contours, although no final cover has been applied.

1.3.1 SITE CAPACITY

No topographical survey was undertaken in 2023, as no waste was deposited at the Site since the previous survey, completed 13 October 2017. A total volume of existing waste of approximately 37,720 cubic metres (m^3) was measured during the 2017 survey, including both waste and interim cover material.

Although no maximum allowable capacity is stated in the Site's ECA, a theoretical maximum capacity of 36,050 m^3 was previously calculated by Cambium, based on MECP approved design requirements. Based on this theoretical capacity, the Site was marginally over capacity upon closure; however, if the slopes of the fill area can be graded appropriately (i.e., per MECP landfill standards) during capping, no removal of material is necessary. It is anticipated that the Site will be capped in 2024.

1.4 MONITORING AND REPORTING PROGRAM OBJECTIVES AND REQUIREMENTS

Historical Site investigations completed by others resulted in the instrumentation of the Site with four multi-level monitoring well nests, each comprised of a deep and shallow installation. Monitoring of these eight historical monitoring wells was initiated in 2014. Although the monitoring wells were installed prior to 2014, an annual sampling program was not historically undertaken at the Site.

Four additional well nests were advanced as part of separate study undertaken by Wood Environment & Infrastructure Solutions (Wood, WSP's predecessor) on behalf of the Municipality. These additional well nests comprise multilevel installations of two or three wells per nest for a total of nine wells. The program for which the new wells were installed was intended to determine an appropriate contaminant attenuation zone (CAZ) for the Site and was submitted to the MECP by 31 March 2020, per a condition of the amended ECA. The new wells were incorporated into the annual monitoring program beginning in 2020. The locations of all groundwater monitoring wells are presented on Figure 2.

1.5 ASSUMPTIONS AND LIMITATIONS

WSP'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 WSP.
4. The objective of this report was to assess the water quality conditions at the Site, given the context of our contract, with respect to existing environmental regulations within the applicable jurisdiction.
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.
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, WSP must be notified in order that we may determine if modifications to our conclusions are necessary.
8. The utilization of WSP's services during future monitoring at the Site will allow WSP 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. WSP 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 bedrock underlying the Site area is described as dolostone of the paleozoic age of the Lockport Formation (lateral equivalent to the top of the Amabel Formation); as illustrated on Manitoulin Island Geological Compilation Map 351A from the Ontario Geological Survey (OGS, 1937). Manitoulin Island is formed of glacially-abraded dolomite and limestone bedrock pavement, widely exposed across a significant portion of the island. Pavement is defined as "a roughly horizontal exposure of limestone (or dolostone) bedrock, the surface of which is approximately parallel to its bedding and is divided into a geometrical pattern of blocks by the intersections of widened fissures" (Paterson and Chambers, 1982). Most soil deposits were stripped away during the Wisconsin period glaciation, resulting in minimal surficial deposits. Soils on the island are mainly of glacial origin and include lacustrine and outwash clays, silts, as well as sands, and occasionally underlain by glacial till (Hoffman, Wicklund, & Richards, December 1959).

Borehole logs detailing soil and groundwater conditions for the 2019 monitoring well installations are provided in Appendix B. It should be noted that the percussion drilling did not allow for core samples to be recovered during the course of drilling in 2019, although surface deposits from coring did appear fairly uniform. Soils at the Site are thin, with exposed bedrock in some areas. No borehole logs for the historical monitoring well network are available. Water well records for locations within one kilometre (km) of the Site indicate that most wells are installed at depths of between 35 m and 45 m below ground surface and are installed in limestone bedrock. These well records also indicate that overburden consists of generally between 1 m and 6 m of clay, loam, fine sand or stony overburden (Cambium, 2013).

Static water levels were recorded by WSP in each of the wells during the October/November 2023 groundwater monitoring event. Appendix C presents the groundwater elevations measured during the 2023 groundwater monitoring event. Figures 3A and 3B present the inferred groundwater elevation contours and groundwater flow directions for the shallow and deep aquifers, respectively, for the 2023 monitoring event. Groundwater flow is inferred to be radial in the immediate vicinity of the landfill, with the overall primary groundwater flow path to the northwest, comprised of components of flow towards the north and west. Both the shallow and deep aquifers appear to be topographically controlled and follow a similar flow path. The radial flow is interpreted to be due to topographic influence of the landfill mound, which is above the surrounding grade, whereas the overall groundwater flow path is interpreted to be towards Mindemoya Lake, situated approximately 2.1 km to the west 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
Well Nest MW-E	412004	5067059	Handheld GPS	+/- 5 m	Trained WSP field crew	14 October 2014
Well Nest MW-N	411925	5067103				
Well Nest MW-S	411927	5067013				
Well Nest MW-W	411828	5067057				
Well Nest MW19-01	412038	5067008				13 August 2019
Well Nest MW19-02	411815	5067085				
Well Nest MW19-03	411814	5067111				
Well Nest MW19-04	411887	5067116				

Table 2 presents a summary of the installation depths and respective on-Site positions of the groundwater monitoring wells. Background groundwater quality at the Site was previously assessed by well nest MW-S, which was considered to be situated hydraulically upgradient (i.e., south) of the landfill; however, progressive filling at the Site resulted in leachate mounding over time and localized radial groundwater flow from the waste deposits. Increasing concentrations of landfill indicator parameters were subsequently observed in the MW-S well nest during recent years and it was determined that the MW-S well nest was no longer hydraulically upgradient of the fill area and not representative of background groundwater conditions. Well nest MW19-01 was installed as a replacement background well nest, at a proximity further from the fill area and upgradient (i.e., southeast) of any potential Site-derived impacts to groundwater quality, allowing a detailed evaluation of the Site to be undertaken with respect to MECP Guideline B-7.

Well nest MW-E is situated immediately east of the fill area and is considered a downgradient monitor, given its proximity to the waste deposits and the localized radial groundwater flow from the fill pile. All remaining monitoring well nests are situated at varying distances downgradient of the fill area to the north, west and northwest and are used to assess the performance of the natural attenuation process at the Site. Recently installed well nests MW19-02, MW19-03 and MW19-04 are located the furthest downgradient, at the proposed CAZ boundary limits, and have been considered compliance wells for the purpose of this report, pending approval of the proposed CAZ by the MECP.

Repairs were made to the historical installations in August 2021, at which time the risers at well nest MW-N were repaired and the protective casing reinstalled following previously documented damage at ground surface. As a preventative measure, the protective casings on the remaining three historical well nests were reinstalled to ensure stability. During the October/November 2023 groundwater monitoring event, well nest MW-W was found in poor condition with damage to the protective casings. Repairs to this well nest should be made in 2024.

Table 2: Groundwater Monitoring Well Construction Details

Well ID	Condition	Total Depth (mbtop)[1]	On-Site Position
MW-NS	Good	8.11	Downgradient shallow
MW-ND	Good	11.75	Downgradient deep
MW-ES	Good	6.45	Downgradient shallow
MW-ED	Good	10.05	Downgradient deep
MW-SS	Good	7.42	Downgradient shallow
MW-SD	Good	11.75	Downgradient deep
MW-WS	Poor	7.54	Downgradient shallow
MW-WD	Poor	11.94	Downgradient deep
MW19-01S	Good	7.91	Upgradient shallow
MW19-01D	Good	13.17	Upgradient deep
MW19-02S	Good	7.91	Downgradient shallow
MW19-02D	Good	13.26	Downgradient deep
MW19-03A	Good	6.44	Downgradient shallow
MW19-03B	Good	7.43	Downgradient moderate
MW19-03D	Good	13.18	Downgradient deep
MW19-04S	Good	7.80	Downgradient deep
MW19-04D	Good	13.07	Downgradient shallow

Notes:

1) mbtop indicates m below top of pipe.

3.2 MONITORING FREQUENCY

Groundwater was sampled by WSP annually, during the fall. The annual monitoring event occurred between 30 October 2023 and 1 November 2023.

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 comprised static water level measurements, temperature, pH, conductivity and dissolved solids. All field equipment was maintained, calibrated, and decontaminated appropriately prior to each use.

3.4 MONITORING PROCEDURES AND METHODS

Monitoring and sample collection followed typical industry standard practices. Each groundwater monitoring well was purged prior to sampling to ensure the sample was representative of the formation water. Dedicated well instrumentation (Waterra Tube and foot valve system) was used to obtain water samples from the groundwater monitoring wells, and samples were immediately transferred to laboratory-prepared sample vials and bottles. Samples identified for metals and dissolved organic carbon analysis were field-filtered using a single use 0.45 µm filter unit, and the remaining samples were preserved following standard laboratory protocols as established in the MECP "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act, Version 3.0" ("Analytical Protocol"; MECP, 2020)".

Samples were 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 were subsequently forwarded to WSP. Laboratory analytical reports for 2023 are provided in Appendix D. The 2023 groundwater monitoring data were reviewed by comparison to the current MECP Ontario Drinking Water Quality Standards (ODWQS).

3.5 QUALITY ASSURANCE FOR SAMPLING AND ANALYSIS

WSP 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 was completed in accordance with accepted protocols. As a minimum, sampling equipment was washed with detergent solution and rinsed with distilled water between sampling locations. Decontamination procedures were undertaken to minimize cross-contamination between monitoring locations and sampling sites. Screening instruments were calibrated prior to each use.

As a minimum, for every ten groundwater samples collected, one field duplicate sample was collected and included in the laboratory submission for analysis. Two field duplicate samples were collected during the 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 and current groundwater data are provided in Appendix E and are presented on a well by well basis.

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 their 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 MW19-01S and MW19-03B and are identified as MIND-DUP1 and MIND-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 of less than 50%, with the exception of total phosphorus and copper in MIND-DUP1. These values are not interpreted to be indicative of any sampling or laboratory biases during 2023.

4.3 GROUNDWATER FLOW MONITORING

As discussed in Section 2.1, the recorded static groundwater levels indicate groundwater flow across the Site towards the northwest, with components of flow towards the north and west. Static groundwater levels are presented in Appendix C; inferred groundwater flow directions for the 2023 groundwater monitoring event are illustrated on Figures 3A and 3B.

In addition to the current groundwater elevation data, previous groundwater elevations were reviewed in order to identify trends or inconsistencies in the data. Overall, the approximate groundwater elevations reported during 2023 are consistent with those recorded during previous monitoring programs (Appendix C).

4.4 GROUNDWATER QUALITY MONITORING

Samples were collected from all of the 17 groundwater monitoring wells during the fall 2023 monitoring event. The obstruction in MW19-03A was removed and the well was successfully sampled in 2023. Data summary tables are provided in Appendix E. A photographic inventory of the monitoring wells is provided in Appendix F. The condition of each monitoring well was assessed during the 2023 monitoring event, with one noticeable requirement for maintenance or repair. The well nest protective casing at MW-W, was noticed to be leaning at

approximately a 45-degree angle prior to sampling efforts during the 2023 event. Well nest MW-W should be repaired by an MECP licenced well contractor in 2024 to facilitate future sampling efforts at this well nest.

4.4.1 BACKGROUND WATER QUALITY

Background water quality in upgradient monitoring well nest MW19-01 is generally characterized by low concentrations of chloride and metals parameters, when compared to the ODWQS. While water quality is generally similar in the shallow and deep installations, concentrations of alkalinity, DOC, TDS, iron and manganese are elevated in MW19-01S, in comparison to MW19-01D. Three ODWQS exceedances were quantified at the well nest during the 2023 monitoring event, namely iron and manganese, in MW19-01S, and iron in MW19-01D, as indicated by a bold entry in the associated data summary table provided in Appendix E. Detectable concentrations of toluene were quantified in both wells during a recent monitoring event (2021), at levels below the ODWQS, however, toluene and the other VOCs concentrations were all below the laboratory detection limits in 2022 and 2023. These results are considered to be representative of Site-specific background water quality in the aquifers intersected by the well screens.

4.4.2 NEARFIELD DOWNGRADIENT WATER QUALITY

Nearfield groundwater quality is characterized by the historical monitoring well network and includes monitoring well nests MW-S, MW-E, MW-N and MW-W. Groundwater quality in MW-S is generally characterized by similar water quality in the shallow and deep installations and elevated concentrations of most parameters in comparison to background wells MW19-01S and MW19-01D. Multiple ODWQS exceedances were quantified at the well nest during the 2023 monitoring event, including alkalinity, DOC, TDS, iron and manganese in MW-SS and alkalinity, DOC, TDS and manganese in MW-SD, as indicated by a bold entry in the associated data summary table provided in Appendix E. A detectable concentration of toluene was quantified in MW-SD and MW-ED, at a level below the ODWQS, in previous years, but was not detected during the 2023 monitoring event. Groundwater quality in well nest MW-E is characterized by slightly higher concentrations of landfill indicator parameters in MW-ED than in MW-ES, with both wells exhibiting water quality similar to background. Multiple ODWQS exceedances were quantified at MW-ED during the 2023 monitoring event, including alkalinity, TDS, iron, and manganese, as indicated by a bold entry in the associated data summary table provided in Appendix E.

Well nests MW-N and MW-W are considered nearfield monitors but are situated further downgradient from the fill area than MW-S and MW-E and in the direction of overall groundwater flow. Groundwater quality in well nest MW-N is generally characterized by concentrations of landfill indicator parameters similar to background, with similar water quality quantified in the shallow and deep installations. One ODWQS exceedance was quantified at the MW-N well nest during the 2023 monitoring event, namely manganese, in MW-ND, as indicated by a bold entry in the associated data summary table provided in Appendix E. At well nest MW-W, an impact to water quality is apparent historically in both the shallow and deep wells, with higher concentrations of indicator parameters quantified in MW-WS, as compared to MW-WD. However, during the 2023 monitoring event, higher concentrations of indicator parameters were seen in MW-WD, as compared to MW-WS.

Given the similarity of the water quality characteristics quantified in shallow and deep installations at the four historical well nests, and the installation of the nested wells within the same borehole at each historical well nest, it is possible that the integrity of the hydraulic seals at these nested locations may be compromised. Groundwater may be infiltrating from the shallow aquifer to the screened layer in the deep well installation due to an inadequate annular well seal.

4.4.3 FARFIELD DOWNGRADIENT WATER QUALITY

Farfield groundwater quality is characterized by recently installed well nests MW19-02, MW19-03 and MW19-04, which are considered representative of the downgradient property boundaries for the purpose of this report. It is

noted that all three well nests are downgradient of the current property boundary and are situated at the proposed CAZ, which is pending approval by the MECP.

Groundwater quality in well nest MW19-02, situated to the northwest of the fill area and east of the proposed CAZ, is generally characterized by concentrations of most leachate parameters at levels generally similar to background in both the shallow and deep monitoring wells. There is a slight variation in water quality between the shallow and deep aquifers at this well nest, but, despite the minor differences in water quality characteristics, neither well is interpreted to indicate a measurable impact to water quality. One ODWQS exceedance was quantified at MW19-02D during the 2023 monitoring event, namely manganese, as indicated by a bold entry in the associated data summary table provided in Appendix E.

Well nest MW19-03, situated in the northwest corner of the proposed CAZ and comprises three wells, MW19-03A, MW19-03B and MW19-03D, which monitor groundwater at shallow, moderate and deep installation depths, respectively. Groundwater quality in MW19-03A and MW19-03B indicates concentrations of landfill indicator parameters at levels similar to background. A detectable concentration of toluene was quantified in MW19-03B in 2021, at a level below the ODWQS, however during 2022 and 2023, the levels of toluene were reported at concentrations below the laboratory detection limit. A slightly different water quality is apparent in MW19-03D, as compared to the shallower installations at this location. Select parameters, including chloride, TDS, sulphate, barium, boron, magnesium, and potassium were quantified at elevated concentrations in MW19-03D, in comparison to background water quality; however, it is not evident that potential groundwater impacts are occurring at this location and installation depth. No ODWQS exceedances were quantified at well nest MW19-03 during the 2023 monitoring event.

Water quality in well nest MW19-04, situated at the north boundary of the proposed CAZ, is generally characterized by concentrations of indicator parameters at levels similar to background in MW19-04S and marginally elevated concentrations of select parameters in MW19-04D. A detectable concentration of toluene was quantified in MW19-04S during 2021, at a level below the ODWQS, however during 2022 and 2023, the levels of toluene were reported at concentrations below the laboratory detection limit. The marginally elevated parameter concentrations in MW19-04D are not interpreted to indicate a significant impact to groundwater quality. No ODWQS exceedances were quantified at well nest MW19-04 during the 2023 monitoring event.

4.4.4 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: Fall 2023 Groundwater Field Parameter Measurements

Well ID	Temperature (°C)	pH	Conductivity (uS/cm)	Dissolved Solids (mg/L)
MW-SD	6.8	7.27	2077	1039
MW-SS	6.0	7.2	2142	1071
MW-ES	6.2	7.56	554	277
MW-ED	7.4	7.55	1307	654
MW-NS	6.3	8.98	603	302
MW-ND	7.7	8.23	700	350
MW-WS	9.2	7.64	739	370
MW-WD	6.9	7.81	986	493
MW19-01S	8.6	7.16	553	277
MW19-01D	4.1	8.09	540	270
MW19-02S	8.5	7.23	658	329
MW19-02D	7.9	7.86	575	288
MW19-03A	7.7	7.06	611	306
MW19-03B	7.1	7.17	630	315
MW19-03D	4.1	7.62	641	321
MW19-04S	6.7	7.54	615	308
MW19-04D	4.0	7.95	623	312

5.0 ASSESSMENT, INTERPRETATION AND DISCUSSION

5.1 GROUNDWATER CHEMISTRY ANALYSIS

The groundwater major ion chemistry analyses for the 2023 monitoring event are presented in a Tri-Linear Piper Plot on Figure 4. A table depicting the calculations used to quantify the geochemical data is presented in Appendix G. The Piper diagram plots the major ions as percentages of milli-equivalents (meq) in two base triangles. The total cations and the total anions are set equal to 100% and the data points in the two triangles are projected onto an adjacent grid.

The positions of the monitoring wells on the Piper Plot indicate generally similar water quality across the Site, with the exception of the MW-S well nest, which indicates an impact to water quality in both the shallow and deep installations, as displayed by a shift away from the interpreted background water quality on the Piper diagram. Remaining shallow monitoring wells illustrate an almost identical water quality, given their common placement on the diagram.

Deep well installations at the historical well nests are placed on the diagram in the same grouping as the shallow installations, which indicates further evidence that the hydraulic seals in the historical monitoring well network may have become compromised. The two deep downgradient wells indicate the same water chemistry at the west and northwest boundaries of the proposed CAZ.

5.2 GROUNDWATER TREND ANALYSIS

The current and previous groundwater elevation and water quality data were reviewed with the objective of identifying apparent trends or inconsistencies in the monitoring record. With respect to the groundwater elevations, the available data indicate relatively stable elevations at the historical monitoring wells over time (Appendix H). Groundwater elevations recorded in recently installed monitoring wells during the September 2019 monitoring event appear to be the result of drilling effects and incomplete water level recovery following drilling and are not likely representative of actual groundwater elevations. All wells reported high groundwater elevations during the November 2019 monitoring event; these elevations are interpreted to be accurate and indicative of a high seasonal water table at the time of the event.

A series of time-concentration graphs were developed for several select typical groundwater landfill indicator parameters (including arsenic, barium, boron, chloride, DOC and TDS) for historical monitoring wells from 2014 to 2023. It is noted that the results for the recent installations, with the exception of MW19-01S, for the initial monitoring event in September 2019 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 the initial sampling event. As indicated above, this is likely the result of drilling effects, resolved following further well purging. These time-concentration graphs are presented in Appendix H.

The available data generally indicate stable concentrations of landfill indicator parameters throughout the monitoring record at most of the groundwater monitoring locations (Appendix H). All monitoring locations show stable concentrations of arsenic over time, with the exception of MW-ED, where concentrations of arsenic are elevated in comparison to the remainder of the monitoring network but indicate a decreasing trend over time. A similar trend is apparent at MW-ED for barium, however, an increase can be seen for the 2023 groundwater monitoring event. Concentrations of barium, boron, chloride, DOC and TDS are elevated in MW-SS and MW-SD as

compared to the remaining historical monitoring wells. Increasing trends are also noted at these wells for boron. Concentrations of all tested parameters at the MW-N, MW-W, MW19-02, MW19-03 and MW19-04 well nests are low (in comparison to background) and stable over time. Once the landfill is capped, the rate of leachate release from the waste pile should decrease; it is therefore expected that the concentrations of indicator parameters in downgradient wells will decrease over time.

5.3 GUIDELINE B-7

In September 1986, a guideline 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 referred to now as Guideline B-7. Simply stated, Guideline B-7 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 Mindemoya Waste Disposal Site, the highest end use for groundwater on the adjacent properties is for drinking water purposes, for which the ODWQS - Table 1 through Table 4 have been established. The purpose of the ODWQS 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). As such, operational guidelines have been established within the ODWQS 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, the geometric mean of the valid concentrations of each applicable ODWQS parameter from well nest MW19-01 is calculated, and the resultant values are factored in along with the ODWQS, to complete a Guideline B-7 analysis for all of the on-Site groundwater monitoring wells for various landfill indicator parameters. Appendix I presents the Guideline B-7 calculations for the fall 2023 monitoring results that have been developed using valid background analytical data observed in MW19-01S and MW19-01D. As discussed above, the results of the initial sampling event conducted in September 2019 do not appear to be representative for MW19-01D. As these results are not considered valid, that data set has not been included in the background geometric mean calculations for the deep aquifer.

It should be noted that these Guideline B-7 values are much lower (i.e., more stringent) than the ODWQS, and a well-by-well comparison of the performance of each of the parameters at all of the downgradient property boundary monitoring wells is also presented in Appendix I for the 2023 monitoring event. Comparing concentrations observed in the monitoring wells during the 2023 sampling event to the maximum allowable concentrations, no exceedances were noted.

The guideline B-7 calculations are provided in Appendix I. Confirmation of these interpretations through additional, regularly scheduled sampling in 2024 is recommended.

5.4 ADEQUACY OF THE MONITORING PROGRAM

It is WSP'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, particularly given that the Site is now closed. The Monitoring and Screening Checklist is provided in Appendix J.

6.0 CONCLUSIONS

Based on the results of the current (2023) monitoring program, the following conclusions have been made:

1. The Site is no longer receiving waste and is marginally over capacity based on the theoretical capacity calculated previously by Cambium. If the side and top slopes of the fill area can be graded according to MECP landfill standards prior to site closure, removal of material can be avoided.
2. Groundwater movement at the Site was determined by static groundwater level measurements recorded at each of the monitoring wells as being radial in the immediate vicinity of the landfill, with the overall primary groundwater flow path to the northwest, comprised of components of flow towards the north and west.
3. A measurable impact to groundwater quality is noted in nearfield downgradient well nest MW-S, which quantifies elevated concentrations of landfill indicator parameters such as alkalinity, DOC and TDS, in comparison to upgradient background monitoring well nest MW19-01. No significant impact to groundwater quality is inferred in farfield downgradient monitoring wells.
4. Three distinct water types are apparent at the Site, with most monitoring wells, including background wells, sharing a similar water chemistry. Well nest MW-S indicates an impacted water type, while deep downgradient boundary wells indicate a water type different from both background and impacted locations, possibly due to differences in bedrock composition at these depths and locations.
5. Increasing trends are apparent at the MW-S well nest for boron, while decreasing trends for some parameters are noted at MW-ED. Concentrations are stable over time at remaining historical monitoring wells.
6. There were no exceedances of Guideline B-7 in 2023.
7. Attenuation of leachate indicator parameters is noticeable with distance from the landfill, therefore, the Site is continuing to operate as designed, as a natural attenuation type facility, with results reported during 2023 generally consistent with those quantified during previous monitoring programs.

7.0 RECOMMENDATIONS

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

- The Municipality should continue with the current frequency of groundwater monitoring, so that variations for certain parameters could be documented and understood.
- Groundwater elevations at all existing monitoring wells should continue to be measured during the annual groundwater sampling round to further confirm groundwater flow directions.
- The Site should be capped, as the addition of low permeability final cover material will significantly reduce infiltration and subsequently reduce leachate generation at the Site. A measurable improvement in groundwater quality in the immediate vicinity of the Site is expected following final capping.
- It is possible that the integrity of the hydraulic seals in nearfield monitoring well nests MW-S, MW-E, MW-N and MW-W may be compromised. It is recommended that an assessment through hydraulic testing be conducted at these monitoring wells to verify integrity of the seals and to determine if replacement of these wells would be warranted.
- Monitoring well nest MW-W, which was reported to be damaged during the 2023 monitoring period, should be repaired or abandoned in accordance with O.Reg. 903. A replacement should be installed if the well cannot be repaired.

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,

WSP E&I Canada Limited



Mikayla Bechard, B.Sc.	Dirk Scheurlen, C.Tech	Larry Rodricks, P.Eng.
Environmental Scientist	Senior Technical Consultant	Senior Associate Engineer

9.0 REFERENCES

Ontario Ministry of Environment, Conservation and Parks (MECP), Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality, Version 3.1, 19 February 2021.

Williams, M Y, 1937: Geological Survey of Canada, Manitoulin Island Geological Compilation, "A" Series Map 351A, 1937, 1 sheet, Map, scale 1:253,440, 1937.

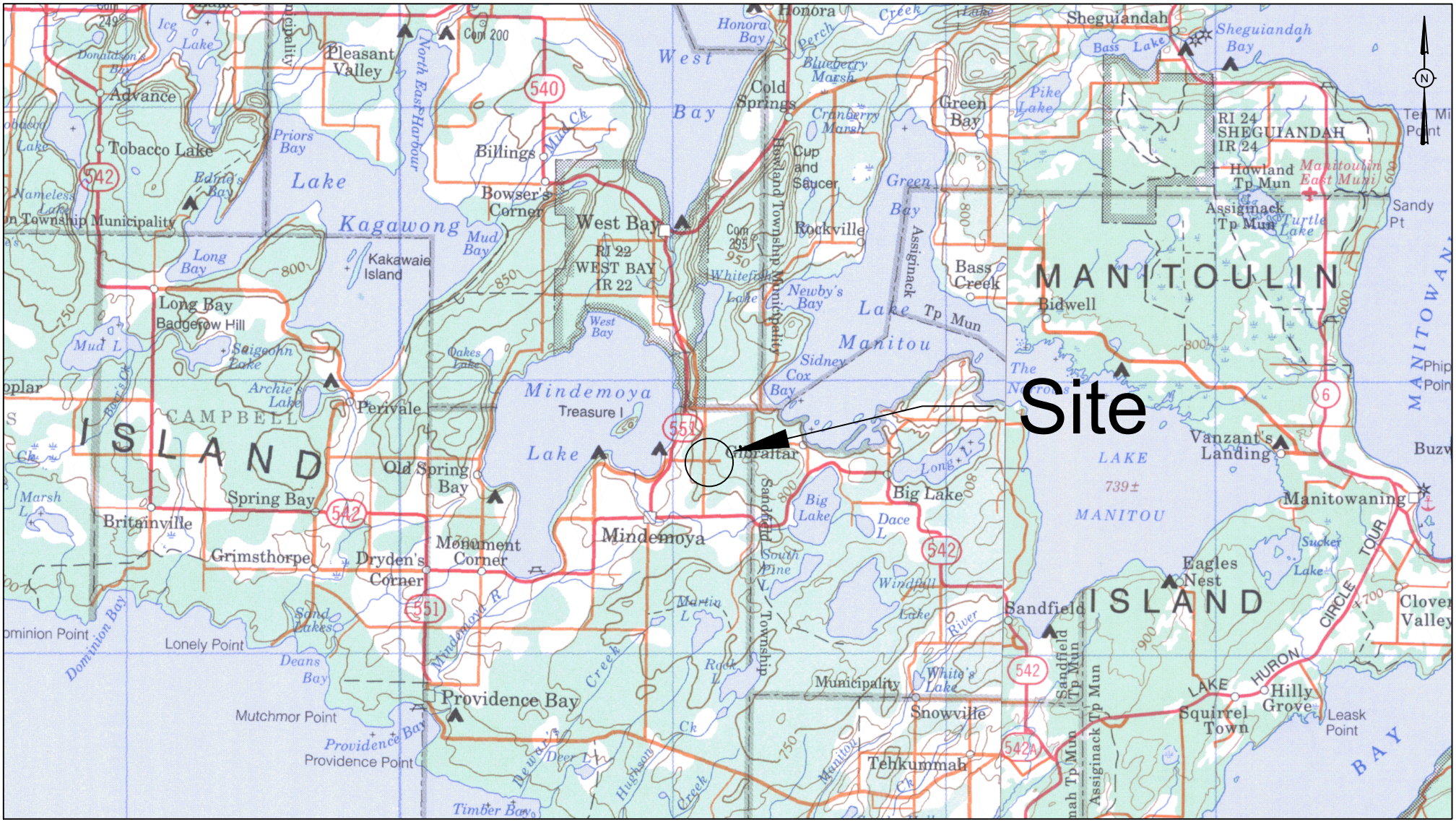
Canadian Council of Ministers of the Environment (CCME), Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment, Volume 4 Analytical Methods, PN1557, ISBN 978-1-77202-032-8 PDF, 2016.

Ontario Ministry of Environment, Conservation and Parks (MECP), Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality, Version 3.1, 19 February 2021.

Ontario Ministry of Environment (MOE), Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines, June 2006.

Ontario Ministry of Environment (MOE), Guideline B-7: Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities and associated Procedure B-7-1: Determination of Contaminant Limits and Attenuation Zones, April 1994.

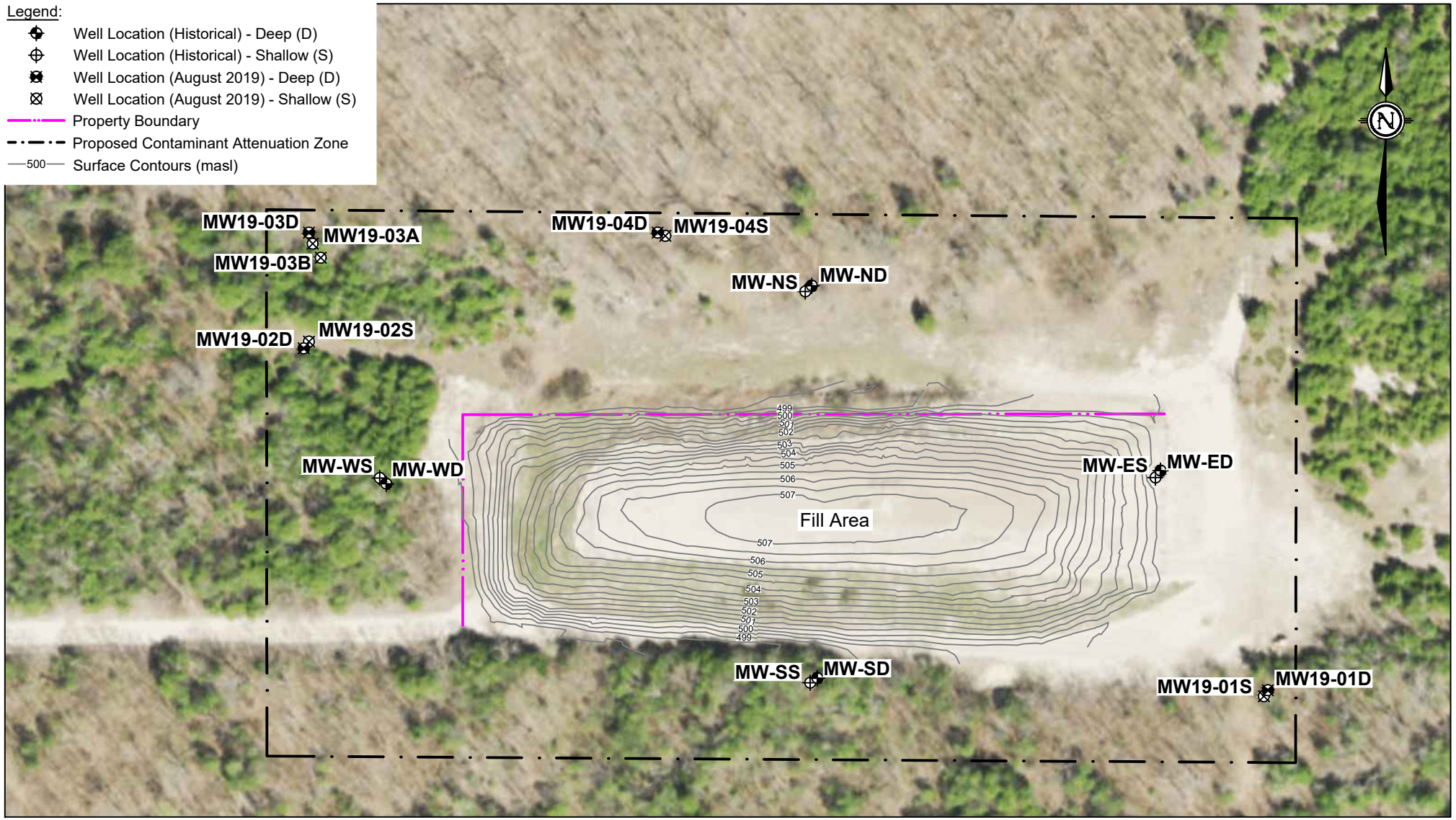
Figures



Notes:
1. Base map from Natural Resources Canada.

CENTRAL MANITOULIN Come home to the heart of it all.	The Municipality of Central Manitoulin	DWN BY: KJ CHK'D BY: DG	PROJECT 2023 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site	REV. NO.: 0 DATE: December 2023
WSP E&I Canada Limited 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1	wsp	Datum: Zone 17 SCALE: as shown	TITLE Site Location Map	PROJECT NO: TY1410143 FIGURE NO: 1

X:\CA\CALVY100-SUD\ProjectF$\projects\2014 Projects\Environmental\TY141014 Central Manitoulin -Landfill Monitoring\TY1410143 2019-2023\2023\04_EngTech\Mindemoya\Drafting\TY1410143 Central Manitoulin - Mindemoya 2023 AMR REV3.dwg - (1) - Dec. 14, 2023 12:25pm - wds_kyle.johnson



Notes:
1. Base image taken from the Ministry of Natural Resources and Forestry.
2. Survey provided by Keatley Surveying Ltd. dated 2 October 2019.

0 20 40 60
Approximate Scale (m)

CENTRAL MANITOULIN Come home to the heart of it all.	The Municipality of Central Manitoulin	DWN BY: KJ CHK'D BY: DG	PROJECT 2023 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site	REV. NO.: 0 DATE: December 2023
WSP E&I Canada Limited 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1	wsp	Datum: Zone 17 SCALE: as shown	TITLE Site Plan	PROJECT NO: TY1410143 FIGURE NO: 2

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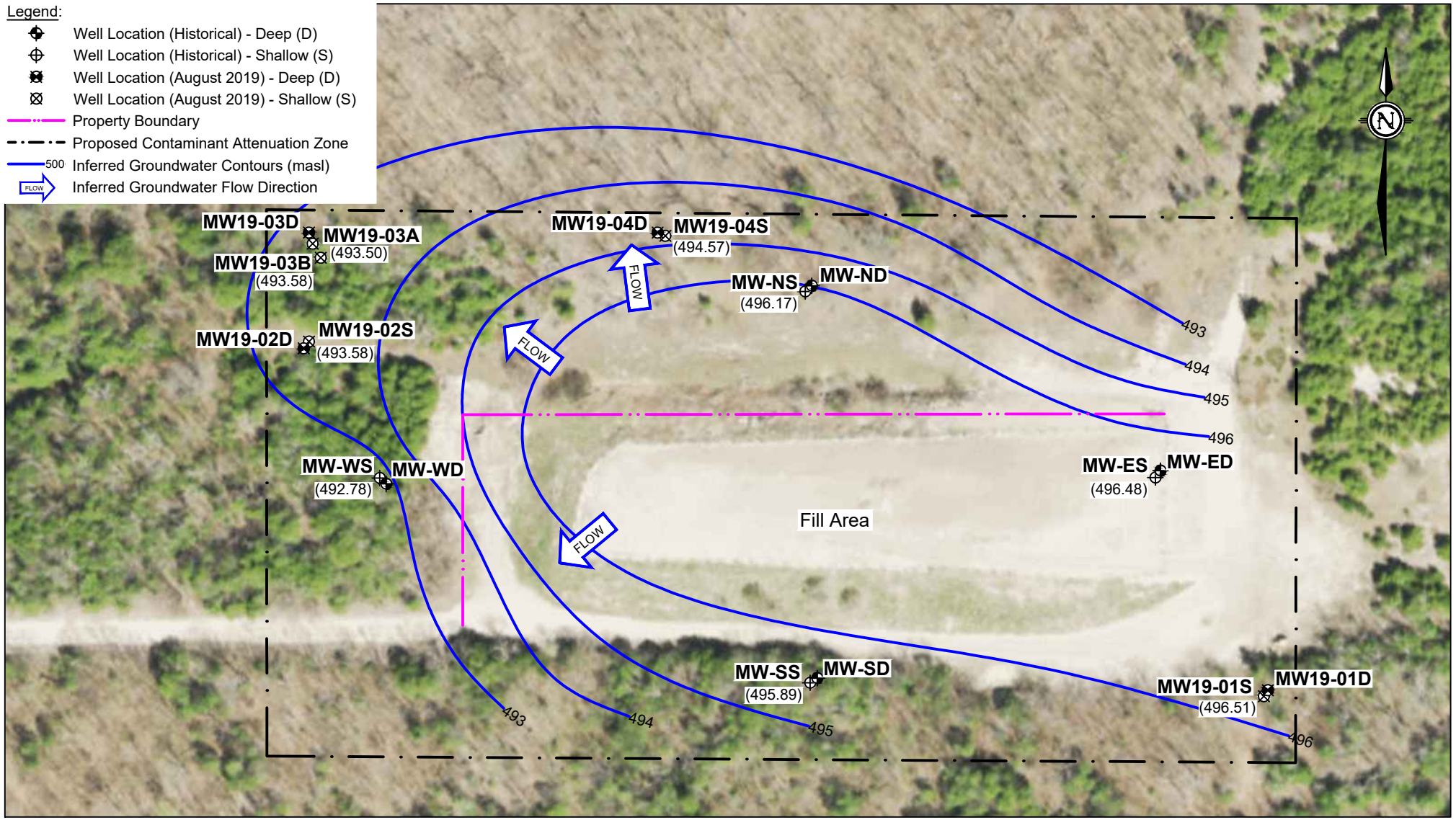

Notes:
1. Base image taken from the Ministry of Natural Resources and Forestry.
2. Survey provided by Keatley Surveying Ltd. dated 2 October 2019.

0 20 40 60
Approximate Scale (m)

CENTRAL MANITOULIN Come home to the heart of it all.	The Municipality of Central Manitoulin	DWN BY: KJ CHK'D BY: DG	PROJECT: 2023 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site	REV. NO.: 0 DATE: December 2023
WSP E&I Canada Limited 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1	wsp	Datum: Zone 17 SCALE: as shown	TITLE: Inferred Shallow Groundwater Contours October 2023	PROJECT NO: TY1410143 FIGURE NO: 3A

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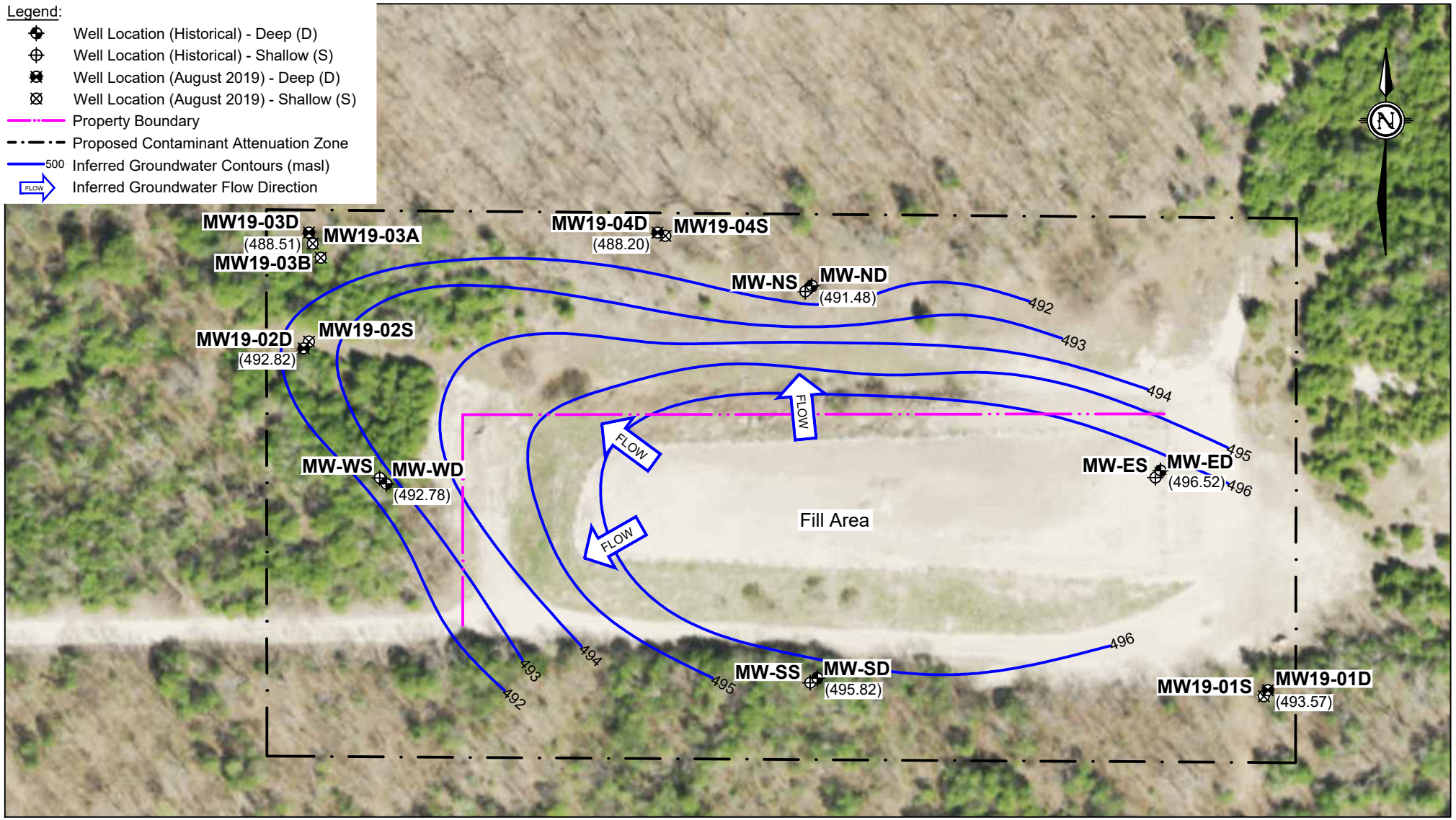
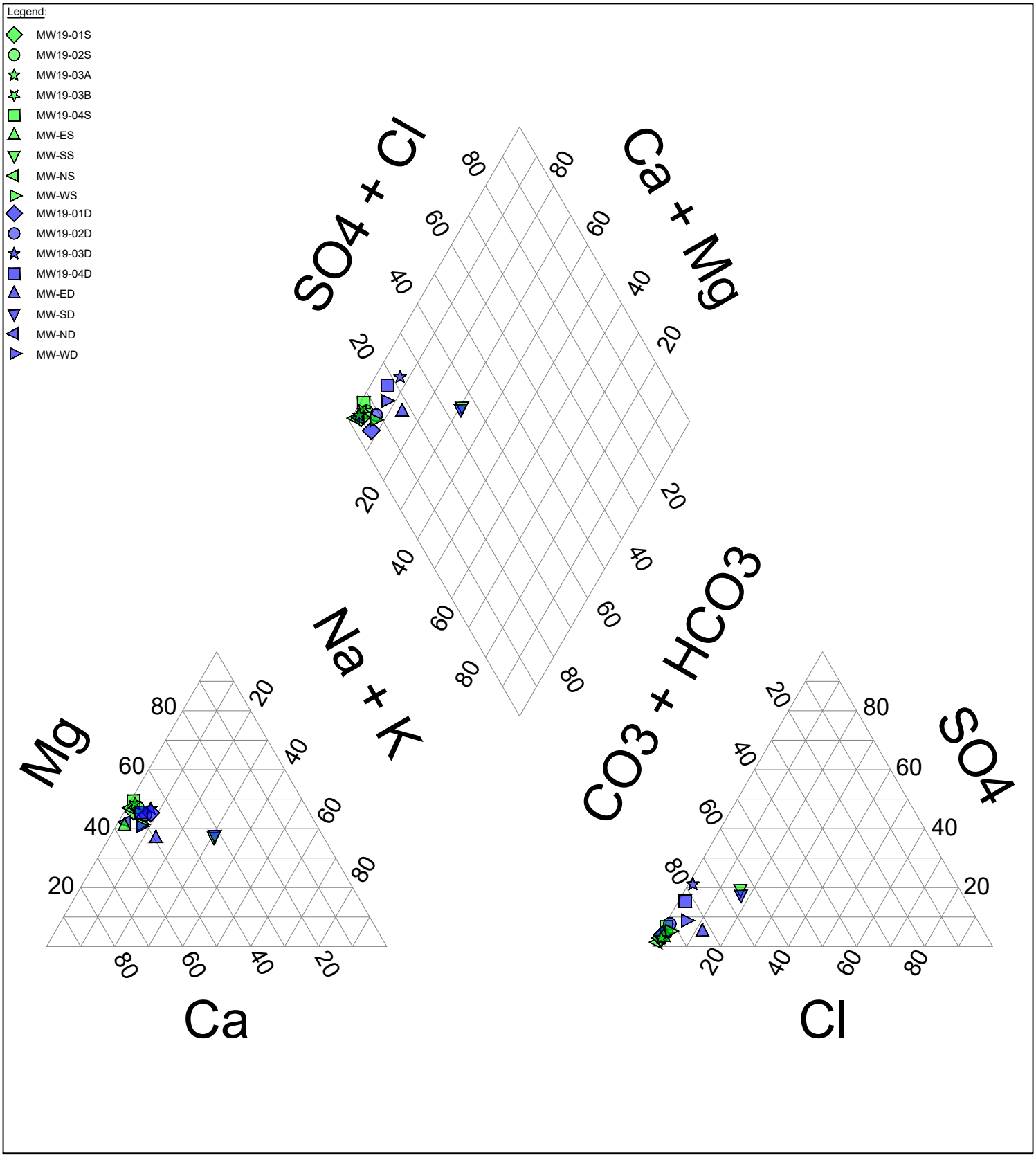


Notes:
1. Base image taken from the Ministry of Natural Resources and Forestry.
2. Survey provided by Keatley Surveying Ltd. dated 2 October 2019.

The Municipality of Central Manitoulin	DWN BY: KJ CHK'D BY: DG	PROJECT: 2023 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site	REV. NO.: 0 DATE: December 2023
WSP E&I Canada Limited 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1	Datum: Zone 17 SCALE: as shown	TITLE: Inferred Deep Groundwater Contours October 2023	PROJECT NO: TY1410143 FIGURE NO: 3B

X:\CA\CALVY100-SUD\ProjectF$\projects\2014 Projects\Environmental\TY141014 Central Manitoulin -Landfill Monitoring\TY1410143 2019-2023\2023\04_EngTech\Mindemoya\Drafting\TY1410143 Central Manitoulin - Mindemoya 2023 AMR REV3.dwg - (3B) - Dec. 14, 2023 12:25pm - wds_kyle.johnson



WSP E&I Canada Limited 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1			The Municipality of Central Manitoulin
PROJECT: 2023 Annual Groundwater Monitoring Report Mindemoya Waste Disposal Site		DWN BY: KJ	CHK'D BY: DG	DATE: December 2023 PROJECT NO: TY1410143
TITLE: Groundwater Tri-Linear Piper Plot - October 2023		REV. NO.: 0	SCALE: as shown	FIGURE NO: 4

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APPENDIX A
ENVIRONMENTAL COMPLIANCE APPROVAL
NO. A550701

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A550701
Notice No. 1
Issue Date: January 10, 2019

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

Site Location: Mindemoya Landfill Site
Lot 27, Concession 2
Municipality of Central Manitoulin, District of Manitoulin

You are hereby notified that I have amended Approval No. A550701 issued on March 18, 1980 for a 0.81 hectare landfilling site , as follows:

I. The following conditions are hereby added:

2. The Site shall cease to receive the waste and be closed in accordance with Item 1-4 of Schedule "A".

3. By March 31, 2020, the Owner shall provide to the Ministry an action plan to acquire the required properties for the Contaminant Attenuation Zone (CAZ) or if necessary to develop an alternative leachate control system.

4. By March 31, 2021, the Owner shall obtain lands necessary to provide a Contaminant Attenuation Zone (CAZ) for the Site and shall register these lands on title.

II. The following items are hereby added to Schedule "A":

1. Application and supporting documentation for a Waste Disposal Site (Landfill) from Municipality of Central Manitoulin, dated February 2, 2017.

2. Report dated January 30, 2017 and revised on November 12, 2018, Closure Plan Mindemoya Waste Disposal Site, prepared for the Corporation of the Municipality of Central Manitoulin.

3. Memorandum dated October 14, 2016, from Luciana Rodrigues, Regional Hydrogeologist, Technical Support, Northern Region, MECP, to Steven Moggy, Senior Environmental Officer, Sudbury District Office, MECP.

4. Memorandum dated October 12, 2018, from Archana Uprety, Hydrogeologist,

Technical Support, Northern Region, MECP, to Steven Moggy, Senior Environmental Officer, Sudbury District Office, MECP.

The reasons for this amendment to the Approval are as follows:

1. The reason of Condition 2 is to approve the closure plan submitted by the proponent.
2. The reasons of Condition 3 and 4 are to ensure the site is in compliance with the Ministry Reasonable Use Concept.

This Notice shall constitute part of the approval issued under Approval No. A550701 dated 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:

a. 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;
b. 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:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. 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

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment, Conservation and

Toronto, Ontario
M5G 1E5

Parks
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 10th day of January, 2019

Mohsen Keyvani, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

AT/
c: District Manager, MECP Sudbury
David Bucholtz, Cambium Inc.

O-File cc P. Kemp

Ministry of the Environment
Ontario

Provisional Certificate No. A 550701

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
P0P 1S0

ENVIRONMENTAL APPROVALS BRANCH
RECEIVED
APR 1 1980
MUNICIPAL & PRIVATE APPROVALS SECTION

for the use and operation of a 0.81 hectare landfilling site

all in accordance with the following plans and specifications:

Located: Lot 27, Concession 2
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, 1980.

Director, Section 39,
The Environmental Protection Act, 1971

APPENDIX B
BOREHOLE LOGS

RECORD OF BOREHOLE No. MW19-01D Co-Ord. 412030E 5067010N

wood.

Project Number:	TY1410144	Drilling Location:	Southeast of fill area	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	150 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	12 Aug 2019 Date Completed: 12 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **INSTRUMENTATION INSTALLATION** | **COMMENTS**

Lithology Plot | DESCRIPTION | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m)

Local Ground Surface Elevation:

0.03 m orgainics over
Dolostone
(Amatel Formation)

Facture

FIELD TESTING: ✖ Pocket Penetrometer (kg/cm²) 1 2 3 4
Penetration Testing: ○ SPT ● DCPT
MTO Vane*: △ Intact ▲ Remould
Nilcon Vane*: ◇ Intact ◆ Remould
* Undrained Shear Strength (kPa) 15 30 45 60

LAB TESTING: Atterberg Limits W_P W W_L Plastic Liquid
✳ Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS: 1 riser pipe in bentonite; 1 riser pipe in sand; 1 slotted pipe in sand

Wood Environment & Infrastructure Solutions
131 Fielding Road
Lively, Ontario
Canada P3Y 1L7
Tel +1(705) 682-2632
Fax +1(705) 682-2260

Groundwater depth on completion of drilling: 11.51 m.

Groundwater depth recorded on 8/12/2019 5:30:00 PM at a depth of 11.62 m.

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 : 25

Continued on Next Page

RECORD OF BOREHOLE No. MW19-01D Co-Ord. 412030E 5067010N

wood.

Project Number: TY1410144 Drilling Location: Southeast of fill area Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	0.03 m orgainics over Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					

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 : 25

Continued on Next Page

RECORD OF BOREHOLE No. MW19-01D Co-Ord. 412030E 5067010N

wood.

Project Number: TY1410144 Drilling Location: Southeast of fill area Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	0.03 m orgainics over Dolostone (Amatel Formation)					10.0					
	Facture					10.5					
						11.0					
						11.8					
						12.0					
	END OF BOREHOLE 12.2										

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 : 25

RECORD OF BOREHOLE No. MW19-01S Co-Ord. 412030E 5067010N

wood.

Project Number:	TY1410144	Drilling Location:	Southeast of fill area	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	150 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	12 Aug 2019 Date Completed: 12 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **COMMENTS**

Lithology Plot | **DESCRIPTION** (Local Ground Surface Elevation:) | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) | INSTRUMENTATION INSTALLATION

Field Testing: ✖ Pocket Penetrometer (kg/cm²) 1 2 3 4; Penetration Testing: ○ SPT ● DCPT; MTO Vane*: △ Intact ▲ Remould; Nilcon Vane*: ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60

Lab Testing: Atterberg Limits W_P W W_L (Plastic – Liquid); ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80

Comments: 1 riser pipe in bentonite; 1 riser pipe in sand; 1 slotted pipe in sand

0.03 m orgainics over
Dolostone
(Amatel Formation)

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0 ▽
4.5

Facture

Wood Environment & Infrastructure Solutions
131 Fielding Road
Lively, Ontario
Canada P3Y 1L7
Tel +1(705) 682-2632
Fax +1(705) 682-2260

▽ Groundwater depth on completion of drilling: 4.02 m.

▼ Groundwater depth recorded on 8/12/2019 5:30:00 PM at a depth of 5.21 m.

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 : 25

Continued on Next Page

RECORD OF BOREHOLE No. MW19-01S Co-Ord. 412030E 5067010N

wood.

Project Number: **TY1410144** Drilling Location: **Southeast of fill area** Logged by: **GLW**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	0.03 m orgainics over Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5 7.0	▼				
	END OF BOREHOLE 7.1										

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 : 25

RECORD OF BOREHOLE No. MW19-02D Co-Ord. 411890E 5067090N

wood.

Project Number:	TY1410144	Drilling Location:	Northwest of fill area	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	150 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	12 Aug 2019 Date Completed: 12 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE

Lithology Plot

DESCRIPTION

Local Ground Surface Elevation:

0.03 m orgainics over
fractured bedrock

Dolostone 0.9
(Amatel Formation)

Facture

SOIL SAMPLING

Sample Type | Sample Number | Recovery (%) | SPT 'N' Value

DEPTH (m) | **ELEVATION (m)**

0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

FIELD TESTING

✖ Pocket Penetrometer (kg/cm²) 1 2 3 4

PenetrationTesting
○ SPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
15 30 45 60

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid

✳ Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

1 riser pipe in bentonite
1 riser pipe in sand
1 slotted pipe in sand

Wood Environment &
Infrastructure Solutions
131 Fielding Road
Lively, Ontario
Canada P3Y 1L7
Tel +1(705) 682-2632
Fax +1(705) 682-2260

▽ Groundwater depth on completion of drilling: 12.61 m.

▼ Groundwater depth recorded on 8/12/2019 5:30:00 PM at a depth of 13.20 m.

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'.

Continued on Next Page

Scale: 1 : 25

RECORD OF BOREHOLE No. MW19-02D Co-Ord. 411890E 5067090N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					

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 : 25

Continued on Next Page

RECORD OF BOREHOLE No. MW19-02D Co-Ord. 411890E 5067090N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)										
	Facture					10.0					
						10.5					
						11.0					
						11.5					
						12.0					
	END OF BOREHOLE 12.1										

▽ ▼

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 : 25

RECORD OF BOREHOLE No. MW19-02S Co-Ord. 411810E 5067090N

wood.

Project Number:	TY1410144	Drilling Location:	Northwest of fill area	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	150 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	12 Aug 2019 Date Completed: 12 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **COMMENTS**

Lithology Plot | **DESCRIPTION** | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) | INSTRUMENTATION INSTALLATION

Local Ground Surface Elevation:

0.03 m orgainics over
fractured bedrock

Dolostone 0.9
(Amatel Formation)

Facture

4.5

FIELD TESTING

✖ Pocket Penetrometer (kg/cm²) 1 2 3 4

Penetration Testing
○ SPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
15 30 45 60

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid

✳ Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

COMMENTS

1 riser pipe in bentonite
1 riser pipe in sand
1 slotted pipe in sand

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Scale: 1 : 25

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RECORD OF BOREHOLE No. MW19-02S Co-Ord. 411810E 5067090N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5					
	END OF BOREHOLE 7.0					7.0					

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 : 25

RECORD OF BOREHOLE No. MW19-03A Co-Ord. 411810E 5067115N

wood.

Project Number:	TY1410144	Drilling Location:	Northwest of fill area; north of MW1902 nest	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	150 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	13 Aug 2019 Date Completed: 13 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE

Lithology Plot

DESCRIPTION

Local Ground Surface Elevation:

0.03 m orgainics over
SAND AND GRAVEL

fractured bedrock 0.6

Dolostone 1.2
(Amatel Formation)

Facture

SOIL SAMPLING

Sample Type | Sample Number | Recovery (%) | SPT 'N' Value

DEPTH (m) | ELEVATION (m)

0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5

FIELD TESTING

✖ Pocket Penetrometer (kg/cm²) 1 2 3 4

PenetrationTesting
○ SPT ● DCPT
MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
15 30 45 60

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid

✳ Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

1 riser pipe in bentonite
1 riser pipe in sand
1 slotted pipe in sand

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Groundwater depth on completion of drilling: 6.36 m.

Groundwater depth recorded on 8/13/2019 5:30:00 PM at a depth of 6.54 m.

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 : 25

RECORD OF BOREHOLE No. MW19-03A Co-Ord. 411810E 5067115N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					5.0 5.5					
	END OF BOREHOLE 5.8										

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 : 25

RECORD OF BOREHOLE No. MW19-03B Co-Ord. 411810E 5067115N

wood.

Project Number:	TY1410144	Drilling Location:	Northwest of fill area; north of MW1902 nest	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	150 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	12 Aug 2019 Date Completed: 12 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	0.03 m orgainics over SAND AND GRAVEL					0.5					
	fractured bedrock 0.6					1.0					
	Dolostone 1.2 (Amatel Formation)					1.5					
						2.0					
						2.5					
						3.0					
						3.5					
						4.0					
	Facture					4.5					

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▽ Groundwater depth on completion of drilling: 6.36 m.

▼ Groundwater depth recorded on 8/13/2019 5:30:00 PM at a depth of 7.34 m.

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 : 25

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RECORD OF BOREHOLE No. MW19-03B Co-Ord. 411810E 5067115N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					5.0 5.5 6.0 ▽ 6.5					
	END OF BOREHOLE 6.6					▼					

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 : 25

RECORD OF BOREHOLE No. MW19-03D Co-Ord. 411810E 5067115N

wood.

Project Number:	TY1410144	Drilling Location:	Northwest of fill area; north of MW1902 nest	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	150 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	12 Aug 2019 Date Completed: 12 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **COMMENTS**

Lithology Plot | DESCRIPTION | Sample Type | Sample Number | Recovery (%) | SPT 'N' Value | DEPTH (m) | ELEVATION (m) | INSTRUMENTATION INSTALLATION

Local Ground Surface Elevation:

Field Testing: ✖ Pocket Penetrometer (kg/cm²) 1 2 3 4; Penetration Testing: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 15 30 45 60

Lab Testing: Atterberg Limits W_P W W_L Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80

Comments: 1 riser pipe in bentonite; 1 riser pipe in sand; 1 slotted pipe in sand

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	0.03 m orgainics over SAND AND GRAVEL					0.5	
	fractured bedrock 0.6					1.0	
	Dolostone (Amatel Formation) 1.2					1.5	
						2.0	
						2.5	
						3.0	
						3.5	
						4.0	
						4.5	

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▽ Groundwater depth on completion of drilling: 12.9 m.

▼ Groundwater depth recorded on 8/12/2019 5:30:00 PM at a depth of 13.09 m.

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 : 25

Continued on Next Page

RECORD OF BOREHOLE No. MW19-03D Co-Ord. 411810E 5067115N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					

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 : 25

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RECORD OF BOREHOLE No. MW19-03D Co-Ord. 411810E 5067115N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					10.0 10.5 11.0 11.5 12.0					
	END OF BOREHOLE 12.1										

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 : 25

RECORD OF BOREHOLE No. MW19-04D Co-Ord. 411890E 5067115N

wood.

Project Number:	TY1410144	Drilling Location:	Northwest of fill area; north of MW1902 nest	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	200 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	13 Aug 2019 Date Completed: 13 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE

Lithology Plot

DESCRIPTION

Local Ground Surface Elevation:

ORGANICS AND GRAVEL

fractured bedrock 0.2

Dolostone (Amatel Formation) 0.6

SOIL SAMPLING

Sample Type | Sample Number | Recovery (%) | SPT 'N' Value

DEPTH (m) | ELEVATION (m)

0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5

FIELD TESTING

✖ Pocket Penetrometer (kg/cm²) 1 2 3 4

Penetration Testing
○ SPT ● DCPT

MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
15 30 45 60

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid

✳ Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

1 riser pipe in bentonite
1 riser pipe in sand
1 slotted pipe in sand

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Groundwater depth on completion of drilling: 12.68 m.

Groundwater depth recorded on 8/13/2019 5:30:00 PM at a depth of 12.71 m.

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'.

Continued on Next Page

Scale: 1 : 25

RECORD OF BOREHOLE No. MW19-04D Co-Ord. 411890E 5067115N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5					

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 : 25

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RECORD OF BOREHOLE No. MW19-04D Co-Ord. 411890E 5067115N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					10.0					
						10.5					
						11.0					
						11.5					
						12.0					
	END OF BOREHOLE 12.0										

▽▼

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 : 25

RECORD OF BOREHOLE No. MW19-04S Co-Ord. 411890E 5067115N

wood.

Project Number:	TY1410144	Drilling Location:	Northwest of fill area; north of MW1902 nest	Logged by:	GLW
Project Client:	Municipality of Central Manitoulin	Drilling Method:	200 mm Hollow Stem Augers	Compiled by:	CKC
Project Name:	mindemoya CAZ Determination Program	Drilling Machine:	Track Mounted Drill	Reviewed by:	BRG
Project Location:	mindemoya, Ontario	Date Started:	13 Aug 2019 Date Completed: 13 Aug 2019	Revision No.:	0, 5/2/20

LITHOLOGY PROFILE

Lithology Plot

DESCRIPTION

Local Ground Surface Elevation:

ORGANICS AND GRAVEL

fractured bedrock 0.2

Dolostone (Amatel Formation) 0.6

SOIL SAMPLING

Sample Type | Sample Number | Recovery (%) | SPT 'N' Value

DEPTH (m) | ELEVATION (m)

FIELD TESTING

✖ Pocket Penetrometer (kg/cm²) 1 2 3 4

PenetrationTesting
○ SPT ● DCPT

MTO Vane* Nilcon Vane*
△ Intact ◇ Intact
▲ Remould ◆ Remould
* Undrained Shear Strength (kPa)
15 30 45 60

LAB TESTING

Atterberg Limits
W_P W W_L
Plastic Liquid

✳ Passing 75 um (%)
○ Moisture Content (%)
20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS

1 riser pipe in bentonite
1 riser pipe in sand
1 slotted pipe in sand

0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5

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Groundwater depth on completion of drilling: 7.4 m.

Groundwater depth recorded on 8/13/2019 5:30:00 PM at a depth of 7.45 m.

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'.

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Scale: 1 : 25

RECORD OF BOREHOLE No. MW19-04S Co-Ord. 411890E 5067115N

wood.

Project Number: TY1410144 Drilling Location: Northwest of fill area; north of MW1902 nest Logged by: GLW

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 PenetrationTesting ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	Dolostone (Amatel Formation)					5.0 5.5 6.0 6.5					
	END OF BOREHOLE 6.8					▽ ▼					

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 : 25

APPENDIX C
GROUNDWATER ELEVATIONS

Summary of Groundwater Elevations

Monitor No.	Measuring Point Elevation (masl)[1]	Elevation of Water (masl)										
		Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
MW-WS	499.26	495.19	494.48	493.83	495.73	495.36	494.41	496.27	495.77	495.15	495.14	492.78
MW-WD	499.26	490.37	488.45	488.26	488.63	488.26	488.55	492.62	490.78	489.24	489.16	492.78
MW-SS	499.84	495.67	495.29	495.37	495.85	495.96	495.70	496.56	495.89	495.25	495.72	495.89
MW-SD	499.85	495.64	495.19	495.22	495.78	495.91	495.69	496.10	495.89	495.78	495.22	495.82
MW-ES	501.28	496.44	495.87	495.56	496.37	496.36	496.14	497.83	496.37	496.31	496.33	496.48
MW-ED	501.28	ND	495.18	494.88	496.04	495.81	495.85	498.05	496.28	495.86	495.63	496.52
MW-NS	499.93	493.19	493.00	493.11	493.14	493.20	493.09	497.29	493.35	493.22	493.13	496.17
MW-ND	499.92	493.22	493.05	493.14	493.19	493.20	493.08	497.31	493.07	493.22	492.86	491.48
MW19-01S	500.61						495.03	497.79	496.44	495.78	496.01	496.51
MW19-01D	500.83						488.85	495.63	495.37	492.55	493.01	493.57
MW19-02S	498.89						492.95	496.36	493.93	493.01	492.93	493.58
MW19-02D	498.86						485.94	491.11	490.93	488.77	488.80	492.82
MW19-03A	499.28						493.00	496.72	493.94	492.98	492.92	493.50
MW19-03B	499.18						493.00	496.73	493.94	493.00	493.00	493.58
MW19-03D	499.33						486.43	488.87	491.42	489.00	488.38	488.51
MW19-04S	499.48						493.39	497.24	495.19	494.51	494.29	494.57
MW19-04D	499.45						486.56	489.72	490.77	487.49	487.17	488.20

Notes:
(1) masl - metres above sea level.
(2) ND - no data available.

APPENDIX D
2023 LABORATORY ANALYTICAL REPORTS

AGAT Laboratories

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CLIENT NAME: WSP E&I CANADA LIMITED
131 FIELDING ROAD
LIVELY, ON P3Y1L7
(705) 682-2632
ATTENTION TO: Diminique Gagnon
PROJECT: TY1410143.2023.FLD.1142.5730-00
AGAT WORK ORDER: 23T088152
TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist
WATER ANALYSIS REVIEWED BY: Yris Verastegui, Inorganic Team Lead
DATE REPORTED: Nov 10, 2023
PAGES (INCLUDING COVER): 17
VERSION*: 1

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

Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
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Certificate of Analysis

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Volatile Organic Compounds in Water (ug/L)

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

		SAMPLE DESCRIPTION:		**MW-WS**	**MW-WD**	**MW-SS**	**MW-SD**	**MW-ES**	**MW-ED**	**MW-NS**	**MW-ND**
		SAMPLE TYPE:		**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
		DATE SAMPLED:		**2023-11-01 13:10**	**2023-11-01 11:30**	**2023-11-01 12:10**	**2023-11-01 12:20**	**2023-11-01 12:50**	**2023-11-01 13:00**	**2023-11-01 10:00**	**2023-11-01 10:15**
Parameter	**Unit**	**G / S**	**RDL**	**5420187**	**5420199**	**5420200**	**5420201**	**5420202**	**5420203**	**5420204**	**5420205**
1,4-Dichlorobenzene	µg/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzene	µg/L		0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Toluene	µg/L		0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L		0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8	% Recovery	50-140		86	86	89	78	94	88	96	91
4-Bromofluorobenzene	% Recovery	50-140		104	102	111	107	108	110	109	106

		SAMPLE DESCRIPTION:		**MW19-01S**	**MW19-01D**	**MW19-02S**	**MW19-02D**	**MW19-03A**	**MW19-03B**	**MW19-03D**	**MW19-04S**
		SAMPLE TYPE:		**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**	**Water**
		DATE SAMPLED:		**2023-10-30 11:50**	**2023-11-01 12:35**	**2023-10-30 14:20**	**2023-11-01 11:00**	**2023-10-30 15:30**	**2023-10-30 15:00**	**2023-11-01 10:45**	**2023-10-30 13:50**
Parameter	**Unit**	**G / S**	**RDL**	**5420206**	**5420207**	**5420208**	**5420209**	**5420210**	**5420211**	**5420212**	**5420213**
1,4-Dichlorobenzene	µg/L		0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Benzene	µg/L		0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Dichloromethane	µg/L		0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Toluene	µg/L		0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Vinyl Chloride	µg/L		0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17
Surrogate	**Unit**	**Acceptable Limits**									
Toluene-d8	% Recovery	50-140		94	95	94	94	96	94	96	95
4-Bromofluorobenzene	% Recovery	50-140		111	116	110	100	110	109	114	108

Certified By:

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Volatile Organic Compounds in Water (ug/L)

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

				SAMPLE DESCRIPTION:	MW19-04D	MIND DUP1	MIND DUP2
				SAMPLE TYPE:	Water	Water	Water
				DATE SAMPLED:	2023-11-01 10:30	2023-10-30 11:50	2023-10-30 15:00
Parameter	**Unit**	**G / S**	**RDL**		**5420214**	**5420215**	**5420216**
1,4-Dichlorobenzene	µg/L		0.10		<0.10	<0.10	<0.10
Benzene	µg/L		0.20		<0.20	<0.20	<0.20
Dichloromethane	µg/L		0.30		<0.30	<0.30	<0.30
Toluene	µg/L		0.20		<0.20	<0.20	<0.20
Vinyl Chloride	µg/L		0.17		<0.17	<0.17	<0.17
Surrogate	**Unit**	**Acceptable Limits**					
Toluene-d8	% Recovery	50-140			92	97	90
4-Bromofluorobenzene	% Recovery	50-140			105	114	108

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5420187-5420216 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. The calculated parameter is non-accredited. The parameters that are components of the calculation are accredited.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: N Popnikolof

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PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

		SAMPLE DESCRIPTION:		MW-WS		MW-WD		MW-SS		MW-SD
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		2023-11-01 13:10		2023-11-01 11:30		2023-11-01 12:10		2023-11-01 12:20
Parameter	Unit	G / S	RDL	5420187	RDL	5420199	RDL	5420200	RDL	5420201
pH	pH Units		NA	7.44	NA	7.59	NA	7.44	NA	7.53
Electrical Conductivity	µS/cm		2	688	2	938	2	1640	2	2150
Total Dissolved Solids	mg/L		10	398	10	556	10	912	10	1210
Alkalinity (as CaCO3)	mg/L		5	341	5	440	5	572	5	785
Chloride	mg/L		0.10	6.65	0.12	19.8	0.12	101	0.24	147
Nitrate as N	mg/L		0.05	2.45	0.05	2.57	0.05	<0.05	0.07	<0.07
Nitrite as N	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05
Sulphate	mg/L		0.10	18.3	0.10	43.1	0.10	166	0.19	203
Ammonia as N	mg/L		0.02	<0.02	0.02	<0.02	0.16	26.6	0.16	29.4
Chemical Oxygen Demand	mg/L		5	33	5	45	5	52	5	60
Dissolved Organic Carbon	mg/L		0.5	2.6	0.5	1.9	0.5	9.2	0.5	12.2
Phenols	mg/L		0.004	0.015	0.004	0.007	0.004	0.019	0.004	0.004
Total Kjeldahl Nitrogen	mg/L		0.10	0.24	0.10	0.42	0.14	27.9	0.14	29.5
Total Phosphorus	mg/L		0.02	0.08	0.02	0.36	0.02	0.71	0.02	0.05
Dissolved Calcium	mg/L		0.05	85.2	0.05	112	0.05	124	0.05	127
Dissolved Magnesium	mg/L		0.05	41.6	0.05	53.2	0.05	87.1	0.05	92.5
Dissolved Potassium	mg/L		0.50	4.87	0.50	5.98	0.50	63.7	0.50	58.6
Dissolved Sodium	mg/L		0.05	10.7	0.05	14.3	0.05	97.5	0.05	106
Dissolved Arsenic	mg/L		0.001	<0.001	0.001	<0.001	0.001	0.002	0.001	0.001
Dissolved Barium	mg/L		0.002	0.033	0.002	0.073	0.002	0.083	0.002	0.120
Dissolved Boron	mg/L		0.010	0.061	0.010	0.101	0.010	0.712	0.010	0.727
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	0.0007
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Dissolved Copper	mg/L		0.001	0.001	0.001	0.002	0.001	<0.001	0.001	0.020
Dissolved Iron	mg/L		0.010	<0.010	0.010	0.011	0.010	2.05	0.010	0.022
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	0.0009
Dissolved Manganese	mg/L		0.002	<0.002	0.002	<0.002	0.002	1.08	0.002	1.45
Dissolved Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001
Dissolved Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	<0.005	0.005	<0.005

Certified By: Iris Verástegui

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Certificate of Analysis

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

Certified By:

AGAT Laboratories

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SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

		SAMPLE DESCRIPTION:		MW-ES		MW-ED		MW-NS	MW-ND	MW19-01S
		SAMPLE TYPE:		Water		Water		Water	Water	Water
		DATE SAMPLED:		2023-11-01 12:50		2023-11-01 13:00		2023-11-01 10:00	2023-11-01 10:15	2023-10-30 11:50
Parameter	Unit	G / S	RDL	5420202	RDL	5420203	RDL	5420204	5420205	5420206
pH	pH Units		NA	7.36	NA	7.49	NA	7.44	7.54	7.55
Electrical Conductivity	µS/cm		2	511	2	1180	2	589	672	553
Total Dissolved Solids	mg/L		10	288	10	672	10	322	372	306
Alkalinity (as CaCO3)	mg/L		5	262	5	544	5	318	359	296
Chloride	mg/L		0.10	3.22	0.12	56.4	0.10	1.86	1.80	2.01
Nitrate as N	mg/L		0.05	0.08	0.05	0.88	0.05	0.08	0.19	0.08
Nitrite as N	mg/L		0.05	<0.05	0.05	0.29	0.05	<0.05	<0.05	<0.05
Sulphate	mg/L		0.10	8.24	0.10	31.1	0.10	4.30	10.4	8.98
Ammonia as N	mg/L		0.02	<0.02	0.02	0.60	0.02	<0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L		5	32	5	40	5	43	23	28
Dissolved Organic Carbon	mg/L		0.5	3.3	0.5	5.0	0.5	3.6	2.3	2.7
Phenols	mg/L		0.004	0.008	0.004	0.013	0.004	0.005	<0.004	0.005
Total Kjeldahl Nitrogen	mg/L		0.10	0.21	0.10	1.77	0.10	0.22	0.22	<0.10
Total Phosphorus	mg/L		0.02	0.52	0.02	0.12	0.02	0.29	0.23	0.19
Dissolved Calcium	mg/L		0.05	65.2	0.05	132	0.05	66.1	91.3	62.0
Dissolved Magnesium	mg/L		0.05	28.4	0.05	58.9	0.05	36.3	42.1	33.6
Dissolved Potassium	mg/L		0.50	0.66	0.50	4.45	0.50	0.51	1.28	0.98
Dissolved Sodium	mg/L		0.05	2.90	0.05	39.3	0.05	1.36	3.63	3.18
Dissolved Arsenic	mg/L		0.001	<0.001	0.001	0.001	0.001	<0.001	0.001	<0.001
Dissolved Barium	mg/L		0.002	0.015	0.002	0.156	0.002	0.020	0.042	0.014
Dissolved Boron	mg/L		0.010	0.021	0.010	0.140	0.010	0.014	0.013	0.015
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Dissolved Copper	mg/L		0.001	0.002	0.001	0.002	0.001	0.001	0.002	0.002
Dissolved Iron	mg/L		0.010	<0.010	0.010	0.665	0.010	0.018	0.079	0.433
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	<0.0005	<0.0005
Dissolved Manganese	mg/L		0.002	0.002	0.002	0.975	0.002	<0.002	0.086	0.051
Dissolved Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001
Dissolved Zinc	mg/L		0.005	<0.005	0.005	0.010	0.005	<0.005	<0.005	<0.005

Certified By: Iris Verástegui

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Certificate of Analysis

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

Certified By:

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CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02 **DATE REPORTED: 2023-11-10**

		SAMPLE DESCRIPTION:		MW19-01D		MW19-02S		MW19-02D		MW19-03A	MW19-03B
		SAMPLE TYPE:		Water		Water		Water		Water	Water
		DATE SAMPLED:		2023-11-01 12:35		2023-10-30 14:20		2023-11-01 11:00		2023-10-30 15:30	2023-10-30 15:00
Parameter	Unit	G / S	RDL	5420207	RDL	5420208	RDL	5420209	RDL	5420210	5420211
pH	pH Units		NA	7.82	NA	7.48	NA	7.86	NA	7.45	7.48
Electrical Conductivity	µS/cm		2	484	2	635	2	519	2	586	597
Total Dissolved Solids	mg/L		10	264	10	366	10	298	10	330	326
Alkalinity (as CaCO3)	mg/L		5	239	5	327	5	270	5	315	311
Chloride	mg/L		0.10	1.67	0.10	4.06	0.10	2.61	0.10	2.56	2.93
Nitrate as N	mg/L		0.05	0.15	0.05	1.69	0.05	0.05	0.05	0.61	0.74
Nitrite as N	mg/L		0.05	<0.05	0.05	<0.05	0.05	<0.05	0.05	<0.05	<0.05
Sulphate	mg/L		0.10	22.8	0.10	17.2	0.10	21.9	0.10	8.86	14.4
Ammonia as N	mg/L		0.02	<0.02	0.02	<0.02	0.02	<0.02	0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L		5	19	5	21	5	25	5	33	31
Dissolved Organic Carbon	mg/L		0.5	1.2	0.5	2.5	0.5	1.2	0.5	3.8	2.2
Phenols	mg/L		0.001	0.006	0.004	0.008	0.001	0.008	0.004	0.005	0.006
Total Kjeldahl Nitrogen	mg/L		0.10	<0.10	0.10	0.21	0.10	<0.10	0.10	0.22	0.22
Total Phosphorus	mg/L		0.02	<0.02	0.02	0.05	0.02	0.03	0.02	0.13	0.08
Dissolved Calcium	mg/L		0.05	53.4	0.05	72.9	0.05	62.7	0.05	65.1	70.1
Dissolved Magnesium	mg/L		0.05	31.4	0.05	42.0	0.05	35.0	0.05	38.3	40.1
Dissolved Potassium	mg/L		0.50	4.00	0.50	2.64	0.50	2.98	0.50	1.54	1.62
Dissolved Sodium	mg/L		0.05	8.05	0.05	3.87	0.05	8.25	0.05	1.76	2.07
Dissolved Arsenic	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001
Dissolved Barium	mg/L		0.002	0.018	0.002	0.013	0.002	0.024	0.002	0.010	0.013
Dissolved Boron	mg/L		0.010	0.058	0.010	0.053	0.010	0.028	0.010	0.024	0.027
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Dissolved Copper	mg/L		0.001	0.004	0.001	<0.001	0.001	<0.001	0.001	0.001	0.001
Dissolved Iron	mg/L		0.010	0.446	0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	<0.0005
Dissolved Manganese	mg/L		0.002	0.030	0.002	0.006	0.002	0.077	0.002	<0.002	<0.002
Dissolved Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001
Dissolved Zinc	mg/L		0.005	0.058	0.005	<0.005	0.005	<0.005	0.005	<0.005	<0.005

Certified By: Iris Verástegui

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Certificate of Analysis

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

Certified By: Iris Verástegui

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PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02

DATE REPORTED: 2023-11-10

		SAMPLE DESCRIPTION:		MW19-03D	MW19-04S	MW19-04D		MIND DUP1	MIND DUP2
		SAMPLE TYPE:		Water	Water	Water		Water	Water
		DATE SAMPLED:		2023-11-01 10:45	2023-10-30 13:50	2023-11-01 10:30		2023-10-30 11:50	2023-10-30 15:00
Parameter	Unit	G / S	RDL	5420212	5420213	5420214	RDL	5420215	5420216
pH	pH Units		NA	7.78	7.77	7.85	NA	7.58	7.62
Electrical Conductivity	µS/cm		2	587	587	600	2	544	593
Total Dissolved Solids	mg/L		10	356	336	360	10	306	340
Alkalinity (as CaCO3)	mg/L		5	260	308	278	5	298	314
Chloride	mg/L		0.10	3.10	1.81	4.54	0.10	1.90	2.91
Nitrate as N	mg/L		0.05	0.09	<0.05	0.47	0.05	0.08	0.74
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05
Sulphate	mg/L		0.10	67.8	21.0	49.4	0.10	8.88	14.0
Ammonia as N	mg/L		0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L		5	23	29	21	5	31	27
Dissolved Organic Carbon	mg/L		0.5	1.0	2.0	1.4	0.5	2.8	2.3
Phenols	mg/L		0.001	0.007	0.009	0.009	0.004	<0.004	0.004
Total Kjeldahl Nitrogen	mg/L		0.10	<0.10	0.12	<0.10	0.10	0.19	0.18
Total Phosphorus	mg/L		0.02	<0.02	0.04	0.05	0.02	0.08	0.07
Dissolved Calcium	mg/L		0.05	60.8	68.5	60.8	0.05	64.6	69.1
Dissolved Magnesium	mg/L		0.05	37.5	41.1	33.9	0.05	35.8	39.3
Dissolved Potassium	mg/L		0.50	4.79	0.86	2.50	0.50	0.91	1.53
Dissolved Sodium	mg/L		0.05	8.23	0.93	5.54	0.05	3.29	2.15
Dissolved Arsenic	mg/L		0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Dissolved Barium	mg/L		0.002	0.038	0.012	0.021	0.002	0.013	0.013
Dissolved Boron	mg/L		0.010	0.077	<0.010	0.043	0.010	0.012	0.027
Dissolved Cadmium	mg/L		0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002
Dissolved Copper	mg/L		0.001	<0.001	0.001	<0.001	0.001	0.001	<0.001
Dissolved Iron	mg/L		0.010	<0.010	<0.010	<0.010	0.010	0.389	<0.010
Dissolved Lead	mg/L		0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	<0.0005
Dissolved Manganese	mg/L		0.002	0.032	<0.002	0.010	0.002	0.050	<0.002
Dissolved Mercury	mg/L		0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001
Dissolved Zinc	mg/L		0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005

Certified By: Iris Verástegui

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Certificate of Analysis

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

CLIENT NAME: WSP E&I CANADA LIMITED

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Manitoulin Landfill - Groundwater - Column 1

DATE RECEIVED: 2023-11-02 **DATE REPORTED: 2023-11-10**

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5420187-5420216 Metals analysis completed on a filtered sample.
Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: WSP E&I CANADA LIMITED

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Trace Organics Analysis

RPT Date: Nov 10, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Volatile Organic Compounds in Water (ug/L)															
1,4-Dichlorobenzene	5426321		<0.10	<0.10	NA	< 0.10	97%	50%	140%	98%	60%	130%	97%	50%	140%
Benzene	5426321		<0.20	<0.20	NA	< 0.20	103%	50%	140%	103%	60%	130%	114%	50%	140%
Dichloromethane	5426321		<0.30	<0.30	NA	< 0.30	91%	50%	140%	108%	60%	130%	106%	50%	140%
Toluene	5426321		<0.20	<0.20	NA	< 0.20	95%	50%	140%	98%	60%	130%	103%	50%	140%
Vinyl Chloride	5426321		<0.17	<0.17	NA	< 0.17	108%	50%	140%	90%	50%	140%	114%	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: N Popnikolof

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Quality Assurance

CLIENT NAME: WSP E&I CANADA LIMITED

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

Water Analysis

RPT Date: Nov 10, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Manitoulin Landfill - Groundwater - Column 1															
pH	5422348		7.60	7.78	2.3%	NA	100%	90%	110%						
Electrical Conductivity	5422348		722	769	6.3%	< 2	91%	90%	110%						
Total Dissolved Solids	5421423		514	498	3.2%	< 10	102%	80%	120%						
Alkalinity (as CaCO3)	5422348		235	235	0.0%	< 5	92%	80%	120%						
Chloride	5420199	5420199	19.8	19.0	4.1%	< 0.10	93%	70%	130%	99%	80%	120%	99%	70%	130%
Nitrate as N	5420199	5420199	2.57	2.45	4.8%	< 0.05	94%	70%	130%	94%	80%	120%	97%	70%	130%
Nitrite as N	5420199	5420199	<0.05	<0.05	NA	< 0.05	97%	70%	130%	94%	80%	120%	93%	70%	130%
Sulphate	5420199	5420199	43.1	41.7	3.3%	< 0.10	95%	70%	130%	98%	80%	120%	97%	70%	130%
Ammonia as N	5423569		<0.02	<0.02	NA	< 0.02	106%	70%	130%	103%	80%	120%	91%	70%	130%
Chemical Oxygen Demand	5420187	5420187	33	33	0.0%	< 5	103%	80%	120%	110%	90%	110%	71%	70%	130%
Dissolved Organic Carbon	5420478		<0.5	<0.5	NA	< 0.5	95%	90%	110%	100%	90%	110%	104%	80%	120%
Phenols	5420207	5420207	0.006	0.006	0.0%	< 0.001	93%	90%	110%	98%	90%	110%	82%	80%	120%
Total Kjeldahl Nitrogen	5420187	5420187	0.24	0.21	NA	< 0.10	97%	70%	130%	100%	80%	120%	100%	70%	130%
Total Phosphorus	5421044		0.05	0.05	NA	< 0.02	101%	70%	130%	97%	80%	120%	100%	70%	130%
Dissolved Calcium	5420187	5420187	85.2	81.1	4.9%	< 0.05	92%	70%	130%	97%	80%	120%	98%	70%	130%
Dissolved Magnesium	5420187	5420187	41.6	40.1	3.7%	< 0.05	96%	70%	130%	97%	80%	120%	100%	70%	130%
Dissolved Potassium	5420187	5420187	4.87	4.43	9.5%	< 0.50	100%	70%	130%	102%	80%	120%	98%	70%	130%
Dissolved Sodium	5420187	5420187	10.7	10.2	4.8%	< 0.05	97%	70%	130%	99%	80%	120%	99%	70%	130%
Dissolved Arsenic	5420187	5420187	<0.001	<0.001	NA	< 0.001	101%	70%	130%	104%	80%	120%	113%	70%	130%
Dissolved Barium	5420187	5420187	0.033	0.033	0.0%	< 0.002	93%	70%	130%	92%	80%	120%	108%	70%	130%
Dissolved Boron	5420187	5420187	0.061	0.058	5.0%	< 0.010	100%	70%	130%	105%	80%	120%	108%	70%	130%
Dissolved Cadmium	5420187	5420187	<0.0001	<0.0001	NA	< 0.0001	102%	70%	130%	102%	80%	120%	108%	70%	130%
Dissolved Chromium	5420187	5420187	<0.002	<0.002	NA	< 0.002	98%	70%	130%	100%	80%	120%	101%	70%	130%
Dissolved Copper	5420187	5420187	0.001	0.002	NA	< 0.001	101%	70%	130%	100%	80%	120%	99%	70%	130%
Dissolved Iron	5420187	5420187	<0.010	<0.010	NA	< 0.010	102%	70%	130%	102%	80%	120%	101%	70%	130%
Dissolved Lead	5420187	5420187	<0.0005	<0.0005	NA	< 0.0005	102%	70%	130%	95%	80%	120%	97%	70%	130%
Dissolved Manganese	5420187	5420187	<0.002	<0.002	NA	< 0.002	102%	70%	130%	104%	80%	120%	106%	70%	130%
Dissolved Mercury	5420187	5420187	<0.0001	<0.0001	NA	< 0.0001	103%	70%	130%	100%	80%	120%	90%	70%	130%
Dissolved Zinc	5420187	5420187	<0.005	<0.005	NA	< 0.005	103%	70%	130%	101%	80%	120%	104%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.
Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: WSP E&I CANADA LIMITED

AGAT WORK ORDER: 23T088152

PROJECT: TY1410143.2023.FLD.1142.5730-00

ATTENTION TO: Diminique Gagnon

SAMPLING SITE:Mindemova - GW

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
1,4-Dichlorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Benzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Dichloromethane	VOL-91- 5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Vinyl Chloride	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
Toluene-d8	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5001	modified from EPA 5030B & EPA 8260D	(P&T)GC/MS

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Method Summary

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AGAT WORK ORDER: 23T088152

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ATTENTION TO: Diminique Gagnon

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SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH3 H	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	modified from SM 5220 A and SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	modified from SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6072	modified from SM 5530 D	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Total Phosphorus	INOR-93-6057	modified from LACHAT 10-115-01-3A	LACHAT FIA
Dissolved Calcium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Magnesium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Dissolved Potassium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Sodium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Arsenic	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Barium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Boron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cadmium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Chromium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Copper	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Iron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Lead	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Manganese	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Dissolved Zinc	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS

AGAT Laboratories

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Mississauga, Ontario L4Z 1Y2
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Chain of Custody Record

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

Laboratory Use Only

Work Order #: 23T088152

Cooler Quantity: 3 large + 1 med

Arrival Temperatures: 3.9 | 4.0 | 4.7
3.9, 3.8, 3.7 4.1 | 4.2 | 4.3

Custody Seal Intact: ☐ Yes ☐ No ☑ N/A

Notes: bagged ; 22 (4.2, 4.0, 4.1)

Report Information:

Company: WSP E&I Canada Limited
Contact: Dominique Gagnon
Address: 131 Fielding Road
Lively, ON P3Y 1L7
Phone: 705-677-4684 Fax: 705-682-2260
Reports to be sent to:
1. Email: meg.russell@wsp.com
2. Email: dominique.gagnon@wsp.com

Regulatory Requirements:

☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☑ Other
ODWS (Indicate One)

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: TY1410143.2023.FLD.1142.5730-00
Site Location: Mindemova - GW
Sampled By:
AGAT Quote #: 233349 PO: C026201607
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☐ No ☑

Company: WSP E&I Canada Limited
Contact: ACCOUNTS PAYABLE
Address:
Email: APInvoice.Canada@wsp.com; meg.russell@wsp.com; dominique.gagnon@wsp.com

Sample Matrix Legend

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

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 (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (Incl. Hydrides))	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	O. Reg 153: Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	O. Reg 153: Volatiles: ☐ VOC ☐ BTEX ☐ THM	O. Reg 153: PHCs F1 - F4	O. Reg 153: ABNs	O. Reg 153: PAHs	O. Reg 153: PCBs: ☐ Total ☐ Aroclors	O. Reg 153: Organochlorine Pesticides	O. Reg 153: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	Comp GW - Col 1 per quote	VOCs per quotet
MW-WS	11/01/23	13:10	11	GW		Y															☑	☑
MW-WD	11/01/23	11:30	11	GW		Y															☑	☑
MW-SS	11/01/23	12:10	11	GW		Y															☑	☑
MW-SD	11/01/23	12:20	11	GW		Y															☑	☑
MW-ES	11/01/23	12:50	11	GW		Y															☑	☑
MW-ED	11/01/23	13:00	11	GW		Y															☑	☑
MW-NS	11/01/23	10:00	11	GW		Y															☑	☑
MW-ND	11/01/23	10:15	11	GW		Y															☑	☑
MW19-01S	10/30/23	11:50	11	GW		Y															☑	☑
MW19-01D	11/01/23	12:35	11	GW		Y															☑	☑
MW19-02S	10/30/23	14:20	11	GW		Y															☑	☑

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Mikayla Bechard	11/01/2023	13:40		NOV 2	9:15

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N°:

AGAT Laboratories

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

Laboratory Use Only
Work Order #: 23T088152
Cooler Quantity:
Arrival Temperatures: Sea 9 11
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes:

Report Information:
Company: WSP E&I Canada Limited
Contact: ~~Dominique Gagnon~~
Address: 131 Fielding Road
Lively, ON P3Y 1L7
Phone: 705-677-4684 Fax: 705-682-2260
Reports to be sent to:
1. Email: meg.russell@wsp.com
2. Email: dominique.gagnon@wsp.com

Project Information:
Project: TY1410143.2023.FLD.1142.5730-00
Site Location: Mindemoya - GW
Sampled By:
AGAT Quote #: 233349 PO: C026201607
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:
Bill To Same: Yes ☐ No ☑
Company: WSP E&I Canada Limited
Contact: ACCOUNTS PAYABLE
Address:
Email: APInvoice.Canada@wsp.com; meg.russell@wsp.com; dominique.gagnon@wsp.com

Regulatory Requirements:
☐ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☑ Other ODWS (Indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

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

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

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 (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides))	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr6+ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	O. Reg 153: Full Metals Scan	O. Reg 153: Regulation/Custom Metals	O. Reg 153: Nutrients: ☐ TP ☐ NH3 ☐ TKN ☐ NO3 ☐ NO2 ☐ NO3+NO2	O. Reg 153: Volatiles: ☐ VOC ☐ BTEX ☐ THM	O. Reg 153: PHCs F1 - F4	O. Reg 153: ABNs	O. Reg 153: PAHs	O. Reg 153: PCBs: ☐ Total ☐ Aroclors	O. Reg 153: Organochlorine Pesticides	O. Reg 153: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 153: Sewer Use	Comp GW - Col 1 per quote	VOCs per quotet
MW19-02D	11/01/23	11:00	11	GW		Y														✔	✔
MW19-03A	10/30/23	15:30	11	GW		Y														✔	✔
MW19-03B	10/30/23	15:00	11	GW		Y														✔	✔
MW19-03D	11/01/23	10:45	11	GW		Y														✔	✔
MW19-04S	10/30/23	13:50	11	GW		Y														✔	✔
MW19-04D	11/01/23	10:30	11	GW		Y														✔	✔
MIND DUP1	10/30/23	11:50	11	GW		Y														✔	✔
MIND DUP2	10/30/23	15:00	11	GW		Y														✔	✔

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Mikayla Bechard	11/01/23	13:40		NOV 2	9:15 AM

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N°:

APPENDIX E
SUMMARY OF GROUNDWATER GEOCHEMICAL ANALYSES

Groundwater Geochemical Results MW-SS

Parameters	Units	ODWS [1]	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	**519**	**505**	463	**870**	**920**	**902**	**826**	**1100**	**938**	**572**
Ammonia	mg/L		0.06	1.26	1.02	16.8	17.0	4.72	34	52.4	32.1	26.6
Chloride	mg/L	250 AO	158	109	110	181	131	179	124	188	128	101
COD	mg/L		21	23	30	60	42	66	52	60	77	52
Conductivity	umho/cm		1720	1640	1520	2240	2290	2390	2040	2710	2180	1640
Dissolved Organic Carbon (DOC)	mg/L	5 AO	**12.2**	**5.7**	4.5	**17.5**	**16.4**	**15.0**	**20.2**	**25.7**	**18.5**	**9.2**
Nitrate (N)	mg/L	10 MAC	<0.25	0.56	0.63	<0.5	<0.5	<1.0	<0.5	<0.14	<0.07	<0.05
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.25	<0.5	<0.5	<1.0	<0.5	<0.11	<0.05	<0.05
pH	pH	6.5-8.5	7.21	7.73	7.89	8.19	7.40	7.69	7.88	7.36	7.46	7.44
Phenols	mg/L		<0.001	<0.001	0.001	<0.001	0.001	0.001	0.004	0.046	0.03	0.019
Total Phosphorus	mg/L		0.86	0.79	0.83	0.94	0.84	1.0	0.3	0.3	0.49	0.71
Sulphate	mg/L	500 AO	246	206	232	326	296	241	153	230	211	166
Total Dissolved Solids (TDS)	mg/L	500 AO	**1190**	**898**	**934**	**1440**	**1420**	**1330**	**1250**	**1600**	**1080**	**912**
TKN	mg/L		0.63	3.58	2.96	18.3	22.5	24.9	36.5	54.7	34.9	27.9
Metals												
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.002	<0.003	<0.001	0.002
Barium	mg/L	1 MAC	0.077	0.095	0.093	0.136	0.105	0.125	0.114	0.116	0.124	0.083
Boron	mg/L	5 IMAC	0.134	0.165	0.181	0.683	0.631	0.694	0.837	1.14	0.904	0.712
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0002	<0.002	<0.0001	<0.0001
Calcium	mg/L		167	149	149	194	194	186	143	162	150	124
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	0.004	0.004	0.005	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	0.004	<0.003	0.003	0.010	<0.003	0.004	0.007	0.007	0.008	<0.001
Iron	mg/L	0.3 AO	0.023	<0.010	0.059	0.042	**4.13**	**1.45**	**3.26**	0.277	0.051	**2.05**
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	0.0011	<0.001	<0.0005	<0.0005
Magnesium	mg/L		83.2	78.3	78.9	130	132	127	107	127	98.3	87.1
Manganese	mg/L	0.05 AO	**0.769**	**1.24**	**1.05**	**1.41**	**1.63**	**1.56**	**1.24**	**1.12**	**1.4**	**1.08**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		17.0	22.3	21.0	63.4	59.5	57.1	64.3	84.9	82	63.7
Sodium	mg/L	200 AO	69.3	56.2	53.2	118	98.8	115	115	150	138	97.5
Zinc	mg/L	5 AO	<0.005	0.007	0.006	<0.005	0.007	<0.005	0.008	<0.005	0.005	<0.005
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	0.00029	0.00036	<0.0002	<0.0004	<0.0004	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0006	<0.0006	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00033	<0.0004	<0.0004	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00034	<0.00034	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-SD

Parameters	Units	ODWS (1)	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	**539**	**543**	**522**	**729**	**850**	**767**	**923**	**1090**	**1050**	**785**
Ammonia	mg/L		0.03	0.10	0.55	<0.02	13.1	13.1	24.1	43.3	40.2	29.4
Chloride	mg/L	250 AO	117	133	178	140	106	125	160	190	161	147
COD	mg/L		7	15	16	45	27	29	49	49	66	60
Conductivity	umho/cm		1530	1840	1990	1870	2070	2010	2370	2700	2610	2150
Dissolved Organic Carbon (DOC)	mg/L	5 AO	4.9	**6.2**	**5.8**	**13.4**	**12.2**	**10.0**	**18.4**	**23.5**	**21**	**12.2**
Nitrate (N)	mg/L	10 MAC	<0.25	<0.25	<0.5	<0.5	<0.25	<0.5	<1.0	<0.14	<0.14	<0.07
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.5	<0.5	<0.25	<0.5	<1.0	<0.11	<0.11	<0.05
pH	pH	6.5-8.5	7.58	7.68	7.98	8.15	7.47	7.64	7.84	7.33	7.44	7.53
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.008	0.048	0.021	0.004
Total Phosphorus	mg/L		0.07	0.15	0.09	0.12	0.04	0.04	0.05	0.05	0.06	0.05
Sulphate	mg/L	500 AO	199	249	357	266	223	215	217	238	261	203
Total Dissolved Solids (TDS)	mg/L	500 AO	**1000**	**1110**	**1180**	**1210**	**1200**	**1170**	**1390**	**1530**	**1440**	**1210**
TKN	mg/L		0.35	0.78	0.97	6.06	15.7	13.9	25.4	43.8	41.4	29.5
Metals												
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.001	<0.003	<0.001	0.001
Barium	mg/L	1 MAC	0.071	0.090	0.100	0.143	0.145	0.157	0.165	0.163	0.187	0.12
Boron	mg/L	5 IMAC	0.115	0.182	0.203	0.546	0.526	0.606	0.801	0.965	0.947	0.727
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0003	<0.002	0.0001	0.0007
Calcium	mg/L		168	168	188	178	176	167	163	183	180	127
Chromium	mg/L	0.05 MAC	<0.003	0.003	<0.003	<0.003	0.004	<0.003	0.005	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	<0.003	0.004	0.004	0.012	0.007	0.005	0.011	0.011	0.018	0.02
Iron	mg/L	0.3 AO	0.188	<0.010	0.103	<0.010	<0.010	<0.010	<0.010	0.054	0.026	0.022
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	0.0006	0.001	0.0007	0.0009
Magnesium	mg/L		78.6	84.4	100	107	108	102	115	133	130	92.5
Manganese	mg/L	0.05 AO	**1.19**	**1.0**	**1.1**	**1.3**	**1.2**	**1.1**	**2.2**	**1.9**	**1.75**	**1.45**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		14.1	21.4	27.1	52.2	54.7	51	58.2	72.2	81.5	58.6
Sodium	mg/L	200 AO	46.3	80.2	103	99.3	87.1	85.7	115	145	162	106
Zinc	mg/L	5 AO	0.01	0.006	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	0.006	<0.005
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	0.00041	<0.0002	<0.0004	<0.0004	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0006	<0.0006	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004	0.00127	0.00243	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00034	<0.00034	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-ES

Parameters	Units	ODWS (1)	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	294	450	**638**	384	399	428	262	356	335	262
Ammonia	mg/L		0.52	1.15	3.08	0.37	0.24	0.42	<0.02	0.06	<0.02	<0.02
Chloride	mg/L	250 AO	6.81	69.8	119	7.85	4.88	15.3	1.41	1.36	2.72	3.22
COD	mg/L		16	59	60	25	18	10	17	<5	16	32
Conductivity	umho/cm		567	1160	1500	694	727	847	480	628	570	511
Dissolved Organic Carbon (DOC)	mg/L	5 AO	**8.5**	4.5	**9.1**	**10.3**	4.1	3.5	**5.2**	5.0	**5.6**	3.3
Nitrate (N)	mg/L	10 MAC	<0.10	<0.05	<0.25	<0.10	<0.05	<0.25	0.08	<0.05	<0.05	0.08
Nitrite (N)	mg/L	1 MAC	<0.10	<0.05	<0.25	<0.10	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	6.98	7.56	7.78	7.90	7.08	7.48	7.65	7.15	7.36	7.36
Phenols	mg/L		<0.001	0.005	0.039	0.002	0.002	<0.001	<0.001	0.047	0.012	0.008
Total Phosphorus	mg/L		0.70	2.71	2.4	1.44	1.36	0.69	0.24	0.48	0.75	0.52
Sulphate	mg/L	500 AO	9.14	46.1	22.2	25.2	10.3	13.0	5.2	5.6	5.79	8.24
Total Dissolved Solids (TDS)	mg/L	500 AO	298	**634**	**800**	382	396	426	264	346	306	288
TKN	mg/L		1.09	5.65	5.05	1.14	1.66	1.08	0.5	0.36	0.24	0.21
Metals												
Arsenic	mg/L	0.01 MAC	0.006	0.008	0.005	0.003	0.004	<0.003	<0.001	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.024	0.061	0.071	0.031	0.045	0.036	0.015	0.016	0.017	0.015
Boron	mg/L	5 IMAC	0.016	0.032	0.045	0.026	0.035	0.068	0.047	0.022	0.016	0.021
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		69.7	116	143	88.4	88.7	102	55.9	70.6	70.7	65.2
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	<0.003	0.002	0.002
Iron	mg/L	0.3 AO	**11.3**	**8.73**	**14.7**	**4.74**	**3.58**	<0.010	<0.010	0.072	0.017	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		31.6	46.9	52.0	37.7	39.2	39.7	29.7	39.6	43.8	28.4
Manganese	mg/L	0.05 AO	**1.65**	**2.13**	**2.05**	**0.887**	**1.17**	**0.439**	0.029	**0.063**	**0.062**	0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		2.17	4.77	8.96	2.29	2.83	3.66	0.77	0.8	1.33	0.66
Sodium	mg/L	200 AO	4.24	31.5	89.0	11.9	6.74	14.0	1.7	1.3	2.02	2.9
Zinc	mg/L	5 AO	<0.005	<0.005	0.008	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	0.00097	0.0058	0.0150	0.00024	0.00056	0.00064	<0.0002	<0.0002	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-ED

Parameters	Units	ODWS [1]	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	**No sample**	**517**	**706**	496	**521**	484	362	402	448	**544**
Ammonia	mg/L		**obtained**	5.6	6.74	1.68	0.73	0.41	0.13	0.09	0.18	0.6
Chloride	mg/L	250 AO		59.6	141	13.4	27.8	31.2	2.54	1.91	6.49	56.4
COD	mg/L			52	51	47	29	24	25	<5	21	40
Conductivity	umho/cm			1240	1630	873	1040	986	660	715	784	1180
Dissolved Organic Carbon (DOC)	mg/L	5 AO		**6.9**	**9.6**	**19.2**	4.1	4.5	**10.3**	3.4	**7.3**	5
Nitrate (N)	mg/L	10 MAC		<0.05	<0.25	<0.25	<0.25	<0.25	0.16	0.14	0.08	0.88
Nitrite (N)	mg/L	1 MAC		<0.05	<0.25	<0.25	<0.25	<0.25	<0.10	<0.05	0.08	0.29
pH	pH	6.5-8.5		7.59	7.84	8.13	7.32	7.56	7.83	7.33	7.6	7.49
Phenols	mg/L			0.009	<0.001	<0.001	0.001	<0.001	0.001	0.198	0.017	0.013
Total Phosphorus	mg/L			0.78	<0.05	2.31	1.21	0.77	0.8	0.89	0.31	0.12
Sulphate	mg/L	500 AO		29.0	25.1	23.7	25.7	15.0	9.6	6.8	12	31.1
Total Dissolved Solids (TDS)	mg/L	500 AO		**662**	**884**	500	**540**	**514**	368	412	390	**672**
TKN	mg/L			8.6	9.38	4.7	1.82	1.45	1.1	0.46	0.37	1.77
Metals												
Arsenic	mg/L	0.01 MAC		**0.018**	**0.024**	0.009	**0.011**	0.006	0.003	<0.003	<0.001	0.001
Barium	mg/L	1 MAC		0.256	0.212	0.118	0.152	0.12	0.073	0.088	0.085	0.156
Boron	mg/L	5 IMAC		<0.010	0.011	<0.010	0.025	0.032	0.033	0.021	0.017	0.14
Cadmium	mg/L	0.005 MAC		<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L			134	166	114	121	125	80.7	91.3	123	132
Chromium	mg/L	0.05 MAC		<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO		<0.003	<0.003	<0.003	<0.003	<0.003	<0.001	<0.003	<0.001	0.002
Iron	mg/L	0.3 AO		**2.29**	**22.2**	**10.0**	**11.6**	**5.2**	**1.1**	**1.1**	**6.2**	**0.665**
Lead	mg/L	0.01 MAC		<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L			46.2	53	36	41.9	44.3	30.6	36.6	40.6	58.9
Manganese	mg/L	0.05 AO		**1.31**	**2.21**	**1.64**	**1.71**	**1.8**	**1.06**	**0.791**	**1.13**	**0.975**
Mercury	mg/L	0.001 MAC		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L			8.71	6.79	3.68	4.88	3.33	0.96	1.28	1.96	4.45
Sodium	mg/L	200 AO		34.3	101	34.9	32.2	20.3	14.4	4.83	13.1	39.3
Zinc	mg/L	5 AO		0.005	0.013	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.01
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO		**0.310**	**0.290**	**0.031**	0.00050	0.00038	0.00072	<0.0002	0.00377	<0.0002
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-NS

Parameters	Units	ODWS (1)	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	397	**549**	431	375		**No sample**	326	396	**No Sample**	318
Ammonia	mg/L		0.11	0.05	0.06	0.02		**obtained**	<0.02	0.1		<0.02
Chloride	mg/L	250 AO	2.18	2.68	2.01	1.0			1.3	1.3		1.86
COD	mg/L		20	32	13	35			16	<5		43
Conductivity	umho/cm		722	1080	780	625			579	702		589
Dissolved Organic Carbon (DOC)	mg/L	5 AO	**13.4**	3.3	3.1	**12.5**			**6.6**	4.3		3.6
Nitrate (N)	mg/L	10 MAC	<0.10	<0.05	0.44	0.20			0.05	0.18		0.08
Nitrite (N)	mg/L	1 MAC	<0.10	<0.05	0.08	<0.10			<0.05	<0.05		<0.05
pH	pH	6.5-8.5	7.62	7.57	8.04	8.08			7.88	7.48		7.44
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001			<0.001	0.022		0.005
Total Phosphorus	mg/L		1.59	1.84	<0.05	1.85			0.23	0.3		0.29
Sulphate	mg/L	500 AO	11.5	12.3	15.2	12.9			2.42	5.86		4.3
Total Dissolved Solids (TDS)	mg/L	500 AO	418	**538**		342			306	396		322
TKN	mg/L		1.2	4.09	0.33	0.69			0.6	0.72		0.22
Metals												
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003		0.001	<0.003		<0.001
Barium	mg/L	1 MAC	0.04	0.048	0.041	0.028	0.037		0.027	0.04		0.02
Boron	mg/L	5 IMAC	<0.010	0.011	<0.010	<0.010	0.013		0.027	0.016		0.014
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002		<0.0001	<0.002		<0.0001
Calcium	mg/L		93.7	131	102	87.2			65.9	87.4		66.1
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003		<0.002	<0.003		<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003		0.004	<0.003		0.001
Iron	mg/L	0.3 AO	**1.23**	**0.561**	0.241	0.048	<0.010		<0.010	0.017		0.018
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001		<0.0005	<0.001		<0.0005
Magnesium	mg/L		43.3	57.1	45.3	38.1			37.7	45.3		36.3
Manganese	mg/L	0.05 AO	**0.155**	**0.452**	**0.140**	**0.072**	0.022		0.002	0.049		<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001		<0.0001
Potassium	mg/L		0.96	0.99	1.12	0.64			0.46	0.8		0.51
Sodium	mg/L	200 AO	1.96	1.49	3.35	1.48			0.7	0.85		1.36
Zinc	mg/L	5 AO	<0.005	<0.005	0.010	0.005	<0.005		<0.005	<0.005		<0.005
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002		<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003			<0.0003	<0.0003		<0.0003
Toluene	mg/L	0.024 AO	0.00048	0.0003	<0.0002	<0.0002			<0.0002	<0.0002		<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017			<0.00017	<0.00017		<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-ND

Parameters	Units	ODWS [1]	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	480	275	312	376	402	357	376	400	451	359
Ammonia	mg/L		38.6	1.5	0.85	0.4	0.28	0.32	0.08	0.05	0.13	<0.02
Chloride	mg/L	250 AO	6.74	2.43	3.25	0.92	1.67	2.06	1.38	1.25	1.8	1.8
COD	mg/L		482	30	37	18	19	6	17	<5	28	23
Conductivity	umho/cm		1030	588	699	622	733	674	678	717	786	672
Dissolved Organic Carbon (DOC)	mg/L	5 AO	**40.1**	3.0	2.9	**9.6**	3.1	3.0	5.0	3.7	3.3	2.3
Nitrate (N)	mg/L	10 MAC	<0.25	0.23	0.9	<0.10	<0.25	<0.10	0.24	0.13	0.08	0.19
Nitrite (N)	mg/L	1 MAC	<0.25	<0.05	0.10	<0.10	<0.25	<0.10	<0.10	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	7.36	7.63	7.97	8.20	7.71	7.64	7.93	7.57	7.78	7.54
Phenols	mg/L		0.364	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.032	0.009	<0.004
Total Phosphorus	mg/L		5.83	0.96	2.34	0.8	2.58	0.29	0.33	0.95	0.85	0.23
Sulphate	mg/L	500 AO	3.16	14.8	8.05	11.3	14.3	12.9	10.8	9.44	18.2	10.4
Total Dissolved Solids (TDS)	mg/L	500 AO	430	344	380	326	402	318	340	394	412	372
TKN	mg/L		38.6	8.54	2.2	0.86	1.01	0.82	0.9	0.26	0.4	0.22
Metals												
Arsenic	mg/L	0.01 MAC	<0.003	0.006	<0.003	<0.003	<0.003	<0.003	0.002	<0.003	0.001	0.001
Barium	mg/L	1 MAC	0.035	0.024	0.028	0.030	0.034	0.030	0.034	0.047	0.05	0.042
Boron	mg/L	5 IMAC	<0.010	<0.010	<0.010	<0.010	<0.010	0.015	0.023	0.014	<0.010	0.013
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		77.6	70.9	72.5	83.9	92.7	84.3	81.6	89.1	108	91.3
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.002	<0.003	0.003	0.002
Iron	mg/L	0.3 AO	**1.13**	**4.79**	**1.66**	**0.941**	**1.14**	**0.35**	0.026	0.039	0.025	0.079
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		36.0	29.7	30.1	37.4	42.5	35.4	37.1	42.4	48.2	42.1
Manganese	mg/L	0.05 AO	**0.269**	**0.622**	**0.678**	**0.263**	**0.19**	**0.358**	**0.213**	**0.326**	**0.293**	**0.086**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		11.1	1.47	1.27	1.2	1.27	1.16	1.06	1.21	1.45	1.28
Sodium	mg/L	200 AO	6.58	4.06	5.15	4.99	3.91	4.99	4.81	3.05	3.12	3.63
Zinc	mg/L	5 AO	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002		<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003		<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	0.0052	0.00084	0.00068	<0.0002		<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017		<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-WS

Parameters	Units	ODWS (1)	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	353	494	**512**	**510**	**539**	**518**	446	472	458	341
Ammonia	mg/L		0.03	2.37	0.12	0.11	<0.02	0.14	<0.02	0.05	0.03	<0.02
Chloride	mg/L	250 AO	10.3	46.0	39.0	24.2	33.8	44.2	17.0	20.6	17.1	6.65
COD	mg/L		33	51	18	19	18	24	23	<5	18	33
Conductivity	umho/cm		689	1150	1080	938	1050	1120	874	944	897	688
Dissolved Organic Carbon (DOC)	mg/L	5 AO	**14.4**	**10.7**	3.5	**7.2**	4.2	3.4	3.4	3.5	3.7	2.6
Nitrate (N)	mg/L	10 MAC	0.49	0.26	0.45	0.8	1.21	0.35	1.04	1.4	2.46	2.45
Nitrite (N)	mg/L	1 MAC	<0.10	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.05	0.2	<0.05
pH	pH	6.5-8.5	7.36	7.74	8.03	8.27	7.41	7.57	7.90	7.35	7.57	7.44
Phenols	mg/L		<0.001	0.015	<0.001	<0.001	<0.001	<0.001	<0.001	0.027	0.017	0.015
Total Phosphorus	mg/L		1.98	2.1	0.79	0.48	1.34	1.11	0.79	0.66	0.58	0.08
Sulphate	mg/L	500 AO	16.0	31.7	43.8	36.8	46.3	57.8	25.7	32.5	36	18.3
Total Dissolved Solids (TDS)	mg/L	500 AO	398	**616**	**598**	**526**	**632**	**584**	**506**	**516**	456	398
TKN	mg/L		0.79	14.5	0.74	0.41	0.76	1.08	0.5	0.5	0.47	0.24
Metals												
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.001	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.051	0.083	0.064	0.073	0.065	0.072	0.047	0.052	0.052	0.033
Boron	mg/L	5 IMAC	0.047	0.093	0.071	0.106	0.095	0.126	0.073	0.101	0.079	0.061
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		88.4	123	127	119	131	130	95.9	118	114	85.2
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	0.005	<0.003	0.003	0.001
Iron	mg/L	0.3 AO	0.19	**0.535**	0.099	0.127	<0.010	<0.010	<0.010	0.013	0.014	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		41.9	53.8	59.8	56.5	61.9	60.3	46.1	57.8	42.5	41.6
Manganese	mg/L	0.05 AO	0.050	**0.441**	**0.086**	**0.163**	0.021	**0.266**	<0.002	<0.002	0.002	<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		3.58	8.56	6.89	7.02	7.82	6.94	4.74	6.17	6.16	4.87
Sodium	mg/L	200 AO	5.43	18.9	18.5	15.6	19.5	20.4	10.6	14.7	14.7	10.7
Zinc	mg/L	5 AO	<0.005	0.007	0.012	<0.005	<0.005	0.014	<0.005	0.007	<0.005	<0.005
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	0.0180	<0.0002	<0.0002	0.00059	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW-WD

Parameters	Units	ODWS [1]	Oct-14	Sep-15	Sep-16	Oct-17	Sep-18	Sep-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry												
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	467	448		**514**		456	**509**	444	**No sample**	440
Ammonia	mg/L		<0.02	1.32	0.07	<0.02			<0.02	0.05		<0.02
Chloride	mg/L	250 AO	18.7	36.3		25.5		35.2	23.6	13.8		19.8
COD	mg/L		18	64	24	19			16	<5		45
Conductivity	umho/cm		914	1050		943		1000	1010	868		938
Dissolved Organic Carbon (DOC)	mg/L	5 AO	**14.4**	**6.5**	4.7	**6.8**			4.2	2.9		1.9
Nitrate (N)	mg/L	10 MAC	<0.25	0.29		0.5		0.9	1.56	1.21		2.57
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25		<0.25		<0.25	<0.25	<0.05		<0.05
pH	pH	6.5-8.5	7.50	7.72		8.19		7.66	7.85	7.54		7.59
Phenols	mg/L		<0.001	0.031		<0.001		<0.001	<0.001	0.025		0.007
Total Phosphorus	mg/L		1.1	1.39	<0.05	0.34			0.14	0.17		0.36
Sulphate	mg/L	500 AO	25.5	36.8		39.5		49.4	37.7	30.3		43.1
Total Dissolved Solids (TDS)	mg/L	500 AO	**528**	**518**		**554**		**528**	**594**	494		**556**
TKN	mg/L		0.47	5.5	1.37	0.3			1.0	0.2		0.42
Metals												
Arsenic	mg/L	0.01 MAC	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	0.001	<0.003		<0.001
Barium	mg/L	1 MAC	0.074	0.068	0.075	0.083	0.077	0.086	0.091	0.061		0.073
Boron	mg/L	5 IMAC	0.052	0.054	0.041	0.084	0.064	0.085	0.099	0.085		0.101
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.002		<0.0001
Calcium	mg/L		113	110		119		116	113	105		112
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.003		<0.002
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	0.006	0.012	0.012	0.005	<0.003		0.002
Iron	mg/L	0.3 AO	<0.010	0.252	<0.010	<0.010	<0.010	<0.010	<0.010	0.01		0.011
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	0.002	<0.001	<0.0005	<0.001		<0.0005
Magnesium	mg/L		53.8	50.7		57.1		53.2	54.8	50.9		53.2
Manganese	mg/L	0.05 AO	<0.002	**0.314**	0.005	0.003	0.004	0.003	<0.002	<0.002		<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001
Potassium	mg/L		4.75	4.77		5.74		5.67	5.87	5.67		5.98
Sodium	mg/L	200 AO	9.93	13.8		15.6		15.4	15.6	11.3		14.3
Zinc	mg/L	5 AO	<0.005	<0.005	0.013	0.006	0.027	0.019	<0.005	<0.005		<0.005
Volatile Organic Compounds												
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001		<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002			<0.0002	<0.0002		<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003			<0.0003	<0.0003		<0.0003
Toluene	mg/L	0.024 AO	<0.0002	0.0079	<0.0002	<0.0002			<0.0002	<0.0002		<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00018	<0.00017	<0.00017			<0.00017	<0.00017		<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-01S

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	287	343	308	478	447	296
Ammonia	mg/L		0.2	0.2	0.1	0.1	<0.02	<0.02
Chloride	mg/L	250 AO	12.6	16.0	1.56	2.68	3.06	2.01
COD	mg/L		10	10	18	<5	13	28
Conductivity	umho/cm		611	672	560	841	770	553
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.0	3.4	**5.1**	3.2	3.1	2.7
Nitrate (N)	mg/L	10 MAC	<0.10	1.26	0.06	<0.05	0.24	0.08
Nitrite (N)	mg/L	1 MAC	<0.10	<0.10	<0.05	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	7.74	7.63	7.85	7.46	7.54	7.55
Phenols	mg/L			<0.001	<0.001	0.036	0.013	0.005
Total Phosphorus	mg/L		0.57	0.34	0.37	0.53	0.04	0.19
Sulphate	mg/L	500 AO	20.3	14.6	7.63	9.63	15.9	8.98
Total Dissolved Solids (TDS)	mg/L	500 AO	296	368	298	458	398	306
TKN	mg/L		0.56	0.75	0.5	<0.10	0.2	<0.10
Metals								
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.001	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.031	0.018	0.016	0.028	0.022	0.014
Boron	mg/L	5 IMAC	0.026	0.048	0.019	0.018	0.012	0.015
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		57.9	75.0	61.8	99.4	97.3	62
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	<0.003	0.005	0.003	<0.003	0.001	0.002
Iron	mg/L	0.3 AO	0.074	0.031	<0.010	0.293	**0.374**	**0.433**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		29.7	40.0	33.6	54.1	51.2	33.6
Manganese	mg/L	0.05 AO	**0.16**	0.02	0.04	**0.37**	**0.195**	**0.051**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		0.60	3.26	0.77	1.3	2.27	0.98
Sodium	mg/L	200 AO	27.2	8.14	6.27	7.35	12.9	3.18
Zinc	mg/L	5 AO	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002	0.00102	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-01D

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	221	250	251	259	264	239
Ammonia	mg/L		0.1	0.03	<0.02	<0.02	<0.02	<0.02
Chloride	mg/L	250 AO	**288**	88.9	4.37	3.88	2.15	1.67
COD	mg/L		7	<5	7	<5	7	19
Conductivity	umho/cm		1420	813	535	543	502	484
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.6	2.0	1.3	1.5	1.6	1.2
Nitrate (N)	mg/L	10 MAC	<0.25	<0.25	0.11	0.2	0.21	0.15
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.05	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	7.74	7.71	7.96	7.76	7.88	7.82
Phenols	mg/L			<0.001	<0.001	0.036	0.012	0.006
Total Phosphorus	mg/L		0.38	0.03	0.08	0.05	0.03	<0.02
Sulphate	mg/L	500 AO	97.4	71.4	36.0	37.8	21.8	22.8
Total Dissolved Solids (TDS)	mg/L	500 AO	**710**	314	294	300	274	264
TKN	mg/L		0.5	0.19	0.4	0.12	<0.10	<0.10
Metals								
Arsenic	mg/L	0.01 MAC	0.006	<0.003	0.001	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.096	0.056	0.022	0.024	0.016	0.018
Boron	mg/L	5 IMAC	0.181	0.112	0.063	0.067	0.054	0.058
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		125	81.2	47.1	57.6	60.1	53.4
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	0.004	0.004	<0.001	<0.003	<0.001	0.004
Iron	mg/L	0.3 AO	<0.010	0.036	<0.010	<0.010	0.013	**0.446**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		63.8	42.2	26.0	32.6	31.9	31.4
Manganese	mg/L	0.05 AO	**0.133**	**0.093**	0.002	0.004	<0.002	0.03
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		10.9	6.5	3.8	4.5	4.74	4
Sodium	mg/L	200 AO	47.2	17.7	9.16	10.3	9.01	8.05
Zinc	mg/L	5 AO	0.008	<0.005	<0.005	<0.005	<0.005	0.058
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	0.00040	0.00033	<0.0002	0.00051	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-02S

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	**555**	246	361	419	455	327
Ammonia	mg/L		7.22	0.17	<0.02	0.05	<0.02	<0.02
Chloride	mg/L	250 AO	53.3	3.56	5.52	4.12	21.5	4.06
COD	mg/L		16	33	12	<5	10	21
Conductivity	umho/cm		1200	497	669	749	833	635
Dissolved Organic Carbon (DOC)	mg/L	5 AO	**5.5**	4.4	4.2	3.4	3.8	2.5
Nitrate (N)	mg/L	10 MAC	1.15	<0.05	0.94	0.94	3.46	1.69
Nitrite (N)	mg/L	1 MAC	<0.25	<0.05	<0.10	<0.05	0.27	<0.05
pH	pH	6.5-8.5	7.90	7.66	7.92	7.42	7.61	7.48
Phenols	mg/L			<0.001	<0.001	0.024	0.062	0.008
Total Phosphorus	mg/L		0.57	0.63	0.2	0.12	0.07	0.05
Sulphate	mg/L	500 AO	31.8	8.7	10.2	8.6	22.9	17.2
Total Dissolved Solids (TDS)	mg/L	500 AO	**620**	218	380	410	432	366
TKN	mg/L		7.87	0.37	0.6	0.13	0.16	0.21
Metals								
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.001	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.066	0.019	0.016	0.015	0.018	0.013
Boron	mg/L	5 IMAC	0.228	0.014	0.050	0.039	0.048	0.053
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		119	48.9	73.8	89.2	97.4	72.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	0.008	0.005	0.003	<0.003	<0.001	<0.001
Iron	mg/L	0.3 AO	<0.010	0.129	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		61.2	25.0	40.0	50.0	52.6	42
Manganese	mg/L	0.05 AO	**0.088**	**0.063**	0.013	0.010	0.007	0.006
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		12.6	0.42	2.41	2.36	3.26	2.64
Sodium	mg/L	200 AO	33.3	11.4	4.6	3.0	7.02	3.87
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-02D

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	212	256	279	266	276	270
Ammonia	mg/L		0.12	<0.02	<0.02	0.07	<0.02	<0.02
Chloride	mg/L	250 AO	**320**	80.5	13.8	14	5.91	2.61
COD	mg/L		28	11	7	<5	9	25
Conductivity	umho/cm		1460	835	647	647	591	519
Dissolved Organic Carbon (DOC)	mg/L	5 AO		2.9	2.2	2.2	1.5	1.2
Nitrate (N)	mg/L	10 MAC	0.6	<0.25	0.28	0.34	0.17	0.05
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.10	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	7.61	7.79	8.03	7.59	7.82	7.86
Phenols	mg/L			<0.001	<0.001	0.021	0.01	0.008
Total Phosphorus	mg/L		2.37	0.19	0.23	0.22	0.37	0.03
Sulphate	mg/L	500 AO	79.9	65.0	58.2	62.6	56	21.9
Total Dissolved Solids (TDS)	mg/L	500 AO	**1080**	372	368	370	308	298
TKN	mg/L		2.18	0.22	0.5	0.21	0.16	<0.10
Metals								
Arsenic	mg/L	0.01 MAC	0.006	0.004	0.001	<0.003	0.001	<0.001
Barium	mg/L	1 MAC	0.07	0.053	0.023	0.038	0.028	0.024
Boron	mg/L	5 IMAC	0.195	0.106	0.034	0.047	0.017	0.028
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		109	79.9	67.5	69.1	71.7	62.7
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	0.017	0.005	<0.001	<0.003	0.002	<0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	0.012	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		57.1	42.3	38.4	38.4	32.8	35
Manganese	mg/L	0.05 AO	**0.109**	**0.137**	**0.058**	**0.236**	**0.07**	**0.077**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		10.3	5.12	3.1	3.62	4.94	2.98
Sodium	mg/L	200 AO	69.5	16.8	9.48	11.6	11.5	8.25
Zinc	mg/L	5 AO	0.01	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO		0.00065	<0.0002	<0.0002	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-03A

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	362	303	349	**Insufficient volume**	**No Sample**	315
Ammonia	mg/L			0.03	<0.02			<0.02
Chloride	mg/L	250 AO	**272**	18.2	4.0			2.56
COD	mg/L			6	11			33
Conductivity	umho/cm		1540	643	654			586
Dissolved Organic Carbon (DOC)	mg/L	5 AO		4.7	4.1			3.8
Nitrate (N)	mg/L	10 MAC	<0.25	0.44	0.52			0.61
Nitrite (N)	mg/L	1 MAC	<0.25	<0.10	<0.10			<0.05
pH	pH	6.5-8.5	7.82	7.78	7.97			7.45
Phenols	mg/L			<0.001	<0.001			0.005
Total Phosphorus	mg/L			0.97	0.38			0.13
Sulphate	mg/L	500 AO	78.5	19.2	15.1			8.86
Total Dissolved Solids (TDS)	mg/L	500 AO	**1080**	320	348			330
TKN	mg/L			0.43	0.6			0.22
Metals								
Arsenic	mg/L	0.01 MAC	0.007	<0.003	<0.001			<0.001
Barium	mg/L	1 MAC	0.110	0.025	0.014			0.01
Boron	mg/L	5 IMAC	0.208	0.032	0.025			0.024
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001			<0.0001
Calcium	mg/L		147	67.4	73.7			65.1
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002			<0.002
Copper	mg/L	1 AO	0.003	0.005	0.002			0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010			<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005			<0.0005
Magnesium	mg/L		75.5	37.7	41.0			38.3
Manganese	mg/L	0.05 AO	**0.354**	0.030	0.004			<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001			<0.0001
Potassium	mg/L		21.2	2.52	1.6			1.54
Sodium	mg/L	200 AO	8.48	4.18	4.27			1.76
Zinc	mg/L	5 AO	0.014	<0.005	<0.005			<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001			<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002			<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003			<0.0003
Toluene	mg/L	0.024 AO		<0.0002	<0.0002			<0.0002
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017			<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-03B

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	341	298	353	371	352	311
Ammonia	mg/L		0.04	<0.02	<0.02	0.03	<0.02	<0.02
Chloride	mg/L	250 AO	**494**	12.7	4.91	2.05	3.42	2.93
COD	mg/L		18	16	12	<5	11	31
Conductivity	umho/cm			596	662	681	638	597
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.5	**5.1**	4.8	3.5	3.3	2.2
Nitrate (N)	mg/L	10 MAC	<0.5	0.45	0.46	0.23	0.82	0.74
Nitrite (N)	mg/L	1 MAC	<0.5	<0.05	<0.10	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	7.72	7.65	7.92	7.53	7.65	7.48
Phenols	mg/L			<0.001	<0.001	0.03	0.01	0.006
Total Phosphorus	mg/L		1.11	0.87	0.57	0.3	0.2	0.08
Sulphate	mg/L	500 AO	104	13.9	16.1	12.7	19.8	14.4
Total Dissolved Solids (TDS)	mg/L	500 AO	**860**	308	330	392	346	326
TKN	mg/L		0.55	0.29	0.8	<0.10	0.15	0.22
Metals								
Arsenic	mg/L	0.01 MAC	0.006	<0.003	0.002	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.123	0.028	0.018	0.019	0.02	0.013
Boron	mg/L	5 IMAC	0.203	0.037	0.036	0.025	0.021	0.027
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		170	64.3	72.5	81.8	84.5	70.1
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	0.005	0.003	0.002	<0.003	<0.001	0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		90.2	35.4	41.3	47.1	45.9	40.1
Manganese	mg/L	0.05 AO	**0.352**	0.031	0.013	0.015	<0.002	<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		10.7	2.19	1.68	1.58	2.39	1.62
Sodium	mg/L	200 AO	35.2	3.39	4.33	1.72	2.78	2.07
Zinc	mg/L	5 AO	0.008	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	0.00029	0.00210	<0.0002	0.000141	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-03D

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	245	298	295	277	312	260
Ammonia	mg/L		0.11	0.02	<0.02	0.04	<0.02	<0.02
Chloride	mg/L	250 AO	241	114	24	7	4.82	3.1
COD	mg/L		15	<5	12	<5	11	23
Conductivity	umho/cm			968	700	642	631	587
Dissolved Organic Carbon (DOC)	mg/L	5 AO	3	2.5	1.8	2.1	3.7	1
Nitrate (N)	mg/L	10 MAC	<0.25	<0.25	<0.10	<0.05	<0.05	0.09
Nitrite (N)	mg/L	1 MAC	<0.25	<0.25	<0.10	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	7.76	7.69	7.99	7.79	7.9	7.78
Phenols	mg/L			<0.001	<0.001	0.038	0.005	0.007
Total Phosphorus	mg/L		0.14	0.05	0.06	0.04	0.04	<0.02
Sulphate	mg/L	500 AO	41.4	77.4	54.8	71.4	75.8	67.8
Total Dissolved Solids (TDS)	mg/L	500 AO	**966**	490	420	378	346	356
TKN	mg/L		0.8	0.59	0.4	0.13	<0.10	<0.10
Metals								
Arsenic	mg/L	0.01 MAC	0.004	0.004	0.001	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.101	0.094	0.050	0.045	0.045	0.038
Boron	mg/L	5 IMAC	0.146	0.145	0.086	0.09	0.077	0.077
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		101	105	70.5	67	65.1	60.8
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	0.004	<0.003	<0.001	<0.003	<0.001	<0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	0.02	0.012	0.01	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		51.8	53.2	41.2	39.4	43.2	37.5
Manganese	mg/L	0.05 AO	**0.273**	**0.404**	**0.249**	**0.08**	0.024	0.032
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		7.07	6.47	4.67	5.03	5.39	4.79
Sodium	mg/L	200 AO	29.8	13.2	6.11	8.63	10.9	8.23
Zinc	mg/L	5 AO	0.012	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	0.00031	0.00047	<0.0002	<0.0002	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-04S

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG	285	336	333	333	379	308
Ammonia	mg/L		0.15	<0.02	<0.02	0.05	<0.02	<0.02
Chloride	mg/L	250 AO	**699**	18.8	2.7	1.6	1.81	1.81
COD	mg/L		7	<5	8	<5	11	29
Conductivity	umho/cm			698	611	614	621	587
Dissolved Organic Carbon (DOC)	mg/L	5 AO	2.9	3.0	2.6	2.8	2.8	2
Nitrate (N)	mg/L	10 MAC	<0.5	<0.10	<0.10	<0.05	<0.05	<0.05
Nitrite (N)	mg/L	1 MAC	<0.5	<0.10	<0.10	<0.05	<0.05	<0.05
pH	pH	6.5-8.5	7.72	7.75	8.05	7.70	7.89	7.77
Phenols	mg/L			<0.001	<0.001	0.027	0.001	0.009
Total Phosphorus	mg/L		0.04	0.02	0.06	0.03	0.04	0.04
Sulphate	mg/L	500 AO	116	20.3	12.8	14.4	18.9	21
Total Dissolved Solids (TDS)	mg/L	500 AO	**1260**	332	320	348	314	336
TKN	mg/L		0.56	0.35	0.4	0.18	<0.10	0.12
Metals								
Arsenic	mg/L	0.01 MAC	0.010	<0.003	<0.001	<0.003	<0.001	<0.001
Barium	mg/L	1 MAC	0.164	0.028	0.020	0.018	0.004	0.012
Boron	mg/L	5 IMAC	0.274	0.017	0.015	0.012	<0.010	<0.010
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L		215	73.6	68.4	72.4	25.2	68.5
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	<0.003	0.004	<0.001	<0.003	<0.001	0.001
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L		114	40.9	40	41.7	13.4	41.1
Manganese	mg/L	0.05 AO	**0.599**	**0.053**	0.021	0.015	<0.002	<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L		16.5	1.96	0.95	0.98	<0.50	0.86
Sodium	mg/L	200 AO	40.2	4.71	0.96	1.69	0.18	0.93
Zinc	mg/L	5 AO	0.007	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.0001
Benzene	mg/L	0.001 MAC	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC	<0.0003	<0.0003	<0.0003	<0.0003	<0.00030	<0.0003
Toluene	mg/L	0.024 AO	<0.0002	<0.0002	<0.0002	0.00057	<0.00020	<0.0002
Vinyl Chloride	mg/L	0.001 MAC	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017	<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

Groundwater Geochemical Results MW19-04D

Parameters	Units	ODWS [1]	Sep-19	Nov-19	Nov-20	Nov-21	Nov-22	Oct-23
General Chemistry								
Alkalinity (Total as CaCO3)	mg/L	30-500 OG		294	305		299	278
Ammonia	mg/L			0.02	<0.02	0.06	<0.02	<0.02
Chloride	mg/L	250 AO		59	14.2		6.18	4.54
COD	mg/L			7	<5	<5	19	21
Conductivity	umho/cm			794	712		652	600
Dissolved Organic Carbon (DOC)	mg/L	5 AO		2.2	2.0	2.0	1.6	1.4
Nitrate (N)	mg/L	10 MAC		<0.25	0.25		0.08	0.47
Nitrite (N)	mg/L	1 MAC		<0.25	<0.10		<0.05	<0.05
pH	pH	6.5-8.5		7.77	8.01		7.97	7.85
Phenols	mg/L			<0.001	<0.001		0.008	0.009
Total Phosphorus	mg/L			0.02	0.04	0.05	0.04	0.05
Sulphate	mg/L	500 AO		51.8	70.5		73.2	49.4
Total Dissolved Solids (TDS)	mg/L	500 AO		454	414		**522**	360
TKN	mg/L			0.29	0.4	0.13	<0.10	<0.10
Metals								
Arsenic	mg/L	0.01 MAC	0.006	<0.003	<0.001	<0.003	0.001	<0.001
Barium	mg/L	1 MAC	0.075	0.062	0.030	0.037	0.048	0.021
Boron	mg/L	5 IMAC	0.181	0.092	0.065	0.062	0.047	0.043
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.0001	<0.002	<0.0001	<0.0001
Calcium	mg/L			81.9	74.9	77.2	75.1	60.8
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.002	<0.003	<0.002	<0.002
Copper	mg/L	1 AO	0.005	0.004	0.003	<0.003	0.002	<0.001
Iron	mg/L	0.3 AO	<0.010	0.064	<0.010	<0.010	0.06	<0.010
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.0005	<0.001	<0.0005	<0.0005
Magnesium	mg/L			42.9	40.9	41.8	46.3	33.9
Manganese	mg/L	0.05 AO	**0.134**	**0.173**	0.007	**0.137**	**0.116**	0.01
Mercury	mg/L	0.001 MAC		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L			4.3	3.51	3.94	2.56	2.5
Sodium	mg/L	200 AO		11.8	12.9	9.32	7.42	5.54
Zinc	mg/L	5 AO	0.006	<0.005	<0.005	<0.005	<0.005	<0.005
Volatile Organic Compounds								
1,4-Dichlorobenzene	mg/L	0.005 MAC		<0.0001	<0.0001	<0.0001		<0.0001
Benzene	mg/L	0.001 MAC		<0.0002	<0.0002	<0.0002		<0.0002
Methylene Chloride(Dichloromethane)	mg/L	0.05 MAC		<0.0003	<0.0003	<0.0003		<0.0003
Toluene	mg/L	0.024 AO		<0.0002	<0.0002	<0.0002		<0.0002
Vinyl Chloride	mg/L	0.001 MAC		<0.00017	<0.00017	<0.00017		<0.00017

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) ODWS exceedances indicated by **bold** and shaded entries.

2023 Groundwater Duplicate Data

Parameters	Units	Oct-23					
		MW19-01S	MIND-DUP1	Relative Percent Difference (%)	MW19-03B	MIND-DUP2	Relative Percent Difference (%)
General Chemistry							
Alkalinity (Total as CaCO3)	mg/L	296	298	0.673	311	314	0.960
Ammonia	mg/L	<0.02	<0.02	NC	<0.02	<0.02	NC
Chloride	mg/L	2.0	1.9	5.627	2.9	2.9	0.685
COD	mg/L	28	31	10.169	31	27	13.793
Conductivity	umho/cm	553	544	1.641	597	593	0.672
Dissolved Organic Carbon (DOC)	mg/L	2.7	2.8	3.636	2.2	2.3	4.444
Nitrate (N)	mg/L	0.08	0.08	0.000	0.74	0.74	0.000
Nitrite (N)	mg/L	<0.05	<0.05	NC	<0.05	<0.05	NC
pH	pH	7.55	7.58	0.397	7.48	7.62	1.854
Phenols	mg/L	0.005	<0.004	NC	0.006	0.004	40.000
Total Phosphorus	mg/L	0.19	0.08	**81.481**	0.08	0.07	13.333
Sulphate	mg/L	9.0	8.9	1.120	14.4	14.0	2.817
Total Dissolved Solids (TDS)	mg/L	306	306	0.000	326	340	4.204
TKN	mg/L	<0.10	0.19	NC	0.2	0.2	20.000
Metals							
Arsenic	mg/L	<0.001	<0.001	NC	<0.001	<0.001	NC
Barium	mg/L	0.014	0.013	7.407	0.013	0.013	0.000
Boron	mg/L	0.015	0.012	22.222	0.027	0.027	0.000
Cadmium	mg/L	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Calcium	mg/L	62	64.6	4.107	70.1	69.1	1.437
Chromium	mg/L	<0.002	<0.002	NC	<0.002	<0.002	NC
Copper	mg/L	0.002	0.001	**66.667**	0.001	<0.001	NC
Iron	mg/L	0.43	0.39	10.706	<0.010	<0.010	NC
Lead	mg/L	<0.0005	<0.0005	NC	<0.0005	<0.0005	NC
Magnesium	mg/L	33.6	35.8	6.340	40.1	39.3	2.015
Manganese	mg/L	0.051	0.05	1.980	<0.002	<0.002	NC
Mercury	mg/L	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Potassium	mg/L	1.0	0.91	7.407	1.6	1.53	5.714
Sodium	mg/L	3.18	3.29	3.400	2.07	2.15	3.791
Zinc	mg/L	<0.005	<0.005	NC	<0.005	<0.005	NC
Volatile Organic Compounds							
1,4-Dichlorobenzene	mg/L	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Benzene	mg/L	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC
Methylene Chloride(Dichloromethane)	mg/L	<0.0003	<0.0003	NC	<0.0003	<0.0003	NC
Toluene	mg/L	<0.0002	<0.0002	NC	<0.0002	<0.0002	NC
Vinyl Chloride	mg/L	<0.00017	<0.00017	NC	<0.00017	<0.00017	NC

Notes:
(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.

APPENDIX F
PHOTOGRAPHIC INVENTORY OF GROUNDWATER MONITORING LOCATIONS

MW-E
Well Nest
2023

MW-E
Well Nest
2023

MW-S
Well Nest
2023

MW-S
Well Nest
2023

MW-W
Well Nest
2023

MW-W
Well Nest
2023

MW-N
Well Nest
2023

MW-N
Well Nest
2023

MW19-01S
2023

MW19-01D
2023

MW19-01
Well Nest
2023

MW19-02S
2023

MW19-02D
2023

MW19-02
Well Nest
2023

MW19-03A
2023

MW19-03B
2023

MW19-03D
2023

MW19-03
Well Nest
2023

MW19-04S
2023

MW19-04D
2023

The Municipality of Central Manitoulin
2023 Annual Groundwater Monitoring Report
Mindemoya Waste Disposal Site
Mindemoya, Ontario
December 2023

MW19-04
Well Nest
2023

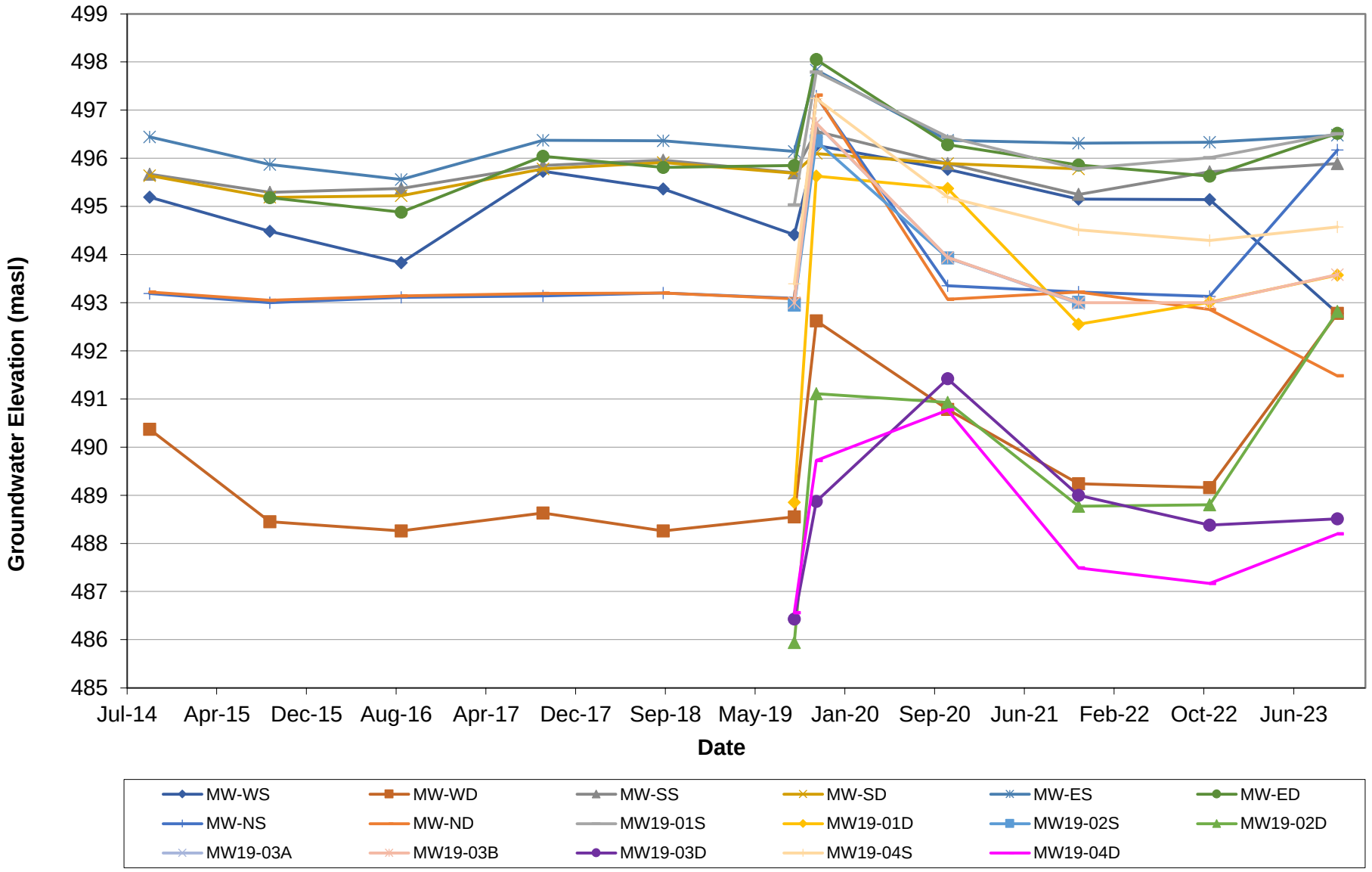
APPENDIX G
GROUNDWATER IONIC BALANCE AND PIPER PLOT DATA TABLE

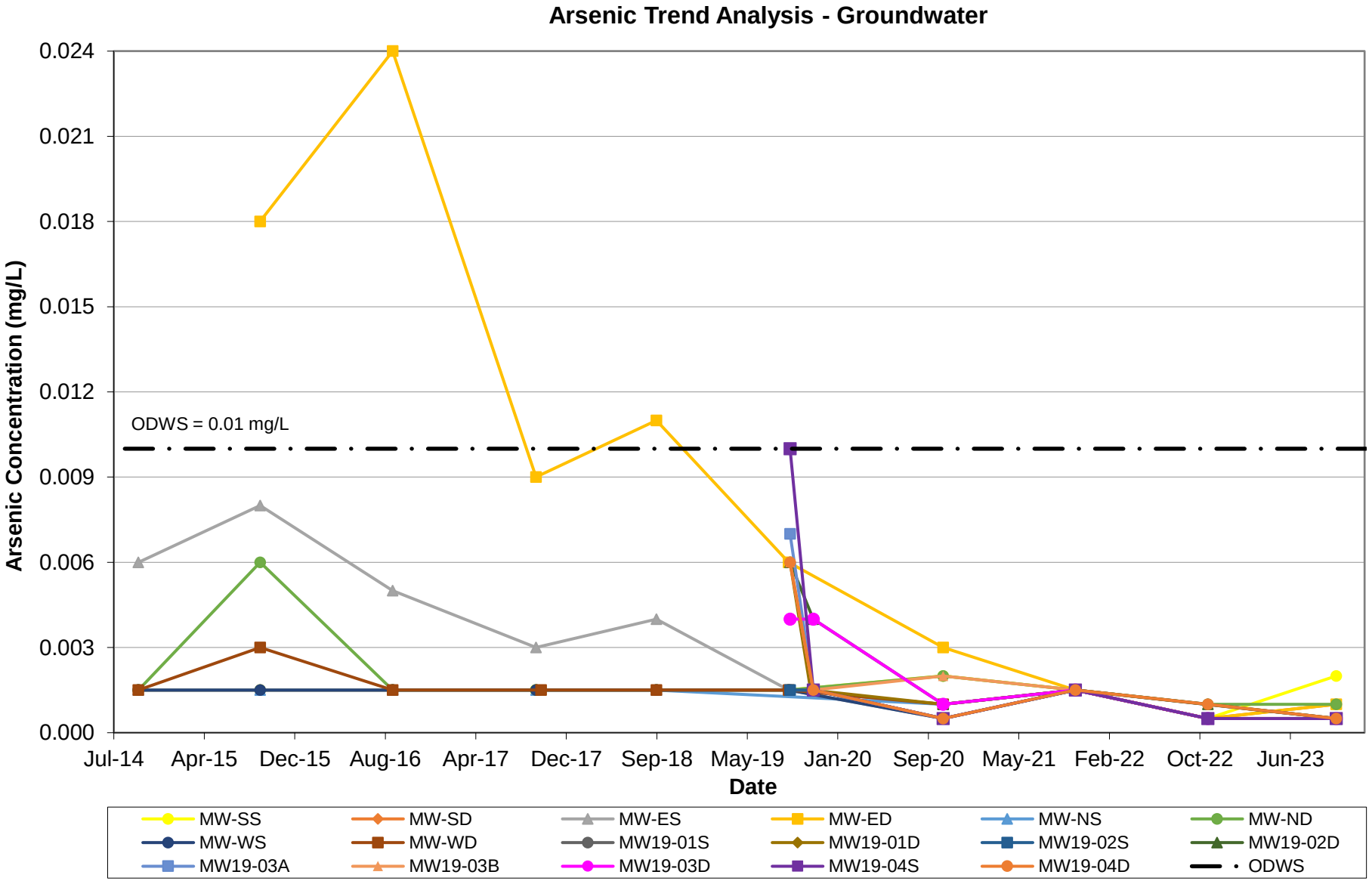
Groundwater Ionic Balance and Piper Plot Data - 2023

Raw Data (mg/L)	MW-ES	MW-ED	MW-SS	MW-SD	MW-NS	MW-ND	MW-WS	MW-WD	MW19-01S	MW19-01D	MW19-02S	MW19-02D	MW19-03A	MW19-03B	MW19-03D	MW19-04S	MW19-04D
Ca	65.2	132	124	127	66.1	91.3	85.2	112	62	53.4	72.9	62.7	65.1	70.1	60.8	68.5	60.8
Mg	28.4	58.9	87.1	92.5	36.3	42.1	41.6	53.2	33.6	31.4	42.0	35	38.3	40.1	37.5	41.1	33.9
Na	2.9	39.3	97.5	106	1.36	3.63	10.7	14.3	3.18	8.05	3.87	8.25	1.76	2.07	8.23	0.93	5.54
K	0.66	4.45	63.7	58.6	0.51	1.28	4.87	5.98	0.98	4.00	2.64	2.98	1.54	1.62	4.79	0.86	2.50
Cl	3.22	56.4	101	147	1.86	1.8	6.7	19.8	2.01	1.67	4.06	2.61	2.56	2.93	3.1	1.81	4.54
SO4	8.24	31.1	166	203	4.3	10.4	18.3	43.1	8.98	22.8	17.2	21.9	8.86	14.4	67.8	21	49.4
ALK	262	544	572	785	318	359	341	440	296	239	327	270	315	311	260	308	278
pH	7.36	7.49	7.44	7.53	7.44	7.54	7.44	7.59	7.55	7.82	7.48	7.86	7.45	7.48	7.78	7.77	7.85
Ion Balance Data and Piper Plot (%)																	
Cations:	5.73	13.26	19.23	20.06	6.36	8.21	8.26	10.74	6.02	5.70	7.33	6.44	6.52	6.93	6.60	6.86	6.13
Anions:	5.50	13.11	17.74	24.06	6.50	7.44	7.38	10.25	6.16	5.30	7.01	5.92	6.55	6.60	6.69	6.64	6.71
CBE (%):	2.10	0.56	4.03	-9.07	-1.08	4.92	5.64	2.35	-1.12	3.67	2.25	4.20	-0.27	2.46	-0.70	1.63	-4.54
Mg:	40.8	36.6	37.3	37.9	47.0	42.2	41.4	40.8	45.9	45.3	47.2	44.7	48.4	47.6	46.8	49.3	45.5
Ca:	56.7	49.7	32.2	31.6	51.9	55.5	51.4	52.0	51.4	46.7	49.6	48.6	49.9	50.5	46.0	49.8	49.5
Na+K:	2.5	13.8	30.5	30.5	1.1	2.3	7.1	7.2	2.7	7.9	3.2	6.8	1.8	1.9	7.3	0.9	5.0
Cl:	1.7	12.1	16.1	17.2	0.8	0.7	2.5	5.5	0.9	0.9	1.6	1.2	1.1	1.3	1.3	0.8	1.9
SO4:	3.1	4.9	19.5	17.6	1.4	2.9	5.2	8.8	3.0	9.0	5.1	7.7	2.8	4.5	21.1	6.6	15.3
HCO3+CO3:	95.2	82.9	64.4	65.2	97.8	96.4	92.3	85.8	96.0	90.1	93.3	91.1	96.1	94.2	77.6	92.6	82.8

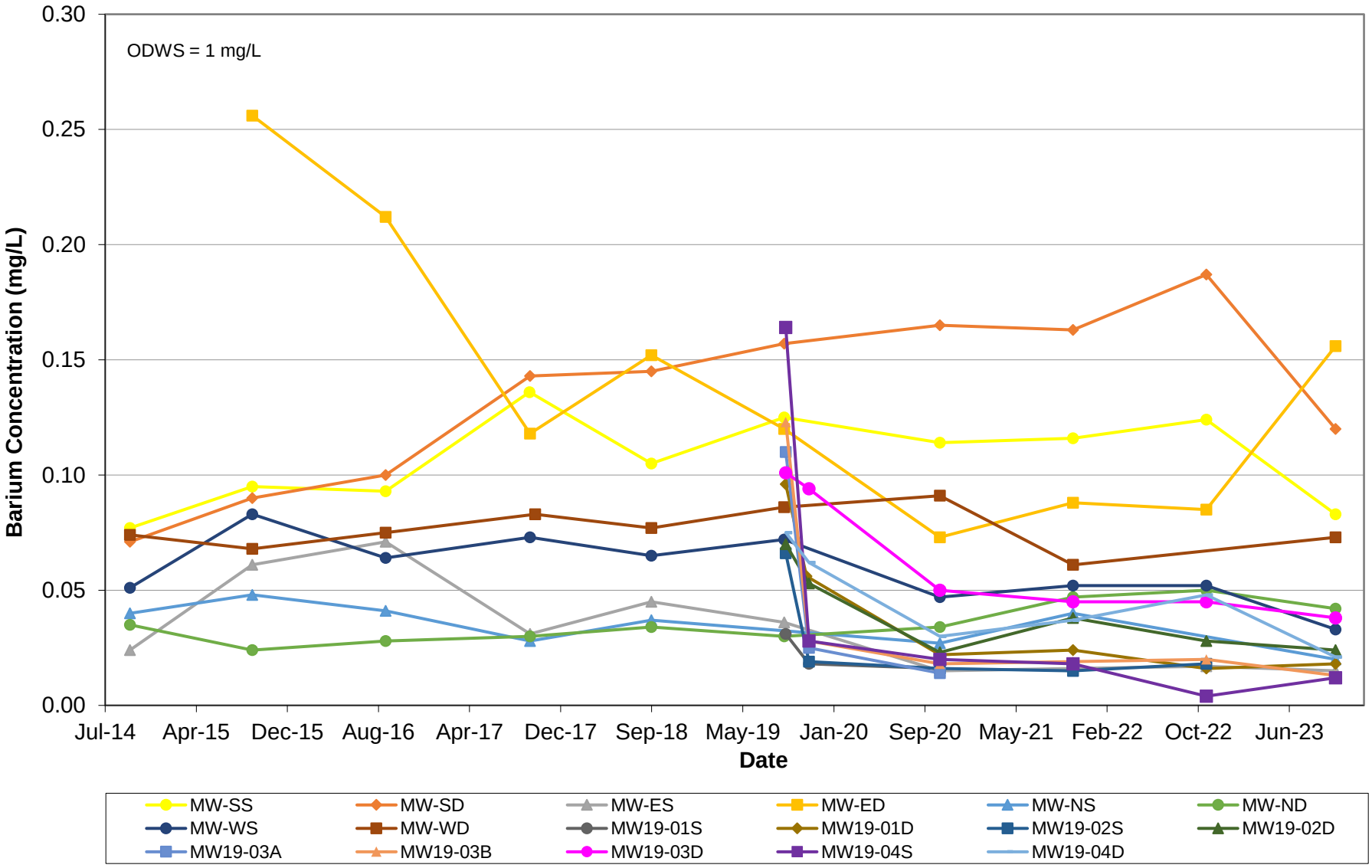
APPENDIX H
TREND ANALYSIS

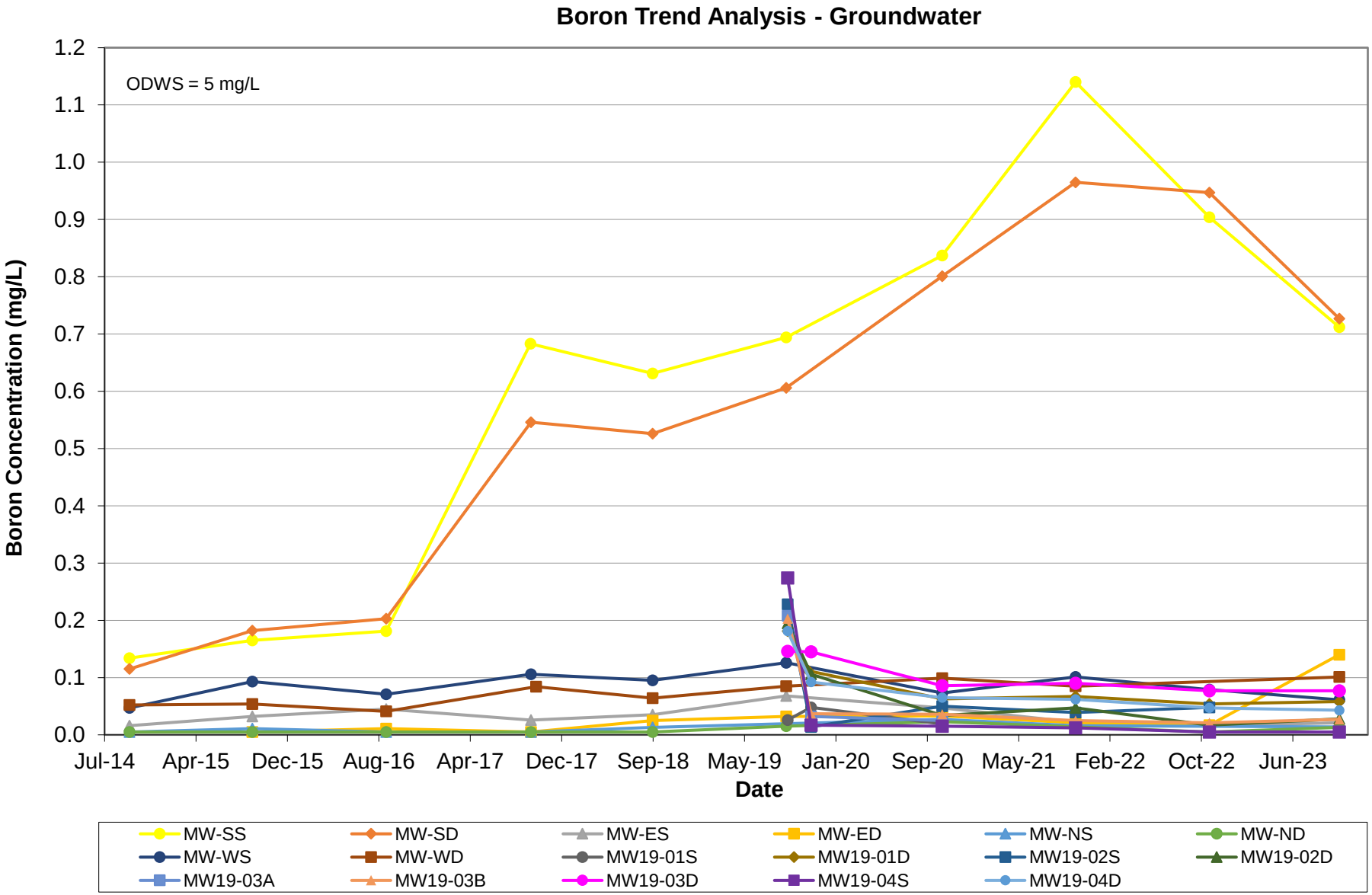
Groundwater Elevation Trend Analysis



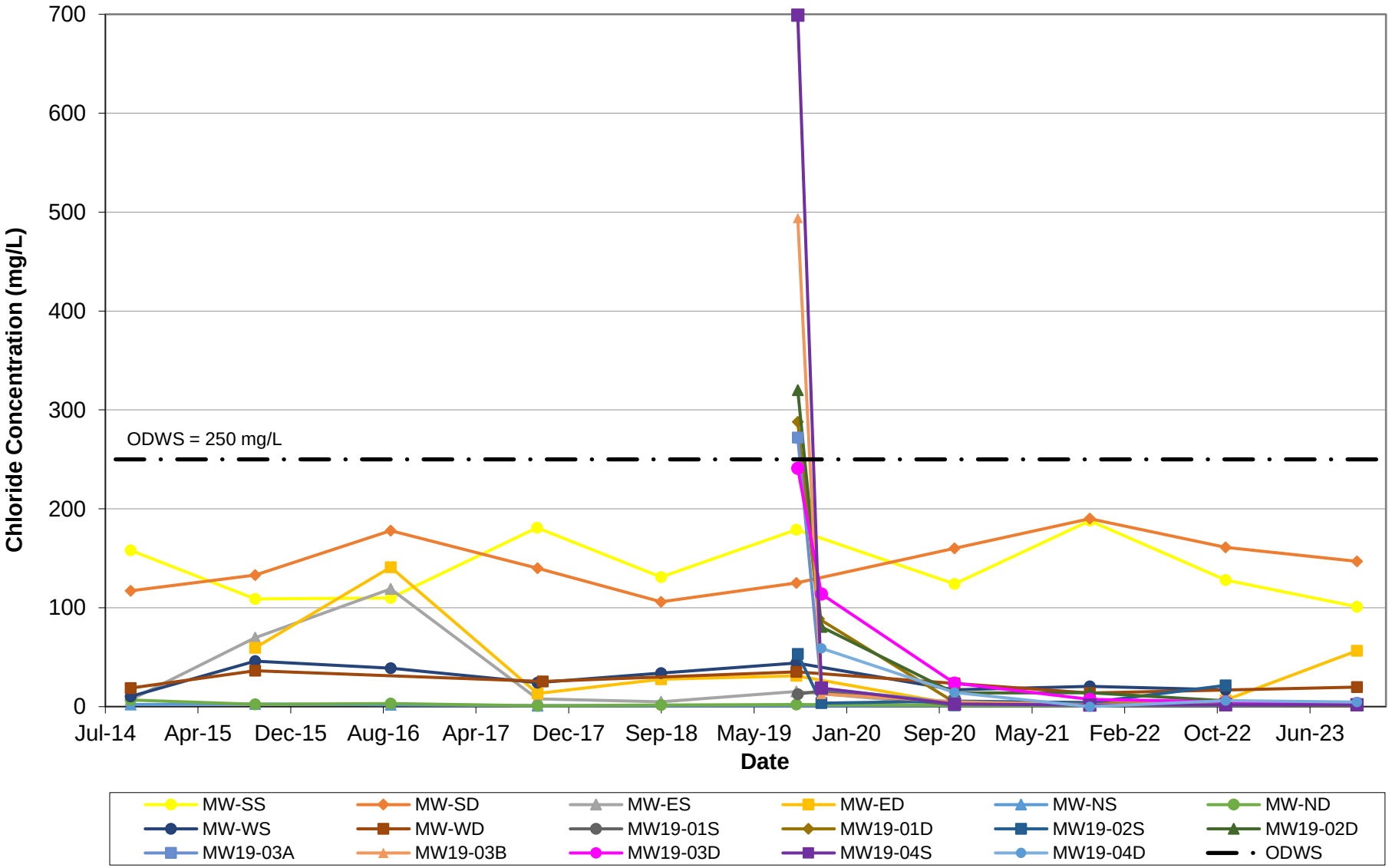

Arsenic Trend Analysis - Groundwater
Arsenic Concentration (mg/L)
0.024
0.021
0.018
0.015
0.012
0.009
0.006
0.003
0.000
ODWS = 0.01 mg/L
Jul-14
Apr-15
Dec-15
Aug-16
Apr-17
Dec-17
Sep-18
May-19
Jan-20
Sep-20
May-21
Feb-22
Oct-22
Jun-23
Date
MW-SS
MW-SD
MW-ES
MW-ED
MW-NS
MW-ND
MW-WS
MW-WD
MW19-01S
MW19-01D
MW19-02S
MW19-02D
MW19-03A
MW19-03B
MW19-03D
MW19-04S
MW19-04D
ODWS

Barium Trend Analysis - Groundwater

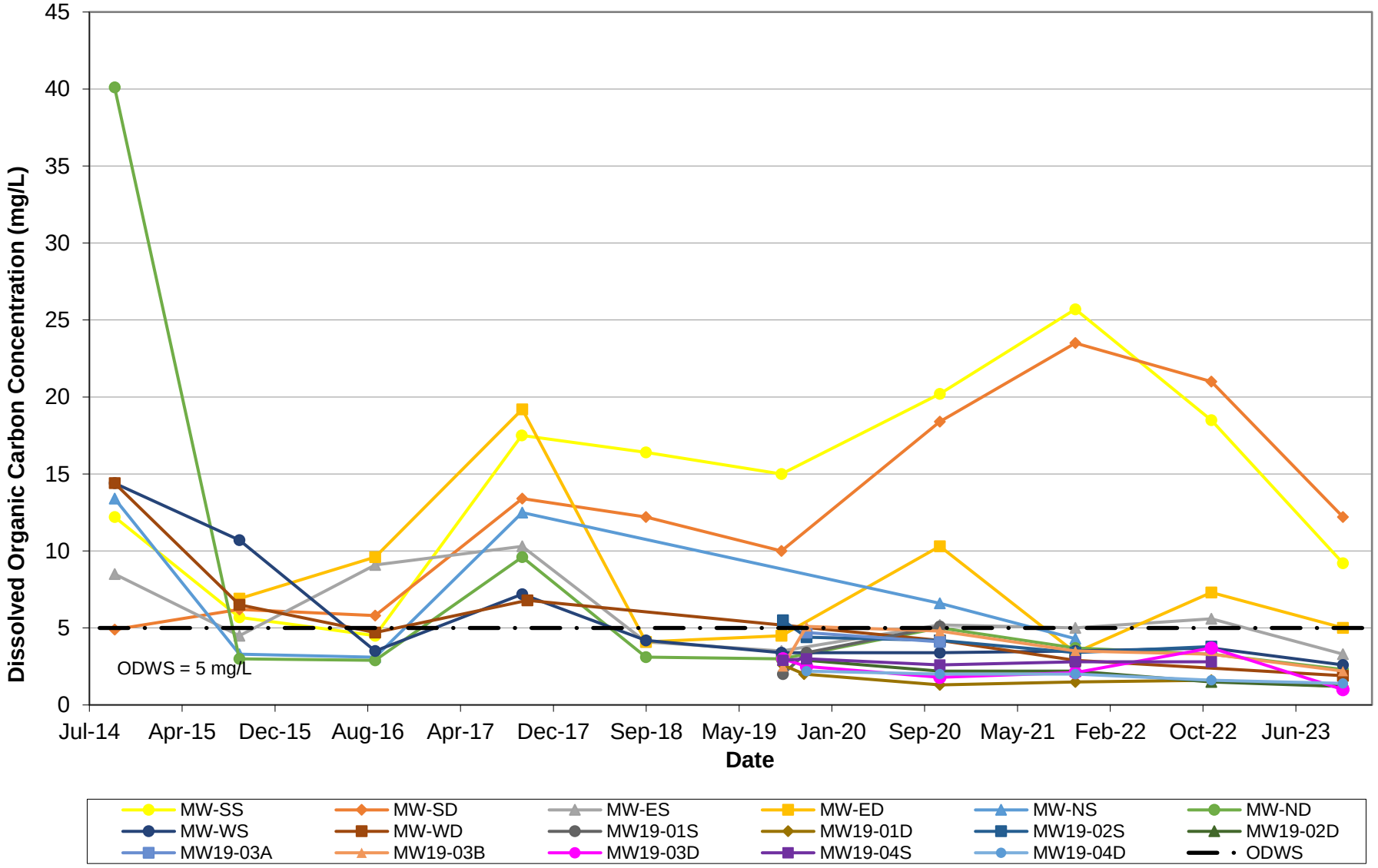



Boron Trend Analysis - Groundwater
ODWS = 5 mg/L
Boron Concentration (mg/L)
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Jul-14
Apr-15
Dec-15
Aug-16
Apr-17
Dec-17
Sep-18
May-19
Jan-20
Sep-20
May-21
Feb-22
Oct-22
Jun-23
Date
MW-SS
MW-SD
MW-ES
MW-ED
MW-NS
MW-ND
MW-WS
MW-WD
MW19-01S
MW19-01D
MW19-02S
MW19-02D
MW19-03A
MW19-03B
MW19-03D
MW19-04S
MW19-04D

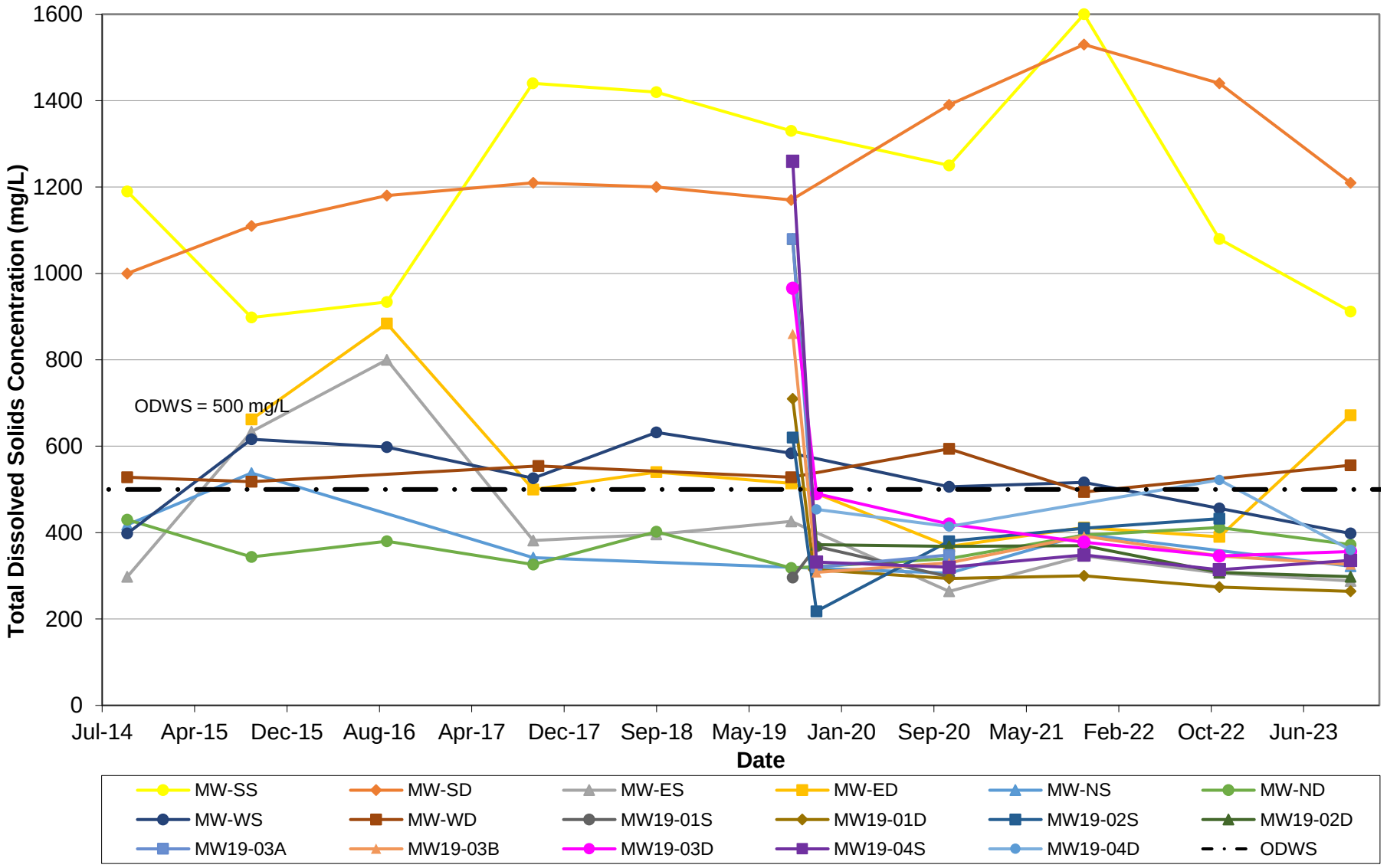
Chloride Trend Analysis - Groundwater



Dissolved Organic Carbon Trend Analysis - Groundwater



Total Dissolved Solids Trend Analysis - Groundwater



APPENDIX I
GUIDELINE B-7 CALCULATIONS

Guideline B-7
2023 Monitoring Event - Shallow Aquifer

Guideline B-7 Calculation				Downgradient Property Boundary Well Concentrations			
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)**	**MW19-02S (mg/L)**	**MW19-03A (mg/L)**	**MW19-03B (mg/L)**	**MW19-04S (mg/L)**
Health Related			x=0.25 [2]				
Arsenic	0.01	0.001	0.003	<0.001	<0.001	<0.001	<0.001
Barium	1	0.021	0.265	0.013	0.010	0.013	0.012
Boron	5	0.021	1.27	0.053	0.024	0.027	<0.010
Cadmium	0.005	0.0002	0.001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	0.05	0.001	0.013	<0.002	<0.002	<0.002	<0.002
Lead	0.01	0.0004	0.003	<0.0005	<0.0005	<0.0005	<0.0005
Nitrate-N	10	0.11	2.58	1.69	0.61	0.74	<0.05
Nitrite-N	1	0.03	0.27	<0.05	<0.05	<0.05	<0.05
Non-Health Related			x=0.50 [2]				
Chloride	250	4.2	127	4.1	2.6	2.9	1.8
Copper	1	0.002	0.50	<0.001	0.001	0.001	0.001
DOC	5	3.1	4.1	2.5	3.8	2.2	2.0
pH	6.5-8.5	7.63	6.5-8.5	7.48	7.45	7.48	7.77
Sodium	200	8.6	104	3.87	1.76	2.07	0.93
Sulphate	500	12.1	256	17.2	8.9	14.4	21.0
TDS	500	349	425	366	330	326	336
Toluene	0.024	0.0001	0.012	<0.0002	<0.0002	<0.0002	<0.0002
Zinc	5	0.003	2.50	<0.005	<0.005	<0.005	<0.005

Notes:

(1) Average of valid sampling rounds at MW19-01S.

(2) Defined according to Guideline B-7 (MECP, 1994).

(3) ODWS - Ontario Drinking Water Standards (MECP, 2001).

(4) **BOLD** and shaded indicates an exceedance of the Maximum Concentration.

Guideline B-7
2023 Monitoring Event - Deep Aquifer

Guideline B-7 Calculation				Downgradient Property Boundary Well Concentrations		
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)**	**MW19-02D (mg/L)**	**MW19-03D (mg/L)**	**MW19-04D (mg/L)**
Health Related			x=0.25 [2]			
Arsenic	0.01	0.001	0.003	<0.001	<0.001	<0.001
Barium	1	0.024	0.268	0.024	0.038	0.021
Boron	5	0.068	1.30	0.028	0.077	0.043
Cadmium	0.005	0.0002	0.001	<0.0001	<0.0001	<0.0001
Chromium	0.05	0.001	0.013	<0.002	<0.002	<0.002
Lead	0.01	0.0003	0.003	<0.0005	<0.0005	<0.0005
Nitrate-N	10	0.15	2.62	0.05	0.09	0.47
Nitrite-N	1	0.03	0.28	<0.05	<0.05	<0.05
Non-Health Related			x=0.50 [2]			
Chloride	250	5.6	128	2.6	3.1	4.54
Copper	1	0.001	0.50	<0.001	<0.001	<0.001
DOC	5	1.5	3.2	1.2	1.0	1.4
pH	6.5-8.5	7.83	6.5-8.5	7.86	7.78	7.9
Sodium	200	10.4	105	8.3	8.2	5.5
Sulphate	500	34.4	267	21.9	67.8	49.4
TDS	500	289	394	298	356	360
Toluene	0.024	0.0002	0.012	<0.0002	<0.0002	<0.0002
Zinc	5	0.005	2.50	<0.005	<0.005	<0.005

Notes:
(1) Average of valid sampling rounds at MW19-01D.
(2) Defined according to Guideline B-7 (MECP, 1994).
(3) ODWS - Ontario Drinking Water Standards (MECP, 2001).
(4) **BOLD** and shaded indicates an exceedance of the Maximum Concentration.

APPENDIX J
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	
Waste Disposal Site Name	Mindemoya Waste Disposal Site
Location (e.g. street address, lot, concession)	408 Elliot Road, Lot 27, Concession 2, Township of Canarvon, Registered Plan No. 22, District of Manitoulin
GPS Location (taken within the property boundary at front gate/ front entry)	411220 Easting and 5067030 Northing, Zone 17
Municipality	Central Manitoulin
Client and/or Site Owner	The Municipality of Central Manitoulin
Monitoring Period (Year)	2023
This Monitoring Report is being submitted under the following:	
Certificate of Approval No.:	A550701
Director's Order No.:	
Provincial Officer's Order No.:	
Other:	

Report Submission Frequency	◉ **Annual** ○ **Other**	Specify (Type Here):
The site is:	○ **Active** ○ **Inactive** ◉ **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?	○ **Yes** ◉ **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)	○ Yes ◉ No	

Groundwater WDS Verification:

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

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	○ **Yes** ◉ **No**	Well nest MW-W in need of repairs.
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):	◉ **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**

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.	○ **Yes** ◉ **No** ○ **Not Applicable**	
b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	○ **Yes** ○ **No** ◉ **Not Applicable**	If no, list exceptions below or attach additional information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

4) All field work for groundwater investigations was done in accordance with standard operating procedures as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	◉ **Yes** ○ **No**	If no, specify (Type Here):

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	○ **Yes** ◉ **No**	Approval of the proposed CAZ by the MECP is pending.	
6) The site meets compliance and assessment criteria.	◉ **Yes** ○ **No**		
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	◉ **Yes** ○ **No**		
1) Is one or more of the following risk reduction practices in place at the site: ***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/treatment; or** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	◉ **Yes** ○ **No**	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☒ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ○ **No** ◉ **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here):	

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.

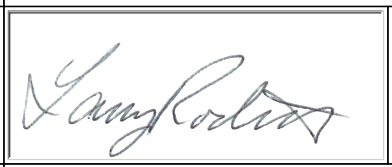
I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), 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**	No changes to the monitoring program are recommended at this time.
○ **The following change(s) to the monitoring program is/are recommended:**	
○ **No Changes to site design and operation are recommended**	
◉ **The following change(s) to the site design and operation is/ are recommended:**	The Site should be capped, as the addition of low permeability final cover material will significantly reduce infiltration and subsequently reduce leachate generation at the Site. A measurable improvement in groundwater quality in the immediate vicinity of the Site is expected following final capping.

Name:	Larry Rodricks		
Seal:	Add Image		
Signature:		**Date:**	30-Jan-2024
CEP Contact Information:	Larry Rodricks, P.Eng.		
Company:	WSP E&I Canada Limited		
Address:	WSP E&I Canada Limited 900 Maple Grove Road, Unit 10 Cambridge, Ontario N3H 4R7 Canada		
Telephone No.:	519-650-7108	Fax No. :	
E-mail Address:	Larry.Rodricks@wsp.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)	NONE
Distance(s)	N/A

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

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	◉ Yes ○ No	No surface water monitoring program required.
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):	○ Yes ○ No ◉ **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

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.	○ **Yes** ○ **No** ◉ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	○ **Yes** ○ **No** ◉ **Not Applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

4) All field work for surface water investigations was done in accordance with 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):	◉ **Yes** ○ **No**	No surface water monitoring program required.

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
		Not applicable
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**	Not applicable

7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.	(●) **Yes** ( ) **No**	N/A
8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g. , PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):	( ) Yes ( ) No ( ) Not Known (●) Not Applicable	If yes, provide details and whether remedial measures are necessary (Type Here)
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	( ) **Yes** ( ) **No** (●) **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here)

Surface Water CEP Declaration:

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

I have examined the applicable 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:

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

CEP Signature	
Relevant Discipline	
Date:	30-Jan-2024
CEP Contact Information:	Larry Rodricks, P.Eng.
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Appendix K

Limitations

LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
    a. The Standard Terms and Conditions which form a part of our Professional Services Contract;
    b. The Scope of Services;
    c. Time and Budgetary limitations as described in our Contract; and
    d. The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Site and attendant structures. Our conclusions cannot and are not extended to include those portions of the Site or structures, which are not reasonably available, in WSP's opinion, for direct observation.
4. The environmental conditions at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the Site with any applicable local, provincial or federal bylaws, orders-in-council, legislative enactments and regulations was not performed.
5. The Site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.
6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on-site and may be revealed by different or other testing not provided for in our contract.
7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, WSP must be notified in order that it may determine if modifications to the conclusions in the report are necessary.
8. The utilization of WSP's services during the implementation of any remedial measures will allow WSP to observe compliance with the conclusions and recommendations contained in the report. WSP's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. WSP accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of WSP.
11. Provided that the report is still reliable, and less than 12 months old, WSP will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on WSP's report, by such reliance agree to be bound by our proposal and WSP's standard reliance letter. WSP's standard reliance letter indicates that in no event shall WSP be liable for any damages, howsoever arising, relating to third-party reliance on WSP's report. No reliance by any party is permitted without such agreement.