FINAL

2019 Annual Monitoring Report

Chapman Waste Disposal Site
Magnetawan, Ontario

Prepared for:

Municipality of Magnetawan
4304 Highway 520
Magnetawan, ON P0A 1P0

Attn: Nicole Gourlay
Clerk-Administrator

December 12, 2019

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1.0 INTRODUCTION

Pinchin Ltd. (Pinchin) was retained by the Corporation of the Municipality of Magnetawan (Client) to prepare the 2019 annual groundwater and surface water monitoring report for the Chapman Waste Disposal Site (the Site). The following report provides a detailed evaluation and summary of the 2019 monitoring data and was completed to constitute the 2019 Annual Monitoring Report. This document includes, but is not limited to, a summary of historical geochemical data, a review/evaluation of the historical and current geochemical data (as well as groundwater flow), and a summary of geochemical trends.

The purpose of completing the monitoring program was to assess the hydraulic media for contaminants of concern as a compliance requirement under the Site Certificate of Approval (CofA) Number **A521202** and the applicable regulatory requirements during the spring and fall of 2019. To achieve the reporting objectives of this Site monitoring program, Pinchin carried out groundwater and surface water sampling at the Site in general accordance with the documents referenced within this report.

1.1 Location

The Site property is located in Lot 108, Concession A, within the Municipality of Magnetawan, District of Parry Sound, Ontario and is located approximately 5.5 kilometres (km) northeast of the Township of Magnetawan, Ontario. The Site is situated in an undeveloped area and the visibility of landfilling activities is limited from the adjacent roadway due to mature tree growth. The Site location is indicated on Figure 1 (all Figures are provided in Appendix I).

The Site is located at Universal Transverse Mercator (UTM) coordinates Zone 17U, 606,831 metres (m) Easting and 5,063,200 m Northing (North American Datum 1983). Landfill coordinates were obtained using a Global Positioning System and are accurate within 10 m.

1.1.1 Site Survey and Aerial Photography

At the time of preparation of this report, previous survey information of the Site and existing monitoring well elevations were provided to Pinchin for review. During September 2018, Pinchin installed additional monitoring wells at the Site. A survey of the top of casings for these newly installed wells has not been completed at the time of preparation of this report. The available top of casing monitoring well elevation data obtained from the previous survey has been used in the following sections of this report to calculate groundwater elevation contours.

A topographic survey of the Site was completed using an Unmanned Aerial Vehicle (UAV) in conjunction with the spring 2019 monitoring event and was provided to Pinchin for the purpose of calculating the remaining waste capacity and remaining lifespan for the Site. The results of the topographic survey indicate that the Site has an approximate remaining capacity of 38, 267.60 cubic meters (m^3) and an

approximate remaining Site lifespan of 15 years. Pinchin completed a report for the Municipality of Magnetawan titled “Waste Capacity Study, Chapman Waste Disposal Site, Magnetawan, Ontario”, dated September 24, 2019, which further discusses the results of the topographic UAV survey.

1.2 Ownership and Key Personnel

The Site is owned and operated by the Corporation of the Municipality of Magnetawan, located in Magnetawan, Ontario. The project was completed for the following representative on behalf of the Municipality:

Nicole Gourlay, Clerk-Administrator

Municipality of Magnetawan Government Office

4304 Highway #520

Magnetawan, ON P0A 1P0

The Competent Environmental Practitioner (CEP) for the Site groundwater and surface water monitoring program was Mr. Tim McBride of Pinchin Ltd. Mr. McBride’s contact information is provided below:

Mr. Tim McBride, B.Sc., P.Geo., Q.P.$_{ESA}$

Pinchin Ltd.

957 Cambrian Heights Drive, Suite #203

Sudbury, ON P3C 5S5

1.3 Description and Development of the Site

The Site is operated as a domestic landfill for municipal and non-hazardous solid industrial and commercial wastes to be utilized by residences of the area. The Site was approved with a total fill area of 1.2 hectares (ha) within a 41-ha property. A road with a locked gate is located northwest of the Site which provides access to the Site from the southeast side of Rocky Road approximately 200 m east of the intersection of Rocky Road and Nipissing Road North. Landfilling began at the Site prior to 1980 and the active landfilling area is currently located within the central portion of the Site.

A map illustrating the site features is provided as Figure 2.

1.3.1 Site Document Review

Pinchin reviewed the following reports for the Site and are referenced within this document:

- Report entitled "*2017 Annual Monitoring Report, Chapman Waste Disposal Site, Magnetawan, Ontario*" completed by D.M. Wills Associates Limited for the Corporation of the Municipality of Magnetawan dated March 2018 (the 2017 D.M. Wills Monitoring Report); and
- Report entitled "*2018 Annual Monitoring Report, Chapman Waste Disposal Site, Magnetawan, Ontario*" completed by D.M. Wills Associates Limited for the Corporation of the Municipality of Magnetawan dated March 2019 (the 2018 D.M. Wills Monitoring Report);
- Report entitled "*Leachate Management Plan Study, Chapman Waste Disposal Site, Magnetawan, Ontario"* completed by Pinchin for the Corporation of the Municipality of Magnetawan dated April 30, 2019 (the 2019 Leachate Management Study Report); and
- Report entitled *"Waste Capacity Study, Chapman Waste Disposal Site, Magnetawan, Ontario"* completed by Pinchin for the Corporation of the Municipality of Magnetawan dated September 24, 2019 (the 2019 Waste Capacity Study Report).

A copy of these documents can be obtained from the Client. Pinchin has relied on the information available in the previous environmental reports reviewed for the Site as part of this assessment. Information reviewed within these reports is referenced in pertinent sections throughout this document.

1.4 Monitoring and Reporting Program Objectives and Requirements

The site specific CofA for the Site was not provided to Pinchin for review at the time of this monitoring period. The monitoring and reporting completed by Pinchin has been generally developed based on the Ministry of Environment, Conservation and Parks (MECP) document entitled "*Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document*" dated November 2010, as well as the Client's request for 2019 monitoring and annual reporting.

1.5 Assumptions and Limitations

Pinchin has assumed that the information generated from historical investigations is accurate and has been completed in accordance with standard engineering practices and regulations. It should be noted that the historical background information made available to Pinchin by the Client was limited, and as such, previous reports have been relied on for information where required.

The scope of the monitoring activities was limited to the parameters listed in the 2018 D.M. Wills Monitoring Report for groundwater and surface water and was limited to the immediate area surrounding the Site. The investigations were limited solely to the groundwater within the monitoring well installations on-Site and the surface water surrounding the Site. The investigation does not constitute an exhaustive investigation of the Site property or adjacent properties for potentially unknown contaminants and/or other unknown sources of environmental impact.

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

- 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;
- 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;
- 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 Pinchin;
- 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;
- 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;
- 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;
- 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, Pinchin

must be notified in order that we may determine if modifications to our conclusions are necessary;

- The utilization of Pinchin's services during future monitoring at the Site will allow Pinchin 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; and
- 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. Pinchin 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

A detailed investigation of the Site geology and hydrogeology was outlined in the 2019 Leachate Management Study Report completed by Pinchin. Based on the report, the regional geology at the Site is dominated by the presence of shallow Precambrian bedrock, with a thin veneer of overburden deposits and frequent bedrock outcroppings. Details provided in the 2017 and 2018 D.M. Wills Monitoring Reports indicated that an incised bedrock low was observed, trending southwest to northeast, and was infilled with glaciolacustrine sand deposits of depths of up to 10 m. Based on these observations, the hydrogeological setting of the Site can best be described as a buried bedrock valley of low permeability, infilled with course granular materials of high permeability. This setting results in a flow system that is contained within the overburden infill materials, but heavily controlled by bedrock topography.

According to the 2019 Leachate Management Study Report, it has been suggested that the landfill development may have been initiated within a historical aggregate extraction pit, on the western half of the Site, with a bedrock high located in the central portion of the landfill footprint area. This second bedrock high trends easterly and results in bedrock outcrop east to the fill deposits with a significant topographic slope towards the south.

Pinchin installed seven new monitoring wells at the Site between September 26 to28, 2018 for the Hydrogeology Assessment as part of the 2019 Leachate Management Plan Study. Based on the results of these well installations, the subsurface soil conditions at the Site are observed to consist of course sand or sand and silt overburden materials. Bedrock was encountered at the Site at depths of approximately 2 metres below ground surface (mbgs) to 4 mbgs in wells located towards the south and the east of the Site. Borehole logs for the newly installed monitoring wells on-Site are provided in Appendix II. No other borehole logs were provided to Pinchin for review.

Based on the 2019 Leachate Management Study report, the groundwater flow system most representative of the performance of the Site occurs within the underlying unconfined overburden aquifer. Bedrock drilling in the area suggests very competent rock with significant water-bearing fractures. The presence of a pronounced bedrock ridge located near the middle of the Site, which trends west to east, appears to present a buried bedrock valley. This feature confines the horizontal and vertical extent of the landfill leachate impacts but also results in the discharge of these waters to the surface along a bedrock plane that outcrops in the incised valley associated with adjacent surface water bodies.

Static water levels were recorded by Pinchin in all of the accessible wells for each of the 2019 groundwater monitoring events. Water levels were measured prior to purging and developing in preparation for sampling, to ensure the water levels are representative of static conditions. Tables that summarize the spring and fall 2019 groundwater elevations, as measured by Pinchin personnel, are presented in Appendix III.

In general, the static groundwater levels exist within 6.5 m of surface for most wells, with the deepest depth to water (5.85 mbgs) recorded at BH-1, located directly east of the fill deposits, during the fall monitoring event. In the monitoring wells directly downgradient of the landfill deposits the static water levels range between 1 to 6 m below grade and become deeper with distance from the landfill footprint with static levels ranging between 3 to 6 m towards the eastern portion of the existing groundwater monitoring network (i.e., BH5-II, BH6-III and BH8-I).

Groundwater movement at the Site has been established (by water level contouring), as being directed in a west to east direction and is similar to that of the orientation of the buried bedrock valley, confirming the conceptual model of a flow system influenced by the underlying bedrock topography.

2.2 Surface Water Features

According to previous annual water quality monitoring reports, the 2019 Leachate Management Study Report and the findings of a Site visit completed by Pinchin, it is documented that two surface water features are present in the immediate vicinity of the Chapman Waste Disposal site. The first creek exists along the southern perimeter of the landfill area, flowing from west to east. Surface water monitoring location SW1 is situated within this creek. This creek flows year-round, with varying flow rates depending on meltwater and precipitation events. The second creek exists along the eastern perimeter of the landfill, flowing from north to southeast. Surface water monitoring location SW3 is situated within this creek. This creek is more ephemeral in nature, with very small flows outside of seasonal precipitation-based events. The 2019 Leachate Management Study Report indicates that there is currently a leachate seep located on the banks of the second tributary upstream of the confluence with the larger creek. Surface water monitoring location SW2 is situated downstream of the confluence of the two streams, at a culvert on Millers Road.

2.3 Historical Data

Pinchin reviewed the 2017 and 2018 D.M. Wills Annual Monitoring Reports to evaluate historical data and groundwater and surface water quality conditions. No other water quality data from the existing monitoring well network was available to review as part of this monitoring program.

2.3.1 Historical Groundwater Data

The 2018 D.M. Wills Monitoring Report indicated that monitoring well BH3 was determined to be located upgradient of the waste deposits and has historically been used to monitor background water quality at the Site. The report indicated that this monitoring well was observed during the fall 2017 sampling event to be destroyed as a result of earthmoving/landfilling operations at the Site. Guideline B-7 calculations for the Site were therefore completing utilizing the historical data at BH3 from 2016 and 2017. Based on a review of the historical data at BH3, background water quality conditions at the Site are characterized by low levels of landfill indicator parameters, with the exception of alkalinity which is generally below the acceptable range set by the Ontario Drinking Water Quality Standards (ODWQS).

Based on the results of the 2018 D.M. Wills Monitoring Report, significant landfill related impacts at the Site were not identified. The report indicated that moderate leachate impacts were observed immediately downgradient of the Site at monitoring wells BH1 and BH2 which quantified elevated levels of dissolved organic carbon (DOC), iron and manganese. At further downgradient monitoring wells (i.e., BH5-II, BH6-II and BH7-II) these concentrations were lower, indicating a dissipation of leachate as it flows east towards the property boundary. All exceedances of the Guideline B-7 were related to either aesthetical objectives or operational guidelines associated with drinking water systems set by the ODWQS and were not considered to be a significant human health or environmental concern originating from the Site.

2.3.2 Historical Surface Water Data

A review of the 2018 D.M. Wills Monitoring Report identified leachate effects at the immediately downgradient surface water location, SW3, and slight leachate effects at further downstream surface water location, SW2. The report indicated that the leachate effects observed are relatively minor, with concentrations below the Provincial Water Quality Objectives (PWQO), except for naturally elevated iron, aluminum, phenols and cobalt; which are also observed at background monitoring location SW1. Based on the results of the report, significant concentrations of landfill related contaminants were not observed at downgradient surface water receptors.

2.3.3 Historical Site Performance

A review of the 2019 Leachate Management Plan Study indicated that the Site currently operates as a typical natural attenuation waste disposal facility. No liner or other leachate collection/management system is in place at the Site. The report indicates that a leachate-impacted groundwater seep/spring has

recently been identified in a downgradient area (east of the Site, upstream from SW3 and in the vicinity of well BH9), resulting in the discharge of said waters to an adjacent surface water feature. This discharge essentially short circuits the natural attenuation process and has the potential to have negative effects on the surface water feature. The Corporation of the Municipality of Magnetawan initiated a proactive approach to leachate management and retained Pinchin to complete the Leachate Management Plan Study. The surface water quality data collected for the study indicated that an impact from the leachate seep is being observed in the two adjacent creeks and it was recommended that steps should be taken to eliminate the seep. These steps include infilling the incised valley and relocating the creek to eliminate the seep, creating an extended CAZ boundary for additional leachate attenuation to occur prior to discharge to surface water bodies. The report also outlined a trigger level program and contingency plan, recommended to be implemented at the Site following the elimination of the seep to monitor the impacts.

3.0 METHODOLOGY

3.1 Scope of Work

The objectives of the monitoring program as requested by the Client included the following scope of work:

- Mobilization to the Site during the spring and fall of 2019 and collection of groundwater and surface water samples from the existing well network and surface water monitoring locations;
- Submission of the groundwater and surface water samples to an accredited analytical laboratory for analysis of the chemical parameters outlined in the previous 2018 D.M. Wills Monitoring Report; and
- Preparation of a report outlining the 2019 field work completed and the analytical results, an evaluation of the results and any subsequent recommendations.

The investigation methodology was also conducted in general accordance with, and reference is made to, the following regulatory and guidance documents:

- MECP document entitled "*Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*", dated December 1996 (MECP Sampling Guideline);
- MECP document entitled "*Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*", dated March 9, 2004 amended July 1, 2011 (Analytical Methods);
- Ontario Regulation 169/03 "*Ontario Drinking Water Quality Standards*" under the Safe Drinking Water Act", dated 2002;

- MECP document entitled "*Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines*", dated June 2003 (ODWQS Guideline);
- MECP document entitled "*Incorporation of the Reasonable Use Concept into MECPE Groundwater Management Activities, Guideline B-7 (formerly 15-08)*" (Guideline B-7), dated April 1994;
- MECP document entitled "*Determination of Contaminant Limits and Attenuation Zones, Procedure B-7-1*", (formerly referenced by 15-08);
- Ontario Regulation 903 R.R.O. 1990 "*Wells*", under the Ontario Water Resources Act;
- MECP document entitled "*Water Management Policies Guidelines Provincial Water Quality Objectives*" (PWQO), dated July 1994, revised February 1999;
- MECP document entitled "*Rationale for the Development of Soil and Groundwater Standards for Use at Contaminated Sites in Ontario*" (Table 3.1 - Aquatic Protection Values) dated April 15, 2011; and
- Canadian Council of Ministers of the Environment (CCME) document entitled "Canadian Environmental Quality Guidelines" (Water Quality Guidelines for the Protection of Freshwater Aquatic Life) dated 1999.

3.2 Groundwater Monitoring Well Locations

Seven overburden groundwater monitoring wells have historically been utilized at the Site (BH1, BH2, BH3, BH4, BH5-II, BH6-II and BH7-II). As part of the leachate management plan study completed by Pinchin, several additional monitoring wells were installed at the Site during September 2018 to support the existing monitoring well network. This included the addition of two new background wells (BH11 and BH3-II) to replace the previously destroyed BH3, one cross-gradient well BH10-I), deeper nested wells at two existing monitoring locations which are consistently dry (BH4-II and BH6-III) and two additional downgradient wells (BH8-I and BH9-I). The locations of all the monitoring wells included in the current monitoring program are illustrated on Figure 3. Detailed locations with coordinates in NAD 83 and the available monitoring well elevations for top of casing are provided in Table 1.

All groundwater monitoring wells were sampled during the spring and fall 2019 sampling events, with the exception of BH4 during the spring and BH6-II during the spring and fall due to the wells having insufficient volume to sample time of the monitoring events.

The following table presents a summary of the construction details and respective on-Site positions of the newly installed groundwater monitoring wells, based on the borehole logs provided in Appendix II. Construction details for the other existing monitoring wells at the Site are unknown as Pinchin was not provided any other borehole logs to review at the time of preparation of this report. All wells were

inspected and found to be in good condition. No wells displayed evidence of a condition non-compliant with Ontario Regulation 903. A photographic log of all groundwater monitoring wells is provided in Appendix IV.

Well ID	Condition	Total Depth (mbgs)	Screened Interval (mbgs)	Unit Screened
BH3-II	Good	6.10	3.05 – 6.10	Sand and silt
BH4-II	Good	8.44	5.1 – 8.44	Bedrock
BH6-III	Good	6.30	3.05 – 6.05	Bedrock
BH8-I	Good	6.05	3.0 – 6.05	Sand and gravel
BH9-I	Good	7.50	4.4 – 7.5	Sand and Silt
BH10-I	Good	4.88	1.8 – 4.88	Bedrock
BH11	Good	4.88	1.8 – 4.88	Sand and silt

The following table illustrates the location of each of the monitoring wells with respect to its rationale in the annual monitoring program.

Monitoring Well ID	Location	Rationale
BH1	East portion of the Site, adjacent to the waste deposits.	Immediately Downgradient
BH2	East portion of the Site, adjacent to the waste deposits.	Immediately Downgradient
BH3-II	West of the Site.	Background
BH4	East portion of the Site, adjacent to the waste deposits.	Immediately Downgradient

Monitoring Well ID	Location	Rationale
BH4-II	East portion of the Site, adjacent to the waste deposits.	Immediately Downgradient
BH5-II	East of the Site.	Downgradient
BH6-II	East of the Site.	Downgradient
BH6-III	East of the Site.	Downgradient
BH7-II	East of the Site.	Downgradient
BH8-I	East of the Site.	Downgradient
BH9-I	East of the Site.	Downgradient
BH10-I	South of the Site.	Cross-gradient
BH11	Southwest of the Site.	Background

3.3 Surface Water Monitoring Locations

The Site has three historical points for surface water monitoring, SW1 through SW3. All surface water monitoring locations were monitored during the spring and fall 2019 sampling events. The following table illustrates the location of each of the surface water monitoring locations with respect to its rationale in the annual monitoring program.

Monitoring Well ID	Location	Rationale
SW1	Within the creek located south of the Site.	Upstream Monitoring Location
SW2	Downgradient of the intersection of the two intermittent creeks at the Site, at the culvert on Millers Road.	Further Downstream Monitoring Location

Monitoring Well ID	Location	Rationale
SW3	Within the creek located east of the Site.	Downstream Monitoring Location

The locations of the surface water monitoring locations are illustrated on Figure 3. Details regarding the surface water monitoring locations are provided in Table 2. Photos of all surface water monitoring locations are provided in Appendix IV.

3.4 Monitoring Frequency

As per previous annual monitoring events, groundwater and surface water was sampled twice annually by Pinchin during 2019, in the spring and fall. Groundwater and surface water sampling events occurred on the following dates:

- Spring – June 11, 2019; and
- Fall – September 26, 2019.

3.5 Monitoring Parameters

3.5.1 Groundwater Monitoring Parameters

Groundwater samples were submitted for laboratory analysis of the parameters listed in the previous 2018 D.M. Wills Annual Water Quality Monitoring Report. At the time of sample collection, field readings for the parameters temperature, pH, conductivity, oxidation reduction potential (ORP) and dissolved oxygen (DO) were measured.

3.5.2 Surface Water Monitoring Parameters

Surface water samples were submitted for laboratory analysis of the parameters listed in in the previous 2018 D.M. Wills Annual Water Quality Monitoring Report. At the time of sample collection, field readings for the parameter's temperature, pH, conductivity, ORP and DO were measured.

3.6 Monitoring Procedures and Methods

3.6.1 Standard Operating Procedures

The following Pinchin Standard Operating Procedures (SOPs) were followed by Pinchin field personnel for each portion of this project:

- Groundwater Sampling SOP; and
- Surface Water Sampling SOP.

All Pinchin monitoring SOPs have been developed in accordance with the MECP Sampling Document and are consistent with standard engineering practices.

3.6.2 Groundwater Monitoring Activities

To perform the groundwater monitoring activities, the following tasks were conducted:

- Pinchin notified the Client prior to field activities, and subsequently mobilized staff from the local Sudbury office to the Site to complete the sampling program;
- Static groundwater levels were collected using a Solinst^{tm} water level tape. Measurements were collected from the top of riser pipe;
- During the monitoring events, groundwater from each monitoring well was purged prior to the collection of the sample, using a moderate-flow sample methodology via high-density polyethylene (HDPE) 3/8" tubing and a Waterra^{tm} inertial footvalve system. The HDPE system was chosen as an approved method to minimize sediment/particulate within each sample, and to minimize sample agitation and well trauma in accordance with the MECP Sampling Document. Pinchin purged a minimum of three well volumes to a maximum of six well volumes using the inertial pump system until the well volume column was representative of the surrounding formation. During purging activities, additional groundwater monitoring parameters were collected from each monitoring well using a YSI-556 water quality meter for measurement of field parameters. Sample residual was disposed of onto the ground surface, on-site and up-gradient within the landfill confines;
- Groundwater samples were collected using the HDPE system in accordance with the MECP Sampling Document. Dissolved metals were field-filtered using a dedicated in-line 0.45 micron disposable filter. Upon completion of field sampling and monitoring activities, all samples collected were submitted to the project laboratory, AGAT Laboratories (AGAT) in Mississauga, Ontario. All parameters were analyzed by the project laboratory using MECP approved procedures and are consistent with the analytical methods prescribed in the Analytical Methods document; and
- The groundwater samples collected were analyzed at the project laboratory for the parameters listed in the D.M. Wills 2018 Monitoring Report. Groundwater sample results were compared to the applicable ODWQS as applied in accordance with the ODWQS Guideline document. Groundwater sample results were also compared to the reasonable usage parameters and were assessed using Guideline B-7 to establish and determine levels of contaminant discharges to the groundwater formation, which would be considered acceptable by the MECP from naturally attenuating landfill sites, with respect to human consumption and potable considerations.

3.6.3 Surface Water Monitoring Activities

To perform the surface water monitoring activities, the following tasks were conducted:

- Pinchin notified the Client prior to field activities, and subsequently mobilized staff from the local Sudbury office to the Site;
- All field activities at each monitoring location were initiated at down-stream locations working up-stream to avoid sediment disturbance and influencing sample integrity;
- Care was taken during collection of surface water samples to ensure that a representative sample was collected, and that underlying sediments were not disturbed. For the surface water samples only, no filtration was done (in accordance with MECP surface water sampling protocols). In the future, and as per previous monitoring events, the component of the samples identified for the analysis of aluminum should be field filtered;
- Surface water samples were collected during each sampling event using a direct grab sampling methodology in accordance with the MECP Sampling Document. Upon completion of field sampling and monitoring activities, all samples collected were submitted to AGAT. All parameters were analyzed by the project laboratory using MECP approved procedures and are consistent with the analytical methods prescribed in the Analytical Methods document;
- During sampling activities, surface water monitoring field parameters were collected at each surface water monitoring location using a YSI-556 water quality meter; and
- Surface water samples were analyzed during the monitoring event at the pre-determined monitoring locations for parameters listed in the 2018 D.M. Wills Monitoring Report. Sample results were compared to the applicable PWQO criteria.

3.6.4 Groundwater and Surface Water Field Measurements

Prior to sampling groundwater in the wells, Pinchin monitored groundwater depth using a Solinst™ 30-metre electronic water level meter. The water level tape is calibrated in 1.0 mm increments. Reproducibility of the depth measurements is generally within 2.0 mm or less.

Subsequent to groundwater depth measurement and during purging activities, additional groundwater monitoring parameters were collected from each monitoring well using a YSI-556 water quality meter for measurement of field parameters. Field parameters at each surface water monitoring location were also collected using the YSI-556.

The following field parameters were measured during the 2019 monitoring program:

- *Dissolved Oxygen* (DO) refers to the relative quantity of oxygen molecules which are dissolved or carried within a quantity of water. Oxygen enters water as rooted aquatic plants and algae undergo photosynthesis, and as oxygen is transferred across an air and water interface. Oxygen's solubility in water is indirectly correlated with water's temperature, salinity and pressure. DO concentrations have a significant effect on groundwater quality by regulating the valence state of trace of metals and constraining the bacterial metabolism of dissolved organic species;
- *Conductivity* is the measurement of water's capacity to pass an electrical current. It is considered to be a reasonable indicator of ionic activity and dissolved solids concentration levels. It is affected by the presence of inorganic dissolved solids which carry a negative charge such as chloride, nitrate, sulfate and phosphate anions or a positive charge such as sodium, magnesium, calcium, iron, and aluminum cations. Organic compounds such as oil and phenol do no conduct an electrical current very well and would therefore have low conductivity in water. Conductivity is also directly correlated to the water temperature. Specific conductivity is a measurement of conductivity values which have been compensated to 25ºC;
- *pH* is a measure of water's acidic/basic properties on a logarithmic scale from 1 (strongly acidic) to 14 (strongly alkaline or basic). It determines the solubility and biological availability of chemical constituents such as nutrients and heavy metals. For example, in addition to affecting how much and what form of phosphorus is most abundant in the water, pH also determines whether aquatic life can use it. The degree to which heavy metals are soluble determines their toxicity. Metals tend to be more toxic at lower pH values because they are more soluble. Excessively high and low pHs can have serious environmental and health effects. A high pH may cause the release of iron, copper or lead into potable water, corrosion on water pipes and water using appliances and reduces the effectiveness of water disinfection with chlorine. Low pH values corrode substances such as metals and plastics. Fluctuations in groundwater pH values may be indicative of groundwater contamination;
- *Temperature;* has a dramatic influence on water quality. The rate of chemical reactions is generally correlated to temperature, which in turn affects the biological availability of nutrients within the water. As previously mentioned, oxygen's solubility in water is indirectly correlated with its temperature. Declining concentrations of oxygen within warming water is magnified by aquatic plants increasing metabolism as water

temperature increases. Low concentrations of DO weaken aquatic plants resistance to disease, parasites and other pollutants; and

- *Oxidation-reduction potential* (ORP) characterizes the oxidation-reduction state of the water on a scale from approximately -300mV (strongly reducing) up to +500mV (strongly oxidizing). The primary application of ORP is recording significant changes in the redox potential which is observed when purging a stagnant water column in piezometer and replacing it with “fresh” groundwater.

Field parameter data collected at the groundwater and surface water monitoring locations are provided in Appendix III.

3.6.5 Record Keeping and Field Notes

Field notes were collected during the water quality monitoring events and recorded relevant observations including, but not limited to:

- Dates and time of work being completed;
- Instrumentation and instrument condition;
- Calibration methods and results;
- Field parameter measurements;
- Field personnel conducting the investigations;
- Field methods used;
- Sampling location identifications;
- Sampling equipment and condition;
- Sample identification (i.e., type, media, number of containers, etc.);
- Sample preparation methods (i.e., preservatives, filtration, etc.);
- Field QA/QC measurements;
- Field and sample identifiers;
- Anomalous conditions (i.e., damage to monitoring wells);
- Photographs of monitoring wells and monitoring stations;
- Weather conditions at the time of the monitoring events; and
- Field conditions.

All raw data and field notes are preserved and retained in Pinchin’s custody.

3.7 Quality Assurance for Sampling and Analysis

Pinchin 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. As such, various QA/QC protocols were followed during the water quality sampling events to ensure that representative samples were obtained and that representative analytical data were reported by the laboratory.

Field QA/QC protocols that were employed by Pinchin included the following:

- Clean, labelled and pre-preserved (when applicable) sample containers were provided by the laboratory;
- Water quality samples were placed in laboratory-supplied sample jars;
- The monitoring wells were purged to remove stagnant water prior to sample collection so that representative groundwater samples could be obtained. Dedicated purging and sampling equipment was used for monitoring well development, purging and sampling to minimize the potential for cross-contamination;
- All water quality samples were placed in coolers on ice immediately upon collection, with appropriate sample temperatures maintained prior submission to the laboratory;
- Dedicated and disposable Nitrile™ gloves were used for all sample handling;
- All non-dedicated monitoring and sampling equipment (i.e., water level meter and YSI-556) was cleaned before initial use and between uses to minimize the potential for cross-contamination by washing with an Alconox™/potable water mixture followed by a deionized water rinse;
- Field duplicate groundwater and surface water samples were collected during the spring and fall sampling event (1 in 10); and
- Sample collection and handling procedures were performed in general accordance with the MECP Sampling Guideline.

The AGAT laboratory has an established QA/QC program and is a member of the Canadian Association for Laboratory Accreditation (CALA) and is accredited by the Standards Council of Canada (SCC) for specified environmental analyses. AGAT's internal laboratory QA/QC consisted of the analysis of laboratory duplicate, method blank, matrix spike and spiked blank samples, an evaluation of relative percent difference calculations for laboratory duplicate samples, and an evaluation of surrogate recoveries for the method blank, matrix spike and spiked blank samples.

3.8 Data Quality Evaluation

In order to provide confidence in the data obtained, a comprehensive QA/QC component was included in the monitoring program. The QA/QC procedures developed for this monitoring program are prepared in accordance with MECP Sampling Document, and in most cases, exceed the minimum requirements.

Water quality samples collected by Pinchin were generated in accordance with acceptable procedures. No analytical hold times were exceeded for samples submitted for analyses and sample temperatures upon receipt at the project laboratory were below 10˚ Celsius.

Relative per cent difference (RPD) values (the absolute difference between two values divided by the average value and expressed as a per cent) were calculated between the parent sample and the field duplicate as part of the QA/QC program. RPD results of sample and duplicate analyses that are less than 50 percent indicate an acceptable level of analytical uncertainty. RPD values calculated for measured analyte concentrations for sample and duplicate pairs that exceed 50 per cent generally warrant discussion because they may indicate the presence of elevated analytical uncertainty and a potential for making interpretive errors based on the analysis results. Use of calculated RPD values to assess analytical uncertainty when using measured analyte concentrations for sample and sample duplicate pairs is not appropriate when either measured analyte concentration is within a multiple of 5 of the method detection limit (a value designated as the practical quantification limit (PQL)), where analytical uncertainty is typically elevated.

All field instrumentation calibration checks were completed by Pinchin field staff members prior to use on-Site. All field operations conducted by Pinchin field staff members were completed using standard equipment decontamination and sampling procedures, and no deviations from the sampling plan were noted.

4.0 ASSESSMENT, INTERPRETATION AND DISCUSSION

4.1 Groundwater Quality Monitoring

4.1.1 The Reasonable Use Criteria Assessment (RUC)

Guideline B-7, the “reasonable use concept” (RUC) approach, is the MECP’s groundwater management strategy for mitigating the effect of contamination on properties adjacent to its source. It establishes procedures for determining the reasonable use of groundwater on a property adjacent to sources of contaminants and establishes limits on the discharge of contaminants from facilities which dispose of waste into the shallow subsurface.

The application of "reasonable use" is outlined in Procedure B-7-1 "*Determination of Contaminant Limits and Attenuation Zones*". The procedure determines the maximum concentration (Cm) of a particular contaminant that would be acceptable in the groundwater beneath an adjacent property and is calculated in accordance with the relationship:

$$C_m = C_b + x\ (C_r - C_b)$$

C_b – This is the background concentration of the particular groundwater contaminant in consideration before it has been affected by human activities. From this it is possible to calculate the extent of human activities impact on contaminant levels.

C_r – In accordance with the Ontario Water Management Guideline, this is the maximum concentration of a particular contaminant that should be present in the groundwater. This value is dependent on property's use of the groundwater as outlined in B-7. It also allows for the total amount of contamination. Pinchin conservatively assumes that the reasonable use of the groundwater on-site is potentially for potable drinking purposes.

x – As determined by the MECP, this constant determines the extent which the contamination has on the groundwater's use. For drinking water x is 0.5 for non-health related parameters or 0.25 for health related parameters. For other reasonable uses it is 0.5.

Contamination concentrations which exceed C_m may have an appreciable effect on the use of an adjacent property and as such the Site should be managed in a manner to minimize environmental damage, or the operation should be modified. It is acceptable to modify the operation of the disposal site to meet the specified limits. However, if these limits are exceeded, all waste disposals, except for that done in conjunction with a reasonable plan for closure or with remedial activities, should be terminated until the specified limits have been met, or until monitoring data indicate that these limits will be met. Determination of the replacement of contaminated water supplies and the abatement of the contaminant plume must be made on a case-by-case basis in accordance of "*Resolution of Groundwater Quality Interference Problems*", Guideline B-9. For the purpose of evaluating compliance with respect to the RUC, Pinchin has compared the calculated C_m values versus the applicable downgradient compliance monitoring wells.

4.1.2 The Ontario Drinking Water Quality Standards (ODWQS)

Through the establishment of the ODWQS, the province of Ontario has determined legally enforceable standards on contaminants in drinking water. The standards are designed to protect public health by restricting the quality of specific contaminants in drinking water. Three categories of contaminates are regulated under the Ontario Regulation 169/03 Drinking Water Standards:

- Microbiological – Originating from human and animals waste, coliforms and bacteria are common in the environment. Most are harmless however their presence may be indicative of other harmful bacteria in the water. Under the ODWQS, Escherichia coli ("E. Coli"), fecal coliforms and total coliforms must be non-detectable in drinking water;
- Chemical – ODWQS regulates maximum quantities of organic and inorganic chemicals allowed in drinking water. Industrial discharges or agricultural runoff are not necessarily removed by drinking water treatment. Consuming water exhibiting a greater concentration of these chemicals than the ODWQS may cause serious health problems; and
- Radiation – Natural and artificial radio nuclides are also regulated in the ODWQS. Standards are expressed as maximum allowable concentrations in becquerels per litre ("L"). Radiological contaminants include radio nuclides, such as radium 228, which are caused from the erosion of naturally occurring deposits, or artificial radio nuclides, such as tritium, released into the water by nuclear power plants. Radiological contaminants do not naturally occur within the study area and the disposal of radiological waste was not suspected in the Site and as a result radiation was not monitored for this study.

The ODWQS Guideline Document is the MECP technical guidance document which provides guidance on applicability of the ODWQS and also provides applicable interim guidelines where legal standards are absent. Both the ODWQS and Guideline B-7 were used in assessing the groundwater results obtained during the 2019 monitoring program.

4.2 Groundwater Results

The following discussion of parameters documents the groundwater quality in comparison to the calculated reasonable use criteria as per Guideline B-7. The reasonable criteria are MECP's groundwater management strategy for mitigating the effect of contamination on properties adjacent to its source. It establishes procedures for determining what constitutes the reasonable use of groundwater on a property adjacent to sources of contaminants and establishes limits on the discharge of contaminants from landfills which have a potential to migrate hydraulically downgradient and off-site and impair the current and future

groundwater use at downgradient properties. To implement Guideline B-7, groundwater samples collected from downgradient monitoring wells have been compared to the calculated RUC values (C_m).

Monitoring well BH3-II is located furthest potentially hydraulically upgradient of the Site and has been used to estimate the background water quality coming onto the Site. An average of the historical results from previous background monitoring well BH3 and the current results from newly installed monitoring well BH3-II has been applied as the source of background water quality for the Guideline B-7 calculations.

The analytical data for each well in comparison to the applicable regulatory criteria is provided in Tables 3 through 16. An evaluation of the RUC criteria in comparison to the downgradient compliance wells is provided in Tables 17 and 18 for the spring and fall events, respectively. Copies of the laboratory analytical reports are presented in Appendix V. The following is a breakdown of the water quality observed the monitoring well locations with comparison to the background quality and leachate being produced on-Site.

4.2.1 Background Water Quality Evaluation

Monitoring Well BH3-II

Background water quality observed west of the waste fill area at BH3-II did not identify elevated levels of common landfill-related contaminant parameters such as conductivity, total dissolved solids (TDS), chloride, sulphate, calcium, sodium, potassium or nitrate. During the spring and fall sampling events, concentrations of pH(low), hardness (low), alkalinity (low), dissolved organic carbon (DOC), aluminum and turbidity were quantified above the recommended levels specified in the ODWQS. pH, hardness, alkalinity, DOC, aluminum and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site.

Monitoring Well BH11

Background water quality observed southwest of the waste fill area at BH11 did not identify elevated levels of common landfill-related contaminant parameters such as conductivity, TDS, chloride, sulphate, calcium, sodium, potassium or nitrate; although, these concentrations are generally slightly higher compared to those quantified at BH3-II. During the spring and fall sampling events, concentrations of hardness (low), alkalinity (low) and turbidity were quantified above the recommended levels specified in the ODWQS. Hardness, alkalinity and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site.

4.2.2 Leachate Source Quality Evaluation

No groundwater monitoring wells in the existing monitoring well network are situated within the active landfill area to evaluate the source leachate quality.

4.2.3 Cross-gradient Water Quality Evaluation

Monitoring Well BH10-I

In comparison to background water quality, groundwater observed immediately south of the waste fill area at BH10-I was observed to have slightly higher concentrations of conductivity, TDS, chloride, sodium, calcium and sulphate, indicating temperate impacts from the landfill. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the Site. Elevated hardness (high), DOC, manganese and turbidity concentrations were identified at BH10-I that exceeded the ODWQS. Hardness, DOC, manganese and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

4.2.4 Immediately Downgradient Water Quality Evaluation

Monitoring Well BH1

In comparison to background water quality, groundwater observed immediately east and downgradient of the waste fill area at BH1 was observed to have slightly higher concentrations of conductivity, TDS, chloride, sulphate, sodium, potassium and nitrate, indicating temperate impacts from the landfill, which is consistent with historical observations at this location. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the active fill zone. Elevated hardness (high), TDS, DOC, nitrate, manganese and turbidity concentrations were identified at BH1 that exceeded both the ODWQS and/or the Guideline B-7 criteria. Hardness, TDS, DOC, manganese and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Nitrate (a health-related parameter) was quantified in the fall at BH1 to be in exceedance of both the ODWQS and the Guideline B-7. Concentrations of nitrate observed at this location fluctuate considerably throughout the historical monitoring record. This is the first quantified ODWQS exceedance of nitrate at this location; therefore, this concentration should be confirmed during the next sampling event.

Monitoring Well BH2

In comparison to background water quality, groundwater observed immediately east of the waste fill area at BH2 was observed to have higher concentrations of conductivity, alkalinity, TDS, chloride, sulphate, sodium and potassium, indicating temperate impacts from the landfill, which is consistent with historical observations at this location. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the active fill zone. Elevated hardness (high), TDS, DOC, iron, manganese and turbidity concentrations were identified at BH2 that exceeded both the ODWQS and/or the Guideline B-7 criteria. These parameters are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and is not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Monitoring Well BH4

Downgradient monitoring well BH4 was observed to have insufficient volume at the time of sampling during the fall 2019 monitoring events, which is consistent with historical observations at this location.

In comparison to background water quality, groundwater observed immediately east of the waste fill area at BH4 was observed to have higher concentrations of conductivity, alkalinity, TDS, nitrate, chloride, sulphate, sodium and calcium, indicating temperate impacts from the landfill, which is consistent with historical observations at this location. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the active fill zone. In the spring, elevated hardness (high), nitrate, DOC, TDS and turbidity concentrations were identified at BH4 that exceeded both the ODWQS and/or the Guideline B-7 criteria. Hardness, DOC, TDS and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Nitrate (a health-related parameter) was quantified in the spring at BH4 to be in exceedance of both the ODWQS and the Guideline B-7. Concentrations of nitrate observed at this location have been consistently quantified at elevated levels throughout the historical monitoring record.

Monitoring Well BH4-II

In comparison to background water quality, groundwater observed immediately east of the waste fill area (nested with well BH4) at BH4-II was observed to have higher concentrations of conductivity, alkalinity, TDS, nitrate, chloride, sulphate, calcium, sodium and potassium, indicating temperate impacts from the

landfill, which are similar to those concentrations quantified at BH4. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the active fill zone. Elevated hardness (high), DOC, TDS, nitrate, manganese and turbidity concentrations were identified at BH4-II that exceeded both the ODWQS and/or the Guideline B-7 criteria. Hardness, DOC, TDS, manganese and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Nitrate (a health-related parameter) was quantified in the spring and fall at BH4-II to be in exceedance of both the ODWQS and the Guideline B-7. Concentrations of nitrate observed at this location are consistent with the concentrations quantified in nearby well BH4 throughout the historical monitoring record.

4.2.5 Downgradient Water Quality Evaluation

Monitoring Well BH5-II

In comparison to background water quality, groundwater observed east of the Site at BH5-II was observed to have higher concentrations of conductivity, alkalinity, TDS, nitrate, chloride, sulphate, calcium, sodium and potassium, indicating temperate impacts from the landfill, which is consistent with historical observations at this location. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the active fill zone. Elevated hardness (high), nitrate, DOC, manganese and turbidity concentrations were identified at BH5-II that exceeded both the ODWQS and/or the Guideline B-7 criteria. Hardness, DOC, manganese and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Nitrate (a health-related parameter) was quantified in the fall at BH5-II to be in exceedance of the Guideline B-7. Concentrations of nitrate observed at this location fluctuate considerably throughout the historical monitoring record; therefore, this concentration should be confirmed during the next sampling event.

Monitoring Well BH6-II

Downgradient monitoring well BH6-II was observed to be dry at the time of sampling during the spring and fall 2019 monitoring events, as is consistent with historical observations.

Monitoring Well BH6-III

In comparison to background water quality, groundwater observed east of the Site at BH6-III was observed to have slightly higher concentrations of conductivity, alkalinity, TDS, chloride, sulphate, calcium and potassium, indicating minor impacts from the landfill. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the active fill zone. Elevated hardness (high), DOC, nitrate, manganese and turbidity concentrations were identified at BH6-III that exceeded both the ODWS ad/or the Guideline B-7 Criteria. Hardness, DOC, manganese and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Nitrate (a health-related parameter) was quantified in the fall at BH6-III to be in exceedance of the Guideline B-7. As only the 2019 data are available for this monitoring location, additional analytical data are required in order to confirm this concentration.

Monitoring Well BH7-II

In comparison to background water quality, groundwater observed east of the Site at BH7-II was observed to have generally similar concentrations of conductivity, alkalinity, TDS, chloride, sulphate, calcium, sodium and potassium, indicating very minor impacts from the landfill, which is consistent with historical observations at this location. Elevated pH (low), hardness (low), alkalinity (low), DOC, aluminum and turbidity concentrations were identified at BH7-II that exceeded both the ODWQS and/or the Guideline B-7 criteria. These parameters are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of pH (low), DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Monitoring Well BH8-I

In comparison to background water quality, groundwater observed east of the Site at BH8-I was observed to have higher concentrations of conductivity, alkalinity, TDS, nitrate, chloride, sulphate, calcium, sodium and potassium, indicating temperate impacts from the landfill. Elevated hardness (high), nitrate, DOC, manganese and turbidity concentrations were identified at BH8-I that exceeded both the ODWQS and/or the Guideline B-7 criteria. Hardness, DOC, manganese and turbidity are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC

and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

Nitrate (a health-related parameter) was quantified in the fall at BH8-I to be in exceedance of the Guideline B-7. This concentration should be confirmed during the next sampling event.

Monitoring Well BH9-I

In comparison to background water quality, groundwater observed east of the Site at BH9-I was observed to have higher concentrations of conductivity, alkalinity, TDS chloride, sulphate, calcium, sodium and potassium, indicating temperate impacts from the landfill, which is consistent with historical observations at this location. It is expected that the groundwater at this location is impacted with minor amounts of landfill leachate considering its close proximity to the active fill zone. Elevated hardness (high), DOC, aluminum, iron, manganese and turbidity concentrations were identified at BH9-I that exceeded both the ODWQS and/or the Guideline B-7 criteria. These parameters are either operational guidelines or aesthetic objectives for drinking water systems set by the ODWQS and are not considered to be a significant environmental concern originating from the Site. Furthermore, elevated concentrations of DOC and turbidity are also quantified at the background monitoring location and therefore are not considered to be landfill derived.

4.3 Groundwater Trend Analysis

A series of time versus concentration graphs were developed to evaluate the concentrations of several select landfill indicator parameters (including alkalinity, chloride, nitrate, pH and dissolved organic carbon) at each monitoring well for the Site. Current and historical groundwater quality data was utilized to identify any apparent trends or inconsistencies in the water quality within the monitoring well network. The time versus concentration graphs are provided in Appendix VI. It should be noted that the newly installed monitoring wells (BH3-II, BH4-II, BH6-III, BH8-I, BH9-I, BH10-I and BH11) currently only have data available for 2019; therefore, further monitoring is required in order to observe accurate trends at these locations.

In general, the landfill indicator parameters are demonstrating fairly stable trends with respect to time at all monitoring well locations, with some exceptions. Concentrations of alkalinity are generally stable, with the exception of wells BH1, BH2 and BH4 which are demonstrating increasing trends. Chloride concentrations at BH4 have generally been high, but have been demonstrating a decreasing trend since 2013. Additionally, chloride concentrations at well BH5-II are demonstrating an increasing trend. Concentrations of nitrate are generally stable within a large range of fluctuation for most wells. Nitrate concentrations at BH4 and BH4-II are above the ODWQS, but have been demonstrating a decreasing trend since 2013. Concentrations of pH are recently stable within the ODWQS range, except for BH3 and

BH7-II which have stabilized at concentrations lower than the ODWQS. Concentrations of DOC have been stable since 2015, with concentrations at BH1, BH2, BH4 and BH5-II consistently above the ODWQS.

Further monitoring investigations are required in order to confirm the trends observed during this monitoring period.

4.4 Groundwater Field Measurement Results

On June 11 and September 26, 2019 Pinchin collected groundwater monitoring parameters from each of the well locations using a YSI-556 water quality meter for measurement of field parameters. The field parameter measurements are provided in Tables 3 through 16.

A review of the field parameters for the project identified no significant concerns in the water quality during the monitoring events. The water quality at the Site monitoring locations did not change significantly between each of the monitoring locations and the measured field parameters were within the normal variability associated with shallow groundwater monitoring systems.

4.5 Surface Water Quality Monitoring

4.5.1 The Provincial Water Quality Objectives (PWQO)

The PWQO are numerical and narrative criteria which serve as chemical and physical indicators representing satisfactory levels for surface water and groundwater where it discharges to the surface. The PWQO are levels which are protective of the water quality for all forms of aquatic life during their indefinite exposures to the water. The PWQO levels include protection for anthropogenic recreational water uses where there is a high potential of exposure and are based on public health and aesthetic considerations.

In general, the PWQO stated that the surface water quality of a water body shall be “free from contaminating levels of substances and materials attributable to human activities which in themselves, or in combination with other factors can: settle to form objectionable deposits; float as debris or scum or oil or other matter to form nuisances; product objectionable colour, odour, taste, or turbidity; injure, are toxic to, or produce adverse physiological or behavioural responses in humans, animals, or plants; or enhance the production of undesirable aquatic life or result in the dominance of nuisance species”.

4.5.2 Aquatic Protection Values (APV)

Under Ontario Regulation 153/04, the MECP have developed APVs to protect aquatic organisms exposed to contaminants from migration of contaminated groundwater to surface water. Protection of aquatic biota from migration of contaminants by overland flow is provided by a Site being designated an environmentally sensitive area if the property includes or is adjacent to a water body or includes land that is within 30 m of a water body.

APVs are designed to provide a scientifically defensible and reasonably conservative level of protection for most aquatic organisms from the migration of contaminated groundwater to surface water resources.

4.5.3 Canadian Water Quality Guidelines (CWQG)

The CWQG were developed by the Canadian Council of Resources and Environment, to provide basic scientific information about the effects of water quality parameters on uses in order to assess water quality issues and concerns and to establish water quality objectives for specific sites. The guidelines contain recommendations for chemical, physical, radiological and biological parameters necessary to protect and enhance designated uses of water. They apply only to inland surface waters and groundwater, and not to estuarine and marine waterbodies. The rationale for each parameter is included to assist in the development of water quality objectives to suit local water conditions.

4.6 Surface Water Results

Pinchin collected surface water samples from all surface water monitoring locations during the spring and fall monitoring events in 2019. Surface water samples were collected to monitor the surface water for contaminants of concern as a compliance requirement. A summary of water quality monitoring data relative to the regulatory standards is presented in the attached Tables 19 through 21. Copies of the laboratory analytical reports are presented in Appendix V.

Surface water monitoring location SW1, located within the creek along the south side of the Site, is considered representative of background water quality conditions and is characterized by naturally elevated concentrations of pH (low), phenols, iron, aluminum and cobalt. These parameter concentrations exceeded the PWQO and/or CWQG during the 2019 sampling events, which is consistent with the observations at this location throughout the historical monitoring record. Exceedances of the APV were quantified at this location for potassium.

Minor leachate impacts are observed at the downstream surface water monitoring location SW3, with PWQO exceedances quantified for iron, boron and cobalt. These impacts are interpreted to improve with distance from the Site, as lower concentrations are quantified at further downstream monitoring location, SW2. No PWQO exceedances were quantified at SW2, other than concentrations of phenols and aluminum which are also naturally elevated at the background location. APV exceedances at SW2 and SW3 were quantified for potassium, similar to background conditions.

Additionally, concentrations of nitrate (health- related parameter) quantified at several of the downgradient groundwater monitoring wells are not interpreted to be impacting the surface water quality at the Site as nitrate concentrations are observed to be at low levels at downstream monitoring location SW2. This interpretation should be confirmed during the future monitoring.

4.7 Surface Water Trend Analysis

A series of time versus concentration graphs were developed to evaluate the concentrations of several select landfill indicator parameters (including alkalinity, chloride, nitrate, pH and dissolved organic carbon) at each surface water monitoring location for the Site. Current and historical surface water quality data was utilized to identify any apparent trends or inconsistencies in the water quality at the Site. The time versus concentration graphs are provided in Appendix VII.

In general, the landfill indicator parameters are demonstrating stable trends with respect to time at all surface water monitoring locations within a large range of fluctuation, with the exception of SW3 which does not demonstrate an identifiable trend for alkalinity or nitrate. Concentrations of pH at SW1 have consistently been below the ODWQS range and have demonstrated a significant decrease since 2018.

Further monitoring investigations are required in order to confirm the trends observed during this monitoring period.

4.8 Surface Water Field Measurement Results

On June 11 and September 26, 2019, Pinchin collected surface water monitoring parameters from each surface water monitoring location using a YSI-556 water quality meter for real-time in-situ measurement of field parameters. The field parameter measurements are provided in Tables 18 through 20.

A review of the field parameters for the project identified no significant concerns in the water quality during the monitoring event. The quality at the surface water monitoring locations did not change significantly between each of the monitoring locations. Surface water flow measurements were not obtained.

4.9 Groundwater Flow Interpretation

The hydraulic flow vector was historically estimated to range to the east. The groundwater flow direction may be influenced by seasonal variations in the amount of precipitation, by aquifer heterogeneity and the buried fill material at the Site. Groundwater level trends indicate seasonal fluctuations in the depth to groundwater which is consistent with seasonal fluctuations in precipitation events. The depth to groundwater measurement results are presented in Table 1.

During the spring monitoring event on June 11, 2019, the depth to groundwater was observed to range from 0.45 mbgs at BH11 to 5.32 mbgs at BH4. During the fall monitoring event on September 26, 2019, the depth to groundwater was observed to range from 1.03 mbgs at BH11 to 7.79 mbgs at BH4-II.

Accurate triangulation of the water table elevations was undertaken for the 2019 sampling events using the available monitoring well system and the survey elevation data provided by the Client. The inferred groundwater contours for both the spring and fall events are presented on Figures 4 and 5, respectively.

The presentation of the groundwater contours and the associated inferred groundwater flow direction for the 2019 sampling events, as illustrated on Figures 4 and 5, confirms the previous findings of earlier Annual Monitoring Reports which indicate groundwater flow is directed towards the east.

4.10 Leachate Characterization

The Site is an operating landfill with minor operational or maintenance being overseen by the Municipality. The Site currently does not have a leachate collection system whereby leachate quality monitoring and characterization is being completed. Currently, there is no groundwater monitoring well included in the existing monitoring well network at the Site that is situated within the active landfill area or which is considered representative of source leachate water quality. Therefore, leachate at the Site cannot be characterized at the time of preparation of this report.

4.11 Contaminant Attenuation Zone

A Contaminant Attenuation Zone (CAZ) has not been established for the Site. However, it should be noted that based on the current observed water quality data, landfill derived leachate impacts appear to attenuate prior to the property boundary. Future investigations should involve the development of a CAZ for this Site.

4.12 Adequacy of the Monitoring Program

At this time there is currently no formal monitoring program for the Site. Pinchin recommends continuation of sampling the groundwater and surface water two times per year (spring and fall) to establish any notable trends or impacts emanating from the landfill. The results of inspection and monitoring will be reported annually to the MECP. After that time, and with the establishment of baseline data/source data leachate concentrations, a review of all data will then be used to establish the expected level of impact and the need and scope for long term monitoring.

During these sampling and reporting events, it is recommended that the monitoring well network be evaluated for adequacy and determine if there is a need for additional monitoring locations.

4.12.1 Monitoring Well Network Efficiency

Pinchin concludes that the current groundwater monitoring well network is considered adequate for evaluating the Chapman Waste Disposal Site geological and hydrogeological characteristics immediately to the east of the landfill (for evaluating downgradient groundwater quality migrating from the Site). The groundwater quality observed in monitoring well BH3-II appears to have minor derived impacts and as such, has been used within this report for assessing the Site's water quality data to Guideline B-7 RUC (i.e., background well).

Based on a visual inspection of the monitoring well installations, Pinchin concludes that the monitoring wells are in satisfactory condition. Borehole logs for several of the wells on-Site were not provided to Pinchin for review of the construction details. Borehole logs should be included as an appendix in every annual monitoring report. The borehole logs for the new monitoring wells installed in September 2018 are provided in Appendix II.

4.12.2 Background Monitoring Well Efficiency

Based on a review of the groundwater contaminant data from BH3 (Destroyed), BH3-II and BH11, as well as the assumed groundwater flow direction, monitoring well BH3-II has been identified as a best-case background location. A review of the dataset (as provided on Table 6) from BH3-II did not identify elevated levels of common landfill-related contaminant parameters, with the exception of alkalinity which is naturally lower than the ODWQS and DOC which is naturally elevated. At this time, monitoring well BH3-II is considered adequate for monitoring background groundwater quality.

4.13 Supplemental Monitoring: Sediment, Benthic and/or Toxicity Monitoring

No supplemental monitoring was completed as part of the 2019 monitoring program completed by Pinchin.

4.14 Assessment of the Need for Implementation of Contingency Measures

There are currently no set trigger levels designed for the Site. As part of the 2019 Leachate Management Study Report completed by Pinchin in April 2019, a trigger level monitoring program and contingency plan has been proposed for the Chapman Waste Disposal Site. The proposed Trigger Level Monitoring Program is a three-tiered program that includes routine monitoring (i.e., the semi-annual monitoring program), compliance monitoring and confirmation monitoring.

4.14.1 Trigger Level Monitoring Program

The following describes in detail the proposed three-tier trigger level monitoring program, as described in the 2019 Leachate Management Plan Study:

Tier I – Routine Monitoring

Groundwater and surface water monitoring will continue to be conducted on a semi-annual basis, in the spring (May/June) and fall (October/November), for a comprehensive list of analytical parameters. The semi-annual monitoring program is part of the Tier I trigger program and is considered to be an “Alert Level” of monitoring.

For groundwater, Tier I monitoring utilizes the ODWQS and RUC allowable limits as the initial trigger values, respectively. For surface water, the PWQO, CWQG or APV values will used for Tier I monitoring. The trigger monitoring parameters, values and locations are outlined in Section 4.14.2.

During Tier I monitoring, the geometric mean of the ten most recent successive monitoring events will be used to assess water quality at the given trigger monitoring locations. If, at the trigger monitoring locations, the geometric mean concentration of two or more parameters are found to exceed the 75th percentile limit RUC or surface water standard, then the Tier II monitoring is triggered.

Tier II – Confirmation Monitoring

Tier II Confirmation Monitoring program would be implemented if, at a single monitoring location, the geometric mean concentration (based on the last ten sampling events) for two or more parameters are found to exceed the 75th percentile RUC or the surface water standard. The Tier II Confirmation monitoring program consists of collecting water quality samples in duplicate from the location exhibiting the Tier I exceedance within forty-five days of receipt of the test results in order to confirm the Tier I exceedances. If the duplicate samples indicate that Tier I trigger concentrations are not consecutively exceeded then Tier I monitoring will resume.

If the Tier I exceedance is confirmed, then the next step in the Tier II Confirmation Monitoring program will be to evaluate the degree, nature and potential source(s) of trigger level impact(s) identified in Tier I. As a first step, during the next scheduled monitoring event, the trigger parameter concentrations will be compared to the applicable standards (i.e., ODWQS and RUC for groundwater, and PWQO, CWQG or APV for surface water). This comparison will be utilized as an indicator of the timing and urgency of response. The comparison will also include parameter concentration trend analysis over time, with an emphasis on seasonality, if any, for trigger parameters. An evaluation of the need to increase monitoring frequency, expand the trigger parameter list and/or establish additional trigger locations will also be undertaken. If the Tier II Confirmation Monitoring program indicates that the Site is out of compliance, as compared to the applicable standards, the Municipality will consult with MECP staff regarding the sampling analytical results and interpretation, and if required, the need for expansion of the established CAZ and/or implementation of an active leachate-impacted groundwater management strategy as outlined in Section 7.0 of the 2019 Leachate Management Plan Study.

Tier III – Compliance Monitoring

The Tier III Compliance Monitoring is a program designed to assess the effectiveness of any remedial measures that are implemented at the Site. The Tier III Compliance Monitoring program details would be determined in conjunction with the development and implementation of a preferred remedial measure arising out of evaluation of the Tier II monitoring results. The compliance performance trigger parameters, concentrations, locations and monitoring frequency would be determined at that time. It is suggested that this program would consist of more frequent sampling of key trigger locations and analysis for a selected suite of parameters, including the trigger parameters, using the ODWQS and RUC allowable limits (for groundwater) and PWQO, CWQG or APV (for surface water), as Tier III compliance concentrations. Once

compliance is confirmed at the Tier III level, and remedial measures have controlled and reduced the impact, the Tier III program would end and Tier I monitoring would resume.

4.14.2 Compliance Evaluation Parameters and Trigger Concentrations

Compliance evaluation parameters are defined as the site-specific leachate indicator parameters which have established ODWQS (for groundwater) and PWQO, CWQG or APV (for surface water). A trigger concentration is an agreed upon threshold of the leachate indicator parameters.

Based on the recent development of a suitable historic database of analytical results for several monitoring locations, having a sampling duration of over five years (i.e., 10 sampling events), with seasonal sampling frequency of twice per year, and the need to consider seasonality and changes or fluctuations in water quality, Pinchin has selected 'Option B - 75th Percentile Non-compliance Window method' from the MECP Guideline to be utilized for the trigger level assessment.

Given the existence of a statistically valid database (i.e., minimum of 8 to 10 water samples over a minimum two-year period) for each of the selected monitoring locations, subsequent semi-annual routine monitoring data can be incorporated, and a running average calculation can be used, based on the most recent ten successive sample events. However, it is cautioned that when using running averages or percentiles for compliance purposes, one must be cognizant of parameter concentrations over time, taking into account the historic variability of both short and long-term water quality/quantity impact trends. The sample period window must therefore be critically examined on a regular basis to ensure that it appropriately current and applicable during the lifetime of the landfill (i.e., accounting for relevant changes in Site operation and leachate generation changes in quality and quantity over time).

Historic background well parameter concentrations are typically low to moderate and consistent. As such, Pinchin has used monitoring location BH3 as the background location. However, it should be noted that during the 2018 fall monitoring program new background wells (BH3-II and BH11) were installed since BH3 was recently destroyed. Therefore, it is Pinchin's opinion that once the dataset becomes more robust, the new background wells will be utilized opposed to the historic data.

The existing background groundwater quality at BH3 comprises low pH, chloride, sulphate, hardness and alkalinity levels, with moderate turbidity levels. These values are considered representative of regional background quality in the aquifer sampled by the well screen. The only ODWQS exceedances at this location are pH, hardness, alkalinity and turbidity. As a result, these parameters have therefore not been used in the proposed groundwater Trigger Level Monitoring Program.

Groundwater Trigger Mechanism

1. Trigger Location: Trigger monitoring locations shall be the nested monitoring wells BH6-III, BH7-II and BH8-I located on the east side of the landfill (i.e., downgradient of the fill areas).
2. Trigger Parameters and Compliance Criteria: The following table presents the RUC allowable limits and trigger concentrations currently proposed for the groundwater and parameters. It should be noted that the calculated RUC concentrations and Tier I trigger level concentrations are dynamic and are subject to change in the future, based on the update of the running 75th percentile background value for the most recent ten successive sample events.

Groundwater Trigger Wells	Parameter	Reasonable Use Criteria Objective (mg/L)	Trigger Level Concentration (mg/L)
BH6-III BH7-II BH8-I	TDS	270	202.49
	Chloride	126.2	94.66
	Sodium	100.8	75.56
	Sulphate	252.4	189.27
	Nitrate as N	3.1	2.36
	Nitrite as N	0.25	0.19
	Iron	0.175	0.13
	Manganese	0.029	0.022
	Arsenic	0.0029	0.0022
	Barium	0.27	0.20
	Boron	1.26	0.95
	Cadmium	0.0013	0.0010
	Chromium	0.014	0.011
	Copper	0.50	0.38
	Lead	0.0026	0.0020
	Zinc	2.51	1.88

Surface Water Trigger Mechanism

1. Trigger Location: Trigger monitoring locations shall encompass all of the downstream surface water sample locations at the Site (SW2 and SW3).
2. Trigger Parameters and Compliance Criteria: The following table presents the PWQO, CWQG or APV allowable limits, trigger parameters and concentrations currently proposed for the surface water. The trigger level concentration is 75% of the guideline value considered appropriate for the Site.

Surface Water Trigger Locations	Parameter	Applicable Guideline	Objective (mg/L)	Trigger Level Concentration (mg/L)
SW2 SW3	Chloride	APV	180	135
	Nitrate as N	CWQG	2.90	2.175
	Nitrite as N	CWQG	0.06	0.045
	Iron	APV	1.0	0.75
	Arsenic	PWQO	0.10	0.075
	Barium	APV	2.30	1.725
	Boron	APV	3.55	2.662
	Copper	PWQO	0.005	0.00375
	Zinc	PWQO	0.03	0.0225

4.14.3 Contingency Plan

Should the results of the Trigger Level Monitoring program indicate that the long-term operation of the Site is resulting in significant impacts to the groundwater or surface water quality at the Site, the Municipality will consult with MECP staff regarding the sampling analytical results, their interpretation and the development of a realistic schedule for implementation of a strategy to manage the leachate-impacted groundwater plume. Additional activities that could be performed at this time could include further leachate characterization and an increase in the groundwater and/or surface water monitoring frequency.

In the event of a confirmed groundwater or surface water exceedance of the trigger parameters and compliance criteria as identified in section 4.14.2, it is proposed that the some or all of the following contingency measures will be implemented:

- Installation of additional monitoring wells located downgradient of the landfilling area and along the property boundary of the Site to confirm off-Site impacts are taking place;
- Acquisition of further downgradient lands and the extension of the contaminant attenuation zone;
- Application of low permeability final cover;
- Installation of a leachate collection system and treatment system; and/or
- Progressive closure program acceleration.

4.15 Waste Disposal Site Gas Impacts

At this time no evidence has been documented to suggest that methane gas generation from the Site is a significant concern.

4.16 Effectiveness of Engineered Controls

With the exception of the intermittent landfill cover, there are no operational engineered controls in effect at the Site. The Client should continue to maintain the integrity of the landfill cover as per the CofA. Annual monitoring and inspections should continue to be completed to ensure regular maintenance is occurring on an as needed basis. At the time of the monitoring event no significant damage or concerns were noted.

4.17 Control Systems Monitoring

Environmental control systems are designed, constructed, and utilized at some waste disposal sites to reduce or increase an environmental variable to an acceptable level, or to maintain an environmental variable within an acceptable range, in order to prevent a negative environmental outcome. Certain environmental control systems such as a leachate collection system or a methane gas collection system can provide the basis for operator intervention to bring about or maintain a desired condition to operate the landfill. The Site does not currently operate any control systems; therefore no control system monitoring was completed as part of the 2019 monitoring program.

4.18 QA/QC Results

In order to provide confidence in the data obtained, a comprehensive QA/QC component was included in the monitoring program. The QA/QC procedures developed for this monitoring program are prepared in accordance with MECP Sampling Document, and in most cases, exceed the minimum requirements.

Water quality samples collected by Pinchin were generated in accordance with acceptable procedures. No analytical hold times were exceeded for samples submitted for analyses and sample temperatures upon receipt at the project laboratory were below 10˚ Celsius.

Two groundwater duplicate sample pairs and one surface water duplicate sample pair were collected from the Site during the spring and fall sampling events and submitted for laboratory analysis of the full suite of analytical parameters. All duplicate data for 2019 are provided in Tables 22 and 23 for groundwater and surface water, respectively. The following table summarizes the duplicate pairs for 2019:

Sampling Event	Duplicate Sample ID	Original Sample ID
Spring 2019	GW DUP1	BH7-II
	GW DUP2	BH5-II
	SW DUP	SW2
Fall 2019	GW DUP1	BH6-III
	GW DUP2	BH7-II
	SW DUP	SW1

The calculated RPDs for the original and field duplicate groundwater sample has been compared to the performance standards considered acceptable by Pinchin (i.e., 50%). Each of the calculated RPDs met the corresponding performance standard, with the exception of GW DUP2 and SW DUP during the fall; the duplicate pair GW DUP2 had RPD exceedances for DOC, iron, phosphorous and aluminum and the duplicate pair SW DUP had an RPD exceedance for sulphate.

Upon review of the QA/QC results for spring and fall sampling programs, Pinchin has not identified any significant concerns that would warrant the invalidation of any of the field or laboratory data, and therefore considers the data generated as part of this program to be reliable.

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

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

5.0 CONCLUSIONS

Based on the work completed, the following is a summary of the activities and findings of the 2019 water quality monitoring program:

- Groundwater samples were collected from all monitoring wells at the Site on June 11 and September 26, 2019, with the exception of BH4 in the fall and BH6-II in the spring and fall due to the wells being dry at the time of sampling. All groundwater samples were submitted for laboratory analysis of parameters identified in the 2018 D.M. Wills Annual Monitoring Report. The groundwater quality was assessed based on the ODWQS and Guideline B-7;
- Surface water samples were collected from all monitoring locations on June 11 and September 26, 2019 and were submitted for laboratory analysis of parameters identified in the 2018 D.M. Wills Annual Monitoring Report. Surface water quality was assessed based on the PWQO, APV and CWQG;
- During the spring monitoring event on June 11, 2019, the depth to groundwater was observed to range from 0.45 mbgs at BH11 to 5.32 mbgs at BH4. During the fall monitoring event on September 26, 2019, the depth to groundwater was observed to range from 1.03 mbgs at BH11 to 7.79 mbgs at BH4-II. Groundwater flow at the Site is interpreted to be directed towards the east;
- All reported concentrations in the groundwater samples submitted for analysis satisfied the respective ODWQS parameters with the exception the following:
    - Hardness (high) at BH1, BH2, BH4, BH4-II, BH5-II, BH6-III, BH8-I, BH9-I and BH10-I;
    - Hardness (low) at BH3-II, BH7-II and BH11;
    - Nitrate at BH1, BH4, BH4-II and BH5-II;
    - DOC at BH1, BH2, BH3-II, BH4, BH4-II, BH5-II, BH6-III, BH9-I and BH10-I;
    - Manganese at BH1, BH2, BH4-II, BH5-II, BH6-III, BH8-I, BH9-I, BH10-I;

- Turbidity at all wells;
- Iron at BH2 and BH9-I;
- Aluminum at BH3-II, BH7-II and BH9-I;
- Alkalinity (low) at BH3-II, BH7-II and BH11;
- TDS at BH4-II; and
- pH (low) at BH3-II and BH7-II.

- All reported concentrations in the groundwater samples collected from the downgradient monitoring wells met the applicable Guideline B-7 criteria for all parameters analyzed, with the exception of the following:
  - TDS at BH1, BH2, BH4 and BH4-II;
  - Nitrate at BH1, BH4, BH4-II, BH5-II, BH6-III and BH8-I;
  - DOC at BH1, BH2, BH4, BH4-II, BH5-II, BH6-III, BH7-II, BH8-I and BH9-I;
  - Iron at BH2 and BH9-I; and
  - Manganese at BH1, BH2, BH4-II, BH5-II, BH6-III, BH8-I and BH9-I.
- All reported concentrations in the surface water samples submitted for analysis satisfied the respective PWQO, APV an/or CWQG parameters, with the exception of the following:
  - pH (low) at SW1;
  - Potassium at all locations;
  - Phenols at SW1 and SW2;
  - Iron at SW1 and SW3;
  - Aluminum at SW1 and SW2;
  - Cobalt at SW1 and SW3; and
  - Boron at SW3.

Based on the results obtained from the existing groundwater monitoring wells and surface water monitoring locations, Pinchin has not identified any significant landfill related impacts at the Site. Concentrations of hardness (high), nitrate, DOC, manganese and turbidity parameters within the groundwater samples analyzed at the furthest downgradient monitoring locations are likely attributed to either naturally occurring conditions within the shallow unconfined aquifer on-site or from temperate impacts from leachate sourced from the waste deposits at the Site. All exceedances of the Guideline B-7 RUC are related to operational guidelines and/or aesthetic objectives associated with drinking water systems set by the ODWQS and are not considered to be an immediate significant human health or

environmental concern originating from the Site, with the exception of nitrate which is a health-related parameter. The elevated concentrations of nitrate are only quantified in some downgradient wells and often fluctuate throughout the historical record. Therefore, these concentrations should be confirmed during the next monitoring period. Furthermore, concentrations of nitrate quantified at the downgradient groundwater wells are not interpreted to be impacting the surface water quality at the Site as nitrate concentrations are observed to be at low levels at downstream monitoring location SW2.

6.0 RECOMMENDATIONS

Based on a review of the existing dataset and regulatory requirements to date, Pinchin recommends the following:

- Continue with routine monitoring of all the available groundwater monitoring wells and surface water monitoring locations. Groundwater and surface water monitoring shall be completed with analyses for the parameters identified in the historical monitoring record. It is recommended that groundwater and surface water monitoring be completed during the spring and late fall to generate a baseline data set, to evaluate trends, and to determine the need and scope of a long-term monitoring program for the Site. Considering the dataset completed thus far, it is Pinchin's opinion that sampling should continue in 2020 before the adequacy of the monitoring program can be fully evaluated;
- It is recommended that downgradient monitoring well BH8-I be sampled in duplicate during the next regularly scheduled sampling event in the spring of 2020 in order to confirm the elevated nitrate concentration quantified at this location;
- It is recommended that the three-tiered trigger level monitoring program, developed as part of the 2019 Leachate Management Plan Study, be implemented for the Site;
- The Client should continue to ensure that the requirements as specified in the CofA are complied with; and
- A contaminant attenuation zone (CAZ) should be developed and defined for the Site in order to effectively apply the RUC Guideline B-7 and confirm the downgradient leachate impacts of elevated nitrate concentrations.

7.0 MONITORING AND SCREENING CHECKLIST

In accordance with the MECP Landfill Standards, the Monitoring and Screening Checklist for the Site completed by the Pinchin CEP is completed and provided in Appendix VIII.

8.0 DISCLAIMER

This Water Quality Monitoring Program was performed for the Corporation of the Municipality of Magnetawan (Client) in order to investigate the environmental condition of the groundwater and surface water at the Chapman Waste Disposal Site (Site). The term recognized environmental condition means the presence or likely presence of any hazardous substance on a property under conditions that indicate an existing release, past release, or a material threat of a release of a hazardous substance into structures on the property or into the ground, groundwater, or surface water of the property. This Water Quality Monitoring Program does not quantify the extent of the extent of the current and/or recognized environmental condition or the cost of any remediation.

Conclusions derived are specific to the immediate area of study and cannot be extrapolated extensively away from sample locations. Samples have been analyzed for a limited number of contaminants that are expected to be present at the Site, and the absence of information relating to a specific contaminant does not indicate that it is not present.

No environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions on a property. Performance of this Water Quality Monitoring Program to the standards established by Pinchin is intended to reduce, but not eliminate, uncertainty regarding the potential for recognized environmental conditions on the Site, and recognizes reasonable limits on time and cost.

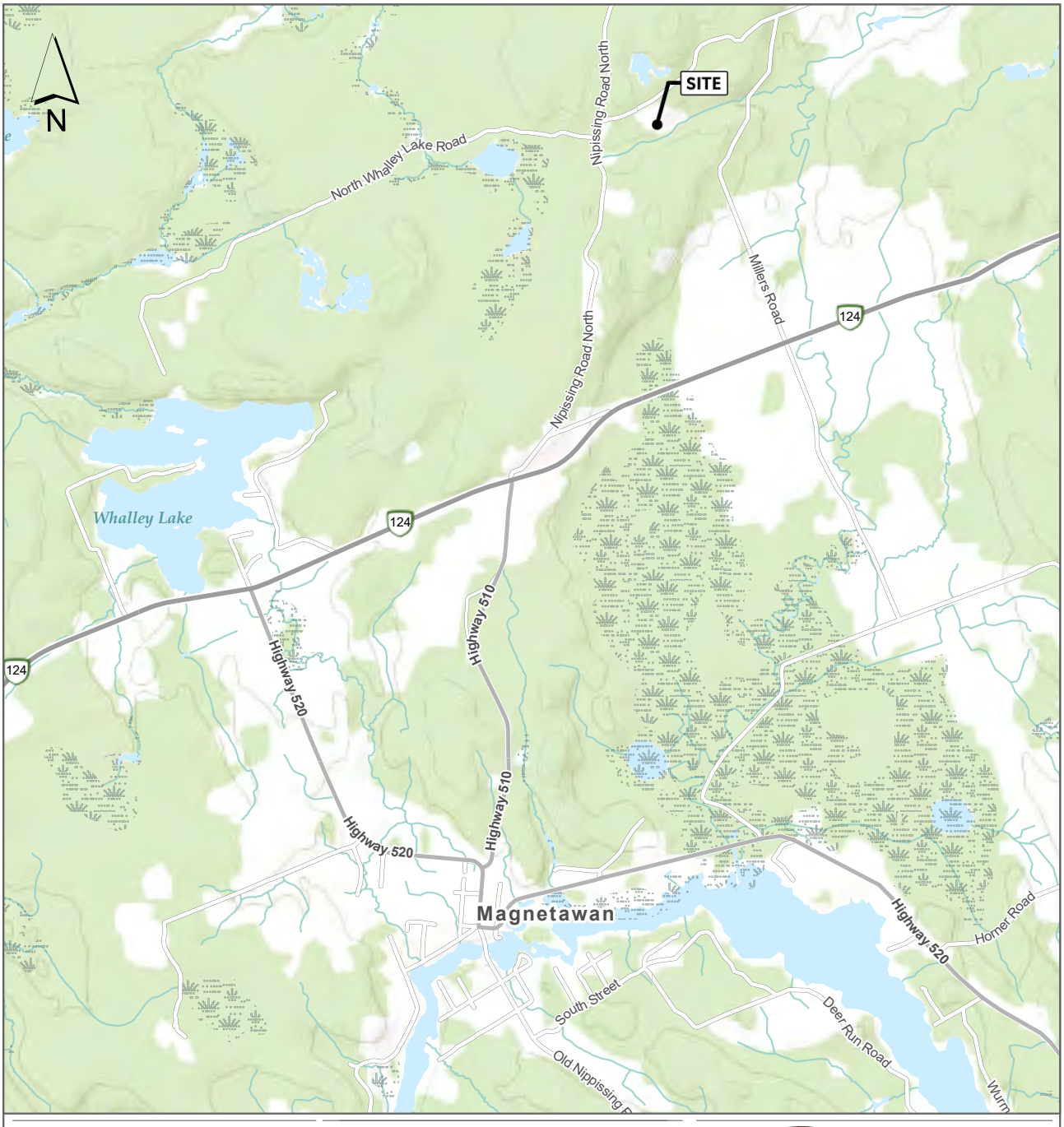
This Water Quality Monitoring Program was performed in general compliance with currently acceptable practices for environmental site investigations, and specific Client requests, as applicable to this Site.

This report was prepared for the exclusive use of the Client, subject to the conditions and limitations contained within the duly authorized work plan. 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 the third parties. If additional parties require reliance on this report, written authorization from Pinchin will be required. Pinchin disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed. Furthermore, this report should not be construed as legal advice.

Pinchin will not be responsible for any consequential or indirect damages. Pinchin will only be held liable for damages resulting from the negligence of Pinchin. Pinchin will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered within the meaning of the Limitations Act, 2002 (Ontario), to commence legal proceedings against Pinchin to recover such losses or damage.

Pinchin makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and these interpretations may change over time.

APPENDIX I
Figures



SCALE

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Meters

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PROJECT NAME

2019 ANNUAL MONITORING REPORT - CHAPMAN WASTE DISPOSAL SITE

PINCHIN

Municipality of Magnetawan

TITLE	FIGURE
KEY MAP	1

PROJECT	225335.002
DATE	DECEMBER 2019
PREPARED PKM	REVIEWED TIM

NOTES, REFERENCES AND SOURCES

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

CLIENT

MUNICIPALITY OF MAGNETEWAN

606650 m 606700 m 606750 m 606800 m 606850 m 606900 m 606950 m

5063300 m
5063250 m
5063200 m
5063150 m
5063100 m

N

Access Road
Propane Tanks
Attendant's Shelter
Metals
Bins
Bins
Active Landfill
Tires

PINCHIN
Municipality of Magnetawan

LEGEND

- Landfill Boundary
- Active Landfill
- Attendant's Shelter
- Bins
- Metals
- Propane Tanks
- Tires

SCALE

0 10 20 30 40 50
Meters
1:1,000

NOTES, REFERENCES AND SOURCES

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4) Coordinate system: NAD 1983 UTM Zone 17N

Sources:

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: NRCan, Esri Canada, and Canadian Community Maps contributors., Esri Canada

KEY PLAN

PROJECT LOCATION

CHAPMAN WASTE DISPOSAL SITE

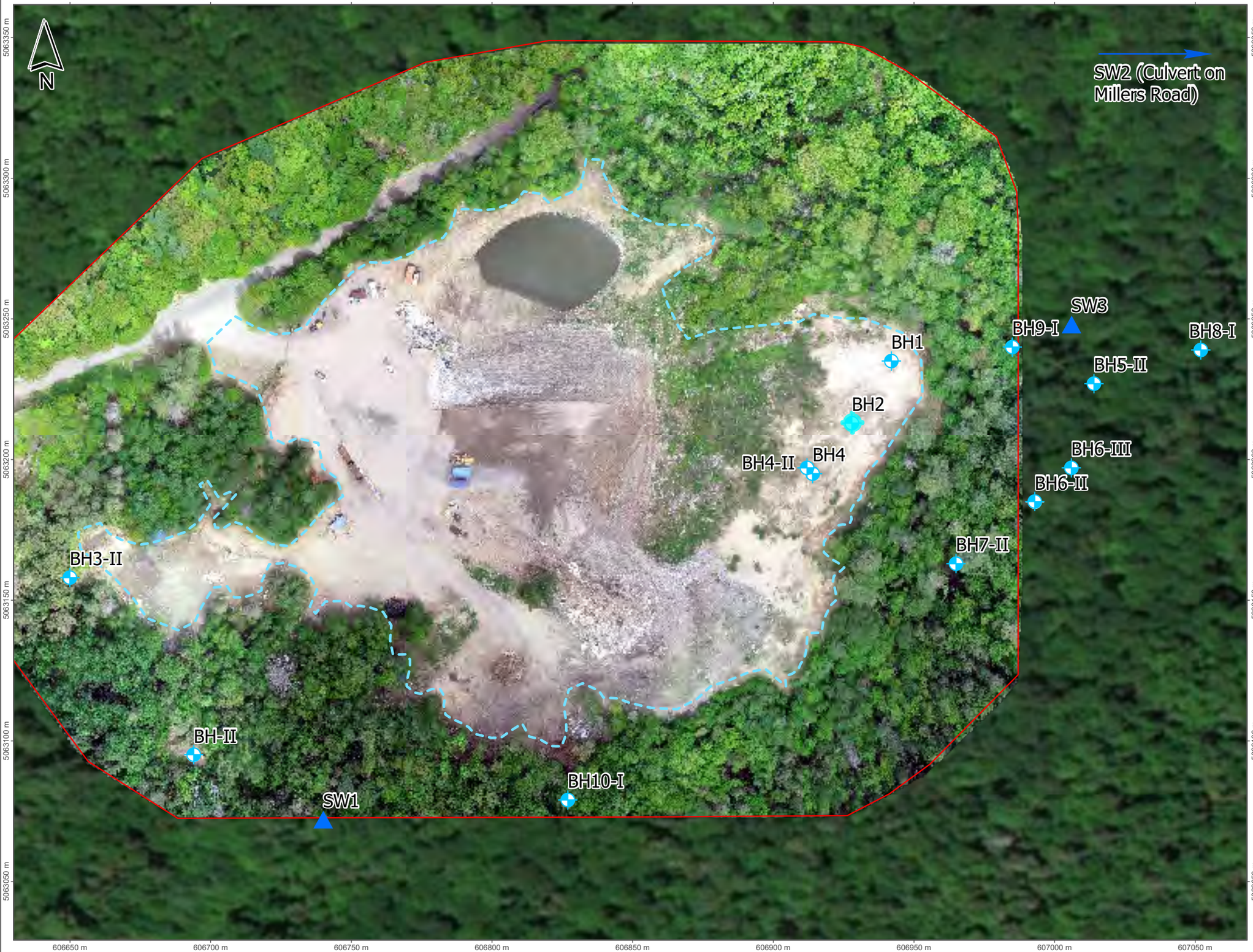
CLIENT

MUNICIPALITY OF MAGNETWAN

TITLE	FIGURE
CHAPMAN LANDFILL LAYOUT PLAN	**2**

PROJECT	**225335.002**
DATE	**DECEMBER 2019**
PREPARED **PKM**	REVIEWED **TIM**

Default Folder: C:\Users\pmurphy\Documents\ArcGIS\Projects\Magnetawan_Chapman



PINCHIN

Municipality of Magnetawan

LEGEND

- Landfill Boundary
- Surface Water Sample
- Monitoring Well
- UAV Survey Area

SCALE

0 10 20 30 40 50

Meters

1:1,300

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Sources:

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KEY PLAN

PROJECT LOCATION

CHAPMAN WASTE DISPOSAL SITE

CLIENT

MUNICIPALITY OF MAGNETAWAN

TITLE	FIGURE
SAMPLE LOCATION PLAN	3

PROJECT	225335.002
DATE	DECEMBER 2019
PREPARED PKM	REVIEWED TIM

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PINCHIN

Municipality of Magnetawan

LEGEND

- Landfill Boundary
- Groundwater Contour
- Surface Water Sample
- Monitoring Well (masl)
- Water Level from Topographic Survey (masl)
- Groundwater flow direction

SCALE

0 10 20 30 40 50

Meters

1:1,300

NOTES, REFERENCES AND SOURCES

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KEY PLAN

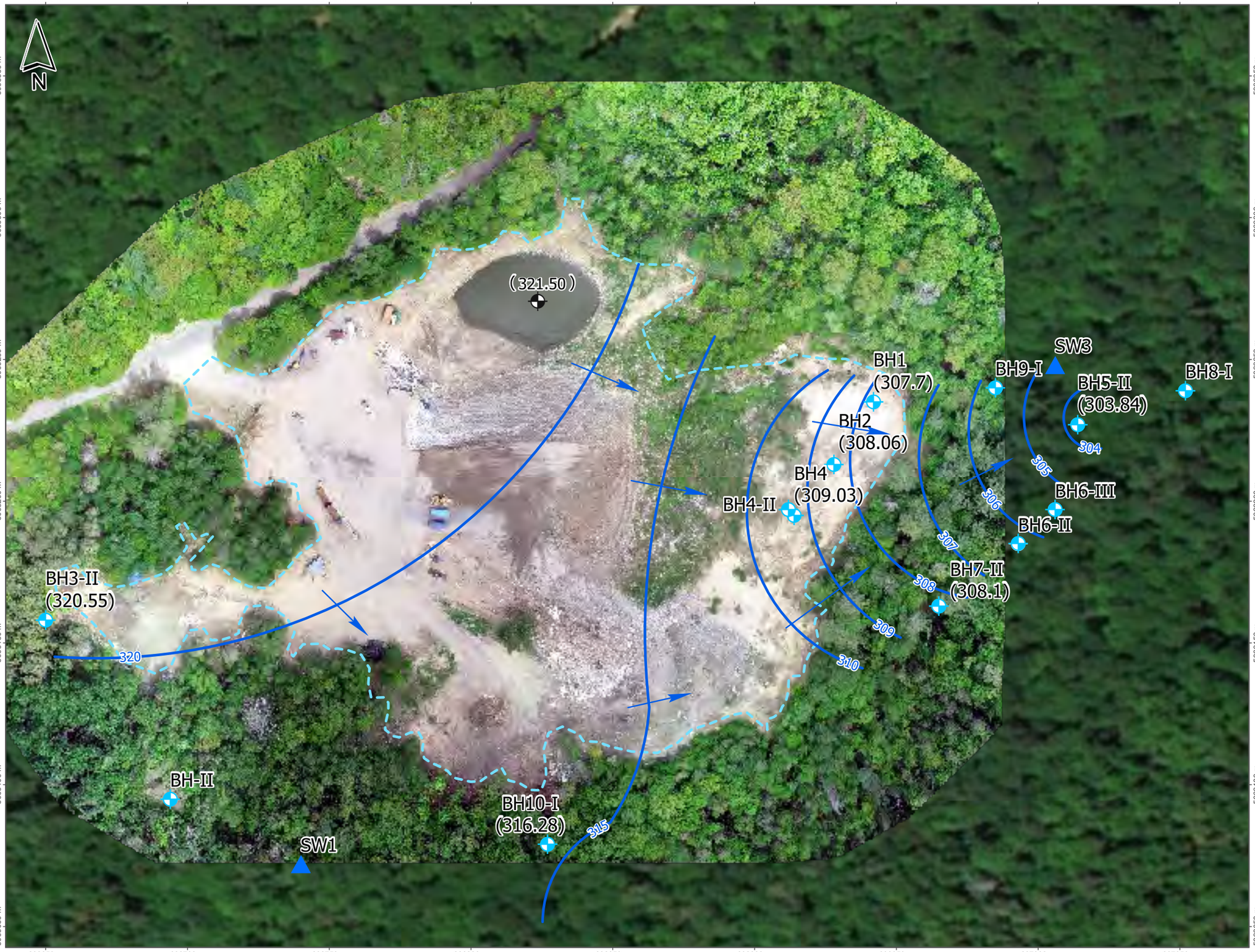
PROJECT LOCATION

CHAPMAN WASTE DISPOSAL SITE

CLIENT

MUNICIPALITY OF MAGNETEWAN

TITLE **GROUNDWATER CONTOUR PLAN (SPRING 2019)**	FIGURE **4**
PROJECT	**225335.002**
DATE	**DECEMBER 2019**
PREPARED **PKM**	REVIEWED **TIM**



PINCHIN

Municipality of Magnetawan

LEGEND

- Landfill Boundary
- Groundwater Contour
- Surface Water Sample
- Monitoring Well (masl)
- Water Level from Topographic Survey (masl)
- Groundwater flow direction

SCALE

0 10 20 30 40 50

Meters

1:1,300

NOTES, REFERENCES AND SOURCES

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4) Coordinate system: NAD 1983 CSRS UTM Zone 17N

Sources:

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/ Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

KEY PLAN

PROJECT LOCATION

CHAPMAN WASTE DISPOSAL SITE

CLIENT

MUNICIPALITY OF MAGNETEWAN

TITLE	FIGURE
GROUNDWATER CONTOUR PLAN (FALL 2019)	5

PROJECT	225335.002
DATE	DECEMBER 2019
PREPARED PKM	REVIEWED TIM

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APPENDIX II

Borehole Logs

Log of Borehole: BH3-II

Project #: 225335.001 **Logged By:** KM

Project: Hydrogeology Assessment

Client: Municipality of Magnetawan

Location: Chapman Waste Disposal Site, Magnetawan, Ontario

Drill Date: September 28, 2018 **Project Manager:** TM

SUBSURFACE PROFILE					SAMPLE	
Depth (ft / m)	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sample #	Recovery (%)
0 / 0		Ground Surface	0.00			
0–10 / 0–3		***Sand*** Brown sand, some gravel, dry, no PHC odour or staining.	3.05	Riser; Bentonite		
10–12 / 3–4		***Sand and Silt*** Grey sand and silt, damp, no PHC odour or staining.	3.66		SS1	
12–20 / 4–6		***Sand and Silt*** Grey sand and silt, saturated, no PHC odour or staining.	6.10	Screen; Silica Sand	SS2	
20 / 6		End of Borehole				

Contractor: CCC

Drilling Method: Hollow Auger

Well Casing Size: 5.08 cm

957 Cambrian Heights Drive
Suite 203
Sudbury, ON P3C 5S5

Grade Elevation: NA

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH4-II

Project #: 225335.001 **Logged By:** KM

Project: Hydrogeology Assessment

Client: Municipality of Magnetawan

Location: Chapman Waste Disposal Site, Magnetawan, Ontario

Drill Date: September 27, 2018 **Project Manager:** TM

SUBSURFACE PROFILE					SAMPLE	
Depth (ft / m)	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sample #	Recovery (%)
0 / 0		Ground Surface	0.00			
0–10 / 0–3		***Sand*** Coarse brown sand, some gravel, dry, no PHC odour or staining.	3.05	Riser; Bentonite		
10–13 / 3–4		***Sand and Gravel*** Coarse brown sand and gravel, trace cobbles, damp, no PHC odour or staining.	3.96		SS1	
13–28 / 4–8.5		***Bedrock*** Bedrock. Auger refusal on assumed bedrock. Sand seam at 20'.	8.44	Screen; Silica Sand		
28–30 / 8.5–9		End of Borehole				

Contractor: CCC

Drilling Method: Hollow Auger

Well Casing Size: 5.08 cm

957 Cambrian Heights Drive

Suite 203

Sudbury, ON P3C 5S5

Grade Elevation: NA

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH6-III

Project #: 225335.001 **Logged By:** KM

Project: Hydrogeology Assessment

Client: Municipality of Magnetawan

Location: Chapman Waste Disposal Site, Magnetawan, Ontario

Drill Date: September 28, 2018 **Project Manager:** TM

SUBSURFACE PROFILE					SAMPLE	
Depth (ft / m)	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sample #	Recovery (%)
0 / 0		Ground Surface	0.00			
0–10 / 0–3		***Sand and Gravel*** Coarse sand and gravel, some cobbles, damp, no PHC odour or staining.	3.05	Riser; Bentonite		
10–13 / 3–4		***Sand and Gravel*** Coarse sand and gravel, large cobbles, damp, no PHC odour or staining.	3.96		SS1	
13–20 / 4–6		***Bedrock*** Bedrock. Auger refusal on assumed bedrock.	6.30	Screen; Silica Sand		
20 / 6		End of Borehole				

Contractor: CCC

Drilling Method: Hollow Auger

Well Casing Size: 5.08 cm

957 Cambrian Heights Drive

Suite 203

Sudbury, ON P3C 5S5

Grade Elevation: NA

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH8-I

Project #: 225335.001 **Logged By:** KM

Project: Hydrogeology Assessment

Client: Municipality of Magnetawan

Location: Chapman Waste Disposal Site, Magnetawan, Ontario

Drill Date: September 27, 2018 **Project Manager:** TM

SUBSURFACE PROFILE					SAMPLE	
Depth (ft / m)	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sample #	Recovery (%)
0 / 0		Ground Surface	0.00			
0–13 / 0–4		***Sand*** Coarse, brown sand with some gravel, no PHC odour or staining.	4.27	Riser; Bentonite		
					SS1	
13–20 / 4–6		***Sand and Gravel*** Coarse, brown sand and gravel, trace cobbles, no PHC odour or staining.	6.05	Screen; Silica Sand		
					SS2	
20 / 6		End of Borehole				
23 / 7						

Contractor: CCC

Drilling Method: Hollow Auger

Well Casing Size: 5.08 cm

957 Cambrian Heights Drive

Suite 203

Sudbury, ON P3C 5S5

Grade Elevation: NA

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH9-I

Project #: 225335.001 **Logged By:** KM

Project: Hydrogeology Assessment

Client: Municipality of Magnetawan

Location: Chapman Waste Disposal Site, Magnetawan, Ontario

Drill Date: September 28, 2018 **Project Manager:** TM

SUBSURFACE PROFILE					SAMPLE	
Depth (ft / m)	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sample #	Recovery (%)
0 / 0		Ground Surface	0.00			
0–13 / 0–4		***Sand*** Coarse brown sand, damp, no PHC odour or staining.	4.27	Riser; Bentonite		
					SS1	
13–23 / 4–7		***Sand and Silt*** Coarse brown sand and fine brown sand and silt, trace gravel, saturated, no PHC odour or staining.			AS1	
23–26 / 7–8		Refusal at 27' on assumed bedrock.	8.23	Screen; Silica Sand	AS2	
		End of Borehole				

Contractor: CCC

Drilling Method: Hollow Auger

Well Casing Size: 5.08 cm

957 Cambrian Heights Drive
Suite 203
Sudbury, ON P3C 5S5

Grade Elevation: NA

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH10-I

Project #: 225335.001 **Logged By:** KM

Project: Hydrogeology Assessment

Client: Municipality of Magnetawan

Location: Chapman Waste Disposal Site, Magnetawan, Ontario

Drill Date: September 26, 2018 **Project Manager:** TM

SUBSURFACE PROFILE					SAMPLE	
Depth (ft / m)	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sample #	Recovery (%)
0 / 0		Ground Surface	0.00			
		Sand Coarse, brown sand, some gravel, trace cobbles, damp, no PHC odour or staining.	1.52	Riser, Bentonite		
		Bedrock Refusal on assumed bedrock.	4.88	Screen, Silica Sand		
		End of Borehole				

ft: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

m: 0 1 2 3 4 5 6 7

Contractor: CCC

Drilling Method: Hollow Auger

Well Casing Size: 5.08 cm

957 Cambrian Heights Drive

Suite 203

Sudbury, ON P3C 5S5

Grade Elevation: NA

Top of Casing Elevation: NA

Sheet: 1 of 1

Log of Borehole: BH11

Project #: 225335 **Logged By:** KM

Project: Hydrogeology Assessment

Client: Municipality of Magnetawan

Location: Chapman Waste Disposal Site, Magnetawan, Ontario

Drill Date: September 26, 2018 **Project Manager:** TM

SUBSURFACE PROFILE					SAMPLE	
Depth (ft / m)	Symbol	Description	Measured Depth (m)	Monitoring Well Details	Sample #	Recovery (%)
0 / 0		Ground Surface	0.00			
0–3 / 0–1		***Sand and Silt*** Brown sand with silt, damp, no PHC odour or staining.		Riser; Bentonite	SS1	
10–16 / 3–5		***Sand*** Coarse, brown sand, saturated, no PHC odour or staining.	3.05	Screen; Silica Sand	SS2 AS1	
16 / 5		End of Borehole	4.88			

Contractor: CCC

Drilling Method: Hollow Auger

Well Casing Size: 5.08 cm

957 Cambrian Heights Drive

Suite 203

Sudbury, ON P3C 5S5

Grade Elevation: NA

Top of Casing Elevation: NA

Sheet: 1 of 1

APPENDIX III

Summary Tables

TABLE 1
Groundwater Monitoring Well Data
Chapman Waste Disposal Site
Magnetawan , Ontario

Well ID Number	*Date (dd/mm/yyyy)*	*Ground Surface Elevation (masl)*	*TOC Elevation (masl)*	*Height of TOC from Ground Surface (m)*	*Water Level Measurement from TOC (m)*	*Total Well Depth from TOC (m)*	*Depth to Groundwater (mbgs)*	*Calculated Water Level Elevation (masl)*	*UTM Coordinates*			Comments
									Zone	*Northing (m)*	*Easting (m)*	
BH1	24-Sep-03	N/A	314.49		6.99			307.50	17	606942	5063235	
	12-May-04				6.46			308.03				
	27-Oct-04				7.11			307.38				
	15-May-05				6.41			308.38				
	26-Oct-05				7.52			306.97				
	8-May-06				6.41			308.08				
	2-Nov-06				6.66			306.97				
	8-May-07				6.65			308.08				
	24-Oct-07				7.07			307.83				
	7-May-08				6.12			307.84				
	29-Oct-08				6.75			307.74				
	11-May-09				7.71			306.78				
	15-Oct-09				6.76			307.73				
	2-Jun-10				6.31			308.18				
	21-Oct-10				6.98			307.51				
	26-Jun-11				6.50			307.99				
	27-Oct-11				6.71			307.78				
	9-May-12				6.47			308.02				
	4-Oct-12				6.94			307.55				
	30-May-13				5.50			308.99				
	24-Oct-13				6.67			307.82				
	8-May-14				5.42			309.07				
	30-Oct-14				6.33			308.16				
	13-May-15				6.31			308.18				
	22-Oct-15				6.93			307.56				
	13-Oct-16				6.83			307.66				
	18-May-17				5.80			308.69				
	25-Oct-17				6.41			308.08				
	2-May-18				6.01			308.48				
	17-Oct-18				6.60			307.89				
	11-Jun-19			1.03	6.10	11.25	5.07	308.39				
	26-Sep-19			0.94	6.79	11.20	5.85	307.70				
BH2	24-Sep-03	N/A	314.14		6.524			307.62	17	606928	5063213	
	12-May-04				6.05			308.09				
	27-Oct-04				6.69			307.45				
	15-May-05				5.87			308.27				
	26-Oct-05				6.62			307.52				
	8-May-06				5.9			308.24				
	2-Nov-06				6.15			307.99				
	8-May-07				6.12			308.02				
	24-Oct-07				6.62			307.52				
	7-May-08				5.56			308.58				
	29-Oct-08				6.26			307.88				
	11-May-09				5.69			308.45				
	15-Oct-09				6.24			307.90				
	2-Jun-10				6.37			307.77				
	21-Oct-10				6.51			307.63				
	26-Jun-11				5.82			308.32				
	27-Oct-11				6.2			307.94				
	9-May-12				5.49			308.65				
	4-Oct-12				6.45			307.69				
	30-May-13				4.85			309.29				
	24-Oct-13				6.13			308.01				
	8-May-14				4.73			309.41				
	30-Oct-14				5.78			308.36				
	13-May-15				5.77			308.37				
	22-Oct-15				6.46			307.68				
	13-Oct-16				6.36			307.78				
	18-May-17				5.2			308.94				
	25-Oct-17				5.9			308.24				
	2-May-18				5.47			308.67				
	17-Oct-18				6.08			308.06				
	11-Jun-19			0.39	5.57	9.80	5.18	308.57				
	26-Sep-19			0.36	6.08	9.68	5.72	308.06				
BH3	24-Sep-03	N/A	314.49		7.15			319.48	17	N/A	N/A	
	12-May-04				6.39			320.24				
	27-Oct-04				7.36			319.27				
	15-May-05				6.33			320.30				
	26-Oct-05				7.36			319.27				
	8-May-06				6.78			319.85				
	2-Nov-06				7.07			319.56				
	8-May-07				6.48			320.15				
	24-Oct-07				7.6			319.03				
	7-May-08				7.93			318.70				
	29-Oct-08				7.96			318.67				
	11-May-09				6.44			320.19				
	15-Oct-09				7.12			319.51				
	2-Jun-10				4.52			322.11				
	21-Oct-10				7.52			319.11				
	26-Jun-11				5.95			320.68				
	27-Oct-11				7.38			319.25				
	9-May-12				6.55			320.08				

Well ID Number	Date (dd/mm/yyyy)	Ground Surface Elevation (masl)	TOC Elevation (masl)	Height of TOC from Ground Surface (m)	Water Level Measurement from TOC (m)	Total Well Depth from TOC (m)	Depth to Groundwater (mbgs)	Calculated Water Level Elevation (masl)	UTM Coordinates			Comments
									Zone	Northing (m)	Easting (m)	
	4-Oct-12				7.53			319.10				
	30-May-13				5.38			321.25				
	24-Oct-13				6.91			319.72				
	8-May-14				5.32			321.31				
	30-Oct-14				6.52			320.11				
	13-May-15				6.39			320.24				
	22-Oct-15				7.47			319.16				
	13-Oct-16				7.4			319.23				
	18-May-17				5.86			308.63				
	25-Oct-17				-			-				
	2-May-18				-			-				
	17-Oct-18				-			-				
	11-Jun-19	**DESTROYED**										
	26-Sep-19											
BH3-II	11-Jun-19	291.0	291.8	0.80	3.54	6.70	2.74	288.26	17	606650	5063072	Installed new tubing.
	26-Sep-19			0.77	4.55	6.50	3.78	287.25				
	24-Sep-03				6.19			308.59				
	12-May-04				5.67			309.11				
	27-Oct-04				-			-				
	15-May-05				5.79			308.99				
	26-Oct-05				-			-				
	8-May-06				5.77			309.01				
	2-Nov-06				-			-				
	8-May-07				6.2			308.58				
	24-Oct-07				6			308.78				
	7-May-08				6.24			308.54				
	29-Oct-08				5.82			308.96				
	11-May-09				-			-				
	15-Oct-09				5.64			309.14				
	2-Jun-10				6.85			307.93				
	21-Oct-10				6.01			308.77				
BH4	26-Jun-11	N/A	314.78		6.46			308.32	17	606914	5063195	
	27-Oct-11				5.49			309.29				
	9-May-12				5.69			309.09				
	4-Oct-12				5.86			308.92				
	30-May-13				5.25			309.53				
	24-Oct-13				5.53			309.25				
	8-May-14				5.14			309.64				
	30-Oct-14				5.66			309.12				
	13-May-15				5.63			309.15				
	22-Oct-15				6.39			308.39				
	13-Oct-16				5.99			308.79				
	18-May-17				5.43			309.35				
	25-Oct-17				6.19			308.59				
	2-May-18				-			-				
	17-Oct-18				5.52			309.26				
	11-Jun-19			0.35	5.67	6.34	5.32	309.11				
	26-Sep-19			0.28	5.75	6.38	5.47	309.03				
BH4-II	11-Jun-19	N/A	N/A	0.73	5.87	8.51	5.14	-	17	606912	563197	Needs new tubing.
	26-Sep-19			0.63	8.42	5.87	7.79	-				Installed new tubing.
	24-Sep-03				-			-				
	12-May-04				-			-				
	27-Oct-04				-			-				
	15-May-05				-			-				
	26-Oct-05				-			-				
	8-May-06				-			-				
	2-Nov-06				-			-				
	8-May-07				-			-				
	24-Oct-07				-			-				
	7-May-08				-			-				
	29-Oct-08				-			-				
	11-May-09				-			-				
	15-Oct-09				-			-				
	2-Jun-10				-			-				
	21-Oct-10				-			-				
BH5-11	26-Jun-11	N/A	308.48		-			-	17	607014	5063227	
	27-Oct-11				4.66			303.82				
	9-May-12				4.45			304.03				
	4-Oct-12				4.72			303.76				
	30-May-13				4.30			304.18				
	24-Oct-13				4.54			303.94				
	8-May-14				4.20			304.28				
	30-Oct-14				4.45			304.03				
	13-May-15				4.37			304.11				
	22-Oct-15				4.71			303.77				
	13-Oct-16				4.67			303.81				
	18-May-17				4.32			304.16				
	25-Oct-17				4.47			304.01				
	2-May-18				4.21			304.27				
	17-Oct-18				4.52			303.96				
	11-Jun-19			0.94	4.43	6.93	3.49	304.05				
	26-Sep-19			0.84	4.64	6.84	3.80	303.84				
	24-Sep-03				-			-				
	12-May-04				-			-				
	27-Oct-04				-			-				
	15-May-05				-			-				
	26-Oct-05				-			-				

Well ID Number	*Date (dd/mm/yyyy)*	*Ground Surface Elevation (masl)*	*TOC Elevation (masl)*	*Height of TOC from Ground Surface (m)*	*Water Level Measurement from TOC (m)*	*Total Well Depth from TOC (m)*	*Depth to Groundwater (mbgs)*	*Calculated Water Level Elevation (masl)*	*UTM Coordinates*			Comments
									Zone	*Northing (m)*	*Easting (m)*	
BH6-11	8-May-06	N/A	N/A		-			-	17	606993	5063185	
	2-Nov-06				-			-				
	8-May-07				-			-				
	24-Oct-07				-			-				
	7-May-08				-			-				
	29-Oct-08				-			-				
	11-May-09				-			-				
	15-Oct-09				-			-				
	2-Jun-10				-			-				
	21-Oct-10				-			-				
	26-Jun-11				-			-				
	27-Oct-11				-			-				
	9-May-12				-			-				
	4-Oct-12				-			-				
	30-May-13				-			-				
	24-Oct-13				-			-				
	8-May-14				-			-				
	30-Oct-14				-			-				
	13-May-15				-			-				
	22-Oct-15				-			-				
	13-Oct-16				-			-				
	18-May-17				-			-				
	25-Oct-17				-			-				
	2-May-18				-			-				
	17-Oct-18				-			-				
	11-Jun-19			1.00	DRY	2.99	DRY	DRY				
	26-Sep-19			1.05	DRY	2.90	DRY	DRY				
BH6-III	11-Jun-19	N/A	N/A	0.88	4.02	6.10	3.14	-	17	607006	5063197	Installed new tubing.
	26-Sep-19			0.62	5.11	6.51	4.49	-				
BH7-11	24-Sep-03	N/A	310.02		-			-	17	606965	5063163	
	12-May-04				-			-				
	27-Oct-04				-			-				
	15-May-05				-			-				
	26-Oct-05				-			-				
	8-May-06				-			-				
	2-Nov-06				-			-				
	8-May-07				-			-				
	24-Oct-07				-			-				
	7-May-08				-			-				
	29-Oct-08				-			-				
	11-May-09				-			-				
	15-Oct-09				-			-				
	2-Jun-10				-			-				
	21-Oct-10				-			-				
	26-Jun-11				-			-				
	27-Oct-11				1.90			308.12				
	9-May-12				1.73			308.29				
	4-Oct-12				2.08			307.94				
	30-May-13				1.54			308.48				
	24-Oct-13				1.66			308.36				
	8-May-14				1.47			308.55				
	30-Oct-14				1.60			308.42				
	13-May-15				1.63			308.39				
	22-Oct-15				2.15			307.87				
	13-Oct-16				-			-				
	18-May-17				1.64			308.38				
	25-Oct-17				1.72			308.30				
	2-May-18				1.29			308.73				
	17-Oct-18				1.88			308.14				
	11-Jun-19			0.94	1.67	2.78	0.73	308.35				
	26-Sep-19			0.87	1.92	2.73	1.05	308.10				
BH8-I	11-Jun-19	N/A	N/A	0.83	4.17	6.71	3.34	-	17	607052	5063239	Red/orange in colour. Needs new tubing.
	26-Sep-19			0.76	6.58	4.30	5.82	-				Installed new tubing.
BH9-I	11-Jun-19	N/A	N/A	0.67	2.33	8.21	1.66	-	17	606985	5063240	Installed new tubing.
	26-Sep-19			0.62	2.4	8.09	1.78	-				
BH10-I	11-Jun-19	N/A	N/A	0.71	2.07	5.27	1.36	-	17	606827	5063079	
	26-Sep-19			0.64	2.13	5.11	1.49	-				Purged Dry.
BH11	11-Jun-19	284.40	285.19	0.79	1.24	5.18	0.45	283.95	17	606694	5063095	Needs new tubing.
	26-Sep-19			0.70	1.73	5.13	1.03	283.46				Installed new tubing.

Notes:

mbgs	Meters below ground surface
masl	Meters above sea level
TOC	Top of casing
NA	No data available

TABLE 2
Surface Water Monitoring Location Data
Chapman Waste Disposal Site
Magnetawan, Ontario

Surface Water Monitoring Location	*UTM Coordinates*			*Comments*
	Zone	*Easting (m)*	*Northing (m)*	
SW1	17	606740	5063072	
SW2	17	607482	5063373	Upstream of culvert.
SW3	17	606914	5063195	

TABLE 3
Groundwater Quality Results - BH-1
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation																														ODWQS
		Sample Collection Date (dd/mm/yyyy)																														
		BH-1																														
		24-Sep-03	**12-May-04**	**27-Oct-04**	**15-May-05**	**26-Oct-05**	**8-May-06**	**2-Nov-06**	**8-May-07**	**24-Oct-07**	**7-May-08**	**29-Oct-08**	**11-May-09**	**15-Oct-09**	**2-Jun-10**	**21-Oct-10**	**23-Jun-11**	**27-Oct-11**	**9-May-12**	**4-Oct-12**	**30-May-13**	**24-Oct-13**	**8-May-14**	**30-Oct-14**	**13-May-15**	**22-Oct-15**	**13-Oct-16**	**18-May-17**	**25-Oct-17**	**2-May-18**	**17-Oct-18**	**11-Jun-19**	**26-Sep-19**	
pH Lab	pH Units	6.84	6.57	7.06	7.11	7.64	7.4	7.7	7.3	6.8	7.9	7.5	6.8	7	-	6.84	7.03	7.28	6.88	6.92	7.63	7.45	6.8	7.2	7.27	7.05	7.2	6.8	6.7	6.7	7	7.44	7.49	6.5-8.5
Conductivity	µS/cm	59	241	83	149	148	234	181	282	58	279	76	369	112	-	85	273	272	230	130	570	400	590	380	320	280	372	716	538	498	434	653	581	-
Hardness	mg/L	**16.1**	**68**	**23**	**70.7**	**47**	80	**70**	100	**20**	87	**22**	**130**	**31**	-	**29**	93	**79**	**59**	**32**	**150**	100	**140**	84	**74**	**73**	**118**	**238**	**157**	**125**	**122**	**230**	**140**	80-100
Total Dissolved Solids	mg/L	42	234	54	176	124	169	115	180	51	200	50	244	60	-	54	168	184	106	60	304	212	318	204	**638**	150	204	440	304	212	206	310	250	500
Alkalinity	mg/L	**13**	50	**18**	42.3	37	67	65	80	**16**	79	**27**	98	43	-	**29**	73	71	80	34	220	140	190	140	110	85	111	277	210	179	167	260	153	30-500
Chloride	mg/L	0.6	12.6	1.6	8.34	5	8	2	15	-	19	-	25	<1	-	2	15	16	7	3	27	14	38	21	20	13	17	44	31	39	26	30.6	22.5	250
Sodium	mg/L	3.3	12.4	2	7	5	13	9	13	2.7	17	4.6	19	6.8	-	5.6	9.5	15	18	8.2	39	16	44	19	14	13	20.2	36	20	23.2	16.5	31.3	20.7	200
Calcium	mg/L	4.83	21.2	7.2	19	16	25	22	31	6.4	27	6.8	41	11	-	9.7	31	26	19	10	46	34	44	27	23	23	40.5	71.5	50.1	38.7	37.4	78.6	48.7	-
Magnesium	mg/L	0.99	3.64	1.29	3.7	3.3	4.2	3.4	5.8	1	4.5	1.1	6.2	1.2	-	1.1	3.8	3.4	3.1	1.5	7.5	4.5	7.9	4.2	4.2	3.9	4.13	14.5	7.7	6.84	6.88	8.27	4.36	-
Potassium	mg/L	2	9.1	2.2	5.5	4.2	6	5.8	5.1	3.4	10	3.9	8.6	4.9	-	3.7	8.3	6.9	6.5	3.5	20	18	15	15	13	7	10.1	21.2	14.4	11.6	7.14	12.5	20.8	-
Sulphate	mg/L	3.6	26.9	6.7	15.9	9	19	8	8	3	19	2	24	4	-	4.0	21	13	9	5	24	9	33	10	7	10	11	61	36	17	12	32.1	13.8	500
Ammonia	mg/L	-	1.46	-	0.11	-	0.25	-	-	-	0.28	0.35	0.64	<0.05	-	<0.05	0.14	<0.05	0.72	0.11	9.2	7.1	7.7	9	8.4	2.6	1.44	7.19	8.55	7.51	2.87	7.2	7.18	-
Nitrate as N	mg/L	2.2	6	1.9	3.7	4.4	5.6	4.1	6	2	6	2	6	3	-	2	3.6	5.2	5	4.3	<0.1	5.1	0.5	0.29	0.93	4.34	7.7	1.1	0.3	0.6	5	<0.10	**10.8**	10
Nitrite as N	mg/L	-	-	-	-	-	-	-	-	-	-	0.2	0.1	<0.01	-	<0.01	<0.01	<0.01	0.049	0.024	0.045	0.022	<0.01	<0.01	0.02	0.111	<0.05	<0.05	<0.05	<0.05	0.12	<0.10	0.16	1
Total Kjeldahl Nitrogen	mg/L	-	1.8	0.12	0.6	0.4	0.7	0.5	0.6	0.8	1.5	0.8	1.6	0.5	-	<0.2	0.6	0.5	1.3	<0.1	10	8.8	7.8	8.4	8.6	3.1	1.6	8.8	10.7	7.6	3.6	7.46	7.74	-
Phenolics	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.0015	<0.001	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001	-
Dissolved Organic Carbon	mg/L	3.3	3.6	1	1.4	1.6	2.2	1.9	2.4	1.4	3.4	1.1	4.4	1.6	-	0.8	2.3	2.7	3.2	1.6	**15**	**5.1**	**13**	**6**	4.4	4	4.6	**10.4**	**9.3**	**8.1**	4.3	**8.9**	**6.3**	5
Chemical Oxygen Demand	mg/L	-	11	-	10	13	12	5	4	10	20	8	14	<4	-	23	10	11	14	8.6	42	5.6	36	14	6.2	<4	26	36	28	25	21	26	20	-
Iron	mg/L	0.05	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	-	<0.0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0001	<0.010	<0.010	0.3
Manganese	mg/L	0.011	**0.195**	0.023	**0.098**	0.007	0.071	0.01	0.007	0.003	**0.22**	0.025	**0.4**	<0.002	-	0.019	0.026	0.01	**0.12**	0.0066	**0.66**	**0.27**	**3.5**	**2.3**	**1.8**	**1.5**	**0.453**	**4.26**	**7.81**	**12.9**	**3.6**	**2.47**	**1.00**	0.05
Phosphorus	mg/L	9.3	8.5	7.4	5.4	5.3	5.1	4.5	5.1	4.8	5.1	3.7	5.2	3.7	-	4.8	4.9	4.5	0.021	0.045	<0.02	<0.02	<0.02	0.032	0.041	<0.02	<0.01	<0.00001	0.02	<0.01	0.02	0.02	<0.02	-
Orthophosphate	mg/L	-	-	-	-	0.008	-	-	-	-	-	-	<0.01	<0.01	-	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.10	-
Turbidity	NTU	-	**19.3**	3.4	**25.9**	**72.9**	**47.8**	**39.6**	**11**	**26.9**	**38.6**	2.3	3.8	4	-	**15**	**6.9**	2.3	1.2	3.3	1.5	0.5	<0.2	1	1	0.7	1.0	1.5	1.8	2.1	**6.4**	1.9	**7.0**	5
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	<10	<10	<10	14	13	5	<2	6	<2	12	<10	72	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	<2	<2	<2	<2	3	<2	<2	<2	<2	<5	<5	-
Anion Sum		-	-	-	-	-	-	-	-	0.504	2.96	0.724	3.57	1.12	-	0.823	2.59	2.53	2.34	1.17	5.55	3.78	5.61	3.64	3.05	2.6	3.50	8.13	5.84	5.08	4.67	-	-	-
Cation Sum		-	-	-	-	-	-	-	-	0.604	2.76	0.759	3.62	1.05	-	0.919	2.5	2.41	2.21	1.09	5.82	3.7	5.69	3.53	3.04	2.38	3.50	6.87	4.37	3.8	3.34	-	-	-
Ion Balance	%	-	-	-	-	-	-	-	-	NC	NC	NC	0.6	NC	-	NC			NC	NC	2.32	1	0.72	1.48	0.1	NC	0.1	-8.4	-14.3	-14.3	-16.6	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	-
Aluminum	mg/L	0.09	0.014	0.007	0.031	0.016	0.011	0.014	0.02	0.006	0.016	0.008	0.016	0.008	-	0.011	0.014	0.008	0.011	0.0081	0.023	0.015	0.03	0.024	0.023	0.017	0.012	0.026	0.029	0.027	0.016	0.022	0.032	0.1
Antimony	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.003	<0.003	0.006
Arsenic	mg/L		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	0.0011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.003	<0.003	0.010
Barium	mg/L	0.023	0.224	0.038	0.12	0.072	0.14	0.095	0.12	0.029	0.2	0.032	0.15	0.041	-	0.035	0.15	0.12	0.1	0.041	0.34	0.23	0.24	0.17	0.14	0.071	0.105	0.301	0.177	0.162	0.088	0.165	0.177	1.00
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	-
Boron	mg/L	0.01	0.187	0.02	0.07	0.057	0.14	0.1	0.17	0.02	0.19	0.068	0.22	0.089	-	0.061	0.14	0.2	0.24	0.12	0.62	0.24	0.53	0.24	0.2	0.19	0.266	0.628	0.351	0.332	0.256	0.551	0.329	5
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00015	0.00036	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0002	0.0001	<0.0001	0.0001	<0.001	<0.001	0.005
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	0.001	<0.001	0.005	<0.001	<0.003	<0.003	0.05
Cobalt	mg/L	-	0.0002	-	-	-	-	-	-	-	0.011	0.0084	0.0099	<0.0005	-	0.0077	0.0051	<0.0005	<0.0005	<0.0005	0.0014	0.00092	0.0049	0.0045	0.0035	0.0034	0.003	0.008	0.0072	0.008	0.0044	0.008	0.005	-
Copper	mg/L	-	0.0019	0.0006	-	0.002	0.001	0.001	0.006	-	0.002	0.002	0.003	0.002	-	<0.001	0.001	0.002	0.0025	0.0021	0.015	0.0068	0.0086	0.0096	0.006	0.0051	0.0058	0.0104	0.009	0.0067	0.0061	0.010	0.009	1
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	<0.001	<0.001	<0.0005	<0.0005	<0.0005	0.0017	0.00098	<0.0005	<0.0005	0.00061	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	-
Nickel	mg/L	-	0.001	-	0.002	-	0.001	-	-	-	0.002	-	0.002	0.003	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.0026	0.0021	0.0014	<0.001	0.002	0.004	0.002	0.002	0.001	<0.003	<0.003	-
Phosphate	mg/L	-	-	-		-	-	-	-	-	-	-	<0.1	<0.1	-	<0.1		<0.1	<0.1	-	-	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.2	<0.2	<0.20	-	-
Lead	mg/L	-	-	-	-	-	0.0007	-	-	-	-	-	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	0.01
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	0.001	<0.001	0.001	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3.6	2.8	3.8	4.3	4.7	4.6	3.6	3.63	3.46	5.56	5.35	3.15	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-
Strontium	mg/L	0.039	0.173	0.051	0.12	0.11	0.15	0.15	0.22	0.046	0.2	0.045	0.23	0.064	-	0.058	0.19	0.15	0.095	0.057	0.31	0.23	0.26	0.18	0.15	0.13	0.187	0.534	0.299	0.262	0.198	0.419	0.379	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-
Uranium	mg/L	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0048	0.0023	0.0015	0.00066	0.0006	0.00049	0.0007	0.0034	0.0015	0.001	0.001	0.004	<0.002	0.02
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	-	<0.0001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.00052	<0.0005	<0.0005	<0.0005	<0.0005	0.0023	<0.0005	<0.0005	0.0082	<0.0005	<0.002	<0.002	-
Zinc	mg/L	0.093	-	-	-	-	-	-	0.007	-	0.009	-	<0.005	0.012	-	<0.005	<0.005	<0.005	<0.005	0.0082	0.0085	0.009	0.0075	0.0096	0.013	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	5
Field Measurements																																		
Temperature	oC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.2	10.9	-
pH	pH Units	6.8	7.0	7.9	**8.6**	**8.6**	6.8	7.1	7	7.4	6.7	8	**5.9**	**6.16**	**6.24**	7.8	**6.34**	7.66	7.25	**9.03**	6.86	6.87	**6.41**	6.52	6.74	**5.31**	**6.31**	6.61	-	7.15	6.8	6.7	**6.2**	6.5-8.5
Coductivity	uS/cm	64	268	92	166	124	229	191	229	70	799	345	168	114	128	221	210	265	218	96	386	351	523	306	225	204	228	0.73	-	0.46	0.54	711.00	416.30	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	168	148.4	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	1.23	-

Notes:

Ontario Drinking Water Quality Standards* — Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 4
Groundwater Quality Results - BH-2
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation																															ODWQS
		Sample Collection Date (dd/mm/yyyy)																															
		BH-2																															
		24-Sep-03	**12-May-04**	**27-Oct-04**	**15-May-05**	**26-Oct-05**	**8-May-06**	**2-Nov-06**	**8-May-07**	**24-Oct-07**	**7-May-08**	**29-Oct-08**	**11-May-09**	**15-Oct-09**	**2-Jun-10**	**21-Oct-10**	**23-Jun-11**	**27-Oct-11**	**9-May-12**	**4-Oct-12**	**30-May-13**	**24-Oct-13**	**8-May-14**	**30-Oct-14**	**13-May-15**	**22-Oct-15**	**13-Oct-16**	**18-May-17**	**25-Oct-17**	**2-May-18**	**17-Oct-18**	**11-Jun-19**	**26-Sep-19**	
pH Lab	pH Units	6.61	6.65	7.04	7.35	8.11	7.8	7.9	7.2	6.8	7.9	7.6	6.5	6.8	7.1	6.96	6.94	6.91	6.83	6.62	7.66	6.84	7.16	7.11	7.22	7.06	7.0	6.9	7.3	6.9	7.0	7.48	7.40	6.5-8.5
Conductivity	µS/cm	531	645	307	256	308	317	246	202	304	284	185	224	174	262	354	336	499	450	570	440	770	490	930	1000	960	954	740	778	820	820	596	923	-
Hardness	mg/L	**183**	**103**	**101**	**116**	**130**	98	100	**76**	**110**	98	**68**	**78**	**68**	**120**	**140**	**110**	**180**	**160**	**190**	100	**280**	**110**	**370**	**430**	**350**	**380**	**222**	**305**	**389**	**298**	**239**	**349**	80-100
Total Dissolved Solids	mg/L	309	262	180	313	**2870**	201	143	123	170	220	120	150	125	170	230	198	314	250	320	248	496	254	**604**	136	**574**	**608**	450	498	488	468	312	452	500
Alkalinity	mg/L	155	153	133	126	148	135	106	82	88	105	69	96	63	85	111	92	105	100	130	160	170	180	250	320	310	263	274	292	338	346	230	311	30-500
Chloride	mg/L	38.4	17.1	11.5	11.4	11	13	8	5	21	15	4	10	3	11	25	29	63	42	64	24	74	24	45	49	42	21	43	19	14	24	26.2	24.1	250
Sodium	mg/L	21.2	15.6	15.8	17	18	16	17	12	13	17	7.8	12	8.7	9.3	9.4	13	17	19	23	24	39	28	61	78	57	69.8	33.1	42.4	23.2	34.6	27.4	33.0	200
Calcium	mg/L	53.3	29.9	27.9	31	36	28	30	21	30	29	18	21	18	32	38	31	51	44	52	30	78	33	100	110	98	107	72.5	87.3	86.5	81.7	72.7	98.8	-
Magnesium	mg/L	12.2	6.87	7.49	8.7	10	6.7	7.5	5.4	8.1	6.4	5.5	6.2	5.5	8.9	11	7.8	14	12	14	5.9	22	5.6	28	34	25	27.4	9.9	21	41.9	22.9	13.9	24.9	-
Potassium	mg/L	11	12.7	4.7	6	6.7	13	7.9	6.7	5.7	11	3.2	5.6	4	4.6	4.3	6.3	5.7	5.7	5.9	18	6.5	17	7.7	7.5	6.4	5.93	19.1	5.69	5.36	7.1	11.9	6.74	-
Sulphate	mg/L	64.1	15.1	11.5	10.9	11	13	12	11	11	18	16	12	12	17	20	18	33	34	34	16	86	22	140	140	120	198	70	118	104	104	46.7	78.0	500
Ammonia	mg/L	1.82	3.94	0.92	3.64	0.54	4.53	2.15	1.54	1.14	2.8	0.3	1.1	0.12	0.07	<0.05	0.54	0.52	1.2	1	5.2	0.74	13	2.6	0.7	0.6	0.18	14.4	1.61	0.04	0.73	5.86	0.51	-
Nitrate as N	mg/L	-	-	-	0.1	0.1	-	0.3	0.4	-	0.4	0.9	1.8	2.3	2.3	1.7	2.1	0.7	1.8	0.55	0.13	4.3	<0.1	7.96	2.17	0.52	8.4	0.7	2.8	2.6	1.1	<0.20	<0.25	10
Nitrite as N	mg/L	-	-	-	-	-	0.02	0.07	0.02	-	0.04	-	<0.01	<0.01	0.14	0.03	0.07	0.06	0.084	<0.01	<0.01	0.085	<0.01	0.109	0.044	0.015	0.32	<0.05	0.13	0.3	0.14	<0.20	<0.25	1
Total Kjeldahl Nitrogen	mg/L		3.85	1.21	6.6	1.5	4.8	3	5	1.7	5	1.1	1.6	1.1	1.4	<1	1.5	1.2	2.1	8.8	11	2.1	13	3.9	1.8	1.5	1.0	14.4	2.1	0.7	1.3	6.63	1.11	-
Phenolics	mg/L					-			-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.003	0.0057	0.0012	0.0035	<0.001	0.0025	0.0013	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	0.002	0.002	-
Dissolved Organic Carbon	mg/L	**10.9**	**5.6**	**6.5**	**5.3**	**10.9**	**6.1**	**5.6**	4.5	3.7	**7.4**	2	2.2	1.4	2.4	4.2	4.6	**7.2**	**6.3**	**9.9**	**9.8**	**13**	**11**	**16**	**18**	**14**	**12.8**	**12.2**	**10.2**	**10.7**	**8.4**	**11.0**	**10.0**	5
Chemical Oxygen Demand	mg/L		24	27	77	21	11	-	17	15	35	9	7	7	7	9	11	21	17	28	31	37	35	44	36	33	55	45	30	31	34	25	26	-
Iron	mg/L	**0.49**	**6.56**	**1.53**	**0.55**	**4.4**	**4.6**	**1.8**	**0.63**	**1.3**	**1**	**0.61**	0.16	0.19	<0.1	<0.1	0.2	<0.1	<0.1	0.15	**3.9**	<0.1	**1.3**	<0.1	<0.1	<0.1	<0.1	**4.9**	**0.455**	<0.1	**0.585**	**9.71**	**0.531**	0.3
Manganese	mg/L	**2.93**	**1.24**	**0.471**	**0.41**	**0.49**	**0.73**	**0.62**	**0.4**	**0.46**	**0.69**	**0.28**	**0.33**	**0.27**	**0.28**	**0.36**	**0.45**	**0.6**	**0.52**	**0.6**	**0.76**	**0.87**	**0.78**	**1.2**	**1.2**	**1.1**	**1.4**	**6.14**	**0.975**	**1.16**	**1.38**	**4.06**	**1.51**	0.05
Phosphorus	mg/L	13.4	10	6.7	4.3	5.7	5.5	4.4	4.3	4.5	4.2	4	4.5	4.2	5	5.1	4.4	5.1	0.078	0.23	0.3	0.12	0.18	0.21	0.071	0.18	0.57	<0.01	0.02	0.05	0.1	0.46	0.57	-
Orthophosphate	mg/L	-	-	-	-	0.009	-	-	-	-	0.01	-	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	<0.50	-
Turbidity	NTU		3.4	**10.2**	**410**	**1350**	**422**	**2350**	**3860**	**398**	**684**	**130**	**200**	**440**	**390**	**220**	**63**	**46**	**38**	**85**	**67**	**17**	**86**	**51**	**15**	**22**	**90.3**	**34.5**	**33.3**	**64.4**	**204**	**52.0**	**81.1**	5
Total Suspended Solids	mg/L															-	-	-	-	-	210	510	140	140	66	62	222	24	47	50	152	289	230	-
BOD	mg/L															-	-	-	-	-	<2	<2	<2	<2	<2	<2	4	3	<2	<2	<2	<5	<5	-
Anion Sum										2.57	2.92	1.86	2.58	1.75	2.55	3.47	3.18	4.62	4.02	5.2	4.15	7.64	4.7	9.65	11	9.95	10.6	8.18	9.04	9.71	9.85	-	-	-
Cation Sum										3.01	3.22	1.85	2.3	1.87	2.87	3.31	2.96	4.57	4.2	5.01	3.99	7.55	4.74	10.5	12.1	9.63	10.8	6.36	8.08	9.5	7.64	-	-	-
Ion Balance	%									7.81	4.86	NC	NC	NC	NC	2.4	3.52	0.51	2.28	1.84	2	0.59	0.41	4.36	5.09	1.59	0.9	-12.5	-5.6	1	-12.6	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	-
Aluminum	mg/L	-	0.346	0.011	0.009	1.1	0.96	0.018	0.025	0.046	0.051	**0.2**	0.056	0.087	0.05	0.033	0.028	0.008	0.0099	0.014	0.027	0.01	0.019	0.011	0.01	0.0093	0.001	0.016	0.062	0.004	0.007	0.024	0.006	0.1
Antimony	mg/L		-	-	-											-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0003	0.006
Arsenic	mg/L		-	-	-											-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.010
Barium	mg/L	0.128	0.119	0.082	0.082	0.11	0.12	0.096	0.07	0.081	0.11	0.039	0.067	0.05	0.086	0.1	0.1	0.15	0.13	0.17	0.13	0.23	0.16	0.29	0.27	0.24	0.212	0.257	0.033	0.179	0.168	0.216	0.186	1.00
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	-
Boron	mg/L	0.21	0.175	0.142	0.12	0.13	0.17	0.17	0.11	0.085	0.2	0.078	0.11	0.071	0.12	0.16	0.2	0.24	0.25	0.27	0.35	0.41	0.36	0.66	0.84	0.81	0.638	0.47	0.083	0.753	0.542	0.419	0.642	5
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00015	0.00015	0.00013	0.00015	0.00019	0.00013	<0.0001	0.0003	<0.0001	<0.0001	<0.0001	<0.001	<0.001	0.005
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	0.002	<0.001	0.006	<0.001	<0.003	<0.003	0.05
Cobalt	mg/L	0.021	0.0065	0.0035	0.0025	0.0038	0.004	0.0028	0.0019	0.0023	0.0029	0.011	0.011	0.014	0.0015	0.01	0.0061	0.0029	0.0028	0.0033	0.0027	0.0047	0.0025	0.0051	0.0057	0.0048	0.0037	0.0101	0.003	0.0029	0.004	0.008	0.004	-
Copper	mg/L	-	0.002	0.0006	-	0.006	0.005	0.001	-	0.001	0.001	0.002	0.003	0.003	0.002	0.002	0.002	0.002	0.0013	0.0028	0.0018	0.0044	0.0028	0.0081	0.0097	0.0085	0.0076	0.0038	0.0005	0.006	0.0066	<0.003	0.004	1
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	0.00064	<0.0005	0.00089	0.00053	0.00088	0.001	<0.0005	<0.0005	<0.0005	0.0006	0.0008	<0.002	<0.002	-
Nickel	mg/L	-	0.003	0.003	0.002	0.004	0.003	0.002	0.001	0.001	0.002	0.002	0.002	0.003	0.001	0.002	0.002	0.002	0.0015	0.0034	0.0014	0.0034	0.0021	0.0053	0.0052	0.0032	0.004	0.004	<0.001	0.003	0.003	<0.003	0.003	-
Phosphate	mg/L	-	-	-		0.093	0.079	-	-	-	-	-	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	<0.0002	<0.2	<0.0002		<0.0002	<0.40	-	-
Lead	mg/L	-	0.0006	-	-	0.0011	0.0015	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	0.01
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	4.6	3.9	4.6	3.7	3.9	4.8	3.8	3.55	4.59	2.11	3.87	2.71	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-
Strontium	mg/L	0.306	0.19	0.184	0.2	0.2	0.18	0.2	0.14	0.19	0.19	0.12	0.14	0.13	0.21	0.25	0.2	0.35	0.29	0.37	0.21	0.53	0.2	0.68	0.76	0.67	0.505	0.257	0.075	0.566	0.506	0.391	0.638	-
Titanium	mg/L	-	0.03	-	-	0.11	0.078	-	-	-	-	0.018	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-
Uranium	mg/L		0.0006	0.0002	0.0002																0.00062	0.00055	0.00097	0.0022	0.004	0.0049	0.0037	0.0037	0.0001	0.0043	0.0035	0.003	0.005	0.02
Vanadium	mg/L	-	0.0046	-	-	0.006	0.007	-	0.001	-	0.001	0.002	0.001	<0.001		<0.0001	<0.001	<0.0005	<0.0005	<0.0005	0.0017	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	0.0049	0.0013	<0.0005	0.0132	<0.0005	<0.002	<0.002	-
Zinc	mg/L	0.02	0.006	-	-	0.036	0.008	-	-	-	0.007	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.018	0.014	0.0081	0.0059	<0.005	0.0091	<0.005	0.009	<0.005	0.01	<0.005	0.008	<0.005	<0.005	5
Field Measurements																																		
Temperature	oC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	10.9	-
pH	pH Units	6.8	7	7.7	8.5	8.5	7.02	6.98	7	7	6.7	7.61	**5.8**	**5.85**	6.52	**6.14**	**6.42**	7.13	7	**8.57**	7.07	6.57	6.82	**6.35**	7	**6.3**	**5.61**	6.57	-	7.09	7.08	6.75	**6.3**	-
Coductivity	uS/cm	466	366	297	279	318	313	279	197	248	902	482	109	203	262	370	98	478	200	550	314	679	445	721	699	684	458	0.77	-	0.85	0.81	633.7	653	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	170.1	170.6	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	1.32	-

Notes:

Ontario Drinking Water Quality Standards* — Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 5
Groundwater Quality Results - BH-3
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation																												ODWQS
		Sample Collection Date (dd/mm/yyyy)																												
		BH-3																												
		24-Sep-03	12-May-04	27-Oct-04	15-May-05	26-Oct-05	8-May-06	2-Nov-06	8-May-07	24-Oct-07	7-May-08	29-Oct-08	11-May-09	15-Oct-09	2-Jun-10	21-Oct-10	23-Jun-11	27-Oct-11	9-May-12	4-Oct-12	30-May-13	24-Oct-13	8-May-14	30-Oct-14	13-May-15	22-Oct-15	13-Oct-16	18-May-17	
pH Lab	pH Units	**4.49**	**6.16**	**6.01**	6.65	7.09	6.9	6.7	**6**	6.9	6.7	6.8	**5.9**	**6.2**	**6.4**	**6.15**	**6.24**	**6.46**	**6.25**	**5.72**	**6.45**	**5.01**	**6.1**	**6.42**	**6.12**	**6.18**	**6.1**	**6.1**	6.5-8.5
Conductivity	µS/cm	560	41	46	31.9	37	34	39	134	41	89	44	54	40	60	69	70	40	46	41	61	63	33	38	70	37	64	85	-
Hardness	mg/L	**242**	**12**	**13**	**11.5**	**12**	**12**	**13**	**27**	**11**	**17**	**16**	**18**	**14**	**19**	**17**	**22**	**12**	**17**	**17**	**20**	**15**	**11**	**11**	**18**	**11**	**19**	**22**	80-100
Total Dissolved Solids	mg/L	395	92	36	480	130	34	27	66	25	60	30	37	30	40	42	40	22	30	<10	68	56	32	58	58	44	46	120	500
Alkalinity	mg/L	-	**6.6**	**3**	**11.1**	**8**	**8**	**7**	**2**	**5**	**3**	**5**	**7**	**10**	**6**	**7**	**6**	**6**	**6.1**	**4.1**	**3.8**	<1	**4.5**	**8.5**	**5.3**	**8.2**	**7**	**14**	30-500
Chloride	mg/L	4.6	1.4	0.9	1.63	2	2	1	30	3	17	4	5	2	6	12	7	2	2	2	3	3	1	1	14	2.1	3	5	250
Sodium	mg/L	11.4	0.8	0.9	1.2	1.3	1.1	1.3	2.2	2.4	4.4	2.2	1.7	1.6	1.7	1.6	2.4	1.1	1.3	1.1	1.3	1.2	1	1.1	1.4	2	3.31	3.13	200
Calcium	mg/L	87	4.3	4.4	5	4.3	4.2	4.4	9.2	3.6	5.8	5.1	6.1	4.8	6.3	5.7	7.3	4.1	5.5	5.7	6.7	5	3.8	3.8	6	3.7	6.51	7.55	-
Magnesium	mg/L	6	0.41	0.51	0.71	0.67	0.44	0.62	1.1	0.45	0.68	0.68	0.73	0.6	0.82	0.76	0.8	0.49	0.65	0.78	0.83	0.59	0.37	0.39	0.76	0.42	0.546	0.647	-
Potassium	mg/L	2	0.9	0.7	1.1	0.78	0.85	0.87	1	0.69	0.95	0.69	0.8	0.67	0.62	0.8	1.1	0.8	0.82	0.73	0.62	0.44	0.41	0.79	0.55	0.54	0.858	1.01	-
Sulphate	mg/L	272	6.4	10.4	6.4	6	6	6	3	6	6	5	5	4	3	4	4	4	4	4	5	12	3	4	2	3.1	10	7	500.0
Ammonia	mg/L	0.28	0.03	-	0.07	-	-	-	-	-	-	-	<0.05	<0.05		<0.05	<0.005	<0.05	<0.05	<0.05	0.18	<0.05	<0.05	<0.05	<0.05	<0.05	0.04	0.01	-
Nitrate as N	mg/L	0.4	0.2	0.2	0.2	0.2	0.2	0.7	1.1	0.2	2	0.5	2.4	0.3	2	0.6	1.9	0.8	1.4	1	3.2	1.2	0.68	0.48	0.28	<0.1	1.6	2.8	10
Nitrite as N	mg/L	-	-	-	-	-	-	-	-	-	-	-	0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	1
Total Kjeldahl Nitrogen	mg/L	-	1.36	0.68	2.6	2.7	1	1.6	2.4	2.7	1.7	1.1	1.8	2.3	1.6	<1	1.5	2	0.76	<0.23	0.43	0.78	0.42	0.34	0.24	0.23	0.2	0.2	-
Phenolics	mg/L	-	-	-	-	0.002			-	-	-	-		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Dissolved Organic Carbon	mg/L	**68.7**	**95.8**	**26.2**	4	**32.1**	**18.4**	**12.8**	**18.1**	**26.1**	**12.5**	**7.7**	1.9	2.7	1.7	1.7	1.8	1.7	1.5	1.9	2.1	2.4	2.6	2.6	2.7	2.7	3.9	3.4	5
Chemical Oxygen Demand	mg/L		254	64	110	110	56	36	60	96	47	21	51	67	15	17	32	61	14	13	13	4.9	7.4	13	4.2	7.8	29	20	-
Iron	mg/L	**56.2**	0.09	**0.4**	**1.9**	**2.1**	0.055	**1.6**	0.073	0.25	-	**0.64**	<0.1	<0.1		<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.3
Manganese	mg/L	**3.01**	0.02	0.028	0.045	**0.092**	0.015	**0.087**	0.028	0.011	0.026	**0.053**	0.046	0.045	0.018	**0.056**	0.011	0.016	0.0058	0.0052	0.0092	0.018	0.0068	0.0034	0.019	0.013	<0.005	0.011	0.05
Phosphorus	mg/L	9.9	4.8	5.4	3.7	4	2.5	3.8	2.8	2.9	2.6	3	3	2.8	2.9	3	3	3	0.13	0.48	0.13	0.18	0.099	0.29	0.39	0.1	0.13	0.08	-
Orthophosphate	mg/L	-	-	-	-	0.013	-	-	-	-	-	-	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	0.01	<0.01			-	-
Turbidity	NTU	-	**24**	**8.8**	**627**	**636**	**792**	**3170**	**1880**	**159**	**910**	**150**	**1900**	**770**	**660**	**500**	**290**	**120**	**120**	**320**	**34**	**81**	**45**	**63**	**37**	**51**	**40.4**	**35.1**	5
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74	140	270	550	62	73	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2	<2	<2	-
Anion Sum		-	-	-	-	-	-	-	-	0.331	0.796	0.362	0.56	0.384		0.598	0.534	0.314	0.362	0.278	0.488	0.399	0.252	0.321	0.583	0.288	0.54	0.78	-
Cation Sum		-	-	-	-	-	-	-	-	0.385	0.576	0.524	0.472	0.389		0.447	0.568	0.319	0.414	0.426	0.498	0.386	0.288	0.303	0.456	0.332	0.54	0.59	-
Ion Balance	%	-	-	-	-	-	-	-	-	NC	NC	NC	NC	NC		NC	NC	NC	NC	NC	NC	NC	NC		NC	NC	-0.2	n/a	-
Silver	mg/L	-	-	-	0.0007	-	-	-	-	-	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00013	<0.0001	<0.0001	<0.0001	<0.0001	-
Aluminum	mg/L	6.93	0.103	0.648	1.2	2.1	0.1	1.9	0.18	0.32	0.1	0.69	0.11	0.13	0.045	0.11	0.055	0.068	0.073	0.076	0.1	0.13	0.11	0.11	0.16	0.12	0.097	0.093	-
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.010
Barium	mg/L	0.121	0.013	0.014	0.022	0.021	0.012	0.022	0.026	0.011	0.021	0.018	0.017	0.011	0.017	0.018	0.027	0.013	0.018	0.018	0.021	0.021	0.017	0.018	0.022	0.013	0.029	0.059	1.00
Beryllium	mg/L	0.0013	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Boron	mg/L	0.01	0.006	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.015	0.019	<0.01	0.023	0.017	<0.01	0.023	0.024	5
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00018	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.005
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	0.05
Cobalt	mg/L	0.124	0.0002	0.0005	0.001	0.002	-	0.0018	-	-	0.011	0.0016	0.01	0.023	0.0009	0.01	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	-
Copper	mg/L	0.015	0.001	0.0017	0.006	0.005	-	0.004	-	0.001	-	0.003	0.001	<0.001	0.002	0.001	<0.001	<0.001	0.0011	0.0015	0.0012	0.0011	0.0011	0.0026	0.0014	0.0011	0.0024	0.0017	1
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	-
Nickel	mg/L	0.13	-	-	0.001	0.001	0.001	0.001	-	-	0.001	-	0.001	0.004	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	-
Phosphate	mg/L	-	-	-	-	0.94	-	0.1	-	-	-	-	<0.1	<0.1	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	<0.0002	<0.0002	0.01
Lead	mg/L	-	0.0005	-	0.0009	0.0012	0.0009	0.001	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	0.01
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	-
Sillicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	2.5	2.5	2.9	2.4	2.5	2.9	2.7	2.01	2.46	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	-
Strontium	mg/L	0.167	0.022	0.025	0.028	0.026	0.02	0.026	0.054	0.028	0.034	0.033	0.039	0.033	0.043	0.044	0.058	0.031	0.037	0.047	0.048	0.033	0.028	0.029	0.045	0.034	0.061	0.086	-
Titanium	mg/L	-	-	0.015	0.069	0.086	-	0.077	-	0.013	-	0.027	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
Uranium	mg/L	-	-	0.0002	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00011	<0.0001	<0.0001	0.02
Vanadium	mg/L	-	-	-	0.002	0.003	-	0.003	-	-	-	-	<0.001	<0.001	-	<0.0001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0005	-
Zinc	mg/L	1.29	0.005	0.009	-	0.009	-	0.006	-	-	0.009	-	<0.005	0.01	0.008	<0.005	0.005	<0.005	0.011	0.016	0.015	0.0068	0.014	0.015	0.012	0.0062	0.036	0.122	5
Field Measurements																													
Temperature	oC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH Units	6.6	6.9	7.7	**8.7**	**8.6**	7.08	7.04	7.2	7	7.4	8.2	**5.6**	**6.03**	**6.04**	**6.42**	**5.99**	7.44	7.86	**8.98**	7.42	6.6	**5.92**	**6.35**	**6.06**	**5.71**	**6.49**	**5.92**	6.5-8.5
Coductivity	uS/cm	464	36	61	54	47	48	55	74	85	253	378	46	73	53	70	135	339	77	132	48	36	40	22	37	45	85	0.1	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

Ontario Drinking Water Quality Standards* Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 6
Groundwater Quality Results - BH-3-II
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation		ODWQS
		Sample Collection Date (dd/mm/yyyy)		
		BH3-II		
		11-Jun-19	**26-Sep-19**	
pH Lab	pH Units	6.58	**6.37**	6.5-8.5
Conductivity	µS/cm	56	65	-
Hardness	mg/L	**4.9**	**4.1**	80-100
Total Dissolved Solids	mg/L	84	42	500
Alkalinity	mg/L	**18**	**20**	30-500
Chloride	mg/L	1.54	0.85	250
Sodium	mg/L	11.7	10.6	200
Calcium	mg/L	1.53	1.29	-
Magnesium	mg/L	0.26	0.22	-
Potassium	mg/L	0.54	0.44	-
Sulphate	mg/L	5.64	6.33	500
Ammonia	mg/L	<0.02	0.12	-
Nitrate as N	mg/L	0.10	0.12	10
Nitrite as N	mg/L	<0.05	<0.05	1
Total Kjeldahl Nitrogen	mg/L	0.57	0.24	-
Phenolics	mg/L	0.001	<0.001	-
Dissolved Organic Carbon	mg/L	**5.6**	3.8	5
Chemical Oxygen Demand	mg/L	29	11	-
Iron	mg/L	<0.010	<0.010	0.3
Manganese	mg/L	0.022	0.008	0.05
Phosphorus	mg/L	12.2	4.90	-
Orthophosphate	mg/L		<0.10	-
Turbidity	NTU	**1140**	**1460**	5
Total Suspended Solids	mg/L	7390	4650	-
BOD	mg/L	<5	<5	-
Anion Sum		-	-	-
Cation Sum		-	-	-
Ion Balance	%	-	-	-
Silver	mg/L	<0.002	<0.002	-
Aluminum	mg/L	0.078	**0.112**	0.1
Antimony	mg/L	<0.003	<0.003	0.006
Arsenic	mg/L	<0.003	<0.003	0.010
Barium	mg/L	0.006	0.003	1.00
Beryllium	mg/L	<0.001	<0.001	-
Bismuth	mg/L	<0.002	<0.002	-
Boron	mg/L	0.020	0.051	5
Cadmium	mg/L	<0.001	<0.001	0.005
Chromium	mg/L	<0.003	<0.003	0.05
Cobalt	mg/L	<0.001	<0.001	-
Copper	mg/L	<0.003	0.006	1
Molybdenum	mg/L	0.006	0.006	-
Nickel	mg/L	<0.003	<0.003	-
Phosphate	mg/L	<0.10	-	-
Lead	mg/L	<0.001	<0.001	0.01
Selenium	mg/L	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-
Tin	mg/L	<0.002	<0.002	-
Strontium	mg/L	0.014	0.007	-
Titanium	mg/L	<0.002	0.002	-
Uranium	mg/L	<0.002	<0.002	0.02
Vanadium	mg/L	<0.002	<0.002	-
Zinc	mg/L	<0.005	0.019	5
Field Measurements				
Temperature	oC	8.4	10.5	-
pH	pH Units	6.48	5.68	6.5-8.5
Coductivity	uS/cm	63.4	48.4	-
Oxidation Reduction Potential	mV	105.1	179.4	-
Dissolved Oxygen	mg/L	4.34	4.84	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 7
Groundwater Quality Results - BH-4
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation												BH-4																		ODWQS
		Sample Collection Date (dd/mm/yyyy)																														
		12-May-04	10/27/2004 (DRY)	5/15/2005 (INSV)	10/26/2005 (DRY)	5/8/2006 9 (INSV)	11/2/2006 (DRY)	8-May-07	10/24/2007 (INSV)	5/7/2008 (INSV)	10/29/2008 (INSV)	5/11/2009 (INSV)	15-Oct-09	2-Jun-10	21-Oct-10	23-Jun-11	27-Oct-11	9-May-12	4-Oct-12	30-May-13	24-Oct-13	8-May-14	30-Oct-14	13-May-15	10/13/2016 (INSV)	5/18/2017 (INSV)	10/25/2017 (INSV)	5/2/2018 (DRY)	17-Oct-18	11-Jun-19	9/26/2019 (INSV)	
pH Lab	pH Units	**6.27**	-	-	-	-	-	-	-	-	-	-	**6.4**	7.1	7.01	**5.74**	**6.41**	7.35	6.6	7.38	7.25	7.12	7.34	7.12	-	-	-	-	7.2	7.56	-	6.5-8.5
Conductivity	µS/cm	94	-	-	-	-	-	-	-	-	-	-	119	208	222	383	435	920	950	1500	1200	1500	1200	970	-	-	-	-	603	730	-	-
Hardness	mg/L	25	-	-	-	-	-	-	-	-	-	-	**39**	**62**	**71**	**69**	**73**	**200**	**210**	**370**	**320**	**500**	**470**	**420**	-	-	-	-	**228**	**350**	-	80-100
Total Dissolved Solids	mg/L	110	-	-	-	-	-	-	-	-	-	-	75	140	150	260	292	**512**	**608**	**1020**	**866**	**1010**	**880**	**672**	-	-	-	-	370	484	-	500
Alkalinity	mg/L	**8.5**	-	-	-	-	-	-	-	-	-	-	**22**	49	**13**	**2**	**13**	170	95	230	170	260	160	130	-	-	-	-	227	184	-	30-500
Chloride	mg/L	1.4	-	-	-	-	-	-	-	-	-	-	3	15	22	35	38	110	97	110	88	73	33	21	-	-	-	-	5	5.67	-	250
Sodium	mg/L	1.9	-	-	-	-	-	-	-	-	-	-	3.3	10	11	37	42	94	90	140	100	98	60	37	-	-	-	-	11.5	11.6	-	200
Calcium	mg/L	7.9	-	-	-	-	-	-	-	-	-	-	13	20	23	21	22	55	60	110	96	160	150	140	-	-	-	-	79.7	123	-	-
Magnesium	mg/L	1.19	-	-	-	-	-	-	-	-	-	-	1.6	2.7	3.2	4.3	4.3	15	15	24	21	26	23	19	-	-	-	-	6.99	10.3	-	-
Potassium	mg/L	2.2	-	-	-	-	-	-	-	-	-	-	2.1	5.9	3	7.4	10	20	18	50	37	43	36	22	-	-	-	-	16.5	12.4	-	-
Sulphate	mg/L	15.3	-	-	-	-	-	-	-	-	-	-	7	7	14	63	50	76	38	220	180	370	370	290	-	-	-	-	63	137	-	500
Ammonia	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.05	0.07	0.07	0.08	<0.05	3.6	<0.05	7.1	<0.05	8.5	<0.05	<0.05	-	-	-	-	0.06	0.09	-	-
Nitrate as N	mg/L	2	-	-	-	-	-	-	-	-	-	-	5.3	5	**11**	10	**13**	5.9	**41**	**32**	**26**	**15.4**	**22.9**	**19**	-	-	-	-	**11.1**	**15.2**	-	10
Nitrite as N	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12	<0.01	<0.01	<0.01	<0.01	-	-	-	-	<0.05	<0.10	-	1
Total Kjeldahl Nitrogen	mg/L	0.25	-	-	-	-	-	-	-	-	-	-	0.7	0.5	2	1.8	1.5	6.9	1.6	11	3.96	11	2.3	1.7	-	-	-	-	0.9	1.1	-	-
Phenolics	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	0.0068	0.0041	0.0043	0.0041	0.0024	0.0011	<0.001	-	-	-	-	<0.001	<0.001	-	-
Dissolved Organic Carbon	mg/L	**6**	-	-	-	-	-	-	-	-	-	-	1.2	2.3	1.3	**5.2**	**9.1**	**35**	**25**	**61**	**51**	**45**	**25**	**17**	-	-	-	-	**11**	**8.7**	-	5
Chemical Oxygen Demand	mg/L	12	-	-	-	-	-	-	-	-	-	-	<4	5	46	20	31	100	58	160	130	120	66	41	-	-	-	-	40	22	-	-
Iron	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	<0.1	<0.010	-	0.3
Manganese	mg/L	**0.143**	-	-	-	-	-	-	-	-	-	-	0.021	0.042	0.035	**0.29**	**0.23**	**1.8**	**1.3**	**1.7**	**1**	**1.5**	**0.36**	0.048	-	-	-	-	<0.005	<0.002	-	0.05
Phosphorus	mg/L	5.6	-	-	-	-	-	-	-	-	-	-	3.1	5	4	3	3.1	0.28	0.23	0.2	1	0.12	0.44	0.15	-	-	-	-	0.05	0.12	-	-
Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	-
Turbidity	NTU	**5.6**	-	-	-	-	-	-	-	-	-	-	**370**	3.4	**1900**	**44**	**220**	**93**	**73**	**7.8**	**180**	**240**	**93**	**52**	-	-	-	-	**55.3**	**30.5**	-	5
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	990	210	400	290	-	-	-	-	97	172	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<2	<2	<2	<2	<2	-	-	-	-	<2	<5	-	-
Anion Sum		-	-	-	-	-	-	-	-	-	-	-	1.06	1.9	1.96	3.09	3.32	8.5	8.35	14.7	11.5	16	13.3	10.6	-	-	-	-	6.77	-	-	-
Cation Sum		-	-	-	-	-	-	-	-	-	-	-	0.982	1.84	1.98	3.19	3.56	8.85	8.62	15.1	11.9	16	12.9	10.6	-	-	-	-	5.48	-	-	-
Ion Balance	%	-	-	-	-	-	-	-	-	-	-	-	NC	NC	NC	1.59	3.55	1.99	1.62	1.58	1.88	0.89	1.58	0.1	-	-	-	-	-10.5	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	<0.0001	<0.002	-	-
Aluminum	mg/L	0.017	-	-	-	-	-	-	-	-	-	-	0.011	0.01	0.018	0.084	**0.11**	0.046	0.067	**0.11**	0.1	0.079	0.066	0.039	-	-	-	-	0.028	0.018	-	0.1
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.003	-	0.006
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	<0.001	0.003	<0.001	<0.001	-	-	-	-	0.001	<0.003	-	0.010
Barium	mg/L	0.047	-	-	-	-	-	-	-	-	-	-	0.076	0.088	0.14	0.23	0.23	0.36	0.41	0.71	0.52	0.66	0.42	0.25	-	-	-	-	0.128	0.126	-	1.00
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.001	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0021	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.001	<0.002	-	-
Boron	mg/L	0.011	-	-	-	-	-	-	-	-	-	-	0.033	0.15	0.025	0.13	0.22	0.2	0.2	0.69	0.66	0.79	0.73	0.56	-	-	-	-	0.504	0.397	-	5
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	0.0002	0.0001	0.00019	0.00034	0.00062	0.00025	0.00015	0.00022	<0.0001	-	-	-	-	<0.0001	<0.001	-	0.005
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	<0.001	<0.003	-	0.05
Cobalt	mg/L	0.001	-	-	-	-	-	-	-	-	-	-	<0.0005	0.012	0.0005	0.0016	0.0018	0.0054	0.0049	0.0047	0.0042	0.0029	0.0017	0.00068	-	-	-	-	0.0007	<0.001	-	-
Copper	mg/L	0.0009	-	-	-	-	-	-	-	-	-	-	<0.001	0.002	0.001	0.003	0.006	0.025	0.015	0.04	0.032	0.033	0.016	0.0079	-	-	-	-	0.0077	0.005	-	1
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.0005	0.0007	0.00064	0.00085	0.0005	0.00064	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.002	-	-
Nickel	mg/L	0.002	-	-	-	-	-	-	-	-	-	-	<0.001	0.001	0.002	0.003	0.004	0.0069	0.004	0.01	0.007	0.0088	0.004	0.0026	-	-	-	-	0.002	<0.003	-	-
Phosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	<0.1	-	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	<0.0002	<0.20	-	-
Lead	mg/L	0.0005	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	0.0041	**0.015**	0.0016	0.0051	0.0058	0.0016	0.0013	0.00055	<0.0005	<0.0005	-	-	-	-	0.0001	<0.001	-	0.01
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	-	-	-	-	0.002	<0.004	-	0.05
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1	3	2.3	3	2.9	3	2.5	-	-	-	-	2.38	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	<0.005	<0.002	-	-
Strontium	mg/L	0.064	-	-	-	-	-	-	-	-	-	-	0.098	0.14	0.19	0.15	0.15	0.28	0.35	0.44	0.39	0.5	0.45	0.42	-	-	-	-	0.276	0.395	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-	-	-	<0.005	<0.002	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0058	0.0031	0.0072	0.003	-	-	-	-	-	0.0016	0.003	-	0.02
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.001		<0.0001	<0.001	<0.0005	<0.0005	<0.0005	0.00052	0.00054	<0.0005	<0.0005	<0.0005	-	-	-	-	<0.0005	<0.002	-	-
Zinc	mg/L	0.035	-	-	-	-	-	-	-	-	-	-	0.008	0.013	0.009	0.007	0.066	0.031	0.0083	0.0089	0.0072	0.023	0.006	0.0062	-	-	-	-	0.006	<0.005	-	5
Field Measurements																																
Temperature	oC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH Units	6.7	-	8.7	-	7.93	-	6.9	6.1	7	7.5	6.7	**5.38**	6.87	6.91	**5.47**	6.94	7.56	**8.59**	7.17	**6**	6.72	**5.73**	7.27	**5.65**	**6.49**	-	-	6.62		-	6.5-8.5
Coductivity	uS/cm	97	-	114	-	248	-	74	82	364	300	52	144	290	325	198	451	381	789	734	1111	1361	953	711	795	6.57	-	-	0.63		-	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-

Notes:

Ontario Drinking Water Quality Standards* Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 8
Groundwater Quality Results - BH4-II
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation		ODWQS
		Sample Collection Date (dd/mm/yyyy)		
		BH4-II		
		11-Jun-19	**26-Sep-19**	
pH Lab	pH Units	7.46	7.16	6.5-8.5
Conductivity	µS/cm	768	826	-
Hardness	mg/L	**342**	**323**	80-100
Total Dissolved Solids	mg/L	**570**	450	500
Alkalinity	mg/L	191	240	30-500
Chloride	mg/L	7.09	4.78	250
Sodium	mg/L	16.0	12.9	200
Calcium	mg/L	117	109	-
Magnesium	mg/L	12.0	12.3	-
Potassium	mg/L	16.3	15.5	-
Sulphate	mg/L	91.9	67.3	500
Ammonia	mg/L	0.54	0.11	-
Nitrate as N	mg/L	**28.7**	**16.7**	10
Nitrite as N	mg/L	<0.10	<0.25	1
Total Kjeldahl Nitrogen	mg/L	<0.10	0.17	-
Phenolics	mg/L	<0.001	0.001	-
Dissolved Organic Carbon	mg/L	**10.7**	**8.6**	5
Chemical Oxygen Demand	mg/L	16	21	-
Iron	mg/L	<0.010	<0.010	0.3
Manganese	mg/L	**0.292**	**0.386**	0.05
Phosphorus	mg/L	0.12	0.07	-
Orthophosphate	mg/L	-	<0.50	-
Turbidity	NTU	**79.7**	**74.6**	5
Total Suspended Solids	mg/L	242	44	-
BOD	mg/L	<5	<5	-
Anion Sum		-	-	-
Cation Sum		-	-	-
Ion Balance	%	-	-	-
Silver	mg/L	<0.002	<0.002	-
Aluminum	mg/L	0.025	0.035	0.1
Antimony	mg/L	<0.003	<0.003	0.006
Arsenic	mg/L	<0.003	<0.003	0.010
Barium	mg/L	0.130	0.119	1.00
Beryllium	mg/L	<0.001	<0.001	-
Bismuth	mg/L	<0.002	<0.002	-
Boron	mg/L	0.519	0.473	5
Cadmium	mg/L	<0.001	<0.001	0.005
Chromium	mg/L	<0.003	<0.003	0.05
Cobalt	mg/L	0.002	0.002	-
Copper	mg/L	0.009	0.010	1
Molybdenum	mg/L	<0.002	<0.002	-
Nickel	mg/L	<0.003	0.004	-
Phosphate	mg/L	<0.20	-	-
Lead	mg/L	<0.001	<0.001	0.01
Selenium	mg/L	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-
Tin	mg/L	<0.002	<0.002	-
Strontium	mg/L	0.384	0.392	-
Titanium	mg/L	<0.002	0.002	-
Uranium	mg/L	<0.002	0.005	0.02
Vanadium	mg/L	<0.002	<0.002	-
Zinc	mg/L	<0.005	<0.005	5
Field Measurements				
Temperature	oC	10.1	10.5	-
pH	pH Units	6.6	6.1	6.5-8.5
Coductivity	uS/cm	847.0	586.000	-
Oxidation Reduction Potential	mV	165.5	142.1	-
Dissolved Oxygen	mg/L	5.23	2.14	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 9
Groundwater Quality Results - BH5-II
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation *Sample Collection Date (dd/mm/yyyy)* BH5-II																ODWQS
		27-Oct-11	**9-May-12**	**4-Oct-12**	**30-May-13**	**24-Oct-13**	**8-May-14**	**30-Oct-14**	**13-May-15**	**22-Oct-15**	**13-Oct-16**	**18-May-17**	**25-Oct-17**	**2-May-18**	**17-Oct-18**	**11-Jun-19**	**26-Sep-19**	
pH Lab	pH Units	7	6.75	**6.46**	6.92	6.79	6.58	6.74	6.7	6.77	6.6	6.5	7.1	6.5	6.7	6.94	6.84	6.5-8.5
Conductivity	µS/cm	235	220	220	180	300	190	240	230	350	456	355	351	276	377	245	421	-
Hardness	mg/L	**75**	**69**	**59**	**63**	**88**	**68**	**78**	**70**	**110**	**181**	**122**	**119**	**47**	**127**	96.0	**142**	80-100
Total Dissolved Solids	mg/L	166	102	120	130	214	124	102	132	212	284	288	230	142	214	176	218	500
Alkalinity	mg/L	46	56	31	39	54	44	52	49	48	66	57	58	59	85	57	83	30-500
Chloride	mg/L	18	15	19	11	24	12	14	12	15	14	9	7	7	15	6.90	10.9	250
Sodium	mg/L	13	12	14	8.8	21	10	13	11	16	22.2	14.9	13.1	8.48	13.4	9.07	13.1	200
Calcium	mg/L	21	19	18	16	25	19	21	19	34	58.9	29.8	31.7	18.9	34.6	26.7	43.0	-
Magnesium	mg/L	5.6	5.3	3.4	5.4	6.4	5.3	6.5	5.7	6.1	8.32	11.6	9.64	<0.2	9.87	7.13	8.43	-
Potassium	mg/L	6.7	4.9	5.4	2.9	5.8	2.8	3.4	3.4	6.7	8.43	4.63	4.17	<0.001	4.57	3.94	5.10	-
Sulphate	mg/L	18	15	18	14	32	19	30	29	50	112	97	93	56	75	45.5	68.4	500
Ammonia	mg/L	0.1	0.15	0.1	0.11	0.19	0.14	0.16	0.17	0.12	0.22	0.23	0.14	0.16	0.33	0.31	0.17	-
Nitrate as N	mg/L	4.2	3	5.4	3.1	4.8	3.17	3.22	3.31	9.18	6.0	3.9	3	2	3.5	1.68	4.13	10
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.001	0.016	<0.05	<0.05	<0.05	<0.05	0.05	0.15	<0.05	1
Total Kjeldahl Nitrogen	mg/L	<	3.6	<1	2.1	1.6	<10	1.1	0.85	0.82	0.9	1	0.8	0.8	0.9	0.72	0.63	-
Phenolics	mg/L	<0.001	<0.001	0.0012	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Dissolved Organic Carbon	mg/L	2.3	2.5	2.7	2.4	4.2	2.6	2.8	3.1	3.8	**7.4**	**5.5**	**7.6**	**5.8**	4.1	2.8	**5.4**	5
Chemical Oxygen Demand	mg/L	42	63	48	49	31	35	26	24	12	64	66	34	53	33	<5	14	-
Iron	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.010	<0.010	0.3
Manganese	mg/L	**0.42**	**0.11**	0.024	0.032	**0.092**	0.046	**0.062**	**0.067**	**0.075**	**0.193**	**0.124**	**0.123**	**0.074**	**0.158**	**0.139**	**0.067**	0.05
Phosphorus	mg/L	11	26	11	11	3.8	9.4	4.9	7.5	2.9	1.72	2.46	0.62	1.23	0.62	1.05	0.29	-
Orthophosphate	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.10	-
Turbidity	NTU	**430**	0.5	**980**	**140**	**860**	**590**	**860**	**210**	**400**	**778**	**860**	**471**	**595**	**424**	**258**	**273**	5
Total Suspended Solids	mg/L	-	-	-	10000	3000	8100	3700	4200	3800	2020	6690	1720	1830	870	1730	2380	-
BOD	mg/L	-	-	-	<2	<2	<2	<2	<2	<2	9	<2	2	7	<2	<5	<5	-
Anion Sum		2.13	2.08	1.92	1.62	2.76	1.85	2.29	2.17	3.06	4.46	3.68	3.5	2.69	3.92	-		-
Cation Sum		2.25	2.06	1.93	1.72	2.82	1.89	2.22	1.99	3.08	4.81	3.21	3.05	1.39	3.24	-		-
Ion Balance	%	NC	NC	NC	NC	NC	NC	-	NC	0.31	3.8	-6.9	-6.8		-9.6	-		-
Silver	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	-
Aluminum	mg/L	0.058	0.021	0.022	0.032	0.026	0.027	0.017	0.031	0.025	0.019	0.015	0.014	0.026	0.012	0.017	0.023	0.1
Antimony	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.003	<0.003	0.006
Arsenic	mg/L	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.010
Barium	mg/L	0.11	0.076	0.095	0.044	0.13	0.05	0.061	0.064	0.019	0.276	0.095	0.095	0.071	0.121	0.091	0.142	1.00
Beryllium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	-
Bismuth	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	-
Boron	mg/L	0.16	0.15	0.14	0.092	0.21	0.1	0.16	0.13	0.26	0.391	0.21	0.257	0.176	0.289	0.215	0.326	5
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.00036	<0.0001	0.00019	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	0.005
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	0.003	<0.001	<0.003	<0.003	0.05
Cobalt	mg/L	0.0059	0.0022	0.00093	0.00094	0.0015	0.00063	0.00062	<0.0005	0.00074	0.0007	0.0005	0.0005	<0.0005	0.0007	<0.001	<0.001	-
Copper	mg/L	0.002	0.002	0.0019	0.0017	0.0039	0.0013	0.0015	0.002	0.0033	0.0033	0.0021	0.0019	0.0012	0.003	<0.003	0.003	1
Molybdenum	mg/L	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	-
Nickel	mg/L	0.002	0.0015	<0.001	0.0016	0.0018	0.0014	0.0014	0.0016	<0.001	0.002	0.003	0.002	0.002	0.003	<0.003	<0.003	-
Phosphate	mg/L	<0.1	<0.1	-	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.10	-	-
Lead	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	0.01
Selenium	mg/L	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	4	4.4	3.9	4.2	4.1	4.4	3.5	3.36	3.73	4.29	3.47	3.1	-	-	-
Tin	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-
Strontium	mg/L	0.16	0.12	0.15	0.11	0.19	0.11	0.13	0.13	0.25	0.265	0.178	0.23	0.142	0.224	0.198	0.239	-
Titanium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-
Uranium	mg/L	-	-	-	0.00012	0.00016	0.0001	<0.0001	0.0001	0.00016	0.0001	<0.0001	0.0001	<0.0001	0.0002	<0.002	<0.002	0.02
Vanadium	mg/L	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0017	<0.0005	<0.0005	0.0032	<0.0005	<0.002	<0.002	-
Zinc	mg/L	<0.005	<0.005	0.0053	0.0056	0.0065	0.0059	<0.005	0.055	<0.005	<0.005	0.005	0.009	<0.005	0.008	<0.005	<0.005	5
Field Measurements																		
Temperature	oC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	9.2	-
pH	pH Units	6.5	6.97	**8.89**	7.56	7.45	**6.16**	6.52	**6.04**	**5.42**	**5.91**	6.67	-	8.48	**6.3**	**6.4**	**5.8**	6.5-8.5
Coductivity	uS/cm	230	204	210	136	275	229	198	140	140	447	0.37	-	0.4	0.36	319.20	293.4	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	211.2	437.3	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.04	4.35	-

Notes:

Ontario Drinking Water Quality Standards* — Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 10
Groundwater Quality Results - BH6-II
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation																ODWQS
		Sample Collection Date (dd/mm/yyyy)																
		BH6-II																
		10/27/2011 (DRY)	**5/9/2012 (DRY)**	**10/4/2012 (DRY)**	**5/30/2013 (DRY)**	**10/24/2013 (DRY)**	**5/8/2014 (DRY)**	**10/30/2014 (DRY)**	**5/13/2015 (DRY)**	**10/22/2015 (DRY)**	**10/13/2016 (DRY)**	**5/18/2017 (DRY)**	**10/25/2017 (DRY)**	**5/2/2018 (DRY)**	**10/17/2018 (DRY)**	**6/11/2019 (DRY)**	**9/26/2019 (DRY)**	
pH Lab	pH Units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.5-8.5
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hardness	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80-100
Total Dissolved Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500
Alkalinity	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	30-500
Chloride	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	250
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	200
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500.0
Ammonia	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
Nitrite as N	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phenolics	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Chemical Oxygen Demand	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.3
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05
Phosphorus	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Orthophosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Total Suspended Solids	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BOD	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anion Sum		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cation Sum		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ion Balance	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.006
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.010
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.00
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Cadmium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.005
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.01
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05
Sillicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Field Measurements																		
Temperature	oC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH Units	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.5-8.5
Coductivity	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:

Ontario Drinking Water Quality Standards* Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 11
Groundwater Quality Results - BH6-III
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation		ODWQS
		Sample Collection Date (dd/mm/yyyy)		
		BH6-III		
		11-Jun-19	**26-Sep-19**	
pH Lab	pH Units	7.04	6.99	6.5-8.5
Conductivity	µS/cm	309	465	-
Hardness	mg/L	**123**	**158**	80-100
Total Dissolved Solids	mg/L	184	232	500
Alkalinity	mg/L	72	101	30-500
Chloride	mg/L	6.03	12.9	250
Sodium	mg/L	11.0	13.2	200
Calcium	mg/L	35.9	47.5	-
Magnesium	mg/L	7.98	9.60	-
Potassium	mg/L	5.49	7.47	-
Sulphate	mg/L	65.7	66.8	500
Ammonia	mg/L	0.30	0.79	-
Nitrate as N	mg/L	1.60	3.36	10
Nitrite as N	mg/L	<0.05	<0.05	1
Total Kjeldahl Nitrogen	mg/L	0.52	1.30	-
Phenolics	mg/L	<0.001	<0.001	-
Dissolved Organic Carbon	mg/L	2.9	**5.3**	5
Chemical Oxygen Demand	mg/L	<5	12	-
Iron	mg/L	<0.010	<0.010	0.3
Manganese	mg/L	**0.404**	**0.615**	0.05
Phosphorus	mg/L	0.25	0.12	-
Orthophosphate	mg/L		<0.10	-
Turbidity	NTU	**36.7**	**24.5**	5
Total Suspended Solids	mg/L	42	66	-
BOD	mg/L	<5	<5	-
Anion Sum		-	-	-
Cation Sum		-	-	-
Ion Balance	%	-	-	-
Silver	mg/L	<0.002	<0.002	-
Aluminum	mg/L	0.013	0.015	0.1
Antimony	mg/L	<0.003	<0.003	0.006
Arsenic	mg/L	<0.003	<0.003	0.010
Barium	mg/L	0.096	0.124	1.00
Beryllium	mg/L	<0.001	<0.001	-
Bismuth	mg/L	<0.002	<0.002	-
Boron	mg/L	0.207	0.341	5
Cadmium	mg/L	<0.001	<0.001	0.005
Chromium	mg/L	<0.003	<0.003	0.05
Cobalt	mg/L	<0.001	<0.001	-
Copper	mg/L	0.006	0.007	1
Molybdenum	mg/L	<0.002	<0.002	-
Nickel	mg/L	<0.003	0.005	-
Phosphate	mg/L	<0.10	-	-
Lead	mg/L	<0.001	<0.001	0.01
Selenium	mg/L	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-
Tin	mg/L	<0.002	<0.002	-
Strontium	mg/L	0.225	0.292	-
Titanium	mg/L	<0.002	<0.002	-
Uranium	mg/L	<0.002	<0.002	0.02
Vanadium	mg/L	<0.002	<0.002	-
Zinc	mg/L	0.005	0.005	5
Field Measurements				
Temperature	oC	8.3	9.8	-
pH	pH Units	6.4	5.8	6.5-8.5
Coductivity	uS/cm	338.8	321.1	-
Oxidation Reduction Potential	mV	209.4	427.5	-
Dissolved Oxygen	mg/L	2.48	1.7	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 12
Groundwater Quality Results - BH7-II
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation																ODWQS
		Sample Collection Date (dd/mm/yyyy)																
		BH7-II																
		27-Oct-11	**9-May-12**	**4-Oct-12**	**30-May-13**	**24-Oct-13**	**8-May-14**	**30-Oct-14**	**13-May-15**	**22-Oct-15**	**10/13/2016 (DRY)**	**18-May-17**	**25-Oct-17**	**2-May-18**	**17-Oct-18**	**11-Jun-19**	**26-Sep-19**	
pH Lab	pH Units	6.67	**6.36**	**6.15**	6.63	**6.07**	**6.21**	**6.24**	**6.05**	**6.44**	-	**5.9**	**6.4**	**6.1**	**6.1**	**6.34**	**5.92**	6.5-8.5
Conductivity	µS/cm	46	61	67	38	50	42	35	26	31	-	78	51	22	14	34	32	-
Hardness	mg/L	**13**	**13**	**16**	**12**	**11**	**8.1**	**9.1**	**7.5**	**7.6**	-	**22**	**12**	**1.0**	**5.0**	**9.2**	**7.2**	80-100
Total Dissolved Solids	mg/L	38	100	110	130	88	82	324	336	192	-	90	56	22	14	28	36	500
Alkalinity	mg/L	**6**	**15**	**2.4**	**6.4**	**1.4**	**8.9**	**8.1**	**4.8**	**4.9**	-	**10**	**11**	**8.0**	**6.0**	**7.0**	**<5**	30-500
Chloride	mg/L	4	2	2	3	2	2	1	2	<1	-	1	1	<1	<1	0.49	0.22	250
Sodium	mg/L	3.1	4.6	3.6	2	2.4	3.7	1.2	1.5	1.3	-	2.89	1.7	3.07	0.674	2.35	1.42	200
Calcium	mg/L	3.1	3.2	4.1	2.9	3.1	2.3	2.3	2	2.1	-	1.48	2.79	0.466	1.2	2.07	1.58	-
Magnesium	mg/L	1.2	1.2	1.3	1	0.79	0.59	0.84	0.62	0.58	-	0.543	1.34	<0.2	0.468	0.97	0.80	-
Potassium	mg/L	1.2	1.9	0.75	1.3	1.2	1.2	1.3	1.4	1	-	1.03	1.48	0.874	0.471	1.42	0.58	-
Sulphate	mg/L	7	9	5	10	7	11	7	7	5.8	-	8	9	1	2	5.68	1.98	500
Ammonia	mg/L	0.08	<0.05	<0.05	0.13	<0.05	0.061	<0.05	<0.05	<0.05	-	0.03	0.06	0.04	0.02	0.11	0.13	-
Nitrate as N	mg/L	0.2	<0.1	4.8	<0.1	2.5	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.3	0.4	0.06	1.64	10
Nitrite as N	mg/L	<0.01	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1
Total Kjeldahl Nitrogen	mg/L	5	2.1	<0.5	3.9	0.84	<1	1.2	0.32	<0.1	-	0.3	0.3	0.6	0.4	0.16	0.56	-
Phenolics	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Dissolved Organic Carbon	mg/L	2.1	2.1	0.92	3.4	1.3	2.6	2.8	2.5	1.5	-	3.7	2.7	5.4	1.6	3.1	4.2	5
Chemical Oxygen Demand	mg/L	84	46	21	15	4.6	27	13	4.5	<4	-	51	35	46	45	<5	<5	-
Iron	mg/L	**1.4**	<0.1	0.13	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	-	<0.1	<0.1	0.125	<0.1	<0.010	0.054	0.3
Manganese	mg/L	**0.14**	0.032	0.034	0.016	0.015	0.011	0.0031	0.0079	0.0036	-	0.012	0.006	<0.005	0.009	0.010	0.022	0.05
Phosphorus	mg/L	5.4	1.8	2.5	0.57	0.41	2.4	0.84	0.46	0.31	-	0.4	0.47	0.83	0.34	0.78	0.62	-
Orthophosphate	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	-	-	-	-	-	-	-	<0.10	-
Turbidity	NTU	**1700**	**430**	**420**	**150**	**170**	**180**	**500**	**330**	**380**	-	**1710**	**1580**	**2420**	**1720**	**2300**	**2470**	5
Total Suspended Solids	mg/L	-	-	-	1100	430	3700	2400	1400	910	-	2530	1920	3550	1820	4160	2290	-
BOD	mg/L	-	-	-	<2	<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<5	<5	-
Anion Sum		0.395	0.539	0.538	0.418	0.425	0.47	0.343	0.292	0.238	-	0.4	0.44	0.23	0.22	-	-	-
Cation Sum		0.55	0.508	0.493	0.381	0.361	0.383	0.278	0.265	0.239	-	0.27	0.36	0.19	0.14	-	-	-
Ion Balance	%	NC	NC	NC	NC	NC	NC	-	-	NC	-	-	-	-	-	-	-	-
Silver	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00024	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	-
Aluminum	mg/L	**0.7**	0.026	0.018	**0.19**	0.063	**0.17**	0.066	**0.12**	0.029	-	**0.203**	0.024	**0.245**	0.061	0.046	**0.151**	0.1
Antimony	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.003	<0.003	0.006
Arsenic	mg/L	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.010
Barium	mg/L	0.022	0.016	0.016	0.018	0.03	0.012	0.012	0.017	0.0086	-	0.014	0.018	0.004	0.007	0.014	0.014	1.00
Beryllium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	-
Bismuth	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	-
Boron	mg/L	<0.01	<0.01	<0.01	<0.01	0.017	<0.01	0.02	0.01	0.011	-	0.014	0.023	0.02	<0.01	0.010	0.029	5
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	0.00016	<0.0001	0.00011	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	0.005
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.05
Cobalt	mg/L	0.0062	<0.0005	<0.0005	0.00077	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	0.0006	<0.001	<0.001	-
Copper	mg/L	0.006	<0.001	0.0013	0.0028	0.0013	0.0012	0.0026	0.002	0.001	-	0.0018	0.001	0.0021	0.0021	<0.003	<0.003	1
Molybdenum	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	-
Nickel	mg/L	0.002	<0.001	0.0011	<0.001	0.001	<0.001	0.001	<0.001	<0.001	-	0.001	<0.001	<0.001	<0.001	<0.003	<0.003	-
Phosphate	mg/L	<0.1	<0.1	-	-	-	-	-	-	-	-	<0.2	<0.2	<0.2	<0.0002	<0.10	-	-
Lead	mg/L	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0001	<0.0001	0.0002	0.0001	<0.001	<0.001	0.01
Selenium	mg/L	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.001	<0.001	<0.001	<0.001	<0.004	<0.004	0.05
Sillicon	mg/L	-	5.8	3.9	4.3	3.2	4.8	4.1	4.3	4.6	-	5.17	6.09	2.3	2.41	-	-	-
Tin	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-
Strontium	mg/L	0.024	0.023	0.04	0.023	0.032	0.013	0.015	0.016	0.012	-	0.017	0.027	<0.01	<0.01	0.018	0.017	-
Titanium	mg/L	0.04	<0.005	<0.005	<0.005	<0.005	0.0057	<0.005	<0.005	<0.005	-	<0.005	<0.005	<0.005	<0.005	<0.002	0.006	-
Uranium	mg/L	-	-	-	0.00013	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	0.0001	<0.0001	<0.002	<0.002	0.02
Vanadium	mg/L	0.0043	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	0.0008	<0.0005	<0.002	<0.002	-
Zinc	mg/L	0.013	<0.005	0.0079	0.0069	0.0069	0.018	0.0087	0.0094	0.0087	-	0.008	0.008	<0.005	0.013	<0.005	0.006	5
Field Measurements																		
Temperature	oC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.5	11.9	-
pH	pH Units	6.73	7.38	**8.93**	6.82	7.46	**5.61**	7	8.19	6.7	-	6.62	-	7.2	7.9	6.2	**5.23**	6.5-8.5
Coductivity	uS/cm	168	48	57	24	33	76	17	35	37	-	0.05	-	0.03	0.003	42.3	24.7	-
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	201.6	411.5	-
Dissolved Oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.22	8.08	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.
BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 13
Groundwater Quality Results - BH8-I
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation		ODWQS
		Sample Collection Date (dd/mm/yyyy)		
		BH8-I		
		11-Jun-19	**23-Sep-19**	
pH Lab	pH Units	7.16	7.13	6.5-8.5
Conductivity	µS/cm	376	459	-
Hardness	mg/L	**135**	**131**	80-100
Total Dissolved Solids	mg/L	200	224	500
Alkalinity	mg/L	98	103	30-500
Chloride	mg/L	16.8	30.6	250
Sodium	mg/L	14.3	19.7	200
Calcium	mg/L	42.3	41.3	-
Magnesium	mg/L	7.06	6.87	-
Potassium	mg/L	10.0	9.37	-
Sulphate	mg/L	55.2	26.1	500
Ammonia	mg/L	0.26	1.71	-
Nitrate as N	mg/L	1.98	4.63	10
Nitrite as N	mg/L	0.25	0.12	1
Total Kjeldahl Nitrogen	mg/L	6.10	4.10	-
Phenolics	mg/L	0.003	0.002	-
Dissolved Organic Carbon	mg/L	4.9	6.0	5
Chemical Oxygen Demand	mg/L	154	130	-
Iron	mg/L	<0.010	<0.010	0.3
Manganese	mg/L	**1.39**	**0.943**	0.05
Phosphorus	mg/L	2.98	3.36	-
Orthophosphate	mg/L	-	<0.10	-
Turbidity	NTU	**7380**	**1450**	5
Total Suspended Solids	mg/L	6680	3300	-
BOD	mg/L	9	<5	-
Anion Sum		-	-	-
Cation Sum		-	-	-
Ion Balance	%	-	-	-
Silver	mg/L	<0.002	<0.002	-
Aluminum	mg/L	0.033	0.035	0.1
Antimony	mg/L	<0.003	<0.003	0.006
Arsenic	mg/L	<0.003	<0.003	0.010
Barium	mg/L	0.183	0.147	1.00
Beryllium	mg/L	<0.001	<0.001	-
Bismuth	mg/L	<0.002	<0.002	-
Boron	mg/L	0.230	0.343	5
Cadmium	mg/L	<0.001	<0.001	0.005
Chromium	mg/L	<0.003	<0.003	0.05
Cobalt	mg/L	<0.001	<0.001	-
Copper	mg/L	0.004	0.004	1
Molybdenum	mg/L	<0.002	<0.002	-
Nickel	mg/L	<0.003	<0.003	-
Phosphate	mg/L	<0.10	-	-
Lead	mg/L	<0.001	<0.001	0.01
Selenium	mg/L	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-
Tin	mg/L	<0.002	<0.002	-
Strontium	mg/L	0.233	0.235	-
Titanium	mg/L	<0.002	<0.002	-
Uranium	mg/L	<0.002	<0.002	0.02
Vanadium	mg/L	<0.002	<0.002	-
Zinc	mg/L	<0.005	<0.005	5
Field Measurements				
Temperature	oC	7.7	9.5	-
pH	pH Units	6.5	**6.0**	6.5-8.5
Coductivity	uS/cm	423.200	321.300	-
Oxidation Reduction Potential	mV	204.8	440.6	-
Dissolved Oxygen	mg/L	0.8	2.01	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 14
Groundwater Quality Results - BH9-I
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation		ODWQS
		Sample Collection Date (dd/mm/yyyy)		
		BH9-I		
		11-Jun-19	**23-Sep-19**	
pH Lab	pH Units	7.40	7.17	6.5-8.5
Conductivity	µS/cm	479	574	-
Hardness	mg/L	**197**	**143**	80-100
Total Dissolved Solids	mg/L	260	240	500
Alkalinity	mg/L	152	168	30-500
Chloride	mg/L	15.5	38.6	250
Sodium	mg/L	11.4	22.5	200
Calcium	mg/L	63.9	45.6	-
Magnesium	mg/L	9.19	7.16	-
Potassium	mg/L	8.04	12.3	-
Sulphate	mg/L	65.9	20.0	500
Ammonia	mg/L	3.58	6.60	-
Nitrate as N	mg/L	0.92	<0.05	10
Nitrite as N	mg/L	<0.05	<0.05	1
Total Kjeldahl Nitrogen	mg/L	4.00	7.46	-
Phenolics	mg/L	0.002	0.001	-
Dissolved Organic Carbon	mg/L	**6.8**	**9.2**	5
Chemical Oxygen Demand	mg/L	35	33	-
Iron	mg/L	0.133	**3.76**	0.3
Manganese	mg/L	**2.06**	**4.48**	0.05
Phosphorus	mg/L	2.09	0.70	-
Orthophosphate	mg/L	-	<0.10	-
Turbidity	NTU	**4050**	**777**	5
Total Suspended Solids	mg/L	2090	1980	-
BOD	mg/L	<5	<5	-
Anion Sum		-	-	-
Cation Sum		-	-	-
Ion Balance	%	-	-	-
Silver	mg/L	<0.002	<0.002	-
Aluminum	mg/L	0.017	**0.213**	0.1
Antimony	mg/L	<0.003	<0.003	0.006
Arsenic	mg/L	<0.003	<0.003	0.010
Barium	mg/L	0.103	0.134	1.00
Beryllium	mg/L	<0.001	<0.001	-
Bismuth	mg/L	<0.002	<0.002	-
Boron	mg/L	0.344	0.320	5
Cadmium	mg/L	<0.001	<0.001	0.005
Chromium	mg/L	<0.003	<0.003	0.05
Cobalt	mg/L	0.006	0.016	-
Copper	mg/L	0.004	0.008	1
Molybdenum	mg/L	<0.002	<0.002	-
Nickel	mg/L	<0.003	<0.003	-
Phosphate	mg/L	<0.10	-	-
Lead	mg/L	<0.001	<0.001	0.01
Selenium	mg/L	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-
Tin	mg/L	<0.002	<0.002	-
Strontium	mg/L	0.275	0.300	-
Titanium	mg/L	0.002	0.013	-
Uranium	mg/L	<0.002	<0.002	0.02
Vanadium	mg/L	<0.002	<0.002	-
Zinc	mg/L	<0.005	<0.005	5
Field Measurements				
Temperature	oC	8.1	9.2	-
pH	pH Units	6.5	**6.1**	6.5-8.5
Coductivity	uS/cm	532.2	3.980	-
Oxidation Reduction Potential	mV	203.8	318.4	-
Dissolved Oxygen	mg/L	1.19	1.54	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 15
Groundwater Quality Results - BH10-I
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation		ODWQS
		Sample Collection Date (dd/mm/yyyy)		
		BH10-I		
		11-Jun-19	**23-Sep-19**	
pH Lab	pH Units	7.08	7.11	6.5-8.5
Conductivity	µS/cm	289	601	-
Hardness	mg/L	**115**	**214**	80-100
Total Dissolved Solids	mg/L	188	338	500
Alkalinity	mg/L	47	76	30-500
Chloride	mg/L	4.10	10.3	250
Sodium	mg/L	9.14	18.1	200
Calcium	mg/L	30.2	56.7	-
Magnesium	mg/L	9.60	17.5	-
Potassium	mg/L	5.52	7.64	-
Sulphate	mg/L	84.2	165	500
Ammonia	mg/L	0.11	0.15	-
Nitrate as N	mg/L	1.24	2.22	10
Nitrite as N	mg/L	<0.05	<0.05	1
Total Kjeldahl Nitrogen	mg/L	0.44	0.68	-
Phenolics	mg/L	<0.001	0.001	-
Dissolved Organic Carbon	mg/L	**5.6**	**5.9**	5
Chemical Oxygen Demand	mg/L	11	21	-
Iron	mg/L	<0.010	<0.010	0.3
Manganese	mg/L	**0.067**	0.016	0.05
Phosphorus	mg/L	1.73	1.58	-
Orthophosphate	mg/L	-	<0.10	-
Turbidity	NTU	**982**	**1940**	5
Total Suspended Solids	mg/L	1130	2060	-
BOD	mg/L	<5	<5	-
Anion Sum		-	-	-
Cation Sum		-	-	-
Ion Balance	%	-	-	-
Silver	mg/L	<0.002	<0.002	-
Aluminum	mg/L	0.049	0.045	0.1
Antimony	mg/L	<0.003	<0.003	0.006
Arsenic	mg/L	<0.003	<0.003	0.010
Barium	mg/L	0.111	0.148	1.00
Beryllium	mg/L	<0.001	<0.001	-
Bismuth	mg/L	<0.002	<0.002	-
Boron	mg/L	0.446	0.790	5
Cadmium	mg/L	<0.001	<0.001	0.005
Chromium	mg/L	<0.003	<0.003	0.05
Cobalt	mg/L	0.001	<0.001	-
Copper	mg/L	0.008	0.008	1
Molybdenum	mg/L	<0.002	<0.002	-
Nickel	mg/L	0.004	0.003	-
Phosphate	mg/L	<0.10	-	-
Lead	mg/L	<0.001	<0.001	0.01
Selenium	mg/L	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-
Tin	mg/L	<0.002	<0.002	-
Strontium	mg/L	0.187	0.343	-
Titanium	mg/L	<0.002	0.003	-
Uranium	mg/L	<0.002	<0.002	0.02
Vanadium	mg/L	<0.002	<0.002	-
Zinc	mg/L	0.007	0.009	5
Field Measurements				
Temperature	oC	10.1	11.4	-
pH	pH Units	6.5	**6.1**	6.5-8.5
Coductivity	uS/cm	311.4	416.300	-
Oxidation Reduction Potential	mV	158.2	179.3	-
Dissolved Oxygen	mg/L	9.19	8.14	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 16
Groundwater Quality Results - BH11
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation		ODWQS
		Sample Collection Date (dd/mm/yyyy)		
		BH11		
		11-Jun-19	**23-Sep-19**	
pH Lab	pH Units	6.38	6.33	6.5-8.5
Conductivity	µS/cm	82	94	-
Hardness	mg/L	**25.1**	**23.5**	80-100
Total Dissolved Solids	mg/L	60	66	500
Alkalinity	mg/L	**7**	**10**	30-500
Chloride	mg/L	13.5	12.6	250
Sodium	mg/L	3.52	3.89	200
Calcium	mg/L	8.18	7.76	-
Magnesium	mg/L	1.14	0.99	-
Potassium	mg/L	1.38	1.34	-
Sulphate	mg/L	4.93	5.64	500
Ammonia	mg/L	0.07	0.12	-
Nitrate as N	mg/L	0.40	0.20	10
Nitrite as N	mg/L	<0.05	<0.05	1
Total Kjeldahl Nitrogen	mg/L	0.18	0.19	-
Phenolics	mg/L	<0.001	<0.001	-
Dissolved Organic Carbon	mg/L	1.8	2.0	5
Chemical Oxygen Demand	mg/L	<5	<5	-
Iron	mg/L	<0.010	<0.010	0.3
Manganese	mg/L	0.021	0.016	0.05
Phosphorus	mg/L	0.87	0.90	-
Orthophosphate	mg/L	-	<0.10	-
Turbidity	NTU	**368**	**216**	5
Total Suspended Solids	mg/L	1760	1110	-
BOD	mg/L	<5	<5	-
Anion Sum		-	-	-
Cation Sum		-	-	-
Ion Balance	%	-	-	-
Silver	mg/L	<0.002	<0.002	-
Aluminum	mg/L	0.030	0.034	0.1
Antimony	mg/L	<0.003	<0.003	0.006
Arsenic	mg/L	<0.003	<0.003	0.010
Barium	mg/L	0.019	0.019	1.00
Beryllium	mg/L	<0.001	<0.001	-
Bismuth	mg/L	<0.002	<0.002	-
Boron	mg/L	<0.010	<0.010	5
Cadmium	mg/L	<0.001	<0.001	0.005
Chromium	mg/L	<0.003	<0.003	0.05
Cobalt	mg/L	<0.001	<0.001	-
Copper	mg/L	<0.003	<0.003	1
Molybdenum	mg/L	<0.002	<0.002	-
Nickel	mg/L	<0.003	<0.003	-
Phosphate	mg/L	<0.10	-	-
Lead	mg/L	<0.001	<0.001	0.01
Selenium	mg/L	<0.004	<0.004	0.05
Sillicon	mg/L	-	-	-
Tin	mg/L	<0.002	<0.002	-
Strontium	mg/L	0.081	0.075	-
Titanium	mg/L	<0.002	<0.002	-
Uranium	mg/L	<0.002	<0.002	0.02
Vanadium	mg/L	<0.002	<0.002	-
Zinc	mg/L	<0.005	<0.005	5
Field Measurements				
Temperature	oC	12.3	11.3	-
pH	pH Units	**6.3**	**5.9**	6.5-8.5
Coductivity	uS/cm	86	63.600	-
Oxidation Reduction Potential	mV	109.9	178.8	-
Dissolved Oxygen	mg/L	9.06	7.11	-

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.

BOLD	Exceeds ODWQS
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 17
B-7 Guideline Calculations - Spring 2019
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation / Sample Collection Date (dd/mm/yyyy)									ODWQS	Guideline B-7 Calculation Cm = Cb + x (Cr - Cb)			
		BH1	BH2	BH4	BH4-II	BH5-II	BH6-III	BH-7-II	BH8-I	BH9-I		Cb	x	Cr	Cm
		11-Jun-19	**11-Jun-19**	**11-Jun-19**	**11-Jun-19**	**11-Jun-19**	**11-Jun-19**	**11-Jun-19**	**11-Jun-19**	**11-Jun-19**					
pH Lab	pH Units	7.44	7.48	7.56	7.46	6.94	7.04	6.34	7.16	7.40	6.5-8.5	6.08	0.50	6.5-8.5	NC
Hardness	mg/L	230	239	350	342	96.0	123	9.2	135	197	80-100	14.2	0.50	80-100	NC
Total Dissolved Solids	mg/L	**310**	**312**	**484**	**570**	176	184	28	200	260	500	42.0	0.50	500	271
Alkalinity	mg/L	260	230	184	191	57	72	7	98	152	30-500	4.79	0.50	30-500	NC
Chloride	mg/L	30.6	26.2	5.67	7.09	6.90	6.03	0.49	16.8	15.5	250	2.35	1	250	126.2
Sodium	mg/L	31.3	27.4	11.6	16.0	9.07	11.0	2.35	14.3	11.4	200	1.72	0.5	200	100.9
Sulphate	mg/L	32.1	46.7	137	91.9	45.5	65.7	5.68	55.2	65.9	500.0	4.79	0.5	500.0	252.4
Nitrate as N	mg/L	<0.10	<0.20	**15.2**	**28.7**	1.68	1.60	0.06	1.98	0.92	10	0.74	0.25	10	3.1
Nitrite as N	mg/L	<0.10	<0.20	<0.10	<0.10	0.15	<0.05	<0.05	0.25	<0.05	1	0.006	0.250	1	0.25
Dissolved Organic Carbon	mg/L	**8.9**	**11.0**	**8.7**	**10.7**	2.8	2.9	3.1	**4.9**	**6.8**	5	2.7	0.5	5	3.8
Iron	mg/L	<0.010	**9.71**	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.133	0.3	0.043	0.5	0.3	0.171
Manganese	mg/L	**2.47**	**4.06**	<0.002	**0.292**	**0.139**	**0.404**	0.010	**1.39**	**2.06**	0.05	0.009	0.5	0.05	0.029
Turbidity	NTU	1.9	52.0	30.5	79.7	258	36.7	2300	7380	4050	5	80.9	0.5	5	NC
Aluminum	mg/L	0.022	0.024	0.018	0.025	0.017	0.013	0.046	0.033	0.017	0.1	0.102	0.5	0.1	NC
Antimony	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.006	0.0003	0.25	0.006	0.0017
Arsenic	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.010	0.0005	0.01	0.010	0.0006
Barium	mg/L	0.165	0.216	0.126	0.130	0.091	0.096	0.014	0.183	0.103	1.00	0.0207	0.25	1.00	0.27
Boron	mg/L	0.551	0.419	0.397	0.519	0.215	0.207	0.010	0.230	0.344	5	0.0131	0.25	5	1.26
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	0.0001	0.25	0.005	0.0013
Chromium	mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.05	0.0024	0.25	0.05	0.014
Copper	mg/L	0.010	<0.003	0.005	0.009	<0.003	0.006	<0.003	0.004	0.004	1	0.0012	0.5	1	0.50
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01	0.0002	0.25	0.01	0.0026
Selenium	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.05	0.0009	0.25	0.05	0.013
Uranium	mg/L	0.004	0.003	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.02	0.00007	0.25	0.02	0.0051
Zinc	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	5	0.014	0.5	5	2.51

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.
BOLD	Exceeds Cm value.
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.
Cb	Background Concentration
Cr	Maximum Acceptable Contaminant Concentration
x	Reduction Constant
Cm	Maximum Off-Site Acceptable Contaminant Concentration

TABLE 18
B-7 Guideline Calculations - Fall 2019
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation									ODWQS	Guideline B-7 Calculation Cm = Cb + x (Cr - Cb)			
		Sample Collection Date (dd/mm/yyyy)										Cb	x	Cr	Cm
		BH1	BH2	BH4	BH4-II	BH5-II	BH6-III	BH7-II	BH8-I	BH9-I					
		26-Sep-19	**26-Sep-19**	**26-Sep-19**	**26-Sep-19**	**26-Sep-19**	**26-Sep-19**	**26-Sep-19**	**26-Sep-19**	**26-Sep-19**					
pH Lab	pH Units	7.49	7.40	No	7.16	6.84	6.99	5.92	7.13	7.17	6.5-8.5	6.10	0.50	6.5-8.5	NC
Hardness	mg/L	140	349	Sample	323	142	158	7.2	131	143	80-100	13.1	0.50	80-100	NC
Total Dissolved Solids	mg/L	250	**452**	-	**450**	218	232	36	224	240	500	42.0	0.50	500	271
Alkalinity	mg/L	153	311	-	240	83	101	<5	103	168	30-500	5.24	0.50	30-500	NC
Chloride	mg/L	22.5	24.1	-	4.78	10.9	12.9	0.22	30.6	38.6	250	2.20	1	250	126.1
Sodium	mg/L	20.7	33.0	-	12.9	13.1	13.2	1.42	19.7	22.5	200	1.93	0.5	200	101.0
Sulphate	mg/L	13.8	78.0	-	67.3	68.4	66.8	1.98	26.1	20.0	500.0	4.87	0.5	500.0	252.4
Nitrate as N	mg/L	**10.8**	<0.25	-	**16.7**	**4.13**	**3.36**	1.64	**4.63**	<0.05	10	0.66	0.25	10	3.0
Nitrite as N	mg/L	0.16	<0.25	-	<0.25	<0.05	<0.05	<0.05	0.12	<0.05	1	0.006	0.250	1	0.25
Dissolved Organic Carbon	mg/L	**6.3**	**10.0**	-	**8.6**	**5.4**	**5.3**	**4.2**	**6.0**	**9.2**	5	2.8	0.5	5	3.9
Iron	mg/L	<0.010	**0.531**	-	<0.010	<0.010	<0.010	0.054	<0.010	**3.76**	0.3	0.037	0.5	0.3	0.169
Manganese	mg/L	**1.00**	**1.51**	-	**0.386**	**0.067**	**0.615**	0.022	**0.943**	**4.48**	0.05	0.009	0.5	0.05	0.029
Turbidity	NTU	7.0	81.1	-	74.6	273	24.5	2470	1450	777	5	96.9	0.5	5	NC
Aluminum	mg/L	0.032	0.006	-	0.035	0.023	0.015	0.151	0.035	0.213	0.1	0.102	0.5	0.1	NC
Antimony	mg/L	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.006	0.0003	0.25	0.006	0.0017
Arsenic	mg/L	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.010	0.0006	0.01	0.010	0.0007
Barium	mg/L	0.177	0.186	-	0.119	0.142	0.124	0.014	0.147	0.134	1.00	0.0183	0.25	1.00	0.26
Boron	mg/L	0.329	0.642	-	0.473	0.326	0.341	0.029	0.343	0.320	5	0.0143	0.25	5	1.26
Cadmium	mg/L	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	0.0001	0.25	0.005	0.0013
Chromium	mg/L	<0.003	<0.003	-	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.05	0.0023	0.25	0.05	0.014
Copper	mg/L	0.009	0.004	-	0.010	0.003	0.007	<0.003	0.004	0.008	1	0.0014	0.5	1	0.50
Lead	mg/L	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01	0.0002	0.25	0.01	0.0027
Selenium	mg/L	<0.004	<0.004	-	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.05	0.0009	0.25	0.05	0.013
Uranium	mg/L	<0.002	0.005	-	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	0.02	0.00008	0.25	0.02	0.0051
Zinc	mg/L	<0.005	<0.005	-	<0.005	<0.005	0.005	0.006	<0.005	<0.005	5	0.014	0.5	5	2.51

Notes:

Ontario Drinking Water Quality Standards*	Ontario Regulation 169/03 "Ontario Drinking Water Quality Standards" under the Safe Drinking Water Act", dated 2002, and "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", dated June 2003.
BOLD	Exceeds Cm value.
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.
Cb	Background Concentration
Cr	Maximum Acceptable Contaminant Concentration
x	Reduction Constant
Cm	Maximum Off-Site Acceptable Contaminant Concentration

TABLE 19
Surface Water Quality Results - SW1
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation																						PWQO	APV	CWQG
		Sample Collection Date (dd/mm/yyyy)																								
		SW1																								
		16-May-05	26-Oct-05	8-May-06	14-May-09	27-Oct-11	9-May-12	4-Oct-12	30-May-13	24-Oct-13	8-May-14	8-Apr-14	30-Oct-14	13-May-15	22-Oct-15	13-Oct-16	18-May-17	25-Oct-17	2-May-18	19-Jun-18	17-Oct-18	11-Jun-19	26-Sep-19			
pH Lab	pH Units	**4.8**	**5.7**	**5.7**	**6.2**	**6.0**	**6.4**	6.6	**6.1**	**5.5**	**6.3**	**6.3**	**6.3**	**5.6**	6.5	6.5	**6.4**	6.7	**5.9**	**6.2**	**6.4**	**5.37**	**3.97**	6.5-8.5	-	6.5-9.0
Conductivity	µS/cm	22.3	35	26	21	54	51	76	35	33	72	77	48	28	77	150	87	119	34	-	78	37	118	-	-	-
Hardness	mg/L	6.75	7.2	4	11	14	14	20	10	9.4	18	18	13	7.9	25	39	25	22	10	-	21	10.0	17.8	-	-	-
Total Dissolved Solids	mg/L	279	72	21	13	44	16	56	52	48	66	68	54	28	66	104	158	26	28	74	38	34	54	-	-	-
Alkalinity	mg/L	-	2	2	6	2	2.5	6.6	3	<1	3.1	3.1	3.1	1.7	6	11	7	14	<5	-	9	<5	<5	-	-	-
Alkalinity Bicarbonate		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	-
Chloride	mg/L	1.38	2	2	<5	10	9	13	6	5	12	13	8	5	14	16	13	11	4	25.1	10	7.09	11.7	-	180	120
Sodium	mg/L	1.7	1.5		0.77	2.4	2.5	3.3	1.8	1.5	5.3	5.4	2.2	1.6	3.5	5.16	3.75	3.43	1.68	-	3.09	2.42	3.51	-	180	-
Calcium	mg/L	1.8	2.2	1.5	-	4.8	4.6	6.8	3.2	3	6	5.9	4.1	2.4	7.6	12.4	7.96	6.98	3.12	-	6.48	2.96	5.51	-	-	-
Magnesium	mg/L	0.38	0.43	0.3	-	0.93	0.79	1.3	0.53	0.54	0.95	0.96	0.69	0.45	1.4	1.98	1.31	1.21	0.556	-	1.16	0.64	0.99	-	-	-
Potassium	mg/L	-	*0.34*		-	*2.1*	*0.68*	*1.8*	*0.51*	*0.62*	*0.75*	*0.76*	*0.77*	*0.5*	*1.5*	*2.15*	*0.841*	*0.923*	*0.551*	-	*0.677*	*0.23*	*0.80*	-	0.039	-
Sulphate	mg/L	4.8	4	3	<5	5	2	3	2	<1	7	8	2	<1	4	27	13	11	5	4	10	0.90	13.8	-	-	-
Ammonia	mg/L	0.07	-	-	0.07	<0.05	0.099	0.063	0.074	<0.05	0.053	<0.05	<0.05	<0.05	0.069	0.02	0.01	0.02	0.02	0.05	0.01	0.09	0.08	-	-	-
Un-ionized Ammonia		0.0005	-	-	-	0	0.0002	0.0084	0.0001	0.0001	0.0002	0.0002	0	0.0009	0.0001	0.00003	0.00001	0.00005	0.000007	-	0.000011	-	-	-	-	-
Nitrate as N	mg/L	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	<0.1	<0.1	<0.1	<0.1	0.2	0.1	<0.1	0.36	0.1	<0.05	<0.05	-	-	13
Nitrite as N	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	0.06
Total Kjeldahl Nitrogen	mg/L	0.6	-	-	-	-	0.74	0.73	0.57	0.52	0.33	0.85	0.35	0.26	0.56	0.2	0.4	0.3	0.2	0.28	0.2	0.30	0.38	-	-	-
Phenolics	mg/L	-	0.001	-	<0.001	**0.003**	**0.0031**	<0.001	**0.0014**	**0.0018**	<0.001	<0.001	**0.003**	<0.001	<0.001	**0.009**	<0.001	**0.002**	<0.001	**0.002**	<0.001	0.001	**0.003**	0.001	0.9610	0.004
Dissolved Organic Carbon	mg/L	8.8	12.4	8.7	18.2	9	8.2	6.1	8.4	11	5.1	5.2	9.2	8.1	6.5	9.4	7.4	10.6	13.4	-	7	8.9	13.2	-	-	-
Chemical Oxygen Demand	mg/L	-	45	26	49	30	30	23	23	31	13	13	25	21	40	35	32	30	21	25	25	19	31	-	-	-
Biological Oxygen Demand	mg/L	-	-	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	4	<2	<2	<2	<5	<2	<5	<5	-	-	-
Iron	mg/L	**0.72**	**1.50**	**1.60**	-	**0.5**	1.00	**0.52**	**0.68**	**0.42**	0.26	0.26	**1.10**	**0.52**	**3.30**	<0.5	**0.46**	**0.40**	0.25	**0.49**	0.21	**0.369**	**0.383**	0.30	-	0.30
Manganese	mg/L	0.048	0.11	0.051	-	0.1	0.082	0.065	0.05	0.069	0.047	0.048	0.072	0.054	0.12	0.063	0.057	0.045	0.032	-	0.046	0.057	0.070	-	-	-
Phosphorus	mg/L	**4.5**	-	-	<.05	**3.5**	0.026	0.003	0.019	0.01	0.003	0.007	0.017	0.012	**0.13**	<0.01	<0.01	0.03	<0.01	<0.02	<0.01	0.02	0.02	0.03	-	-
Orthophosphate	mg/L	-	0.009	-	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-		<0.10	-	-	-
Total Suspended Solids	mg/L	-	8	-	<10	<10	64	<10	<10	<10	<10	<10	<10	1	11	<2	15	8	6	<10	<2	<10	<10	-	-	-
Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Turbidity	NTU	71	113	79	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anion Sum		-	-	-	-	0.411	0.333	0.564	0.267	0.141	0.583	0.617	0.33	0.167	0.59	1.24	0.79	0.82	0.28	-	0.66	-	-	-	-	-
Cation Sum		-	-	-	-	0.448	0.445	0.541	0.327	0.314	0.642	0.64	0.399	0.272	0.74	1.06	0.69	0.62	0.29	-	0.57	-	-	-	-	-
Ion Balance	%	-	-	-	-	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	-7.7	N/A	N/A	1	-	-7.5	-	-	-	-	-
Silver	mg/L	-	-		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.1	<0.0001	-	<0.0001	<0.0001	<0.0001	0.0001	0.00012	0.00025
Aluminum	mg/L	**0.37**	**0.56**	**0.55**	-	**0.23**	**0.36**	**0.12**	**0.27**	**0.31**	**0.25**	**0.25**	**0.41**	**0.27**	**0.8**	**0.085**	**0.139**	**0.177**	**0.178**	-	**0.158**	**0.200**	**0.220**	0.075	-	0.1
Antimony	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.001	<0.003	0.02	1.6	-
Arsenic	mg/L	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.003	<0.003	0.005	0.15	0.005
Barium	mg/L	0.022	0.023	0.018	-	0.027	0.025	0.026	0.019	0.017	0.041	0.042	0.022	0.015	0.035	0.045	0.033	0.029	0.014	0.043	0.024	0.020	0.035	-	2.3	-
Beryllium	mg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.001	1.1	0.0053	-
Bismuth	mg/L	-	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.01	<0.001	<0.001	<0.001	-	<0.001	<0.002	<0.002	-	-	-
Boron	mg/L	-	-	-	-	<0.01	<0.01	0.021	<0.01	<0.01	0.015	0.014	0.014	<0.01	0.013	0.111	0.053	0.139	0.03	0.022	0.032	<0.010	0.010	0.20	3.55	1.5
Cadmium	mg/L	0.0001	-	0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00015	0.0001	<0.0001	<0.0001	***0.00024***	<0.0005	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00020	0.00021	0.00026
Chromium	mg/L	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.003	<0.003	0.0089	0.064	0.001
Cobalt	mg/L	0.0006	-	-	-	**0.00140**	0.00089	0.00052	**0.00099**	**0.00110**	0.00089	0.00075	**0.00110**	**0.00100**	**0.00120**	<0.0025	0.0009	0.0006	0.0005	-	0.0007	**0.0012**	**0.0014**	0.0009	0.0052	-
Copper	mg/L	-	-	0.002	-	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0023	<0.0025	0.0006	<0.0005	<0.0005	<0.002	0.0008	<0.001	<0.003	0.005	0.0069	0.004
Molybdenum	mg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0029	<0.0005	0.0041	<0.0005	-	<0.0005	<0.002	<0.002	0.04	0.73	0.073
Nickel	mg/L	-	-	-	-	0.001	0.0011	<0.001	<0.001	<0.001	<0.001	<0.001	0.0014	<0.001	<0.001	<0.005	0.001	<0.001	<0.001	-	<0.001	<0.003	<0.003	0.025	0.039	0.15
Phosphate	mg/L	-	-		-											<0.0002	<0.2	<0.2	<0.2	-	<0.2	<0.10	-	-	-	-
Lead	mg/L	0.0009	-	0.0018	-	<0.0005	0.00096	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	*0.0021*	0.0025	0.0002	0.0003	0.0003	<0.001	0.0001	<0.001	<0.001	0.005	0.002	0.007
Selenium	mg/L	-	-	-	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0025	<0.001	<0.001	<0.001	-	<0.001	<0.004	<0.004	0.1	0.005	0.001
Sillicon	mg/L	-	-	-	-		2.8	4.5	1.8	2.6	1.8	1.8	3.8	1.6	4.8	<0.005	2.26	2.63	1.77	-	2.49	2.07	2.79	-	-	-
Tin	mg/L	-	-	-	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	18.1	<0.005	<0.005	<0.005	-	<0.005	<0.002	<0.002	-	-	-
Strontium	mg/L	0.021	0.025	-	0.016	0.047	0.049	0.07	0.034	0.029	0.061	0.061	0.04	0.024	0.076	<0.025	0.068	0.059	0.025	-	0.056	0.031	0.061	-	-	-
Titanium	mg/L	-	0.007	-	<0.005	<0.005	0.0093	<0.005	<0.005	<0.005	<0.005	<0.005	0.0094	<0.005	0.038	0.099	<0.005	<0.005	<0.005	-	<0.005	0.002	0.003	-	-	-
Uranium	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00016	<0.025	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.002	<0.002	0.005	0.033	0.015
Vanadium	mg/L	-	-	-	<0.001	<0.0005	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0016	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.002	<0.002	0.006	0.02	-
Zinc	mg/L	0.009	0.015	0.01	0.007	0.012	0.012	<0.005	0.013	0.013	0.018	0.018	0.012	0.0098	0.012	<0.0025	0.029	0.007	0.007	0.007	0.011	0.013	0.016	0.03	0.089	0.093
Dissolved Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	0.0002	0.00077	0.000026
Field Measurements																										
Temperature	oC	5.1	14.3	-	-	-	11.5	14.6	5.5	11.8	11.8	6.3	11.2	-	8.2	-	-	-	6.4	11.9	-	18	15.3			
pH	pH Units	7.6	8.2	5.51	-	6.2	6.95	8.87	6.72	7.33	7.19	7.19	6.52	7.96	7.12	7.01	6.98	-	7.98	5.62	7.3	6.5	6.8			
Coductivity	uS/cm	66	44	37	-	48	59	123	22	18	59	59	172	17	78	157	0.09	-	0.04	131.2	0.08	41.10	58.40			
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-		-	146.7	186.7			
Dissolved Oxygen	mg/L	5.51	4.01	5.96	-	1.45	6.4	6.72	6.16	11.31	5.85	5.85	7.81	9.36	7.23	-	-	-	-	8.92	-	7.99	6.66			

Notes:

PWQO	Provincial Water Quality Objective
APV	Aquatic Protection Values
CWQG	Canadian Water Quality Guidelines
BOLD	Exceeds PWQO
ITALICS	Exceeds APV
UNDERLINED	Exceeds CWQG
INSV	Insufficient volume to allow for sampling

TABLE 20
Surface Water Quality Results - SW2
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation													PWQO	APV	CWQG
		Sample Collection Date (dd/mm/yyyy)															
		SW2															
		30-May-13	**24-Oct-13**	**8-May-14**	**30-Oct-14**	**13-May-15**	**22-Oct-15**	**10/13/2016 (DRY)**	**18-May-17**	**25-Oct-17**	**2-May-18**	**17-Oct-18**	**11-Jun-19**	**26-Sep-19**			
pH Lab	pH Units	7.2	**6.3**	6.8	6.5	**6.1**	6.8	-	7.2	7.4	**6.4**	6.7	6.72	6.43	6.5-8.5	-	6.5-9.0
Conductivity	µS/cm	68	34	82	47	37	100	-	112	122	29	58	62	105	-	-	-
Hardness	mg/L	19	11	23	13	12	34	-	29	26	8	19	19.8	28.4	-	-	-
Total Dissolved Solids	mg/L	52	40	62	24	38	84	-	102	26	18	42	40	66	-	-	-
Alkalinity	mg/L	12	3	12	6.8	4.2	14	-	21	40	<5	12	8	7	-	-	-
Alkalinity Bicarbonate		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride	mg/L	6	3	8	5	4	12	-	9	7	3	6	6.99	11.1	-	180	120
Sodium	mg/L	4.2	1.7	5.3	2.8	1.9	5.1	-	4.62	4.81	1.39	2.65	3.16	4.63	-	180	-
Calcium	mg/L	5.9	2.9	7.1	4.5	3.3	8.9	-	8.85	10.2	2.53	5.68	6.02	8.65	-	-	-
Magnesium	mg/L	1.2	0.66	1.4	0.94	0.69	2.4	-	1.76	<2.0	0.515	1.2	1.15	1.65	-	-	-
Potassium	mg/L	*1.9*	*0.75*	*1.9*	*1.2*	*0.81*	*3.1*	-	*2.12*	*2.53*	*0.616*	*1.02*	*1.19*	*1.55*	-	0.039	-
Sulphate	mg/L	7	4	9	4	4	11	-	13	9	4	7	4.74	10.6	-	-	-
Ammonia	mg/L	0.43	<0.05	0.27	0.13	<0.05	<0.05	-	0.35	1.42	0.06	0.03	0.19	0.12	-	-	-
Un-ionized Ammonia		0.0035	0	0.0003	0.0001	0.0002	0	-	0.003	0.018	0.0001	0.0001	-	-	-	-	-
Nitrate as N	mg/L	0.29	<0.1	0.53	0.15	0.17	0.14	-	0.7	0.2	0.2	0.3	0.21	0.17	-	-	13
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	0.06
Total Kjeldahl Nitrogen	mg/L	1.1	0.45	0.53	0.4	<0.5	0.18	-	0.6	1.4	0.2	0.2	0.43	0.41	-	-	-
Phenolics	mg/L	**0.0012**	<0.001	<0.001	0.001	<0.001	<0.001	-	<0.001	**0.002**	<0.001	<0.001	<0.001	**0.002**	0.001	0.9610	0.004
Dissolved Organic Carbon	mg/L	6.6	6.6	4.4	0.26	5.5	6.3	-	5.4	7	7.7	4.8	6.4	9.8	-	-	-
Chemical Oxygen Demand	mg/L	21	19	12	11	9.1	7.4	-	29	16	13	21	16	22	-	-	-
Biological Oxygen Dema-	mg/L	<2	<2	<2	<2	<2	<2	-	<2	<2	<2	<2	<5	<5	-	-	-
Iron	mg/L	0.26	**0.34**	0.14	**0.5**	**0.59**	**1.40**	-	<0.1	**0.39**	0.30	0.16	0.151	0.088	0.30	-	0.30
Manganese	mg/L	0.044	0.056	0.04	0.11	0.11	0.12	-	0.031	1.29	0.048	1.2	0.070	0.030	-	-	-
Phosphorus	mg/L	0.007	0.011	0.008	0.018	0.01	0.017	-	<0.01	0.01	<0.01	<0.01	0.02	<0.02	0.03	-	-
Orthophosphate	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-		<0.10	-	-	-
Total Suspended Solids	mg/L	<10	<10	<10	<10	4	20	-	<2	11	6	<2	<10	<10	-	-	-
Anion Sum		0.577	0.229	0.7	0.358	0.286	0.847	-	1.02	1.19	0.26	0.58	-	-	-	-	-
Cation Sum		0.652	0.337	0.775	0.431	0.356	1.03	-	0.84	0.94	0.24	0.52	-	-	-	-	-
Ion Balance	%	NC	NC	-	NC	NC	NC	-	-9.6	N/A	-3.3	-5.1	-	-	-	-	-
Silver	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.1	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.00012	0.00025
Aluminum	mg/L	**0.16**	**0.25**	**0.18**	**0.26**	**0.40**	**0.89**	-	**0.082**	0.042	**0.12**	**0.12**	**0.110**	**0.099**	0.075	-	0.1
Antimony	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.003	0.02	1.6	-
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.10	0.15	0.01
Barium	mg/L	0.032	0.02	0.038	0.025	0.022	0.044	-	0.04	0.171	0.015	0.024	0.027	0.037	-	2.3	-
Beryllium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	1.1	0.0053	-
Bismuth	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	-	-	-
Boron	mg/L	0.044	<0.01	0.048	0.04	0.018	0.053	-	0.07	**0.61**	0.021	0.027	0.028	0.043	0.20	3.55	1.50
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00020	0.00021	0.00026
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	0.0089	0.064	0.001
Cobalt	mg/L	0.00053	0.00052	<0.0005	0.00087	**0.0012**	**0.0011**	-	<0.0005	**0.0032**	<0.0005	<0.0005	<0.0005	<0.0005	0.0009	0.0052	-
Copper	mg/L	<0.001	0.0013	0.001	<0.001	0.0012	0.0025	-	0.0006	0.0048	<0.0005	0.0006	<0.001	<0.003	0.005	0.0069	0.004
Molybdenum	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	-	<0.0005	0.0015	<0.0005	<0.0005	<0.002	<0.002	0.04	0.73	0.073
Nickel	mg/L	0.0011	0.0011	0.0022	0.0011	0.0017	0.0012	-	0.001	0.001	<0.001	<0.001	<0.003	<0.003	0.025	0.039	0.15
Phosphate	mg/L	-	-	-	-	-	-	-	<0.2	<0.2	<0.0002	<0.0002	<0.10	-	-	-	-
Lead	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.00051	0.0013	-	<0.0001	<0.0001	0.0002	0.0001	<0.001	<0.001	0.005	0.002	0.007
Selenium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-	<0.001	0.001	<0.001	<0.001	<0.004	<0.004	0.1	0.005	0.001
Sillicon	mg/L	2.5	2.6	2.6	3.8	2.2	5.1	-	2.27	3.55	1.72	2.43	2.31	3.47	-	-	-
Tin	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-	-	-
Strontium	mg/L	0.049	0.027	0.061	0.035	0.029	0.073	-	0.076	0.528	0.02	0.047	0.045	0.074	-	-	-
Titanium	mg/L	<0.005	<0.005	<0.005	0.0054	0.013	0.075	-	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	-	-	-
Uranium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	<0.0001	0.0033	<0.0001	<0.0001	<0.002	<0.002	0.005	0.033	0.015
Vanadium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	0.00071	0.0018	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.002	0.006	0.02	-
Zinc	mg/L	0.0084	0.016	0.0099	0.013	0.0078	0.01	-	0.007	0.009	0.01	0.012	0.008	0.007	0.03	0.089	0.093
Dissolved Mercury		-	-	-	-	-	-	-	-	-	-	-	-	-	0.0002	0.00077	0.000026
Field Measurements																	
Temperature	oC	13.9	5.4	9	5.5	9.4	7.2	-	16.6	-	9.2	6.9	13.1	10.9			
pH	pH Units	7.52	**6.49**	6.74	6.83	7.45	6.57	-	7.68	-	**9.16**	7.18	6.9	6.20			
Coductivity	uS/cm	48	21	80	27	17	85	-	0.12	-	1.55	0.07	67.6	416.30			
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	122.9	148.4			
Dissolved Oxygen	mg/L	7.47	12.16	8.17	11.71	11.28	11.86	-	-	-	-	-	9.1	1.23			

Notes:

PWQO	Provincial Water Quality Objective
APV	Aquatic Protection Values
CWQG	Canadian Water Quality Guidelines
BOLD	Exceeds PWQO
ITALICS	Exceeds APV
UNDERLINED	Exceeds CWQG
INSV	Insufficient volume to allow for sampling
NC	Not Calculated
CNL	Could Not Locate
LS	Limited Sample
Units	All Units in mg/L Unless Otherwise Noted.

TABLE 21
Surface Water Quality Results - SW3
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	Sample Designation																PWQO	APV	CWQG
		Sample Collection Date (dd/mm/yyyy)																		
		SW3																		
		9-May-12	4-Oct-12	30-May-13	24-Oct-13	8-May-14	30-Oct-14	13-May-15	22-Oct-15	13-Oct-16	18-May-17	25-Oct-17	2-May-18	19-Jun-18	17-Oct-18	11-Jun-19	26-Sep-19			
pH lab	pH Units	7.2	7.3	7.8	6.6	7.5	6.9	**6.4**	7.6	7.0	7.3	6.8	7.1	7.1	7.0	7.34	6.79	6.5-8.5	-	6.5-9.0
Conductivity	uS/cm	180	250	230	34	220	87	47	240	321	318	74	69	-	86	114	397	-	-	-
Hardness	mg/L	42	61	55	10	57	21	14	76	88	95	20	17	-	25	35.6	96.6	-	-	-
Total Dissolved Solids	mg/L	82	138	128	14	124	64	18	146	186	216	34	24	174	26	52	198	-	-	-
Alkalinity, total	mg/L	55	71	76	7	64	28	10	67	89	102	13	23	-	30	37	38	-	-	-
Alkalinity Bicarbonate	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	108	-	-	-	-	-	-
Chloride	mg/L	12	16	12	2	12	4	3	21	27	18	6	5	27	7	5.88	29.2	-	180	120
Sodium	mg/L	14	15	15	1.6	13	4.9	2.3	12	10.9	14.3	2.84	2.96	-	3.29	4.83	16.8	-	180	-
Calcium	mg/L	15	21	18	3	17	7	3.9	22	28.7	29.2	6.15	5.25	-	7.71	11.3	30.8	-	-	-
Magnesium	mg/L	2.6	3.6	3.2	0.62	3.2	1.4	0.8	3.9	4.09	5.27	1.24	0.993	-	1.3	1.79	4.77	-	-	-
Potassium	mg/L	*8.4*	*13*	*9.5*	*1.2*	*7.4*	*3.2*	*1.3*	*10*	*8.55*	*8.66*	*1.37*	*1.69*	-	*2.22*	*2.88*	*9.14*	-	0.039	-
Sulphate	mg/L	8	8	12	2	17	4	4	8	14	31	8	3	16	3	6.70	75.5	-	-	-
Ammonia as N	mg/L	1.6	1.3	3.8	0.2	2.6	1.2	0.1	1.7	2.1	4.1	0.1	1.3	1.7	0.5	1.31	1.65	-	-	-
Un-ionized Ammonia	mg/L	0.0032	0.1862	0.0028	0.0009	0.0025	0.0013	0	0.0013	0.009	0.038	0.0005	0.0077	-	0.0027	-	-	-	-	-
Nitrate as N	mg/L	1.30	2.60	0.62	0.27	1.21	0.32	0.27	1.53	2.80	1.10	0.70	0.20	1.54	0.40	0.16	1.10	-	-	13
Nitrite as N	mg/L	0.080	0.160	0.032	<0.01	<0.01	0.025	<0.01	0.013	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-	0.06
Total Kjeldahl Nitrogen	mg/L	2.2	2.5	4.4	0.8	2.8	1.4	0.57	2.1	2.6	4.3	0.3	1.3	2.1	0.8	1.49	2.12	-	-	-
Phenolics	mg/L	**0.0013**	<0.001	**0.0014**	<0.001	<0.001	**0.0018**	<0.001	<0.001	0.0040	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.9610	0.004
Dissolved Organic Carbon	mg/L	6.3	6.2	7.5	5.4	6.4	5.2	4.6	5.3	7.4	7	6.6	7.6	-	4	4.2	7.2	-	-	-
Chemical Oxygen Demand	mg/L	25	24	21	20	17	15	11	7.4	48	33	17	<10	26	18	7	17	-	-	-
Biological Oxygen Demand	mg/L	<2	6	<2	<2	<2	<2	<2	<2	11	<2	<2	<2	<5	<2	<5	<5	-	-	-
Iron	mg/L	**0.62**	**0.40**	**0.33**	**0.83**	**0.31**	**1.00**	**0.64**	0.24	**1.23**	<0.1	0.2	**1.70**	0.013	**5.60**	**0.411**	**5.82**	0.30	-	0.30
Manganese	mg/L	0.25	0.91	0.5	0.072	0.23	0.23	0.063	0.56	3.03	1.72	0.069	0.57	-	0.46	0.613	5.49	-	-	-
Phosphorus, total	mg/L	0.03	0.011	0.008	0.023	0.003	0.028	0.016	0.009	0.03	<0.01	<0.01	<0.01	<0.02	0.01	0.02	0.02	0.03	-	-
Orthophosphate	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-	-	-	-	<0.10	-	-	-
Total Suspended Solids	mg/L	<10	<10	<10	11	<10	10	<1	<10	65	6	14	39	<10	21	<10	30	-	-	-
Anion Sum		1.71	2.26	2.13	0.257	2.06	0.786	0.388	2.19	3.03	3.27	0.66	0.67	-	0.89	-	-	-	-	-
Cation Sum		1.7	2.19	2.19	0.35	2.14	0.794	0.452	2.44	2.46	2.73	0.57	0.52	-	0.69	-	-	-	-	-
Ion Balance	%	NC	NC	NC	NC	NC	NC	NC	NC	-10.3	-8.9	N/A	<0.1	-	-12.7	-	-	-	-	-
Silver	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.1	<0.0001	-	<0.0001	<0.0001	<0.0001	0.0001	0.00012	0.00025
Aluminum	mg/L	**0.170**	**0.130**	**0.086**	**0.160**	**0.082**	**0.150**	**0.100**	**0.076**	0.019	**0.190**	**0.096**	0.025	-	0.071	0.035	0.016	0.075	-	0.1
Antimony	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0087	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.001	<0.003	0.02	1.6	-
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.003	<0.003	0.10	0.15	0.01
Barium	mg/L	0.063	0.095	0.069	0.017	0.074	0.033	0.021	0.082	0.13	0.085	0.028	0.029	0.061	0.022	0.033	0.154	-	2.3	-
Beryllium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.0005	<0.001	1.1	0.0053	-
Bismuth	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.035	<0.001	<0.001	<0.001	-	<0.001	<0.002	<0.002	-	-	-
Boron	mg/L	0.17	0.19	**0.210**	0.011	0.18	0.071	0.03	0.15	0.18	**0.22**	0.06	0.04	**0.26**	0.034	0.075	**0.232**	0.20	3.55	1.50
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.00020	0.00021	0.00026
Chromium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.003	<0.001	<0.003	<0.003	0.0089	0.064	0.001
Cobalt	mg/L	**0.00230**	**0.00410**	**0.00170**	**0.00096**	**0.00092**	**0.0024**	**0.0010**	**0.0022**	*0.0117*	**0.0021**	<0.0005	**0.0034**	-	**0.0016**	**0.0021**	*0.0166*	0.0009	0.0052	-
Copper	mg/L	0.0025	0.0024	0.0035	<0.001	0.0029	0.0012	<0.001	0.0022	0.00380	0.0023	<0.0005	<0.0005	<0.002	0.0009	0.001	0.004	0.005	0.0069	0.004
Molybdenum	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0093	<0.0005	<0.0005	<0.0005	-	<0.0005	<0.002	<0.002	0.04	0.73	0.073
Nickel	mg/L	0.0013	0.0013	0.0018	0.0011	<0.001	<0.001	<0.001	<0.001	<0.005	0.001	<0.001	0.001	-	<0.001	<0.003	<0.003	0.025	0.039	0.15
Phosphate as P	mg/L	-	-	-	-	-	-	-	-	<0.0002	<0.2	<0.2	<0.2	-	<0.2	<0.10	-	-	-	-
Lead	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0014	<0.0001	<0.0001	0.0005	<0.001	0.0003	<0.001	<0.001	0.005	0.002	0.007
Selenium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.001	<0.001	<0.001	-	<0.001	<0.004	<0.004	0.1	0.005	0.001
Silicon	mg/L	2.8	4.3	2.8	1.4	2.6	2.1	1.3	3.9	18.2	2.9	2.71	1.36	-	1.17	1.44	4.79	-	-	-
Tin	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.025	<0.005	<0.005	<0.005	-	<0.005	<0.002	<0.002	-	-	-
Strontium	mg/L	0.11	0.15	0.12	0.023	0.13	0.049	0.029	0.15	0.195	0.187	0.049	0.038	-	0.054	0.069	0.218	-	-	-
Titanium	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0059	<0.025	<0.005	<0.005	<0.005	-	<0.005	<0.002	0.009	-	-	-
Uranium	mg/L	0.00019	0.00013	0.00042	<0.0001	0.00031	0.00011	<0.0001	0.00013	0.0008	0.0004	<0.0001	0.0001	-	<0.0001	<0.002	<0.002	0.005	0.033	0.015
Vanadium	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0025	0.0013	<0.0005	<0.0005	-	<0.0005	<0.002	<0.002	0.006	0.02	-
Zinc	mg/L	0.0065	0.0074	0.0054	0.0067	<0.005	0.0071	<0.005	<0.005	<0.025	<0.005	0.009	0.007	<0.005	0.007	0.006	0.012	0.03	0.089	0.093
Dissolved Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	0.0002	0.00077	0.000026
Field Measurements																				
Temperature	oC	10.5	11.6	10.8	4.2	7.7	4.6	7.8	7.6	8.4	16.2	-		13.7	7	13.1	11.8			
pH	pH Units	7.02	8.9	6.56	7.58	6.8	6.94	6.28	6.68	5.83	6.89	-	-	6.4	7.13	6.57	6.55			
Coductivity	uS/cm	169	248	173	20	201	68	30	176	328	0.33	-	-	24.3	0.09	126.3	262.4			
Oxidation Reduction Potential	mV	-	-	-	-	-	-	-	-	-	-	-	-		-	186.3	428			
Dissolved Oxygen	mg/L	5.87	4.84	8.69	12.67	6.31	10.96	11.59	5.55	-	-	-	-	9.76	-	5.65	4.71			

Notes:

PWQO	Provincial Water Quality Objective
APV	Aquatic Protection Values
CWQG	Canadian Water Quality Guidelines
BOLD	Exceeds PWQO
ITALICS	Exceeds APV
UNDERLINED	Exceeds CWQG
INSV	Insufficient volume to allow for sampling

TABLE 22
Groundwater Duplicate Data
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	RDL	PQL	11-Jun-19						26-Sep-19					
				BH7-II	GW DUP 1	Relative Percent Difference (%)	BH5-II	GW DUP 2	Relative Percent Difference (%)	BH6-III	GW DUP 1	Relative Percent Difference (%)	BH7-II	GW DUP 2	Relative Percent Difference (%)
pH Lab	pH Units	NA		6.34	6.37	0.47	6.94	7.03	1.29	6.99	7.13	1.98	5.92	5.72	3.44
Conductivity	µS/cm	2	10	34	32	6.06	245	242	1.23	465	463	0.43	32	30	6.45
Hardness	mg/L	0.5	2.5	9.20	8.40	9.09	96.00	95.10	0.94	158	155	1.92	7.20	7.10	1.40
Total Dissolved Solids	mg/L	20	100	28	<20	NC	176	156	12.05	232	242	4.22	36	50	NC
Alkalinity	mg/L	5	25	7	7	NC	57	55	3.57	101	101	0.00	<5	<5	NC
Chloride	mg/L	0.20	1	0.49	0.44	NC	6.9	6.92	0.29	12.9	12.8	0.78	0.22	0.26	NC
Sodium	mg/L	0.05	0.25	2.35	2.3	2.15	9.07	9	0.77	13.2	12.9	2.30	1.42	1.88	27.88
Calcium	mg/L	0.05	0.25	2.07	1.86	10.69	26.7	26.5	0.75	47.5	46.3	2.56	1.58	1.54	2.56
Magnesium	mg/L	0.05	0.25	0.97	0.9	7.49	7.13	7.02	1.55	9.6	9.47	1.36	0.8	0.78	2.53
Potassium	mg/L	0.05	0.25	1.42	1.37	3.58	3.94	3.88	1.53	7.47	7.2	3.68	0.58	0.59	1.71
Sulphate	mg/L	0.20	1	5.68	5.74	1.05	45.5	45.1	0.88	66.8	67.1	0.45	1.98	2.43	20.41
Ammonia	mg/L	0.2	1	0.11	0.08	NC	0.31	0.31	NC	0.79	0.82	NC	0.13	0.18	NC
Nitrate as N	mg/L	0.10	0.5	0.06	0.06	NC	1.68	1.7	1.18	3.36	3.33	0.90	1.64	1.59	3.10
Nitrite as N	mg/L	0.10	0.5	<0.05	<0.05	NC	0.15	0.19	NC	<0.05	<0.05	NC	<0.05	<0.05	NC
Total Kjeldahl Nitrogen	mg/L	0.10	0.5	0.16	0.13	NC	0.72	0.68	5.71	1.3	1.22	6.35	0.56	0.78	32.84
Phenolics	mg/L	0.001	0.005	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC
Dissolved Organic Carbon	mg/L	0.5	2.5	3.1	3.2	3.17	2.8	3	6.90	5.3	5.4	1.87	4.2	7.8	**60.00**
Chemical Oxygen Demand	mg/L	5	25	<5	<5	NC	<5	<5	NC	12	10	NC	<5	33	NC
Iron	mg/L	0.010	0.05	<0.010	<0.010	NC	<0.010	<0.010	NC	<0.010	<0.010	NC	0.054	0.391	**151.46**
Manganese	mg/L	0.002	0.01	0.01	0.01	0.00	0.139	0.135	2.92	0.615	0.629	2.25	0.022	0.03	30.77
Phosphorus	mg/L	0.02	0.1	0.78	0.68	13.70	1.05	1.12	6.45	0.12	0.13	8.00	0.62	3.57	**140.81**
Turbidity	NTU	0.5	2.5	2300	2480	7.53	258	242	6.40	24.5	23	6.32	2470	3550	35.88
Total Suspended Solids	mg/L	10	50	4160	3760	10.10	1730	1520	12.92	66	107	47.40	2290	3740	48.09
BOD	mg/L	5	25	<5	<5	NC	<5	<5	NC	<5	<5	NC	<5	<5	NC
Silver	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC
Aluminum	mg/L	0.004	0.02	0.046	0.04	13.95	0.017	0.018	NC	0.015	0.019	NC	0.151	0.342	**77.48**
Antimony	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC	<0.003	<0.003	NC	<0.003	<0.003	NC
Arsenic	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC	<0.003	<0.003	NC	<0.003	<0.003	NC
Barium	mg/L	0.002	0.01	0.014	0.014	0.00	0.091	0.09	1.10	0.124	0.123	0.81	0.014	0.02	35.29
Beryllium	mg/L	0.001	0.005	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC
Bismuth	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC
Boron	mg/L	0.010	0.05	0.01	<0.010	NC	0.215	0.2	7.23	0.341	0.321	6.04	0.029	0.016	NC
Cadmium	mg/L	0.001	0.005	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC
Chromium	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC	<0.003	<0.003	NC	<0.003	<0.003	NC
Cobalt	mg/L	0.001	0.005	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	0.001	NC
Copper	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC	0.007	0.007	NC	<0.003	<0.003	NC
Molybdenum	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC
Nickel	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC	0.005	0.005	NC	<0.003	<0.003	NC
Phosphate	mg/L	0.20	1	<0.10	<0.10	NC	<0.10	<0.10	NC	<0.10	<0.10	NC	<0.10	<0.10	NC
Lead	mg/L	0.001	0.005	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	<0.001	NC	<0.001	0.001	NC
Selenium	mg/L	0.004	0.02	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC	<0.004	<0.004	NC
Tin	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC
Strontium	mg/L	0.005	0.025	0.018	0.017	NC	0.198	0.191	3.60	0.292	0.296	1.36	0.017	0.02	NC
Titanium	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC	0.006	0.014	NC
Uranium	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC
Vanadium	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC	<0.002	<0.002	NC
Zinc	mg/L	0.005	0.025	<0.005	<0.005	NC	<0.005	<0.005	NC	0.005	0.006	NC	0.006	0.005	NC

Notes:

NC — Not calculable due to one or more of the concentrations being quantified over the reasonable detection limit (RDL) or the practical quantification limit (PQL).

BOLD — Bolded and shaded entries indicates that the relative percent difference (RPD) exceeds the industry standard of 50%.

TABLE 23
Surface Water Duplicate Data
Chapman Waste Disposal Site
Magnetawan, Ontario

Parameter	Units	RDL	PQL	11-Jun-19			26-Sep-19		
				SW2	SW DUP	Relative Percent Difference (%)	SW1	SW DUP	Relative Percent Difference (%)
pH	pH Units	NA		6.72	6.76	0.59	3.97	5.4	30.52
Electrical Conductivity	µS/cm	2	10	62	61	1.63	118	76	43.30
Total Hardness (as CaCO3) (Calculated)	mg/L	0.5	2.5	19.80	19.70	0.51	17.80	17.90	0.56
Total Dissolved Solids	mg/L	20	100	40	46	NC	54	68	NC
Alkalinity (as CaCO3)	mg/L	5	25	8	9	NC	<5	<5	NC
Chloride	mg/L	0.10	0.5	6.99	6.88	1.59	11.7	11.3	3.48
Sodium	mg/L	0.05	0.25	3.16	3.13	0.95	3.51	3.48	0.86
Calcium	mg/L	0.05	0.25	6.02	5.99	0.50	5.51	5.48	0.55
Magnesium	mg/L	0.05	0.25	1.15	1.15	0.00	0.99	1.02	2.99
Potassium	mg/L	0.05	0.25	1.19	1.17	1.69	0.8	0.73	9.15
Sulphate	mg/L	0.10	0.5	4.74	4.92	3.73	13.8	5.38	**87.80**
Ammonia as N	mg/L	0.02	0.1	0.19	0.16	17.14	0.08	0.15	NC
Nitrate as N	mg/L	0.05	0.25	0.21	0.22	NC	<0.05	<0.05	NC
Nitrite as N	mg/L	0.05	0.25	<0.05	<0.05	NC	<0.05	<0.05	NC
Total Kjeldahl Nitrogen	mg/L	0.10	0.5	0.43	0.4	NC	0.38	0.46	NC
Phenols	mg/L	0.001	0.005	<0.001	<0.001	NC	0.003	0.004	NC
Dissolved Organic Carbon	mg/L	0.5	2.5	6.4	6.8	6.06	13.2	13.3	0.75
Chemical Oxygen Demand	mg/L	5	25	16	9	NC	31	35	12.12
BOD (5)	mg/L	5	25	<5	<5	NC	<5	<5	NC
Iron	mg/L	0.010	0.05	0.151	0.126	18.05	0.383	0.371	3.18
Manganese	mg/L	0.002	0.01	0.07	0.063	10.53	0.07	0.069	1.44
Total Phosphorus	mg/L	0.02	0.1	0.02	0.02	NC	0.02	0.02	NC
Total Suspended Solids	mg/L	10	50	<10	<10	NC	<10	24	NC
Silver	mg/L	0.0001	0.0005	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Aluminum-dissolved	mg/L	0.004	0.02	0.11	0.107	2.76	0.22	0.216	1.83
Antimony	mg/L	0.003	0.015	<0.001	<0.001	NC	<0.003	<0.003	NC
Arsenic	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC
Barium	mg/L	0.002	0.01	0.027	0.028	3.64	0.035	0.035	0.00
Beryllium	mg/L	0.001	0.005	<0.0005	<0.0005	NC	<0.001	<0.001	NC
Bismuth	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC
Boron	mg/L	0.010	0.05	0.028	0.028	NC	0.01	0.016	NC
Cadmium	mg/L	0.0001	0.0005	<0.0001	<0.0001	NC	<0.0001	<0.0001	NC
Chromium	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC
Cobalt	mg/L	0.0005	0.0025	<0.0005	<0.0005	NC	0.0014	0.0014	NC
Copper	mg/L	0.003	0.015	<0.001	<0.001	NC	<0.003	<0.003	NC
Molybdenum	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC
Nickel	mg/L	0.003	0.015	<0.003	<0.003	NC	<0.003	<0.003	NC
Ortho Phosphate as P	mg/L	0.10	0.5	<0.10	<0.10	NC	<0.10	<0.10	NC
Lead	mg/L	0.001	0.005	<0.001	<0.001	NC	<0.001	<0.001	NC
Selenium	mg/L	0.004	0.02	<0.004	<0.004	NC	<0.004	<0.004	NC
Silicon	mg/L	0.05	0.25	2.31	2.24	3.08	2.79	2.78	0.36
Tin	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC
Strontium	mg/L	0.005	0.025	0.045	0.045	0.00	0.061	0.062	1.63
Titanium	mg/L	0.002	0.01	<0.002	<0.002	NC	0.003	0.003	NC
Uranium	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC
Vanadium	mg/L	0.002	0.01	<0.002	<0.002	NC	<0.002	<0.002	NC
Zinc	mg/L	0.005	0.025	0.008	0.007	NC	0.016	0.016	NC

Notes:

NC — Not calculable due to one or more of the concentrations being quantified over the reasonable detection limit (RDL) or the practical quantification limit (PQL).

BOLD — Bolded and shaded entries indicates that the relative percent difference (RPD) exceeds the industry standard of 50%.

APPENDIX IV

Photoplates

	**BH1**

	**BH1**

	**BH2**

	**BH2**

	**BH3-II**

	**BH3-II**

	**BH4**

	**BH4**

	**BH4-II**

	**BH4-II**

	**BH5-II**

	**BH5-II**

	**BH6-II**

	**BH6-II**

	**BH6-III**

	**BH6-III**

BH7-II

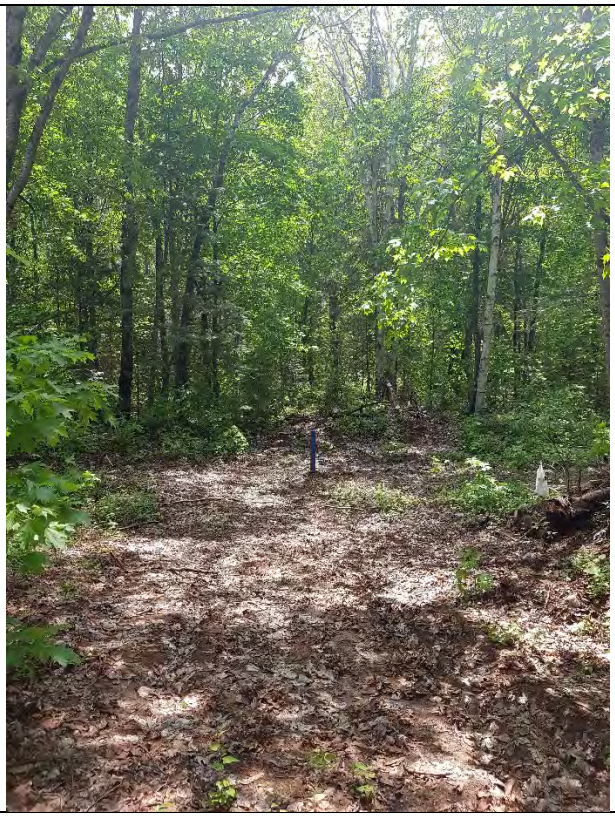
BH7-II

	**BH8-I**

	**BH8-I**

	**BH9-I**

	**BH9-I**

	**BH10-I**
	**BH10-I**

	**BH11**

	**BH11**

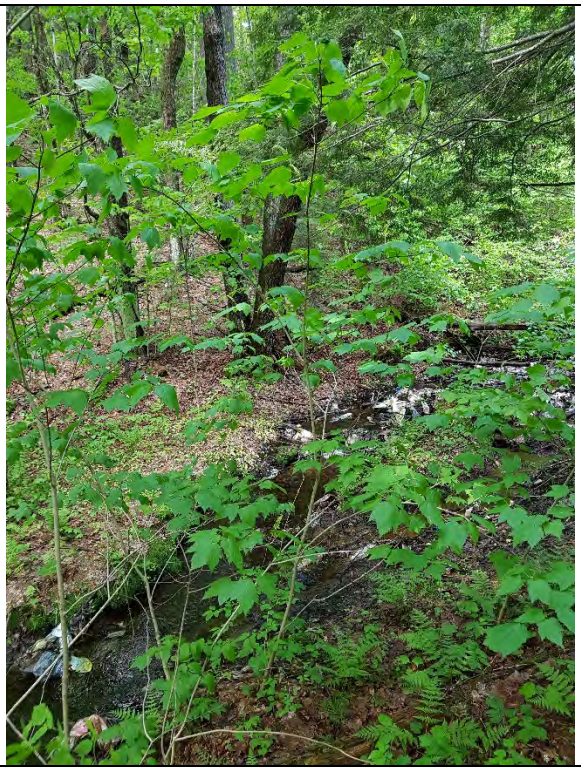
	**SW1**

	**SW1**

	**SW2**

	**SW2**

	**SW3**

	**SW3**

APPENDIX V

Laboratory Certificates of Analysis

AGAT Laboratories

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

CLIENT NAME: PINCHIN LTD.
957 CAMBRIAN HEIGHTS DRIVE, UNIT 203
SUDBURY, ON P3C 5S5
(705) 521-0560

ATTENTION TO: Ryan Lawrence

PROJECT: 225335 Chapman Landfill GW & SW

AGAT WORK ORDER: 19T479294

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Jun 27, 2019

PAGES (INCLUDING COVER): 21

VERSION*: 1

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

*NOTES

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

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

SAMPLE DESCRIPTION:					BH-1	BH-2		BH-3-II		BH-4	BH-4-II
SAMPLE TYPE:					Water	Water		Water		Water	Water
DATE SAMPLED:					2019-06-11	2019-06-11		2019-06-11		2019-06-11	2019-06-11
Parameter	Unit	G / S: A	G / S: B	RDL	274647	274668	RDL	274669	RDL	274670	274671
BOD (5)	mg/L			5	<5	<5	5	<5	5	<5	<5
Electrical Conductivity	µS/cm			2	653	596	2	56	2	730	768
pH	pH Units		6.5-8.5	NA	7.44	7.48	NA	6.58	NA	7.56	7.46
Total Hardness (as CaCO3)	mg/L		80-100	0.5	230	239	0.5	4.9	0.5	350	342
Total Dissolved Solids	mg/L		500	20	310[<B]	312[<B]	20	84[<B]	20	484[<B]	570[>B]
Total Suspended Solids	mg/L			10	<10	289	10	7390	10	172	242
Alkalinity (as CaCO3)	mg/L		30-500	5	260	230	5	18	5	184	191
Chloride	mg/L		250	0.20	30.6[<B]	26.2[<B]	0.10	1.54[<B]	0.20	5.67[<B]	7.09[<B]
Nitrate as N	mg/L	10.0		0.10	<0.10[<A]	<0.20[<A]	0.05	0.10[<A]	0.10	15.2[>A]	28.7[>A]
Nitrite as N	mg/L	1.0		0.10	<0.10[<A]	<0.20[<A]	0.05	<0.05[<A]	0.10	<0.10[<A]	<0.10[<A]
Sulphate	mg/L		500	0.20	32.1[<B]	46.7[<B]	0.10	5.64[<B]	0.20	137[<B]	91.9[<B]
Phosphate as P	mg/L			0.20	<0.20	<0.40	0.10	<0.10	0.20	<0.20	<0.20
Ammonia as N	mg/L			0.2	7.2	5.86	0.02	<0.02	0.02	0.09	0.54
Total Kjeldahl Nitrogen	mg/L			0.10	7.46	6.63	0.10	0.57	0.10	1.10	<0.10
Total Phosphorus	mg/L			0.02	0.02	0.46	0.2	12.2	0.02	0.12	0.12
Chemical Oxygen Demand	mg/L			5	26	25	5	29	5	22	16
Dissolved Organic Carbon	mg/L		5	0.5	8.9[>B]	11.0[>B]	0.5	5.6[>B]	0.5	8.7[>B]	10.7[>B]
Phenols	mg/L			0.001	0.001	0.002	0.001	0.001	0.001	<0.001	<0.001
Turbidity	NTU		5	0.5	1.9[<B]	52.0[>B]	0.5	1140[>B]	0.5	30.5[>B]	79.7[>B]
Calcium	mg/L			0.05	78.6	72.7	0.05	1.53	0.05	123	117
Magnesium	mg/L			0.05	8.27	13.9	0.05	0.26	0.05	10.3	12.0
Sodium	mg/L	20	200	0.05	31.3[A-B]	27.4[A-B]	0.05	11.7[<A]	0.05	11.6[<A]	16.0[<A]
Potassium	mg/L			0.05	12.5	11.9	0.05	0.54	0.05	12.4	16.3
Aluminum	mg/L		0.1	0.004	0.022[<B]	0.024[<B]	0.004	0.078[<B]	0.004	0.018[<B]	0.025[<B]
Antimony	mg/L	0.006		0.003	<0.003[<A]	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]	<0.003[<A]
Arsenic	mg/L	0.010		0.003	<0.003[<A]	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]	<0.003[<A]
Barium	mg/L	1		0.002	0.165[<A]	0.216[<A]	0.002	0.006[<A]	0.002	0.126[<A]	0.130[<A]
Beryllium	mg/L			0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001
Bismuth	mg/L			0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Boron	mg/L	5		0.010	0.551[<A]	0.419[<A]	0.010	0.020[<A]	0.010	0.397[<A]	0.519[<A]

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

SAMPLE DESCRIPTION:					BH-1	BH-2		BH-3-II		BH-4	BH-4-II
SAMPLE TYPE:					Water	Water		Water		Water	Water
DATE SAMPLED:					2019-06-11	2019-06-11		2019-06-11		2019-06-11	2019-06-11
Parameter	Unit	G / S: A	G / S: B	RDL	274647	274668	RDL	274669	RDL	274670	274671
Cadmium	mg/L	0.005		0.001	<0.001[<A]	<0.001[<A]	0.001	<0.001[<A]	0.001	<0.001[<A]	<0.001[<A]
Chromium	mg/L	0.05		0.003	<0.003[<A]	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]	<0.003[<A]
Cobalt	mg/L			0.001	0.008	0.008	0.001	<0.001	0.001	<0.001	0.002
Copper	mg/L		1	0.003	0.010[<B]	<0.003[<B]	0.003	<0.003[<B]	0.003	0.005[<B]	0.009[<B]
Iron	mg/L		0.3	0.010	<0.010[<B]	9.71[>B]	0.010	<0.010[<B]	0.010	<0.010[<B]	<0.010[<B]
Lead	mg/L	0.01		0.001	<0.001[<A]	<0.001[<A]	0.001	<0.001[<A]	0.001	<0.001[<A]	<0.001[<A]
Manganese	mg/L		0.05	0.002	2.47[>B]	4.06[>B]	0.002	0.022[<B]	0.002	<0.002[<B]	0.292[>B]
Molybdenum	mg/L			0.002	<0.002	<0.002	0.002	0.006	0.002	<0.002	<0.002
Nickel	mg/L			0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003	<0.003
Selenium	mg/L	0.05		0.004	<0.004[<A]	<0.004[<A]	0.004	<0.004[<A]	0.004	<0.004[<A]	<0.004[<A]
Silver	mg/L			0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Strontium	mg/L			0.005	0.419	0.391	0.005	0.014	0.005	0.395	0.384
Thallium	mg/L			0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006	<0.006
Tin	mg/L			0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Titanium	mg/L			0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Tungsten	mg/L			0.010	<0.010	<0.010	0.010	<0.010	0.010	<0.010	<0.010
Uranium	mg/L	0.02		0.002	0.004[<A]	0.003[<A]	0.002	<0.002[<A]	0.002	0.003[<A]	0.005[<A]
Vanadium	mg/L			0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Zinc	mg/L		5	0.005	<0.005[<B]	<0.005[<B]	0.005	<0.005[<B]	0.005	<0.005[<B]	<0.005[<B]

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

				SAMPLE DESCRIPTION:	BH-5-II	BH-6-III	BH-7-II		BH-8-I		BH-9-I
				SAMPLE TYPE:	Water	Water	Water		Water		Water
				DATE SAMPLED:	2019-06-11	2019-06-11	2019-06-11		2019-06-11		2019-06-11
Parameter	Unit	G / S: A	G / S: B	RDL	274672	274673	274674	RDL	274675	RDL	274676
BOD (5)	mg/L			5	<5	<5	<5	5	9	5	<5
Electrical Conductivity	µS/cm			2	245	309	34	2	376	2	479
pH	pH Units		6.5-8.5	NA	6.94	7.04	6.34	NA	7.16	NA	7.40
Total Hardness (as CaCO3)	mg/L		80-100	0.5	96.0	123	9.2	0.5	135	0.5	197
Total Dissolved Solids	mg/L		500	20	176[<B]	184[<B]	28[<B]	20	200[<B]	20	260[<B]
Total Suspended Solids	mg/L			10	1730	42	4160	10	6680	10	2090
Alkalinity (as CaCO3)	mg/L		30-500	5	57	72	7	5	98	5	152
Chloride	mg/L		250	0.10	6.90[<B]	6.03[<B]	0.49[<B]	0.10	16.8[<B]	0.10	15.5[<B]
Nitrate as N	mg/L	10.0		0.05	1.68[<A]	1.60[<A]	0.06[<A]	0.05	1.98[<A]	0.05	0.92[<A]
Nitrite as N	mg/L	1.0		0.05	0.15[<A]	<0.05[<A]	<0.05[<A]	0.05	0.25[<A]	0.05	<0.05[<A]
Sulphate	mg/L		500	0.10	45.5[<B]	65.7[<B]	5.68[<B]	0.10	55.2[<B]	0.10	65.9[<B]
Phosphate as P	mg/L			0.10	<0.10	<0.10	<0.10	0.10	<0.10	0.10	<0.10
Ammonia as N	mg/L			0.02	0.31	0.30	0.11	0.02	0.26	0.10	3.58
Total Kjeldahl Nitrogen	mg/L			0.10	0.72	0.52	0.16	0.50	6.10	0.10	4.00
Total Phosphorus	mg/L			0.02	1.05	0.25	0.78	0.02	2.98	0.02	2.09
Chemical Oxygen Demand	mg/L			5	<5	<5	<5	10	154	5	35
Dissolved Organic Carbon	mg/L		5	0.5	2.8[<B]	2.9[<B]	3.1[<B]	0.5	4.9[<B]	0.5	6.8[>B]
Phenols	mg/L			0.001	<0.001	<0.001	<0.001	0.001	0.003	0.001	0.002
Turbidity	NTU		5	0.5	258[>B]	36.7[>B]	2300[>B]	0.5	7380[>B]	0.5	4050[>B]
Calcium	mg/L			0.05	26.7	35.9	2.07	0.05	42.3	0.05	63.9
Magnesium	mg/L			0.05	7.13	7.98	0.97	0.05	7.06	0.05	9.19
Sodium	mg/L	20	200	0.05	9.07[<A]	11.0[<A]	2.35[<A]	0.05	14.3[<A]	0.05	11.4[<A]
Potassium	mg/L			0.05	3.94	5.49	1.42	0.05	10.0	0.05	8.04
Aluminum	mg/L		0.1	0.004	0.017[<B]	0.013[<B]	0.046[<B]	0.004	0.033[<B]	0.004	0.017[<B]
Antimony	mg/L	0.006		0.003	<0.003[<A]	<0.003[<A]	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]
Arsenic	mg/L	0.010		0.003	<0.003[<A]	<0.003[<A]	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]
Barium	mg/L	1		0.002	0.091[<A]	0.096[<A]	0.014[<A]	0.002	0.183[<A]	0.002	0.103[<A]
Beryllium	mg/L			0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L			0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Boron	mg/L	5		0.010	0.215[<A]	0.207[<A]	0.010[<A]	0.010	0.230[<A]	0.010	0.344[<A]

Certified By:

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

					SAMPLE DESCRIPTION:	BH-5-II	BH-6-III	BH-7-II		BH-8-I		BH-9-I
					SAMPLE TYPE:	Water	Water	Water		Water		Water
					DATE SAMPLED:	2019-06-11	2019-06-11	2019-06-11		2019-06-11		2019-06-11
Parameter	Unit	G / S: A	G / S: B	RDL		274672	274673	274674	RDL	274675	RDL	274676
Cadmium	mg/L	0.005		0.001		<0.001[<A]	<0.001[<A]	<0.001[<A]	0.001	<0.001[<A]	0.001	<0.001[<A]
Chromium	mg/L	0.05		0.003		<0.003[<A]	<0.003[<A]	<0.003[<A]	0.003	<0.003[<A]	0.003	<0.003[<A]
Cobalt	mg/L			0.001		<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.006
Copper	mg/L		1	0.003		<0.003[<B]	0.006[<B]	<0.003[<B]	0.003	0.004[<B]	0.003	0.004[<B]
Iron	mg/L		0.3	0.010		<0.010[<B]	<0.010[<B]	<0.010[<B]	0.010	<0.010[<B]	0.010	0.133[<B]
Lead	mg/L	0.01		0.001		<0.001[<A]	<0.001[<A]	<0.001[<A]	0.001	<0.001[<A]	0.001	<0.001[<A]
Manganese	mg/L		0.05	0.002		0.139[>B]	0.404[>B]	0.010[<B]	0.002	1.39[>B]	0.002	2.06[>B]
Molybdenum	mg/L			0.002		<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Nickel	mg/L			0.003		<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Selenium	mg/L	0.05		0.004		<0.004[<A]	<0.004[<A]	<0.004[<A]	0.004	<0.004[<A]	0.004	<0.004[<A]
Silver	mg/L			0.002		<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L			0.005		0.198	0.225	0.018	0.005	0.233	0.005	0.275
Thallium	mg/L			0.006		<0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L			0.002		<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L			0.002		<0.002	<0.002	<0.002	0.002	<0.002	0.002	0.002
Tungsten	mg/L			0.010		<0.010	<0.010	<0.010	0.010	<0.010	0.010	<0.010
Uranium	mg/L	0.02		0.002		<0.002[<A]	<0.002[<A]	<0.002[<A]	0.002	<0.002[<A]	0.002	<0.002[<A]
Vanadium	mg/L			0.002		<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L		5	0.005		<0.005[<B]	0.005[<B]	<0.005[<B]	0.005	<0.005[<B]	0.005	<0.005[<B]

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

					SAMPLE DESCRIPTION:	BH-10-I	BH-11	BH-DUP1	BH-DUP2
					SAMPLE TYPE:	Water	Water	Water	Water
					DATE SAMPLED:	2019-06-11	2019-06-11	2019-06-11	2019-06-11
Parameter	Unit	G / S: A	G / S: B	RDL		274677	274678	274679	274680
BOD (5)	mg/L			5		<5	<5	<5	<5
Electrical Conductivity	µS/cm			2		289	82	32	242
pH	pH Units		6.5-8.5	NA		7.08	6.38	6.37	7.03
Total Hardness (as CaCO3)	mg/L		80-100	0.5		115	25.1	8.4	95.1
Total Dissolved Solids	mg/L		500	20		188[<B]	60[<B]	<20[<B]	156[<B]
Total Suspended Solids	mg/L			10		1130	1760	3760	1520
Alkalinity (as CaCO3)	mg/L		30-500	5		47	7	7	55
Chloride	mg/L		250	0.10		4.10[<B]	13.5[<B]	0.44[<B]	6.92[<B]
Nitrate as N	mg/L	10.0		0.05		1.24[<A]	0.40[<A]	0.06[<A]	1.70[<A]
Nitrite as N	mg/L	1.0		0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]	0.19[<A]
Sulphate	mg/L		500	0.10		84.2[<B]	4.93[<B]	5.74[<B]	45.1[<B]
Phosphate as P	mg/L			0.10		<0.10	<0.10	<0.10	<0.10
Ammonia as N	mg/L			0.02		0.11	0.07	0.08	0.31
Total Kjeldahl Nitrogen	mg/L			0.10		0.44	0.18	0.13	0.68
Total Phosphorus	mg/L			0.02		1.73	0.87	0.68	1.12
Chemical Oxygen Demand	mg/L			5		11	<5	<5	<5
Dissolved Organic Carbon	mg/L		5	0.5		5.6[>B]	1.8[<B]	3.2[<B]	3.0[<B]
Phenols	mg/L			0.001		<0.001	<0.001	<0.001	<0.001
Turbidity	NTU		5	0.5		982[>B]	368[>B]	2480[>B]	242[>B]
Calcium	mg/L			0.05		30.2	8.18	1.86	26.5
Magnesium	mg/L			0.05		9.60	1.14	0.90	7.02
Sodium	mg/L	20	200	0.05		9.14[<A]	3.52[<A]	2.30[<A]	9.00[<A]
Potassium	mg/L			0.05		5.52	1.38	1.37	3.88
Aluminum	mg/L		0.1	0.004		0.049[<B]	0.030[<B]	0.040[<B]	0.018[<B]
Antimony	mg/L	0.006		0.003		<0.003[<A]	<0.003[<A]	<0.003[<A]	<0.003[<A]
Arsenic	mg/L	0.010		0.003		<0.003[<A]	<0.003[<A]	<0.003[<A]	<0.003[<A]
Barium	mg/L	1		0.002		0.111[<A]	0.019[<A]	0.014[<A]	0.090[<A]
Beryllium	mg/L			0.001		<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L			0.002		<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5		0.010		0.446[<A]	<0.010[<A]	<0.010[<A]	0.200[<A]

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Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

					SAMPLE DESCRIPTION:	BH-10-I	BH-11	BH-DUP1	BH-DUP2
					SAMPLE TYPE:	Water	Water	Water	Water
					DATE SAMPLED:	2019-06-11	2019-06-11	2019-06-11	2019-06-11
Parameter	Unit	G / S: A	G / S: B	RDL		274677	274678	274679	274680
Cadmium	mg/L	0.005		0.001		<0.001[<A]	<0.001[<A]	<0.001[<A]	<0.001[<A]
Chromium	mg/L	0.05		0.003		<0.003[<A]	<0.003[<A]	<0.003[<A]	<0.003[<A]
Cobalt	mg/L			0.001		0.001	<0.001	<0.001	<0.001
Copper	mg/L		1	0.003		0.008[<B]	<0.003[<B]	<0.003[<B]	<0.003[<B]
Iron	mg/L		0.3	0.010		<0.010[<B]	<0.010[<B]	<0.010[<B]	<0.010[<B]
Lead	mg/L	0.01		0.001		<0.001[<A]	<0.001[<A]	<0.001[<A]	<0.001[<A]
Manganese	mg/L		0.05	0.002		0.067[>B]	0.021[<B]	0.010[<B]	0.135[>B]
Molybdenum	mg/L			0.002		<0.002	<0.002	<0.002	<0.002
Nickel	mg/L			0.003		0.004	<0.003	<0.003	<0.003
Selenium	mg/L	0.05		0.004		<0.004[<A]	<0.004[<A]	<0.004[<A]	<0.004[<A]
Silver	mg/L			0.002		<0.002	<0.002	<0.002	<0.002
Strontium	mg/L			0.005		0.187	0.081	0.017	0.191
Thallium	mg/L			0.006		<0.006	<0.006	<0.006	<0.006
Tin	mg/L			0.002		<0.002	<0.002	<0.002	<0.002
Titanium	mg/L			0.002		<0.002	<0.002	<0.002	<0.002
Tungsten	mg/L			0.010		0.025	<0.010	<0.010	<0.010
Uranium	mg/L	0.02		0.002		<0.002[<A]	<0.002[<A]	<0.002[<A]	<0.002[<A]
Vanadium	mg/L			0.002		<0.002	<0.002	<0.002	<0.002
Zinc	mg/L		5	0.005		0.007[<B]	<0.005[<B]	<0.005[<B]	<0.005[<B]

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Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

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

274647-274668 Total Hardness (as CaCO3) is a calculated parameter.
Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

274669 Total Hardness (as CaCO3) is a calculated parameter.

274670-274671 Total Hardness (as CaCO3) is a calculated parameter.
Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

274672-274674 Total Hardness (as CaCO3) is a calculated parameter.

274675-274676 Total Hardness (as CaCO3) is a calculated parameter.
Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

274677-274680 Total Hardness (as CaCO3) is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

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AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Surface Water Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

		SAMPLE DESCRIPTION:		SW-1	SW-2	SW-3	SW-DUP 1
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2019-06-11	2019-06-11	2019-06-11	2019-06-11
Parameter	Unit	G / S	RDL	274696	274704	274705	274706
BOD (5)	mg/L		5	<5	<5	<5	<5
Electrical Conductivity	µS/cm		2	37	62	114	61
pH	pH Units	6.5-8.5	NA	5.37	6.72	7.34	6.76
Total Hardness (as CaCO3)	mg/L		0.5	10.0	19.8	35.6	19.7
Total Dissolved Solids	mg/L		20	34	40	52	46
Total Suspended Solids	mg/L		10	<10	<10	<10	<10
Alkalinity (as CaCO3)	mg/L		5	<5	8	37	9
Chloride	mg/L		0.10	7.09	6.99	5.88	6.88
Nitrate as N	mg/L		0.05	<0.05	0.21	0.16	0.22
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L		0.10	0.90	4.74	6.70	4.92
Phosphate as P	mg/L		0.10	<0.10	<0.10	<0.10	<0.10
Ammonia as N	mg/L		0.02	0.09	0.19	1.31	0.16
Total Kjeldahl Nitrogen	mg/L		0.10	0.30	0.43	1.49	0.40
Total Phosphorus	mg/L	0.030	0.01	0.02	0.02	0.02	0.02
Chemical Oxygen Demand	mg/L		5	19	16	7	9
Dissolved Organic Carbon	mg/L		0.5	8.9	6.4	4.2	6.8
Phenols	mg/L	0.001	0.001	0.001	<0.001	<0.001	<0.001
Colour	TCU		5	104	58	27	56
Calcium	mg/L		0.05	2.96	6.02	11.3	5.99
Magnesium	mg/L		0.05	0.64	1.15	1.79	1.15
Sodium	mg/L		0.05	2.42	3.16	4.83	3.13
Potassium	mg/L		0.05	0.23	1.19	2.88	1.17
Aluminum-dissolved	mg/L	0.075	0.004	0.200	0.110	0.035	0.107
Antimony	mg/L	0.020	0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.1	0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L		0.002	0.020	0.027	0.033	0.028
Beryllium	mg/L	0.011	0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth	mg/L		0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	0.20	0.010	<0.010	0.028	0.075	0.028

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Certificate of Analysis

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Surface Water Parameters

DATE RECEIVED: 2019-06-13

DATE REPORTED: 2019-06-27

		SAMPLE DESCRIPTION:		SW-1	SW-2	SW-3	SW-DUP 1
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2019-06-11	2019-06-11	2019-06-11	2019-06-11
Parameter	Unit	G / S	RDL	274696	274704	274705	274706
Cadmium	mg/L	0.0002	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	mg/L		0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L	0.0009	0.0005	0.0012	<0.0005	0.0021	<0.0005
Copper	mg/L	0.005	0.001	<0.001	<0.001	0.001	<0.001
Iron	mg/L	0.3	0.010	0.369	0.151	0.411	0.126
Lead	mg/L	**	0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L		0.002	0.057	0.070	0.613	0.063
Molybdenum	mg/L	0.04	0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L	0.025	0.003	<0.003	<0.003	<0.003	<0.003
Selenium	mg/L	0.1	0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		0.05	2.07	2.31	1.44	2.24
Silver	mg/L	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium	mg/L		0.005	0.031	0.045	0.069	0.045
Tin	mg/L		0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.005	0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L	0.006	0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	0.03	0.005	0.013	0.008	0.006	0.007

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to PWQO (mg/L) **Dependent on alkalinity
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

274696-274706 Total Hardness (as CaCO3) is a calculated parameter.

Analysis performed at AGAT Toronto (unless marked by *)

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Guideline Violation

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
274647	BH-1	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	8.9
274647	BH-1	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	2.47
274647	BH-1	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	230
274647	BH-1	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Sodium	mg/L	20	31.3
274668	BH-2	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	11.0
274668	BH-2	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Iron	mg/L	0.3	9.71
274668	BH-2	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	4.06
274668	BH-2	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	239
274668	BH-2	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	52.0
274668	BH-2	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Sodium	mg/L	20	27.4
274669	BH-3-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Alkalinity (as CaCO3)	mg/L	30-500	18
274669	BH-3-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	5.6
274669	BH-3-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	4.9
274669	BH-3-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	1140
274670	BH-4	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	8.7
274670	BH-4	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	350
274670	BH-4	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	30.5
274670	BH-4	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Nitrate as N	mg/L	10.0	15.2
274671	BH-4-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	10.7
274671	BH-4-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	0.292
274671	BH-4-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Dissolved Solids	mg/L	500	570
274671	BH-4-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	342
274671	BH-4-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	79.7
274671	BH-4-II	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Nitrate as N	mg/L	10.0	28.7
274672	BH-5-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	0.139

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Guideline Violation

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
274672	BH-5-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	258
274673	BH-6-III	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	0.404
274673	BH-6-III	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	123
274673	BH-6-III	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	36.7
274674	BH-7-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Alkalinity (as CaCO3)	mg/L	30-500	7
274674	BH-7-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	9.2
274674	BH-7-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	2300
274674	BH-7-II	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	pH	pH Units	6.5-8.5	6.34
274675	BH-8-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	1.39
274675	BH-8-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	135
274675	BH-8-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	7380
274676	BH-9-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	6.8
274676	BH-9-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	2.06
274676	BH-9-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	197
274676	BH-9-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	4050
274677	BH-10-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Dissolved Organic Carbon	mg/L	5	5.6
274677	BH-10-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	0.067
274677	BH-10-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	115
274677	BH-10-I	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	982
274678	BH-11	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Alkalinity (as CaCO3)	mg/L	30-500	7
274678	BH-11	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	25.1
274678	BH-11	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	368
274678	BH-11	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	pH	pH Units	6.5-8.5	6.38
274679	BH-DUP1	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Alkalinity (as CaCO3)	mg/L	30-500	7

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Guideline Violation

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

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CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Ryan Lawrence

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
274679	BH-DUP1	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Total Hardness (as CaCO3)	mg/L	80-100	8.4
274679	BH-DUP1	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	2480
274679	BH-DUP1	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	pH	pH Units	6.5-8.5	6.37
274680	BH-DUP2	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Manganese	mg/L	0.05	0.135
274680	BH-DUP2	O.Reg. 169(mg/L)AO&OG	Chapman Landfill - Groundwater Parameters	Turbidity	NTU	5	242
274696	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Aluminum-dissolved	mg/L	0.075	0.200
274696	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Cobalt	mg/L	0.0009	0.0012
274696	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Iron	mg/L	0.3	0.369
274696	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	pH	pH Units	6.5-8.5	5.37
274704	SW-2	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Aluminum-dissolved	mg/L	0.075	0.110
274705	SW-3	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Cobalt	mg/L	0.0009	0.0021
274705	SW-3	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Iron	mg/L	0.3	0.411
274706	SW-DUP 1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Aluminum-dissolved	mg/L	0.075	0.107

AGAT Laboratories

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Quality Assurance

CLIENT NAME: PINCHIN LTD.

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 27, 2019

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Chapman Landfill - Groundwater Parameters															
BOD (5)	277579	274647	<5	<5	NA	< 5	101%	75%	125%						
Electrical Conductivity	274671	274671	768	769	0.1%	< 2	101%	80%	120%						
pH	274671	274671	7.46	7.42	0.5%	NA	100%	90%	110%						
Total Dissolved Solids	274673	274673	184	178	3.3%	< 20	98%	80%	120%						
Total Suspended Solids	274680	274680	1520	1530	0.7%	< 10	102%	80%	120%						
Alkalinity (as CaCO3)	274671	274671	263	263	0.0%	< 5	97%	80%	120%						
Chloride	275032		24.6	25.2	2.4%	< 0.10	92%	90%	110%	99%	90%	110%	104%	80%	120%
Nitrate as N	275032		0.07	0.08	NA	< 0.05	91%	90%	110%	100%	90%	110%	105%	80%	120%
Nitrite as N	275032		<0.05	<0.05	NA	< 0.05	NA	90%	110%	96%	90%	110%	106%	80%	120%
Sulphate	275032		1.72	1.63	5.4%	< 0.10	91%	90%	110%	97%	90%	110%	101%	80%	120%
Phosphate as P	275032		0.16	<0.10	NA	< 0.10	110%	90%	110%	94%	90%	110%	99%	80%	120%
Ammonia as N	280912		<0.02	<0.02	NA	< 0.02	101%	90%	110%	105%	90%	110%	99%	80%	120%
Total Kjeldahl Nitrogen	274243		2.07	2.05	1.0%	< 0.10	95%	80%	120%	97%	80%	120%	97%	70%	130%
Total Phosphorus	274647	274647	0.02	<0.02	NA	< 0.02	97%	80%	120%	102%	90%	110%	105%	70%	130%
Chemical Oxygen Demand	274647	274647	26	22	NA	< 5	95%	80%	120%	103%	90%	110%	115%	70%	130%
Dissolved Organic Carbon	274668	274668	11.0	11.0	0.0%	< 0.5	97%	90%	110%	99%	90%	110%	88%	80%	120%
Phenols	274647	274647	0.001	0.001	NA	< 0.001	104%	90%	110%	98%	90%	110%	94%	80%	120%
Turbidity	277579		58.4	59.2	1.4%	< 0.5	98%	90%	110%						
Calcium	274647	274647	78.6	78.3	0.4%	< 0.05	99%	90%	110%	101%	90%	110%	100%	70%	130%
Magnesium	274647	274647	8.27	8.21	0.7%	< 0.05	98%	90%	110%	100%	90%	110%	100%	70%	130%
Sodium	274647	274647	31.3	31.3	0.0%	< 0.05	97%	90%	110%	98%	90%	110%	97%	70%	130%
Potassium	274647	274647	12.5	12.3	1.6%	< 0.05	98%	90%	110%	100%	90%	110%	99%	70%	130%
Aluminum	274647	274647	0.022	0.020	9.5%	< 0.004	100%	90%	110%	96%	90%	110%	91%	70%	130%
Antimony	274647	274647	<0.003	<0.003	NA	< 0.003	104%	90%	110%	100%	90%	110%	100%	70%	130%
Arsenic	274647	274647	<0.003	<0.003	NA	< 0.003	107%	90%	110%	103%	90%	110%	105%	70%	130%
Barium	274647	274647	0.165	0.163	1.2%	< 0.002	103%	90%	110%	101%	90%	110%	101%	70%	130%
Beryllium	274647	274647	<0.001	<0.001	NA	< 0.001	102%	90%	110%	97%	90%	110%	98%	70%	130%
Bismuth	274647	274647	<0.002	<0.002	NA	< 0.002	103%	90%	110%	108%	90%	110%	99%	70%	130%
Boron	274647	274647	0.551	0.581	5.3%	< 0.010	99%	90%	110%	94%	90%	110%	94%	70%	130%
Cadmium	274647	274647	<0.001	<0.001	NA	< 0.001	104%	90%	110%	106%	90%	110%	108%	70%	130%
Chromium	274647	274647	<0.003	<0.003	NA	< 0.003	105%	90%	110%	104%	90%	110%	98%	70%	130%
Cobalt	274647	274647	0.008	0.008	0.0%	< 0.001	106%	90%	110%	103%	90%	110%	99%	70%	130%
Copper	274647	274647	0.010	0.010	NA	< 0.003	106%	90%	110%	105%	90%	110%	98%	70%	130%
Iron	274647	274647	<0.010	<0.010	NA	< 0.010	106%	90%	110%	96%	90%	110%	79%	70%	130%
Lead	274647	274647	<0.001	<0.001	NA	< 0.001	106%	90%	110%	108%	90%	110%	101%	70%	130%
Manganese	274647	274647	2.47	2.41	2.5%	< 0.002	109%	90%	110%	107%	90%	110%	102%	70%	130%
Molybdenum	274647	274647	<0.002	<0.002	NA	< 0.002	101%	90%	110%	100%	90%	110%	103%	70%	130%
Nickel	274647	274647	<0.003	<0.003	NA	< 0.003	108%	90%	110%	104%	90%	110%	97%	70%	130%
Selenium	274647	274647	<0.004	<0.004	NA	< 0.004	94%	90%	110%	92%	90%	110%	103%	70%	130%

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Quality Assurance

CLIENT NAME: PINCHIN LTD.

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Jun 27, 2019			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
Silver	274647	274647	<0.002	<0.002	NA	< 0.002	103%	90%	110%	108%	90%	110%	92%	70%	130%
Strontium	274647	274647	0.419	0.433	3.3%	< 0.005	96%	90%	110%	96%	90%	110%	98%	70%	130%
Thallium	274647	274647	<0.006	<0.006	NA	< 0.006	108%	90%	110%	108%	90%	110%	102%	70%	130%
Tin	274647	274647	<0.002	<0.002	NA	< 0.002	99%	90%	110%	103%	90%	110%	103%	70%	130%
Titanium	274647	274647	<0.002	<0.002	NA	< 0.002	106%	90%	110%	102%	90%	110%	101%	70%	130%
Tungsten	274647	274647	<0.010	<0.010	NA	< 0.010	101%	90%	110%	99%	90%	110%	100%	70%	130%
Uranium	274647	274647	0.004	0.004	NA	< 0.002	102%	90%	110%	105%	90%	110%	101%	70%	130%
Vanadium	274647	274647	<0.002	<0.002	NA	< 0.002	102%	90%	110%	101%	90%	110%	99%	70%	130%
Zinc	274647	274647	<0.005	<0.005	NA	< 0.005	108%	90%	110%	107%	90%	110%	107%	70%	130%
Chapman Landfill - Surface Water Parameters															
Colour	272155		14	15	NA	< 5	106%	90%	110%						
Aluminum-dissolved	272356		0.016	0.016	NA	< 0.004	95%	90%	110%	97%	90%	110%	93%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

AGAT Laboratories

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CANADA L4Z 1Y2
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http://www.agatlabs.com

Method Summary

CLIENT NAME: PINCHIN LTD.

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
BOD (5)	INOR-93-6006	SM 5210 B	DO METER
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Total Suspended Solids	INOR-93-6028	SM 2540 D	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	QuikChem 10-107-06-1-J & SM 4500 NH3-F	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Total Phosphorus	INOR-93-6057	QuikChem 10-115-01-3-A & SM 4500-P I	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6050	MOE ROPHEN-E 3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Turbidity	INOR-93-6044	SM 2130 B	NEPHELOMETER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Antimony	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tungsten	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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FAX (905)712-5122
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Method Summary

CLIENT NAME: PINCHIN LTD.

AGAT WORK ORDER: 19T479294

PROJECT: 225335 Chapman Landfill GW & SW

ATTENTION TO: Ryan Lawrence

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Total Phosphorus	INOR-93-6022	SM 4500-P B&E	SPECTROPHOTOMETER
Colour	INOR-93-6046	SM 2120 B	SPECTROPHOTOMETER
Aluminum-dissolved	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

4 4g + 1 SMALL

AGAT Laboratories

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Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100;
Fax: 905-712-5122

CHAIN OF CUSTODY RECORD

TURBIDITY

LABORATORY USE ONLY
Arrival Condition: [ ] Good [ ] Poor (complete "Notes")
Arrival Temperature: 19T479294
AGAT Job Number:
Notes: SEE ATTACHED

Client Information
Company: Pinchin Ltd.
Contact: Ryan Lawrence
Address: 957 Cambrian Heights, Unit # 203
Sudbury ON P3C 5S5
Phone: 705-521-0560 Fax:
PO#:
Client Project #: 225335 Chapman Landfill
AGAT Quotation #: 267698 ✓

Report Information
1. Name: Ryan Lawrence
Email: rlawrence@Pinchin.com
2. Name:
Email:
3. Name:
Email:
4. Name:
Email:

Report Format
(Please "x" those that apply)
[ ] Single sample per page
[x] Multiple samples per page
[ ] Results by Fax

Turnaround Time (TAT)*
(Please "x" the applicable box below)
Regular TAT:
[x] 5 to 7 working days
Rush TAT (Rush Surcharges Apply):
[ ] 3 to 5 days
[ ] 48 to 72 hours
[ ] 24 to 48 hours
Date Required (Rush surcharges may apply)

Regulatory Guideline Required:
(Please "x" those that apply)
[ ] Reg 153 Table (indicate one) [ ] Ind/Com [ ] Res/Park [ ] Ag [ ] Med/Fine [ ] Coarse
[ ] Sewer Use Region (indicate one) [ ] Sanitary [ ] Storm
[ ] PWQO [ ] Reg 558 [ ] CCME [x] Other (indicate) GW - ODWS

Is this a drinking water sample (potable water intended for human consumption)?
[ ] Yes [x] No
If "Yes" please use the Drinking Water Chain of Custody Record

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info, Sample Containment	Anions - Cl, NO3, NO2, Phos-P, SO4	Cations (K, Na, Mg, Ca)	Metals (see quote for list)	Alkalinity, Ammonia, BOD	COD, DOC, Conductivity	pH, Phenols	Total Phosphorous	TDS, TSS	TKN, Turbidity	BTEX
BH-1	June 11, 19	8:30 AM	water	10		x	x	x	x	x	x	x	x	x	x
BH-2			water	10		x	x	x	x	x	x	x	x	x	x
BH-3-II			water	10		x	x	x	x	x	x	x	x	x	x
BH-4			water	10		x	x	x	x	x	x	x	x	x	x
BH-4-II			water	10		x	x	x	x	x	x	x	x	x	x
BH-5-II			water	10		x	x	x	x	x	x	x	x	x	x
~~BH-6-II~~			~~water~~	~~10~~		~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~
BH-6-III			water	10		x	x	x	x	x	x	x	x	x	x
BH-7-II			water	10		x	x	x	x	x	x	x	x	x	x
BH-8-I			water	10		x	x	x	x	x	x	x	x	x	x
BH-9-I		2:30 PM	water	10		x	x	x	x	x	x	x	x	x	x
TOTAL # OF CONTAINERS				100 ~~110~~											

* Samples received after 2:00 PM will be logged in for the next business day. TAT is exclusive of weekends and statutory holidays

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Kathleen Murr KMurr	June 11, 19 7PM	MANOJ JOHN	JUNE 13 19
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
			9:15

Special Instructions
PLEASE FILTER DOC AT SAMPLE RECEPTION

AGAT Laboratories
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Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100;
Fax: 905-712-5122

CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: [ ] Good [ ] Poor (complete "Notes")
Arrival Temperature:
AGAT Job Number:
Notes:

Client Information

Company: Pinchin Ltd.
Contact: Ryan Lawrence
Address: 957 Cambrian Heights, Unit # 203
Sudbury ON P3C 5S5
Phone: 705-521-0560 Fax:
PO#:
Client Project #: 225335 Chapman Landfill
AGAT Quotation #: 267698

Report Information

1. Name: Ryan Lawrence
Email: rlawrence@Pinchin.com
2. Name:
Email:
3. Name:
Email:
4. Name:
Email:

Report Format

(Please "x" those that apply)
[ ] Single sample per page
[x] Multiple samples per page
[ ] Results by Fax

Turnaround Time (TAT)*

(Please "x" the applicable box below)
Regular TAT:
[x] 5 to 7 working days
Rush TAT (Rush Surcharges Apply):
[ ] 3 to 5 days
[ ] 48 to 72 hours
[ ] 24 to 48 hours
Date Required (Rush surcharges may apply)

Regulatory Guideline Required:

(Please "x" those that apply)
[ ] Reg 153 Table (indicate one) [ ] Ind/Com [ ] Res/Park [ ] Ag [ ] Med/Fine [ ] Coarse
[ ] Sewer Use Region (indicate one) [ ] Sanitary [ ] Storm
[ ] PWQO [ ] Reg 558 [ ] CCME [x] Other (indicate) GW - ODWS

Is this a drinking water sample (potable water intended for human consumption)?
[ ] Yes [x] No
If "Yes" please use the Drinking Water Chain of Custody Record

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info, Sample Containment	Anions - Cl, NO3, NO2, Phos-P, SO4	Cations (K, Na, Mg, Ca)	Metals (see quote for list)	Alkalinity, Ammonia, BOD	COD, DOC, Conductivity	pH, Phenols	Total Phosphorous	TDS, TSS	TKN, Turbidity	BTEX
1 BH-10-I	June 11, 19	8:30 AM	water	10		x	x	x	x	x	x	x	x	x	x
2 BH-11	↓	↓	water	10		x	x	x	x	x	x	x	x	x	x
3 BH-DUP1	↓	↓	water	10		x	x	x	x	x	x	x	x	x	x
4 BH-DUP2	↓	2:30 PM	water	10		x	x	x	x	x	x	x	x	x	x
TOTAL # OF CONTAINERS				40											

* Samples received after 2:00 PM will be logged in for the next business day. TAT is exclusive of weekends and statutory holidays

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Kathleen Murr	June 11, 19 7PM	MANOJ JOHN	JUNE 13/19
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
			9:15

Special Instructions
PLEASE FILTER DOC AT SAMPLE RECEPTION

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100;
Fax: 905-712-5122

CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: [ ] Good [ ] Poor (complete "Notes")
Arrival Temperature:
AGAT Job Number:
Notes:

Client Information

Company: Pinchin Ltd
Contact: Ryan Lawrence
Address: 957 Cambrian Heights, Unit # 203
Sudbury ON P3C 5S5
Phone: 705-521-0560 Fax:
PO#:
Client Project #: 225335 Chapman Landfill
AGAT Quotation #: 267698

Report Information

1. Name: Ryan Lawrence
Email: rlawrence@Pinchin.com
2. Name:
Email:
3. Name:
Email:
4. Name:
Email:

Report Format

(Please "x" those that apply)
[ ] Single sample per page
[x] Multiple samples per page
[ ] Results by Fax

Turnaround Time (TAT)*

(Please "x" the applicable box below)
Regular TAT:
[x] 5 to 7 working days
Rush TAT (Rush Surcharges Apply):
[ ] 3 to 5 days
[ ] 48 to 72 hours
[ ] 24 to 48 hours
Date Required (Rush surcharges may apply)

Regulatory Guideline Required:

(Please "x" those that apply)
[ ] Reg 153 Table (indicate one) [ ] Ind/Com [ ] Res/Park [ ] Ag [ ] Med/Fine [ ] Coarse
[ ] Sewer Use Region (indicate one) [ ] Sanitary [ ] Storm
[x] PWQO [ ] Reg 558 [ ] CCME [ ] Other (indicate)

Is this a drinking water sample (potable water intended for human consumption)?
[ ] Yes [x] No
If "Yes" please use the Drinking Water Chain of Custody Record

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info, Sample Containment	Anions - Cl, NO3, NO2, Phos., SO4	Cations (K, Na, Mg, Ca)	Metals (see quote for list)	Alkalinity, Ammonia, BOD	COD, DOC, Conductivity	Colour	Phenols	Total Phosphorous	TDS, TSS	TKN	Dissolved Aluminum					
SW-1	June 11,19	8:30 AM	water	8		x	x	x	x	x	x	x	x	x	x	x					
SW-2			water	8		x	x	x	x	x	x	x	x	x	x	x					
SW-3			water	8		x	x	x	x	x	x	x	x	x	x	x					
SW-DUP 1		2:30 PM	water	8		x	x	x	x	x	x	x	x	x	x	x					
TOTAL # OF CONTAINERS				32																	

* Samples received after 2:00 PM will be logged in for the next business day. TAT is exclusive of weekends and statutory holidays

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Kathleen Murr	June 11,19 7PM	MANOJ JOHN	JUNE 13/19
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
			9:15

Special Instructions
PLEASE FILTER for Diss. Al & DOC AT SR

AGAT Laboratories

Sample Temperature Log

Client: PINCHIN

COC# or Work Order #: 19T479294

# of Coolers: 5

# of Submissions:

Arrival Temperatures - Branch/Driver

Cooler #1:	8.8	8.0	8.9
Cooler #2:	9.1	8.8	9.3
Cooler #3:	8.9	9.0	8.7
Cooler #4:	9.1	8.9	9.3
Cooler #5:	8.9	9.0	8.8
Cooler #6:			
Cooler #7:			
Cooler #8			
Cooler #9:			
Cooler #10:			

IR Gun ID:

Taken By: MANOS JOHN

Date (yyyy/mm/dd): 2019/08/13 Time: 9 : 15 AM / PM

Arrival Temperatures - Laboratory

Cooler #1:			
Cooler #2:			
Cooler #3:			
Cooler #4:			
Cooler #5:			
Cooler #6:			
Cooler #7:			
Cooler #8			
Cooler #9:			
Cooler #10:			

IR Gun ID:

Taken By:

Date (yyyy/mm/dd): Time: : AM / PM

Instructions for use of this form: 1) complete all fields of info including total # of coolers and # of submissions rec'd, 2) photocopy and place in each submission prior to giving a WO#, 3) Proceed as normal, write the WO# and scan (please make sure to scan along with the COC)

Document ID: SR-78-9511.003
Date Issued: 2017-2-23

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CLIENT NAME: PINCHIN LTD.
957 CAMBRIAN HEIGHTS DRIVE, UNIT 203
SUDBURY, ON P3C 5S5
(705) 521-0560

ATTENTION TO: Tim McBride

PROJECT: 225335 Chapman Landfill GW & SW

AGAT WORK ORDER: 19T523309

WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Supervisor

DATE REPORTED: Oct 10, 2019

PAGES (INCLUDING COVER): 18

VERSION*: 1

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

*NOTES

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

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Certificate of Analysis

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

		SAMPLE DESCRIPTION:		BH-1		BH-2		BH-3-II		BH-4-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		2019-09-26		2019-09-26		2019-09-26		2019-09-26
Parameter	Unit	G / S	RDL	567226	RDL	567228	RDL	567229	RDL	567230
BOD (5)	mg/L		5	<5	5	<5	5	<5	5	<5
Electrical Conductivity	µS/cm		2	581	2	923	2	65	2	826
pH	pH Units		NA	7.49	NA	7.40	NA	6.37	NA	7.16
Total Hardness (as CaCO3) (Calculated)	mg/L		0.5	140	0.5	349	0.5	4.1	0.5	323
Total Suspended Solids	mg/L		10	72	10	230	10	4650	10	44
Total Dissolved Solids	mg/L		20	250	20	452	20	42	20	450
Alkalinity (as CaCO3)	mg/L		5	153	5	311	5	20	5	240
Chloride	mg/L		0.10	22.5	0.50	24.1	0.10	0.85	0.50	4.78
Nitrate as N	mg/L	10.0	0.05	10.8	0.25	<0.25	0.05	0.12	0.25	16.7
Nitrite as N	mg/L	1.0	0.05	0.16	0.25	<0.25	0.05	<0.05	0.25	<0.25
Sulphate	mg/L		0.10	13.8	0.50	78.0	0.10	6.33	0.50	67.3
Ortho Phosphate as P	mg/L		0.10	<0.10	0.50	<0.50	0.10	<0.10	0.50	<0.50
Ammonia as N	mg/L		0.2	7.18	0.02	0.51	0.02	0.12	0.02	0.11
Total Phosphorus	mg/L		0.02	<0.02	0.02	0.57	0.04	4.90	0.02	0.07
Chemical Oxygen Demand	mg/L		5	20	5	26	5	11	5	21
Dissolved Organic Carbon	mg/L		0.5	6.3	0.5	10.0	0.5	3.8	0.5	8.6
Total Kjeldahl Nitrogen	mg/L		0.10	7.74	0.10	1.11	0.10	0.24	0.10	0.17
Phenols	mg/L		0.001	<0.001	0.001	0.002	0.001	<0.001	0.001	0.001
Turbidity	NTU		0.5	7.0	0.5	81.1	0.5	1460	0.5	74.6
Calcium	mg/L		0.05	48.7	0.10	98.8	0.05	1.29	0.05	109
Magnesium	mg/L		0.05	4.36	0.10	24.9	0.05	0.22	0.05	12.3
Sodium	mg/L	20	0.05	20.7	0.10	33.0	0.05	10.6	0.05	12.9
Potassium	mg/L		0.05	20.8	0.10	6.74	0.05	0.44	0.05	15.5
Aluminum	mg/L		0.004	0.032	0.004	0.006	0.004	0.112	0.004	0.035
Antimony	mg/L	0.006	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.177	0.002	0.186	0.002	0.003	0.002	0.119
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002

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Certificate of Analysis

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

		SAMPLE DESCRIPTION:		BH-1		BH-2		BH-3-II		BH-4-II
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		2019-09-26		2019-09-26		2019-09-26		2019-09-26
Parameter	Unit	G / S	RDL	567226	RDL	567228	RDL	567229	RDL	567230
Boron	mg/L	5	0.010	0.329	0.010	0.642	0.010	0.051	0.010	0.473
Cadmium	mg/L	0.005	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	0.005	0.001	0.004	0.001	<0.001	0.001	0.002
Copper	mg/L		0.003	0.009	0.003	0.004	0.003	0.006	0.003	0.010
Iron	mg/L		0.010	<0.010	0.010	0.531	0.010	<0.010	0.010	<0.010
Lead	mg/L	0.01	0.001	<0.001	0.001	<0.001	0.001	<0.001	0.001	<0.001
Manganese	mg/L		0.002	1.00	0.002	1.51	0.002	0.008	0.002	0.386
Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	0.002	0.006	0.002	<0.002
Nickel	mg/L		0.003	<0.003	0.003	0.003	0.003	<0.003	0.003	0.004
Selenium	mg/L	0.05	0.004	<0.004	0.004	<0.004	0.004	<0.004	0.004	<0.004
Silver	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.379	0.005	0.638	0.005	0.007	0.005	0.392
Thallium	mg/L		0.006	<0.006	0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	0.002	<0.002	0.002	0.002	0.002	0.002
Tungsten	mg/L		0.010	<0.010	0.010	<0.010	0.010	<0.010	0.010	<0.010
Uranium	mg/L	0.02	0.002	<0.002	0.002	0.005	0.002	<0.002	0.002	0.005
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	0.019	0.005	<0.005

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AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

SAMPLE DESCRIPTION:				BH-5-II	BH-6-III	BH-7-II		BH-8-I		BH-9-I
SAMPLE TYPE:				Water	Water	Water		Water		Water
DATE SAMPLED:				2019-09-26	2019-09-26	2019-09-26		2019-09-26		2019-09-26
Parameter	Unit	G / S	RDL	567231	567232	567233	RDL	567234	RDL	567236
BOD (5)	mg/L		5	<5	<5	<5	5	<5	5	<5
Electrical Conductivity	µS/cm		2	421	465	32	2	459	2	574
pH	pH Units		NA	6.84	6.99	5.92	NA	7.13	NA	7.17
Total Hardness (as CaCO3) (Calculated)	mg/L		0.5	142	158	7.2	0.5	131	0.5	143
Total Suspended Solids	mg/L		10	2380	66	2290	10	3300	10	1980
Total Dissolved Solids	mg/L		20	218	232	36	20	224	20	240
Alkalinity (as CaCO3)	mg/L		5	83	101	<5	5	103	5	168
Chloride	mg/L		0.10	10.9	12.9	0.22	0.10	30.6	0.10	38.6
Nitrate as N	mg/L	10.0	0.05	4.13	3.36	1.64	0.05	4.63	0.05	<0.05
Nitrite as N	mg/L	1.0	0.05	<0.05	<0.05	<0.05	0.05	0.12	0.05	<0.05
Sulphate	mg/L		0.10	68.4	66.8	1.98	0.10	26.1	0.10	20.0
Ortho Phosphate as P	mg/L		0.10	<0.10	<0.10	<0.10	0.10	<0.10	0.10	<0.10
Ammonia as N	mg/L		0.02	0.17	0.79	0.13	0.02	1.71	0.04	6.60
Total Phosphorus	mg/L		0.02	0.29	0.12	0.62	0.04	3.36	0.02	0.70
Chemical Oxygen Demand	mg/L		5	14	12	<5	10	130	5	33
Dissolved Organic Carbon	mg/L		0.5	5.4	5.3	4.2	0.5	6.0	0.5	9.2
Total Kjeldahl Nitrogen	mg/L		0.10	0.63	1.30	0.56	0.10	4.10	0.10	7.46
Phenols	mg/L		0.001	<0.001	<0.001	<0.001	0.001	0.002	0.001	0.001
Turbidity	NTU		0.5	273	24.5	2470	0.5	1450	0.5	777
Calcium	mg/L		0.05	43.0	47.5	1.58	0.05	41.3	0.05	45.6
Magnesium	mg/L		0.05	8.43	9.60	0.80	0.05	6.87	0.05	7.16
Sodium	mg/L	20	0.05	13.1	13.2	1.42	0.05	19.7	0.05	22.5
Potassium	mg/L		0.05	5.10	7.47	0.58	0.05	9.37	0.05	12.3
Aluminum	mg/L		0.004	0.023	0.015	0.151	0.004	0.035	0.004	0.213
Antimony	mg/L	0.006	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Arsenic	mg/L	0.025	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Barium	mg/L	1	0.002	0.142	0.124	0.014	0.002	0.147	0.002	0.134
Beryllium	mg/L		0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002

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Certificate of Analysis

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

SAMPLE DESCRIPTION:				BH-5-II	BH-6-III	BH-7-II		BH-8-I		BH-9-I
SAMPLE TYPE:				Water	Water	Water		Water		Water
DATE SAMPLED:				2019-09-26	2019-09-26	2019-09-26		2019-09-26		2019-09-26
Parameter	Unit	G / S	RDL	567231	567232	567233	RDL	567234	RDL	567236
Boron	mg/L	5	0.010	0.326	0.341	0.029	0.010	0.343	0.010	0.320
Cadmium	mg/L	0.005	0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Chromium	mg/L	0.05	0.003	<0.003	<0.003	<0.003	0.003	<0.003	0.003	<0.003
Cobalt	mg/L		0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.016
Copper	mg/L		0.003	0.003	0.007	<0.003	0.003	0.004	0.003	0.008
Iron	mg/L		0.010	<0.010	<0.010	0.054	0.010	<0.010	0.010	3.76
Lead	mg/L	0.01	0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
Manganese	mg/L		0.002	0.067	0.615	0.022	0.002	0.943	0.002	4.48
Molybdenum	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Nickel	mg/L		0.003	<0.003	0.005	<0.003	0.003	<0.003	0.003	<0.003
Selenium	mg/L	0.05	0.004	<0.004	<0.004	<0.004	0.004	<0.004	0.004	<0.004
Silver	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Strontium	mg/L		0.005	0.239	0.292	0.017	0.005	0.235	0.005	0.300
Thallium	mg/L		0.006	<0.006	<0.006	<0.006	0.006	<0.006	0.006	<0.006
Tin	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Titanium	mg/L		0.002	<0.002	<0.002	0.006	0.002	<0.002	0.002	0.013
Tungsten	mg/L		0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.010	<0.010
Uranium	mg/L	0.02	0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	<0.002	0.002	<0.002	0.002	<0.002
Zinc	mg/L		0.005	<0.005	0.005	0.006	0.005	<0.005	0.005	<0.005

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Certificate of Analysis

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

SAMPLE DESCRIPTION:				BH-10-I		BH-11	BH-DUP1	BH-DUP2
SAMPLE TYPE:				Water		Water	Water	Water
DATE SAMPLED:				2019-09-26		2019-09-26	2019-09-26	2019-09-26
Parameter	Unit	G / S	RDL	567239	RDL	567242	567244	567246
BOD (5)	mg/L		5	<5	5	<5	<5	<5
Electrical Conductivity	µS/cm		2	601	2	94	463	30
pH	pH Units		NA	7.11	NA	6.33	7.13	5.72
Total Hardness (as CaCO3) (Calculated)	mg/L		0.5	214	0.5	23.5	155	7.1
Total Suspended Solids	mg/L		10	2060	10	1110	107	3740
Total Dissolved Solids	mg/L		20	338	20	66	242	50
Alkalinity (as CaCO3)	mg/L		5	76	5	10	101	<5
Chloride	mg/L		0.10	10.3	0.10	12.6	12.8	0.26
Nitrate as N	mg/L	10.0	0.05	2.22	0.05	0.20	3.33	1.59
Nitrite as N	mg/L	1.0	0.05	<0.05	0.05	<0.05	<0.05	<0.05
Sulphate	mg/L		0.50	165	0.10	5.64	67.1	2.43
Ortho Phosphate as P	mg/L		0.10	<0.10	0.10	<0.10	<0.10	<0.10
Ammonia as N	mg/L		0.02	0.15	0.02	0.12	0.82	0.18
Total Phosphorus	mg/L		0.02	1.58	0.02	0.90	0.13	3.57
Chemical Oxygen Demand	mg/L		5	21	5	<5	10	33
Dissolved Organic Carbon	mg/L		0.5	5.9	0.5	2.0	5.4	7.8
Total Kjeldahl Nitrogen	mg/L		0.10	0.68	0.10	0.19	1.22	0.78
Phenols	mg/L		0.001	0.001	0.001	<0.001	<0.001	<0.001
Turbidity	NTU		0.5	1940	0.5	216	23.0	3550
Calcium	mg/L		0.05	56.7	0.05	7.76	46.3	1.54
Magnesium	mg/L		0.05	17.5	0.05	0.99	9.47	0.78
Sodium	mg/L	20	0.05	18.1	0.05	3.89	12.9	1.88
Potassium	mg/L		0.05	7.64	0.05	1.34	7.20	0.59
Aluminum	mg/L		0.004	0.045	0.004	0.034	0.019	0.342
Antimony	mg/L	0.006	0.003	<0.003	0.003	<0.003	<0.003	<0.003
Arsenic	mg/L	0.025	0.003	<0.003	0.003	<0.003	<0.003	<0.003
Barium	mg/L	1	0.002	0.148	0.002	0.019	0.123	0.020
Beryllium	mg/L		0.001	<0.001	0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Groundwater Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

		SAMPLE DESCRIPTION:		BH-10-I		BH-11	BH-DUP1	BH-DUP2
		SAMPLE TYPE:		Water		Water	Water	Water
		DATE SAMPLED:		2019-09-26		2019-09-26	2019-09-26	2019-09-26
Parameter	Unit	G / S	RDL	567239	RDL	567242	567244	567246
Boron	mg/L	5	0.010	0.790	0.010	<0.010	0.321	0.016
Cadmium	mg/L	0.005	0.001	<0.001	0.001	<0.001	<0.001	<0.001
Chromium	mg/L	0.05	0.003	<0.003	0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.001	<0.001	0.001	<0.001	<0.001	0.001
Copper	mg/L		0.003	0.008	0.003	<0.003	0.007	<0.003
Iron	mg/L		0.010	<0.010	0.010	<0.010	<0.010	0.391
Lead	mg/L	0.01	0.001	<0.001	0.001	<0.001	<0.001	0.001
Manganese	mg/L		0.002	0.016	0.002	0.016	0.629	0.030
Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.003	0.003	0.003	<0.003	0.005	<0.003
Selenium	mg/L	0.05	0.004	<0.004	0.004	<0.004	<0.004	<0.004
Silver	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002
Strontium	mg/L		0.005	0.343	0.005	0.075	0.296	0.020
Thallium	mg/L		0.006	<0.006	0.006	<0.006	<0.006	<0.006
Tin	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	0.003	0.002	<0.002	<0.002	0.014
Tungsten	mg/L		0.010	0.013	0.010	<0.010	<0.010	<0.010
Uranium	mg/L	0.02	0.002	<0.002	0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	0.002	<0.002	<0.002	<0.002
Zinc	mg/L		0.005	0.009	0.005	<0.005	0.006	0.005

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

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Surface Water Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

		SAMPLE DESCRIPTION:		SW-1	SW-2	SW-3	SW-DUP 1
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2019-09-26	2019-09-26	2019-09-26	2019-09-26
Parameter	Unit	G / S	RDL	567248	567257	567258	567260
BOD (5)	mg/L		5	<5	<5	<5	<5
Electrical Conductivity	µS/cm		2	118	105	397	76
pH	pH Units	6.5-8.5	NA	3.97	6.43	6.79	5.40
Total Hardness (as CaCO3) (Calculated)	mg/L		0.5	17.8	28.4	96.6	17.9
Total Suspended Solids	mg/L		10	<10	<10	30	24
Total Dissolved Solids	mg/L		20	54	66	198	68
Alkalinity (as CaCO3)	mg/L		5	<5	7	38	<5
Chloride	mg/L		0.10	11.7	11.1	29.2	11.3
Nitrate as N	mg/L		0.05	<0.05	0.17	1.10	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L		0.10	13.8	10.6	75.5	5.38
Ortho Phosphate as P	mg/L		0.10	<0.10	<0.10	<0.10	<0.10
Ammonia as N	mg/L		0.02	0.08	0.12	1.65	0.15
Total Phosphorus	mg/L	0.030	0.02	0.02	<0.02	0.02	0.02
Chemical Oxygen Demand	mg/L		5	31	22	17	35
Dissolved Organic Carbon	mg/L		0.5	13.2	9.8	7.2	13.3
Total Kjeldahl Nitrogen	mg/L		0.10	0.38	0.41	2.12	0.46
Phenols	mg/L	0.001	0.001	0.003	0.002	0.001	0.004
Colour	TCU		5	63	54	15	81
Calcium	mg/L		0.05	5.51	8.65	30.8	5.48
Magnesium	mg/L		0.05	0.99	1.65	4.77	1.02
Sodium	mg/L		0.05	3.51	4.63	16.8	3.48
Potassium	mg/L		0.05	0.80	1.55	9.14	0.73
Aluminum-dissolved	mg/L	0.075	0.004	0.220	0.099	0.016	0.216
Antimony	mg/L	0.020	0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	mg/L	0.1	0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L		0.002	0.035	0.037	0.154	0.035
Beryllium	mg/L	*	0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	<0.002	<0.002

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Certificate of Analysis

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

Chapman Landfill - Surface Water Parameters

DATE RECEIVED: 2019-09-27

DATE REPORTED: 2019-10-10

		SAMPLE DESCRIPTION:		SW-1	SW-2	SW-3	SW-DUP 1
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2019-09-26	2019-09-26	2019-09-26	2019-09-26
Parameter	Unit	G / S	RDL	567248	567257	567258	567260
Boron	mg/L	0.20	0.010	0.010	0.043	0.232	0.016
Cadmium	mg/L	0.0002	0.0001	<0.0001	<0.0001	0.0002	<0.0001
Chromium	mg/L		0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L	0.0009	0.0005	0.0014	<0.0005	0.0166	0.0014
Copper	mg/L	0.005	0.003	<0.003	<0.003	0.004	<0.003
Iron	mg/L	0.3	0.010	0.383	0.088	5.82	0.371
Lead	mg/L	**	0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L		0.002	0.070	0.030	5.49	0.069
Molybdenum	mg/L	0.04	0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L	0.025	0.003	<0.003	<0.003	<0.003	<0.003
Selenium	mg/L	0.1	0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		0.05	2.79	3.47	4.79	2.78
Silver	mg/L	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium	mg/L		0.005	0.061	0.074	0.218	0.062
Tin	mg/L		0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	0.003	<0.002	0.009	0.003
Uranium	mg/L	0.005	0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L	0.006	0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	0.03	0.005	0.016	0.007	0.012	0.016

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to PWQO (mg/L) * Dependent on Hardness as CaCO3 **Dependent on alkalinity as CaCO3
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

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Guideline Violation

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

CLIENT NAME: PINCHIN LTD.

ATTENTION TO: Tim McBride

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
567226	BH-1	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Nitrate as N	mg/L	10.0	10.8
567226	BH-1	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Sodium	mg/L	20	20.7
567228	BH-2	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Sodium	mg/L	20	33.0
567230	BH-4-II	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Nitrate as N	mg/L	10.0	16.7
567236	BH-9-I	O.Reg.169/03(mg/L)	Chapman Landfill - Groundwater Parameters	Sodium	mg/L	20	22.5
567248	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Aluminum-dissolved	mg/L	0.075	0.220
567248	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Cobalt	mg/L	0.0009	0.0014
567248	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Iron	mg/L	0.3	0.383
567248	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Phenols	mg/L	0.001	0.003
567248	SW-1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	pH	pH Units	6.5-8.5	3.97
567257	SW-2	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Aluminum-dissolved	mg/L	0.075	0.099
567257	SW-2	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Phenols	mg/L	0.001	0.002
567257	SW-2	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	pH	pH Units	6.5-8.5	6.43
567258	SW-3	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Boron	mg/L	0.20	0.232
567258	SW-3	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Cobalt	mg/L	0.0009	0.0166
567258	SW-3	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Iron	mg/L	0.3	5.82
567260	SW-DUP 1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Aluminum-dissolved	mg/L	0.075	0.216
567260	SW-DUP 1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Cobalt	mg/L	0.0009	0.0014
567260	SW-DUP 1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Iron	mg/L	0.3	0.371
567260	SW-DUP 1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	Phenols	mg/L	0.001	0.004
567260	SW-DUP 1	ON PWQO 2015 (mg/L)	Chapman Landfill - Surface Water Parameters	pH	pH Units	6.5-8.5	5.40

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Quality Assurance

CLIENT NAME: PINCHIN LTD.
AGAT WORK ORDER: 19T523309
PROJECT: 225335 Chapman Landfill GW & SW
ATTENTION TO: Tim McBride
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Oct 10, 2019

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Chapman Landfill - Groundwater Parameters															
BOD (5)	567242	567242	<5	<5	NA	< 5	102%	75%	125%						
Electrical Conductivity	566802		4420	4420	0.0%	< 2	104%	80%	120%						
pH	566802		7.62	7.57	0.7%	NA	100%	90%	110%						
Total Suspended Solids	564157		60	57	5.1%	< 10	98%	80%	120%						
Total Dissolved Solids	567186		530	524	1.1%	< 20	98%	80%	120%						
Alkalinity (as CaCO3)	566802		277	280	1.1%	< 5	100%	80%	120%						
Chloride	567228	567228	24.1	24.1	0.0%	< 0.10	94%	90%	110%	104%	90%	110%	108%	85%	115%
Nitrate as N	567228	567228	<0.25	<0.25	NA	< 0.05	96%	90%	110%	108%	90%	110%	107%	85%	115%
Nitrite as N	567228	567228	<0.25	<0.25	NA	< 0.05	NA	90%	110%	108%	90%	110%	109%	85%	115%
Sulphate	567228	567228	78.0	78.7	0.9%	< 0.10	97%	90%	110%	106%	90%	110%	107%	85%	115%
Ortho Phosphate as P	567228	567228	<0.50	<0.50	NA	< 0.10	101%	90%	110%	101%	90%	110%	101%	80%	120%
Ammonia as N	567229	567229	0.12	0.12	0.0%	< 0.02	101%	90%	110%	100%	90%	110%	100%	70%	130%
Total Phosphorus	567026		0.06	0.06	NA	< 0.02	97%	80%	120%	105%	90%	110%	106%	70%	130%
Chemical Oxygen Demand	567226	567226	20	18	NA	< 5	93%	80%	120%	99%	90%	110%	102%	70%	130%
Dissolved Organic Carbon	567226	567226	6.3	6.5	3.1%	< 0.5	102%	90%	110%	97%	90%	110%	93%	80%	120%
Total Kjeldahl Nitrogen	567026		0.68	0.67	1.5%	< 0.10	100%	80%	120%	97%	80%	120%	93%	70%	130%
Phenols	567026		<0.001	<0.001	NA	< 0.001	106%	90%	110%	105%	90%	110%	105%	80%	120%
Turbidity	567226	567226	7.0	7.0	0.0%	< 0.5	102%	90%	110%						
Calcium	567226	567226	48.7	48.9	0.4%	< 0.05	98%	90%	110%	100%	90%	110%	99%	70%	130%
Magnesium	567226	567226	4.36	4.25	2.6%	< 0.05	97%	90%	110%	99%	90%	110%	98%	70%	130%
Sodium	567226	567226	20.7	20.8	0.5%	< 0.05	100%	90%	110%	102%	90%	110%	101%	70%	130%
Potassium	567226	567226	20.8	20.4	1.9%	< 0.05	98%	90%	110%	101%	90%	110%	101%	70%	130%
Aluminum	567226	567226	0.032	0.029	9.8%	< 0.004	106%	90%	110%	107%	90%	110%	101%	70%	130%
Antimony	567226	567226	<0.003	<0.003	NA	< 0.003	103%	90%	110%	96%	90%	110%	96%	70%	130%
Arsenic	567226	567226	<0.003	<0.003	NA	< 0.003	101%	90%	110%	100%	90%	110%	108%	70%	130%
Barium	567226	567226	0.177	0.174	1.7%	< 0.002	100%	90%	110%	99%	90%	110%	91%	70%	130%
Beryllium	567226	567226	<0.001	<0.001	NA	< 0.001	104%	90%	110%	105%	90%	110%	111%	70%	130%
Bismuth	567226	567226	<0.002	<0.002	NA	< 0.002	100%	90%	110%	101%	90%	110%	95%	70%	130%
Boron	567226	567226	0.329	0.340	3.3%	< 0.010	107%	90%	110%	107%	90%	110%	100%	70%	130%
Cadmium	567226	567226	<0.001	<0.001	NA	< 0.001	103%	90%	110%	103%	90%	110%	104%	70%	130%
Chromium	567226	567226	<0.003	<0.003	NA	< 0.003	104%	90%	110%	103%	90%	110%	100%	70%	130%
Cobalt	567226	567226	0.005	0.005	0.0%	< 0.001	99%	90%	110%	99%	90%	110%	100%	70%	130%
Copper	567226	567226	0.009	0.009	NA	< 0.003	104%	90%	110%	105%	90%	110%	103%	70%	130%
Iron	567226	567226	<0.010	<0.010	NA	< 0.010	100%	90%	110%	97%	90%	110%	72%	70%	130%
Lead	567226	567226	<0.001	<0.001	NA	< 0.001	104%	90%	110%	105%	90%	110%	100%	70%	130%
Manganese	567226	567226	1.00	0.981	1.9%	< 0.002	105%	90%	110%	105%	90%	110%	100%	70%	130%
Molybdenum	567226	567226	<0.002	<0.002	NA	< 0.002	100%	90%	110%	100%	90%	110%	103%	70%	130%
Nickel	567226	567226	<0.003	<0.003	NA	< 0.003	102%	90%	110%	102%	90%	110%	102%	70%	130%
Selenium	567226	567226	<0.004	<0.004	NA	< 0.004	96%	90%	110%	97%	90%	110%	108%	70%	130%

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Quality Assurance

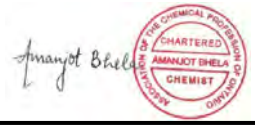
CLIENT NAME: PINCHIN LTD.
AGAT WORK ORDER: 19T523309
PROJECT: 225335 Chapman Landfill GW & SW
ATTENTION TO: Tim McBride
SAMPLING SITE:
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Oct 10, 2019			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
Silver	567226	567226	<0.002	<0.002	NA	< 0.002	104%	90%	110%	105%	90%	110%	101%	70%	130%
Strontium	567226	567226	0.379	0.380	0.3%	< 0.005	99%	90%	110%	101%	90%	110%	101%	70%	130%
Thallium	567226	567226	<0.006	<0.006	NA	< 0.006	104%	90%	110%	104%	90%	110%	100%	70%	130%
Tin	567226	567226	<0.002	<0.002	NA	< 0.002	100%	90%	110%	102%	90%	110%	102%	70%	130%
Titanium	567226	567226	<0.002	<0.002	NA	< 0.002	103%	90%	110%	102%	90%	110%	98%	70%	130%
Tungsten	567226	567226	<0.010	<0.010	NA	< 0.010	97%	90%	110%	98%	90%	110%	99%	70%	130%
Uranium	567226	567226	<0.002	<0.002	NA	< 0.002	99%	90%	110%	101%	90%	110%	101%	70%	130%
Vanadium	567226	567226	<0.002	<0.002	NA	< 0.002	103%	90%	110%	102%	90%	110%	102%	70%	130%
Zinc	567226	567226	<0.005	<0.005	NA	< 0.005	103%	90%	110%	104%	90%	110%	112%	70%	130%
Chapman Landfill - Groundwater Parameters															
Electrical Conductivity	567233	567233	32	30	6.5%	< 2	97%	80%	120%	NA			NA		
pH	567233	567233	5.92	5.83	1.5%		100%	90%	110%	NA			NA		
Alkalinity (as CaCO3)	567233	567233	<5	<5	NA	< 5	98%	80%	120%	NA			NA		
Total Phosphorus	567244	567244	0.13	0.13	0.0%	< 0.02	99%	80%	120%	104%	90%	110%	105%	70%	130%
Total Kjeldahl Nitrogen	567234	567234	4.10	4.14	1.0%	< 0.10	102%	80%	120%	97%	80%	120%	94%	70%	130%
Phenols	579156		<0.001	<0.001	NA	< 0.001	94%	90%	110%	98%	90%	110%	103%	80%	120%
Chapman Landfill - Surface Water Parameters															
Total Phosphorus	567999		0.03	0.03	NA	< 0.02	100%	90%	110%	101%	90%	110%	102%	80%	120%
Colour	577146		32	33	3.1%	< 5	100%	90%	110%						
Aluminum-dissolved	567248	567248	0.220	0.222	0.9%	< 0.004	104%	90%	110%	102%	90%	110%	82%	70%	130%
Cadmium	567226	567226	<0.0001	<0.0001	NA	< 0.0001	103%	90%	110%	103%	90%	110%	104%	70%	130%
Cobalt	567226	567226	0.0054	0.0054	0.4%	< 0.0005	99%	90%	110%	99%	90%	110%	100%	70%	130%
Silver	567226	567226	<0.0001	<0.0001	NA	< 0.0001	104%	90%	110%	105%	90%	110%	110%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:



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Method Summary

CLIENT NAME: PINCHIN LTD.

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
BOD (5)	INOR-93-6006	SM 5210 B	DO METER
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Hardness (as CaCO3) (Calculated)	MET-93-6105	EPA SW-846 6010C & 200.7	CALCULATION
Total Suspended Solids	INOR-93-6028	SM 2540 D	BALANCE
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ortho Phosphate as P	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Total Phosphorus	INOR-93-6057	QuikChem 10-115-01-3-A & SM 4500-P I	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Phenols	INOR-93-6050	MOE ROPHEN-E 3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Turbidity	INOR-93-6044	SM 2130 B	NEPHELOMETER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Antimony	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tungsten	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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

Method Summary

CLIENT NAME: PINCHIN LTD.

AGAT WORK ORDER: 19T523309

PROJECT: 225335 Chapman Landfill GW & SW

ATTENTION TO: Tim McBride

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Total Phosphorus	INOR-93-6022	SM 4500-P B&E	SPECTROPHOTOMETER
Colour	INOR-93-6046	SM 2120 C	SPECTROPHOTOMETER
Aluminum-dissolved	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

7 of 15 BH

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100;
Fax: 905-712-5122

LABORATORY USE ONLY

Arrival Condition: [X] Good [ ] Poor (complete "Notes")
Arrival Temperature: See Attached
AGAT Job Number:
Notes: 19T523309

CHAIN OF CUSTODY RECORD

Client Information

Company: Pinchin Ltd.
Contact: Tim McBride
Address: 957 Cambrian Heights, Unit # 203
Sudbury ON P3C 5S5
Phone: 705-521-0560 Fax:
PO#:
Client Project #: 225335 Chapman Landfill
AGAT Quotation #: 267698

Report Information

1. Name: Tim McBride
Email: tmcbride@Pinchin.com
2. Name:
Email:
3. Name:
Email:
4. Name:
Email:

Report Format

(Please "x" those that apply)

[ ] Single sample per page
[x] Multiple samples per page
[ ] Results by Fax

Turnaround Time (TAT)*

(Please "x" the applicable box below)

Regular TAT:

[x] 5 to 7 working days

Rush TAT (Rush Surcharges Apply):

[ ] 3 to 5 days
[ ] 48 to 72 hours
[ ] 24 to 48 hours

Date Required (Rush surcharges may apply)

Regulatory Guideline Required:

(Please "x" those that apply)

[ ] Reg 153 Table (indicate one) [ ] Ind/Com [ ] Res/Park [ ] Ag — [ ] Med/Fine [ ] Coarse
[ ] Sewer Use — Region (indicate one) [ ] Sanitary [ ] Storm
[ ] PWQO
[ ] Reg 558
[ ] CCME
[X] Other (indicate) GW - ODWS

Is this a drinking water sample (potable water intended for human consumption)?
[ ] Yes
[x] No
If "Yes" please use the Drinking Water Chain of Custody Record

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info, Sample Containment	Anions - Cl, NO3, NO2, Phos-P, SO4	Cations (K, Na, Mg, Ca)	Metals (see quote for list)	Alkalinity, Ammonia, BOD	COD, DOC, Conductivity	pH, Phenols	Total Phosphorous	TDS, TSS	TKN, Turbidity							
BH-1	26/09/19	10am - 1pm	water	7		x	x	x	x	x	x	x	x	x							
BH-2	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
BH-3-II	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
~~BH-4~~			~~water~~	~~7~~		x	x	x	x	x	x	x	x	x							
BH-4-II	26/09/19	10am - 1pm	water	7		x	x	x	x	x	x	x	x	x							
BH-5-II	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
~~BH-6-II~~			~~water~~	~~7~~		x	x	x	x	x	x	x	x	x							
BH-6-III	26/09/19	10am - 1pm	water	7		x	x	x	x	x	x	x	x	x							
BH-7-II	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
BH-8-I	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
BH-9-I	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
			TOTAL # OF CONTAINERS	77	* Samples received after 2:00 PM will be logged in for the next business day. TAT is exclusive of weekends and statutory holidays																

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Alana Valle	26/09/19		5:27
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Alana Valle	2pm		9:00

Special Instructions
PLEASE FILTER DOC AT SAMPLE RECEPTION

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100;
Fax: 905-712-5122

CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: [ ] Good [ ] Poor (complete "Notes")
Arrival Temperature:
AGAT Job Number:
Notes:

Client Information

Company: Pinchin Ltd.
Contact: Tim McBride
Address: 957 Cambrian Heights, Unit # 203
Sudbury ON P3C 5S5
Phone: 705-521-0560 Fax:
PO#:
Client Project #: 225335 Chapman Landfill
AGAT Quotation #: 267698

Report Information

1. Name: Tim McBride
Email: tmcbride@Pinchin.com
2. Name:
Email:
3. Name:
Email:
4. Name:
Email:

Report Format

(Please "x" those that apply)
[ ] Single sample per page
[x] Multiple samples per page
[ ] Results by Fax

Turnaround Time (TAT)*

(Please "x" the applicable box below)
Regular TAT:
[x] 5 to 7 working days
Rush TAT (Rush Surcharges Apply):
[ ] 3 to 5 days
[ ] 48 to 72 hours
[ ] 24 to 48 hours
Date Required (Rush surcharges may apply)

Regulatory Guideline Required:

(Please "x" those that apply)
[ ] Reg 153 Table (indicate one) [ ] Ind/Com [ ] Res/Park [ ] Ag [ ] Med/Fine [ ] Coarse
[ ] Sewer Use Region (indicate one) [ ] Sanitary [ ] Storm
[ ] PWQO [ ] Reg 558 [ ] CCME [X] Other (indicate) GW - ODWS

Is this a drinking water sample (potable water intended for human consumption)?
[ ] Yes [x] No
If "Yes" please use the Drinking Water Chain of Custody Record

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info, Sample Containment	Anions - Cl, NO3, NO2, Phos-P, SO4	Cations (K, Na, Mg, Ca)	Metals (see quote for list)	Alkalinity, Ammonia, BOD	COD, DOC, Conductivity	pH, Phenols	Total Phosphorous	TDS, TSS	TKN, Turbidity							
BH-10-I	26/09/19	10am-1pm	water	7		x	x	x	x	x	x	x	x	x							
BH-11	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
BH-DUP1	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
BH-DUP2	↓	↓	water	7		x	x	x	x	x	x	x	x	x							
TOTAL # OF CONTAINERS				28																	

* Samples received after 2:00 PM will be logged in for the next business day. TAT is exclusive of weekends and statutory holidays

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Alana Valle	26/09/19		26/09/19
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Alana Valle	2pm		9:00

Special Instructions
PLEASE FILTER DOC AT SAMPLE RECEPTION

AGAT Laboratories
5835 Coopers Avenue
Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100;
Fax: 905-712-5122

CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: [ ] Good [ ] Poor (complete "Notes")
Arrival Temperature:
AGAT Job Number:
Notes:

Client Information

Company: Pinchin Ltd
Contact: Tim McBride
Address: 957 Cambrian Heights, Unit # 203
Sudbury ON P3C 5S5
Phone: 705-521-0560 Fax:
PO#:
Client Project #: 225335 Chapman Landfill
AGAT Quotation #: 267698

Report Information

1. Name: Tim McBride
Email: tmcbride@Pinchin.com
2. Name:
Email:
3. Name:
Email:
4. Name:
Email:

Report Format

(Please "x" those that apply)
[ ] Single sample per page
[x] Multiple samples per page
[ ] Results by Fax

Turnaround Time (TAT)*

(Please "x" the applicable box below)
Regular TAT:
[x] 5 to 7 working days
Rush TAT (Rush Surcharges Apply):
[ ] 3 to 5 days
[ ] 48 to 72 hours
[ ] 24 to 48 hours
Date Required (Rush surcharges may apply)

Regulatory Guideline Required:

(Please "x" those that apply)
[ ] Reg 153 Table (indicate one) [ ] Ind/Com [ ] Res/Park [ ] Ag [ ] Med/Fine [ ] Coarse
[ ] Sewer Use Region (indicate one) [ ] Sanitary [ ] Storm
[X] PWQO [ ] Reg 558 [ ] CCME [ ] Other (indicate)

Is this a drinking water sample (potable water intended for human consumption)?
[ ] Yes [x] No
If "Yes" please use the Drinking Water Chain of Custody Record

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info, Sample Containment	Anions - Cl, NO3, NO2, Phos., SO4	Cations (K, Na, Mg, Ca)	Metals (see quote for list)	Alkalinity, Ammonia, BOD	COD, DOC, Conductivity	Colour	Phenols	Total Phosphorous	TDS, TSS	TKN	Dissolved Aluminum					
SW-1	26/09/19	10am - 1pm	water	8		x	x	x	x	x	x	x	x	x	x	x					
SW-2			water	8		x	x	x	x	x	x	x	x	x	x	x					
SW-3			water	8		x	x	x	x	x	x	x	x	x	x	x					
SW-DUP 1			water	8		x	x	x	x	x	x	x	x	x	x	x					
TOTAL # OF CONTAINERS				32	* Samples received after 2:00 PM will be logged in for the next business day. TAT is exclusive of weekends and statutory holidays																

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Alana Valle	26/09/19		5:27
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
Alana Valle	2pm		9:00

Special Instructions
PLEASE FILTER for Diss. Al & DOC AT SR

AGAT Laboratories

Sample Temperature Log

Client: Pinchin

COC# or Work Order #:

# of Coolers: 7

# of Submissions:

Arrival Temperatures - Branch/Driver

Cooler #1:	3.0	2.7	2.1
Cooler #2:	2.2	2.8	2.3
Cooler #3:	3.7	3.0	3.1
Cooler #4:	3.9	3.9	2.0
Cooler #5:	2.7	2.1	2.3
Cooler #6:	3.0	3.1	3.3
Cooler #7:	2.2	2.7	2.9
Cooler #8			
Cooler #9:			
Cooler #10:			

IR Gun ID:

Taken By:

Date (yyyy/mm/dd): Time: ____:____ AM / PM

Arrival Temperatures - Laboratory

Cooler #1:			
Cooler #2:			
Cooler #3:			
Cooler #4:			
Cooler #5:			
Cooler #6:			
Cooler #7:			
Cooler #8			
Cooler #9:			
Cooler #10:			

IR Gun ID:

Taken By:

Date (yyyy/mm/dd): Time: ____:____ AM / PM

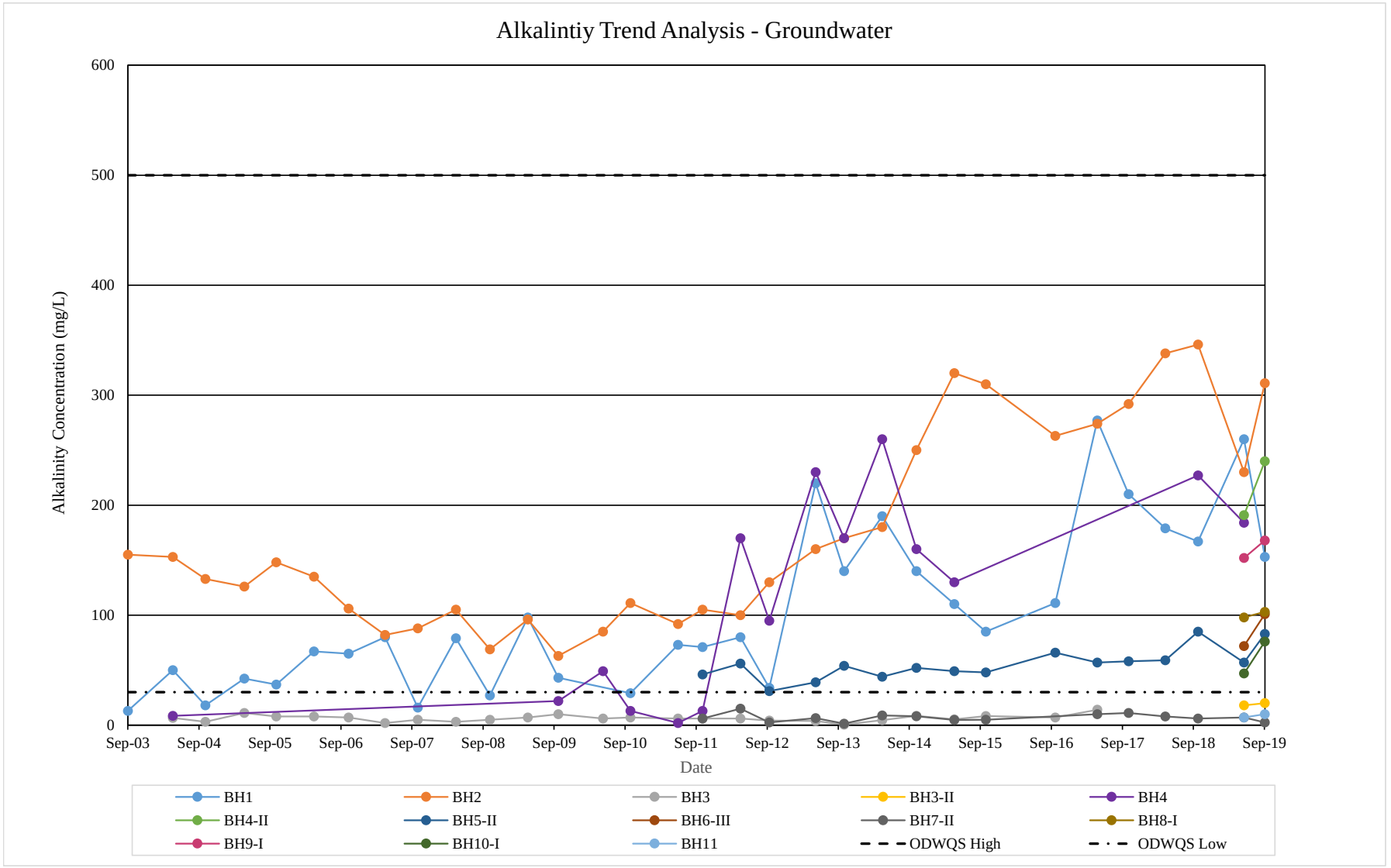
Instructions for use of this form: 1) complete all fields of info including total # of coolers and # of submissions rec'd, 2) photocopy and place in each submission prior to giving a WO#, 3) Proceed as normal, write the WO# and scan (please make sure to scan along with the COC)

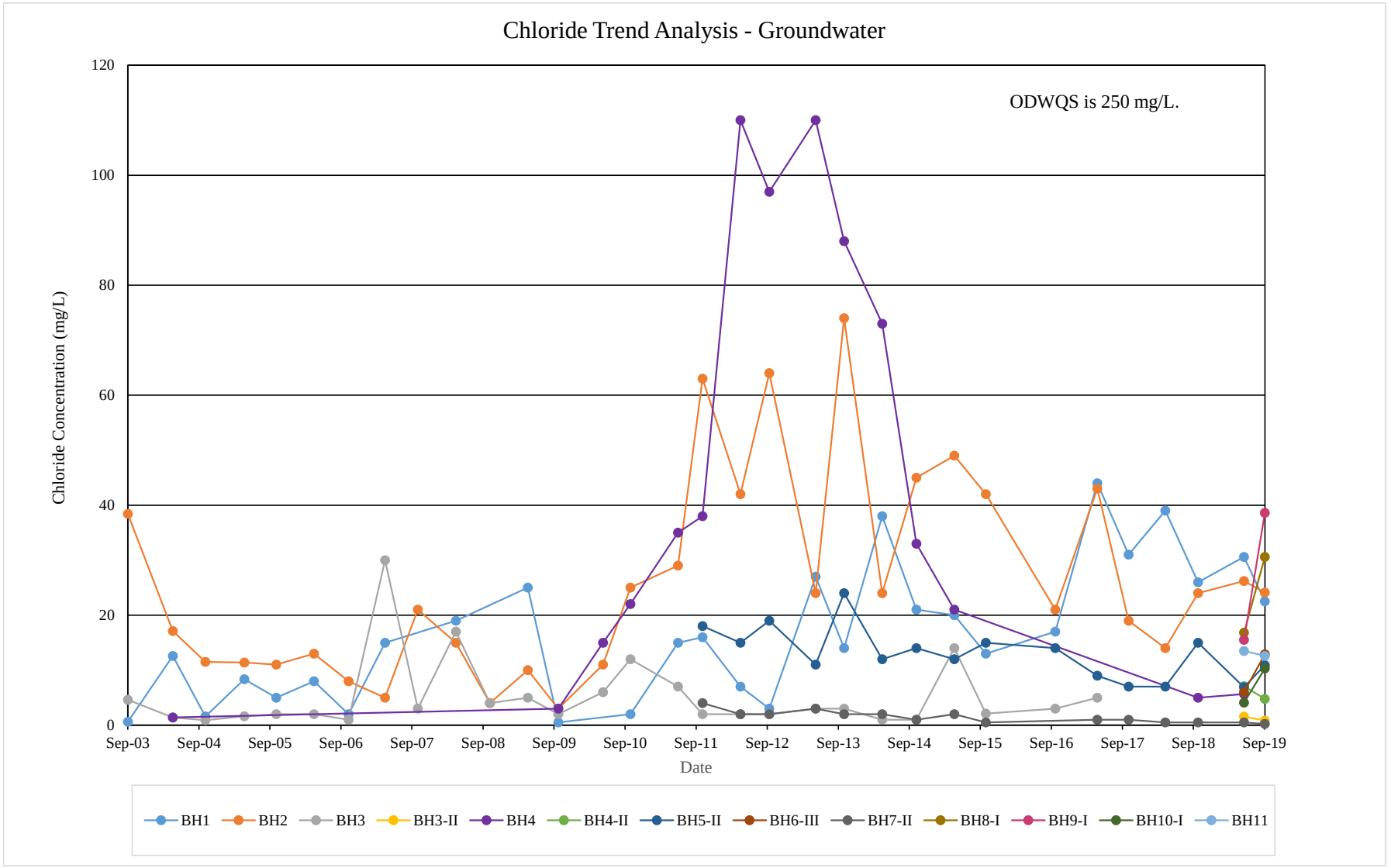
Document ID: SR-78-9511.003
Date Issued: 2017-2-23

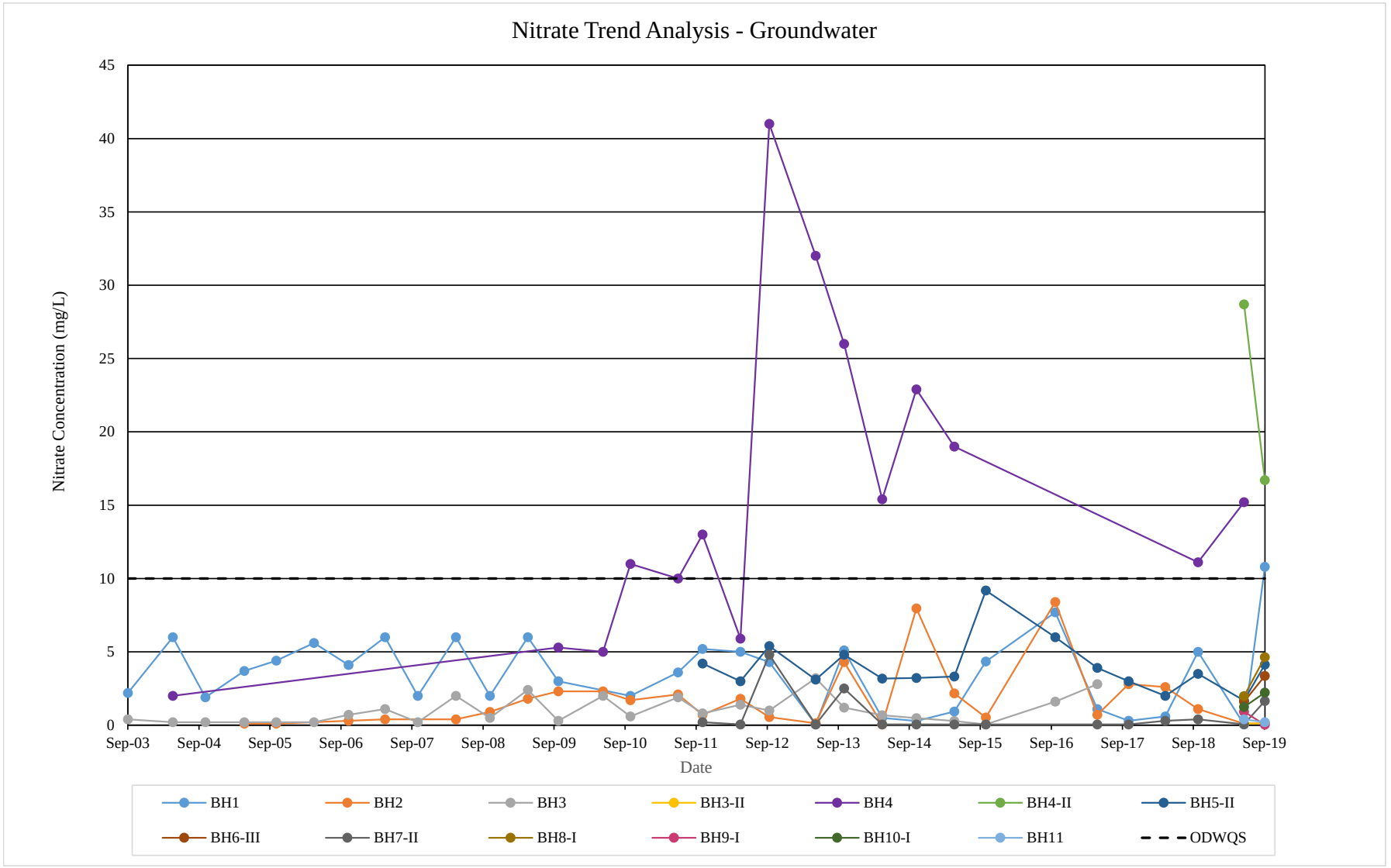
Page:_____ of _____

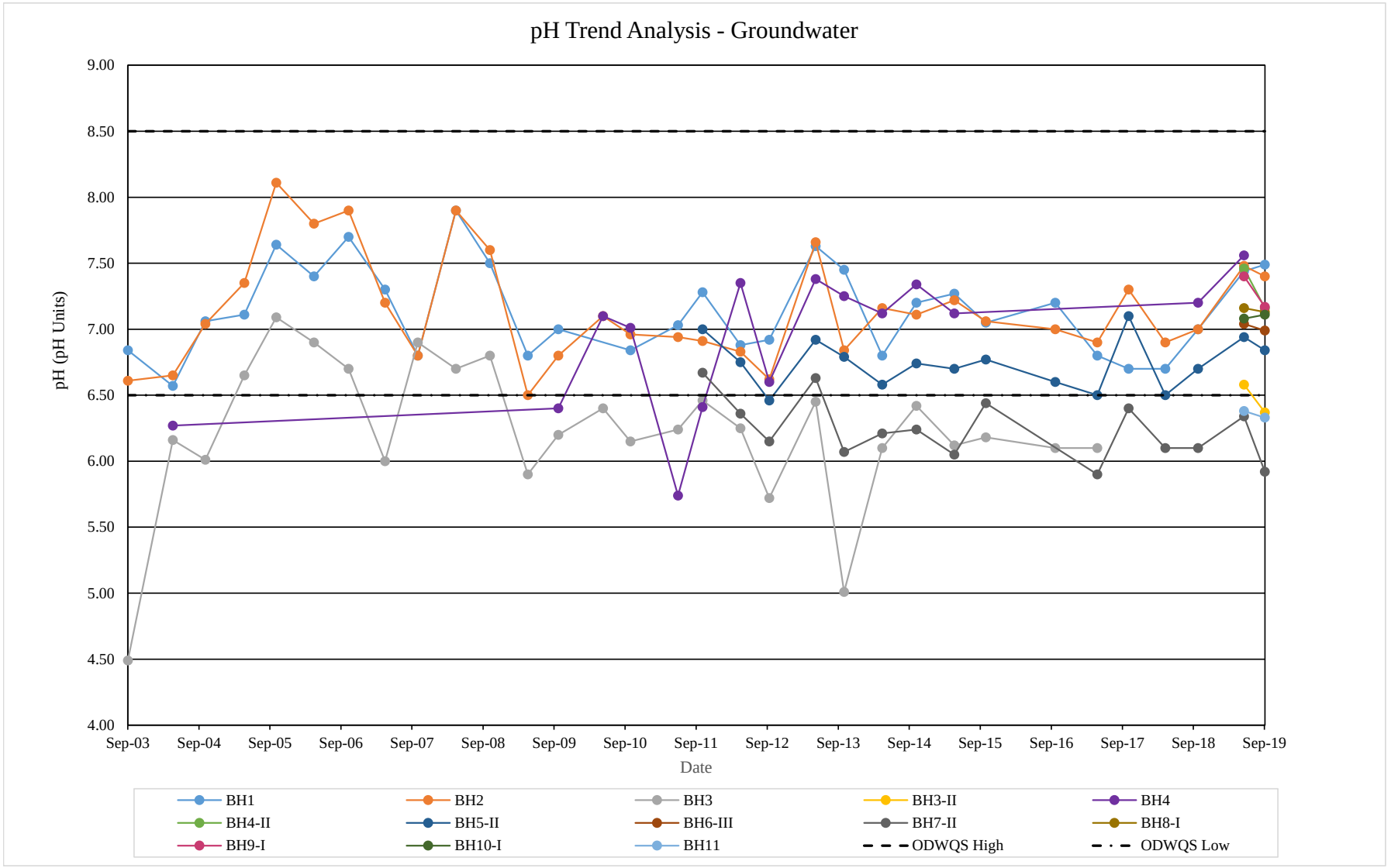
APPENDIX VI

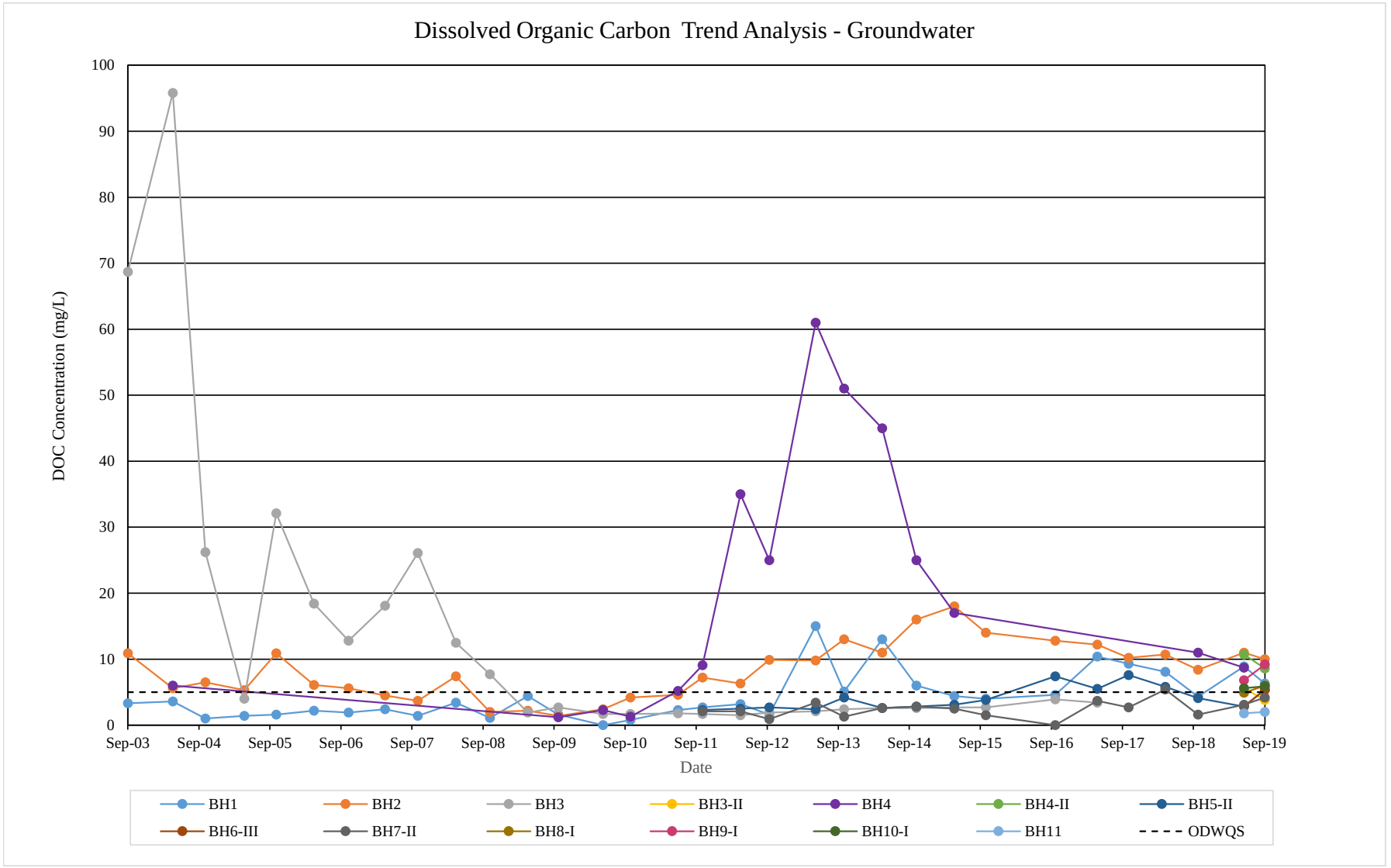
Groundwater Trend Analysis


Alkalintiy Trend Analysis - Groundwater
Alkalinity Concentration (mg/L)
600
500
400
300
200
100
0
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
BH1
BH2
BH3
BH3-II
BH4
BH4-II
BH5-II
BH6-III
BH7-II
BH8-I
BH9-I
BH10-I
BH11
ODWQS High
ODWQS Low


Chloride Trend Analysis - Groundwater
ODWQS is 250 mg/L.
Chloride Concentration (mg/L)
120
100
80
60
40
20
0
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
BH1
BH2
BH3
BH3-II
BH4
BH4-II
BH5-II
BH6-III
BH7-II
BH8-I
BH9-I
BH10-I
BH11

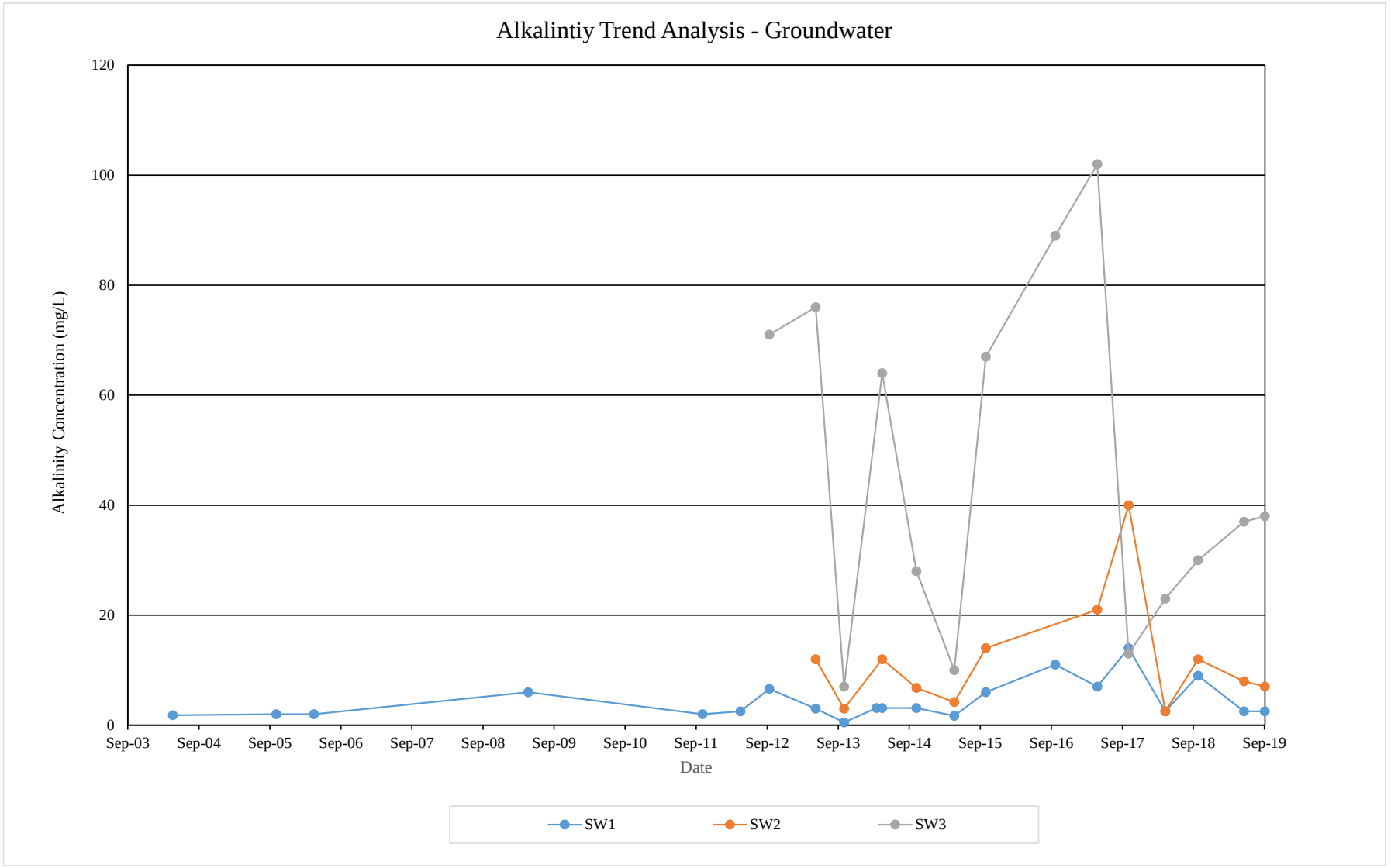

Nitrate Trend Analysis - Groundwater
Nitrate Concentration (mg/L)
45
40
35
30
25
20
15
10
5
0
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
BH1
BH2
BH3
BH3-II
BH4
BH4-II
BH5-II
BH6-III
BH7-II
BH8-I
BH9-I
BH10-I
BH11
ODWQS

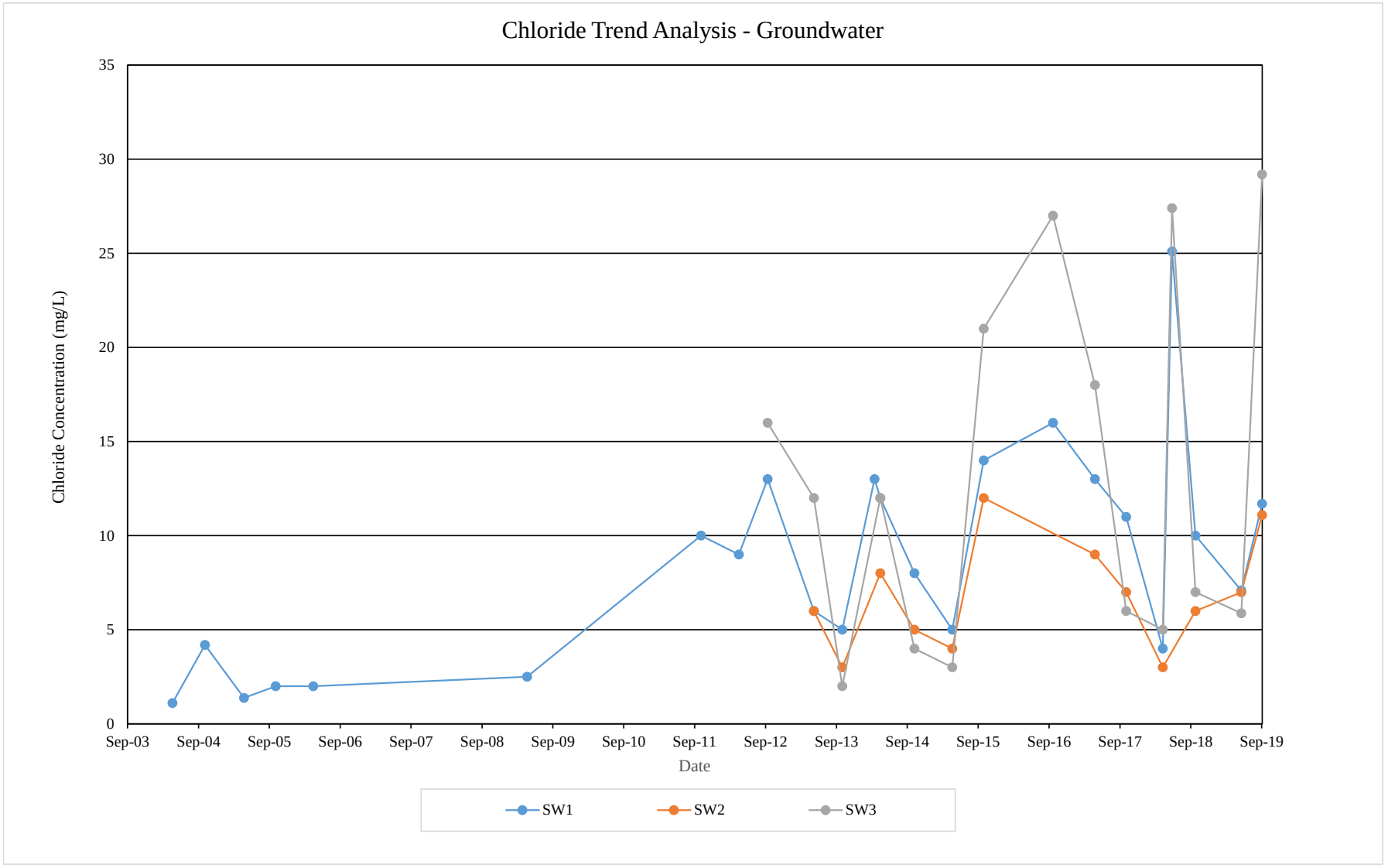

pH Trend Analysis - Groundwater
pH (pH Units)
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
BH1
BH2
BH3
BH3-II
BH4
BH4-II
BH5-II
BH6-III
BH7-II
BH8-I
BH9-I
BH10-I
BH11
ODWQS High
ODWQS Low

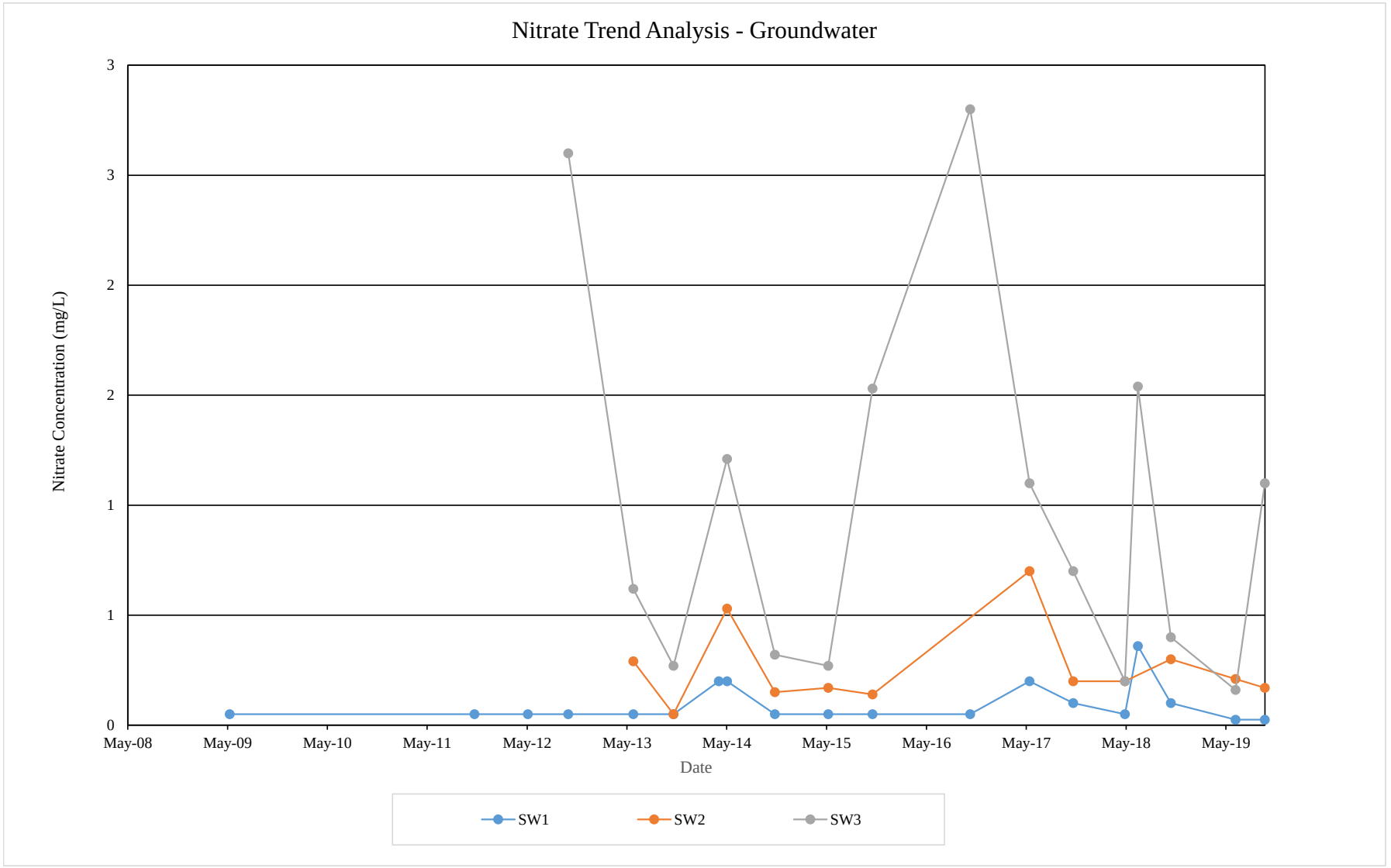

Dissolved Organic Carbon Trend Analysis - Groundwater
DOC Concentration (mg/L)
100
90
80
70
60
50
40
30
20
10
0
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
BH1
BH2
BH3
BH3-II
BH4
BH4-II
BH5-II
BH6-III
BH7-II
BH8-I
BH9-I
BH10-I
BH11
ODWQS

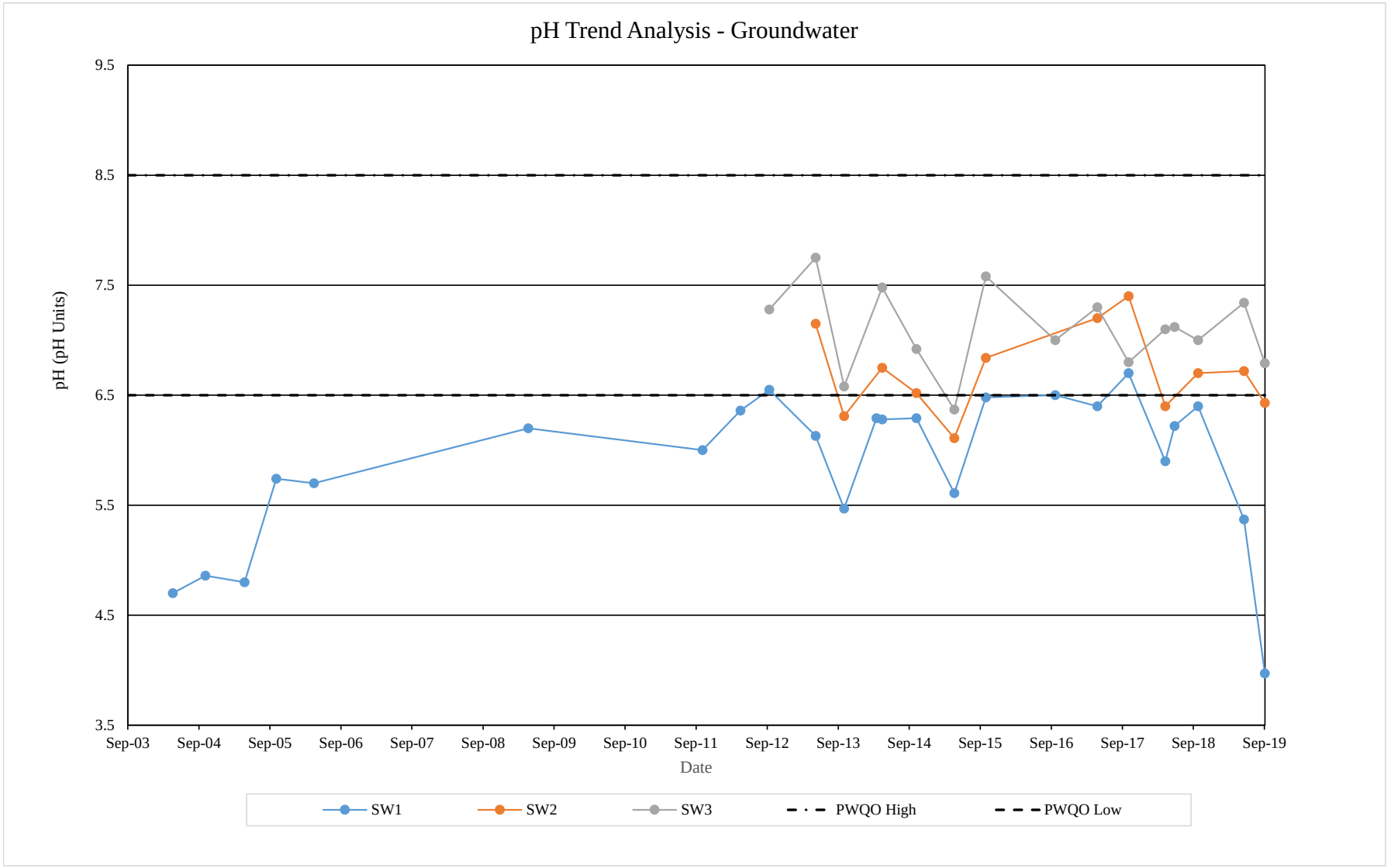
APPENDIX VII

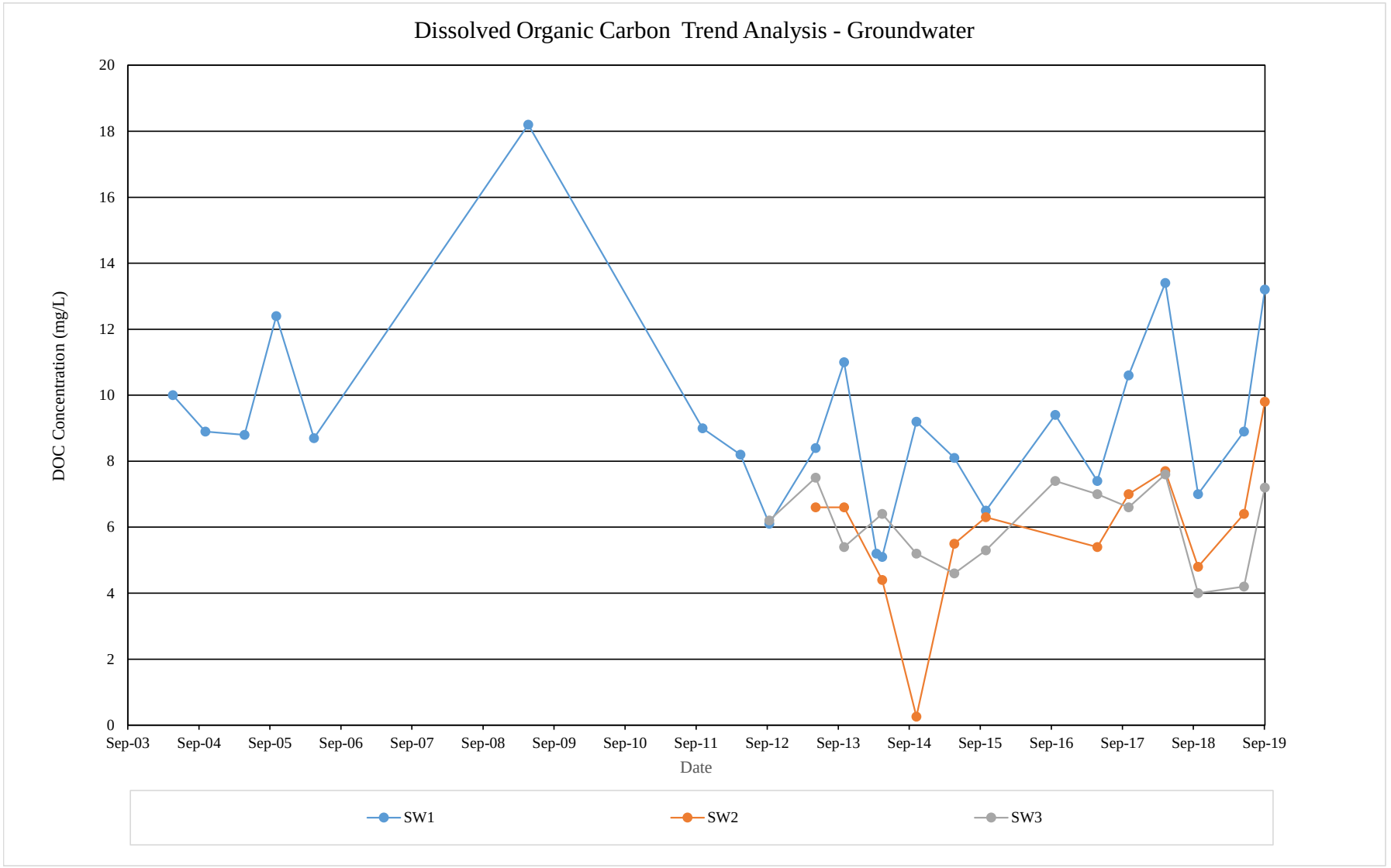
Surface Water Trend Analysis


Alkalintiy Trend Analysis - Groundwater
Alkalinity Concentration (mg/L)
120
100
80
60
40
20
0
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
SW1
SW2
SW3


Chloride Trend Analysis - Groundwater
Chloride Concentration (mg/L)
35
30
25
20
15
10
5
0
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
SW1
SW2
SW3


Nitrate Trend Analysis - Groundwater
Nitrate Concentration (mg/L)
3
3
2
2
1
1
0
May-08
May-09
May-10
May-11
May-12
May-13
May-14
May-15
May-16
May-17
May-18
May-19
Date
SW1
SW2
SW3


pH Trend Analysis - Groundwater
9.5
8.5
7.5
6.5
5.5
4.5
3.5
pH (pH Units)
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
SW1
SW2
SW3
PWQO High
PWQO Low


Dissolved Organic Carbon Trend Analysis - Groundwater
DOC Concentration (mg/L)
20
18
16
14
12
10
8
6
4
2
0
Sep-03
Sep-04
Sep-05
Sep-06
Sep-07
Sep-08
Sep-09
Sep-10
Sep-11
Sep-12
Sep-13
Sep-14
Sep-15
Sep-16
Sep-17
Sep-18
Sep-19
Date
SW1
SW2
SW3

APPENDIX VIII

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	Chapaman Waste Disposal Site
Location (e.g. street address, lot, concession)	Lot 108, Concession A, within the Municipality of Magnetawan, District of Parry Sound, Ontario
GPS Location (taken within the property boundary at front gate/ front entry)	Universal Transverse Mercator (UTM) coordinates Zone 17U, 606831 metres (m) Easting and 5063200 m Northing (North American Datum 1983)
Municipality	Municipality of Magnetawan
Client and/or Site Owner	Corporation of the Municipality of Magnetawan
Monitoring Period (Year)	2019
This Monitoring Report is being submitted under the following:	
Certificate of Approval No.:	A521202
Director's Order No.:	Type Here
Provincial Officer's Order No.:	Type Here
Other:	Type Here

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:		Select Date
Has the nature of the operations at the site changed during this monitoring period?	○ **Yes** ◉ **No**	
If yes, provide details:	Type Here	
Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i. e. exceeded the LEL for methane)	○ Yes ◉ No	

Groundwater WDS Verification:

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

Sampling and Monitoring Program Status:

1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:	◉ **Yes** ○ **No**	If no, list exceptions (Type Here):
2) All groundwater, leachate and WDS gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by Certificate(s) of Approval or other relevant authorizing/control document(s):	◉ **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**
		Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

3) a) Some or all groundwater, leachate and WDS gas sampling and monitoring requirements have been established or defined outside of a ministry C of A, authorizing, or control document.	○ **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**	A CAZ boundary should be developed for the Site.	
6) The site meets compliance and assessment criteria.	◉ **Yes** ○ **No**	If no, list and explain exceptions (Type Here):	
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	◉ **Yes** ○ **No**	If no, list exceptions and explain reason for increase/change (Type Here):	
1) Is one or more of the following risk reduction practices in place at the site: ***(a)*** **There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/treatment; or** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	◉ **Yes** ○ **No**	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☒ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	○ **Yes** ○ **No** ◉ **Not Applicable**	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.

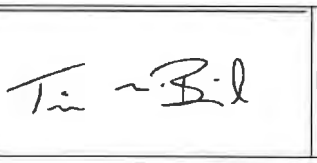
If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances 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:

9-Dec-2019

Recommendations:

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

○ **No changes to the monitoring program are recommended**	
◉ **The following change(s) to the monitoring program is/are recommended:**	It is recommended that the three-tiered trigger level monitoring program, developed as part of the 2019 Leachate Management Plan Study, be implemented for the Site.
◉ **No Changes to site design and operation are recommended**	
○ **The following change(s) to the site design and operation is/ are recommended:**	Type Here

Name:	Tim McBride		
Seal:	Add Image		
Signature:		**Date:**	9-Dec-2019
CEP Contact Information:	Tim McBride		
Company:	Pinchin Ltd.		
Address:	957 Cambrian Heights Drive, Unit 203 Sudbury, Ontario P3C 5S5		
Telephone No.:	705.521.0560 ext 3416	Fax No. :	705.521.1309
E-mail Address:	tmcbride@pinchin.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)	Unnamed creek to the south of the Site Unnamed creek to the east of the Site
Distance(s)	Approximately 50 m south of the Site Approximately 50 m east of the Site

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

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	◉ Yes ○ No	If no, identify issues (Type Here):
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the 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**	If no, specify (Type Here):

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

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

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table 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
Phenols	PWQO - 0.001 mg/L	SW1 - 0.003 mg/L (fall) SW2 - 0.002 mg/L (fall)
pH (low)	PWQO/CWQG - 6.5-8.5 pH Units	SW1 - 5.37 (spring), 3.97 (fall)
Iron	PWQO/CWQG - 0.3 mg/L	SW1 - 0.369 mg/L (spring), 0.383 mg/L (fall) SW3 - 0.411 mg/L (spring), 5.82 mg/L (fall)
Potassium	APV - 0.039 mg/L	SW1 - 0.23 mg/L (spring), 0.80 mg/L (fall) SW2 - 1.19 mg/L (spring), 1.55 mg/L (fall) SW3 - 2.88 mg/L (spring), 9.14 mg/L (fall)
Aluminum	PWQO - 0.075 mg/L CWQO - 0.1 mg/L	SW1 - 0.2 mg/L (spring), 0.22 mg/L (fall) SW2 - 0.11 mg/L (spring), 0.099 mg/L (fall)
Cobalt	PWQO - 0.009 mg/L APV - 0.0052 mg/L	SW1 - 0.0012 mg/L (spring), 0.0014 mg/L (fall) SW3 - 0.021 mg/L (spring), 0.0166 mg/L (fall)
Boron	PWQO - 0.2 mg/L	SW3 - 0.232 mg/L (fall)
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**	All parameters exceeded at SW-1 suggest elevated background concentrations not related to landfill operations.

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**	If no, list parameters and stations that is outside the expected range. Identify whether parameter concentrations show an increasing trend or are within a high historical range (Type Here)
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:

9-Dec-2019

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	Hydrogeologist
Date:	9-Dec-2019
CEP Contact Information:	Tim McBride
Company:	Pinchin Ltd.
Address:	957 Cambrian Heights Drive, Unit 203 Sudbury, Ontario P3C 5S5
Telephone No.:	705.521.0560 ext 3416
Fax No. :	705.521.1309
E-mail Address:	tmcbride@pinchin.com

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