2023 ANNUAL MONITORING REPORT
HICKEY ROAD WASTE DISPOSAL SITE
ENVIRONMENTAL COMPLIANCE APPROVAL
NO. A362301

Prepared for:

The Corporation of the Municipality of Hastings Highlands
P.O. Box 130
33011 Highway No. 62
Maynooth, ON K0L 2S0

Prepared by:

BluMetric Environmental Inc.
4 Cataraqui Street
The Woolen Mill, The Tower
Kingston, ON K7K 1Z7

Project Number: 230225-05
25 March 2024

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(Provided on USB drive for Hard Copy)

1 Introduction

This report provides a summary and analysis of environmental monitoring activities at the Hickey Road Waste Disposal Site (WDS), in Maynooth, Ontario. The WDS as shown in Figure 01 is herein referred to as the "Site".

This report is being prepared for the Corporation of the Municipality of Hastings Highlands (the Municipality, or MHHs). The Municipality has been in the process of purchasing the Crown land from the Ministry of Natural Resources and Forestry (MNRF) for the past few years. In January of 2020, it was thought that ownership of the 4.0 hectares (ha) waste site had been transferred from the Crown to the Municipality, however as of October 2023, it remains in the final stages of documentation processing. The Site is operated under Environmental Compliance Approval (ECA) No. A362301, dated December 20, 2018, which is included in **Appendix A.**

This report covers all work and activities carried out for the period of January 1, 2023, to December 31, 2023. BluMetric Environmental Inc. (BluMetric®) was retained by the Municipality to conduct the 2023 environmental monitoring and sampling program and prepare the 2023 Annual Monitoring Report.

The intent of this report is to be consistent with the general requirements of the Ontario Ministry of Environment, Conservation and Parks (MECP) document titled; *Monitoring and Reporting for Waste Disposal Sites (WDS), Groundwater and Surface Water: Technical Guidance Document* (MOE November 2010), referred to as the "WDS Technical Guidance". The Monitoring and Screening Checklist from the WDS Technical Guidance has been completed and is included as **Appendix B** of this report. The screening checklist was completed with the Operational Status set as "open" as the Site operated throughout 2023.

1.1 Location

The WDS is located on the eastern end of Hickey Road East, approximately 850 m from the intersection with Highway 62 in the community of Hickey Settlement (Figure 01). The civic address is 202 Hickey Road and is located approximately 8.5 km south of Maynooth, Ontario. The total Site area is 4.0 ha located on Part of Lot 30, Concession 8 (formerly Wicklow Township), and now part of the MHHs. The facility layout, road network, and site features are shown on Figure 02 – Site Plan.

The Site includes a 3.0 ha approved footprint. There is a 30 metre (m) buffer around the footprint and a proposed Contaminant Attenuation Zone (CAZ) of 1.12 ha to the south of the 4.0 ha WDS area.

1.2 Site Ownership and Key Personnel

The facility is owned and operated by the MHHs, with the Municipal office located in Maynooth, Ontario.

The transfer of the land from MNRF to MHHs is in the final stages. It is anticipated that the final documentation for the 4.0 ha WDS property will be completed and registered on title in 2024. We understand that the transfer of the easement from the Crown for the 1.12 ha CAZ area shown on Figure 04 is also still in progress and should also be completed in 2024. The Municipality initiated consultations with MNRF with respect to the WDS property in 2015. Over the past eight years several steps (e.g. Environmental Assessment, Indigenous and Public Consultations) were required to be completed for the Municipality to purchase the property and secure the easement for the CAZ.

The facility's operational representative is responsible for all activities on-site. The Site contact is David Stewart, of MHHs and the Competent Environmental Practitioner (CEP) for both groundwater and surface water is Mark Somers, P.Eng., of BluMetric. Mr. Somers is a Professional Engineer as designated by Professional Engineers Ontario (PEO).

Contact information is outlined in the following Table 1:

Table 1: Contact Information

	Name	Address	Email
Site Owner/Contact	The Corporation of the Municipality of Hastings Highlands CAO – David Stewart	P.O. Box 130 33011 Highway No. 62 Maynooth, ON K0L 2S0	dstewart@hastingshighlands.ca (613) 338 – 2811 ext. 289
CEP	Mark Somers, P.Eng., BluMetric Environmental	1682 Woodward Dr, Ottawa, ON K2C 3R8	msomers@blumetric.ca (877) 487 – 8436 ext. 246

1.3 Description and Development of the Site

The Site has a total site area of 4.0 ha with a 3-ha landfilling area. In addition to domestic waste, Hickey Road WDS includes recycling bins for metal, plastic, paper/cardboard products, as well as segregated areas for scrap metal, tires, large bulky items, and brush. The Ontario Electronic Stewardship (OES) has approved the Hickey Road WDS for the collection of Waste Electrical and Electronic Equipment (WEEE) wastes. New regulations came into effect in 2020 with respect to this material, now referred to as Electrical and Electronic Equipment (EEE). The new regulation with respect to EEE falls under the Resource Recovery and Circular Economy Act, 2016, and the regulation was filed on September 21, 2020.

The Site is in a former sand and gravel pit within a forested area, surrounded by Crown land to the north, east, and south. It is believed that the first waste was placed in the 1960's or early 1970's. It is our understanding that the MECP has records dating back to 1971. Historically, domestic wastes were disposed of in trenches; however, the Site is currently using an area fill method of operation.

1.4 Monitoring and Reporting Program and Objectives and Requirements

The objectives of the monitoring and reporting program are to identify and mitigate impacts to the environment caused by the municipal solid WDS. In addition, the monitoring and reporting program are designed to adhere to the WDS Technical

Guidance and the ECA for the Site. The ECA specifies routine monitoring for explosive methane gas under Section 8(1). Groundwater and surface water parameters are to be monitored in accordance with Schedule A and B of the ECA (pages 22 and 23).

2 Physical Setting

2.1 Geology and Hydrogeology

2.1.1 Surficial Geology

The surficial geology underlying the Site is sand with some gravel as determined from the monitoring well logs which are provided in **Appendix C**. There are 10 monitoring well locations on-site with each being drilled to depths ranging from approximately 6.7 to 9.14 m below ground surface (mbgs) in a sand unit. The surficial geology of the area is described as glaciofluvial outwash deposits (MNDM, 2556).

2.1.2 Overburden Hydrogeology

On October 23, 2019, slug-bail testing was carried out on two of the new monitoring wells (HR7-19 and HR8-19). The results of the field testing were analyzed using the Hvorslev analyses for the overburden sand unit at HR7-19, and the sand unit at HR8-19. The results of these analyses for the sand unit at HR7-19 were 9.62×10^{-4} m/s and 9.10×10^{-4} m/s. The results of these analyses at HR8-19 for the sand unit were 2.28×10^{-3} m/s and 3.14×10^{-4} m/s.

2.1.3 Bedrock Geology

The bedrock geology of the area is predominantly clastic rocks (for example, conglomerate, wake, quartz arenite, arkose, limestone) (MNDM, Map 2544). There are minor metavolcanic rocks in the area (MNDM, Map 2544).

2.1.4 Bedrock Hydrogeology

A groundwater well information search indicates there are ten domestic wells within 1.5 km of the Site. Seven of the wells are located to the north-west of the Site and not in the direction of groundwater flow. Of these seven wells, one well is drilled to a depth of 26 mbgs, while the other six are at depths of 50 mbgs or more. Six of the seven well intakes are in bedrock.

Two of the wells are located to the south-west of the Site and are not in the direction of groundwater flow. These wells are drilled to a depth of 48 mbgs and 60 mbgs and both intakes are in bedrock.

One well is located south-east of Site and in the direction of groundwater flow. This well is drilled to a depth of 23 mbgs and the intake is in gravel. The groundwater well search did not result in well information for the two closest residences; however, it is presumed there are wells at these locations.

2.2 Surface Water Features

Based on topography, surface water and groundwater flowing from the Site likely travels towards an un-named tributary to the south-east which eventually enters Bird Creek located approximately 0.7 km to the south.

2.3 Potential Receptors

Potential groundwater and surface water receptors in the area surrounding the Site include:

- Residential houses that comprise what is known as Hickey Settlement, 1.3 km west of the Site (low potential based on groundwater and surface water flow direction);
- Domestic well located 1.2km south-east of the Site;
- Bird Creek Junction, 0.7 km south of the Site; and

- Un-named tributary of Bird Creek directly south/south-east of the Site.

Site personnel confirmed the flow of Bird Creek in the fall of 2016 to be southward at Hickey Road, therefore O'Shaughnessy Lake is not a potential receptor.

3 Monitoring Program

3.1 Site Inspections and Operational Monitoring

Site visits to the Hickey Road WDS were conducted on May 3 and October 17, 2023. The detailed site checklists are provided in **Appendix D-1**. Generally, the Site was in good condition and the following concerns were noted:

During the spring 2023 site visit, there were no landfill operations issues observed. During the fall 2023 site visit, the metal/steel pile was noted as being messy and the bulky waste pile was overflowing. No other concerns were identified.

Select photographs taken during the site visits are provided at the end of the text following the tables and figures.

3.2 Monitoring Locations, Frequency, and Monitoring Parameters

3.2.1 Groundwater Monitoring

The Hickey Road WDS is monitored on a semi-annual basis (spring and fall) for groundwater. There are currently 10 groundwater monitoring wells located at the Site. Four groundwater monitoring well drilling events have occurred at the Site. The first drilling program was initiated in 2003, with the completion of HR1-03, HR2-03, and HR3-03. In 2010, HR4-10 and HR5-10 were drilled and installed. In 2019, HR6-19, HR7-19, and HR8-19 were added to the groundwater monitoring program. In the summer of 2021, HR9-21 and HR10-21 were drilled and installed. The monitoring wells at the Site are drilled to bottom depths ranging from 6.7 to 9.14 mbgs. The groundwater sampling locations are illustrated on the Site Plan (Figure 02). Table 2 summarizes the

GPS co-ordinates and location description of the groundwater monitoring wells. Monitoring well logs are provided in **Appendix C**.

Table 2: Groundwater Monitoring Well Details

Sample Location	Northing (m)	Easting (m)	Location Description	Screened Interval
HR1-03	5005344	273269	5 m upgradient of WDS	Slot 10 PVC screen – from 3.7 to 6.7 metres below ground surface (mbgs)
HR2-03R	5005293	273292	Middle of waste area	Slot 10 PVC screen – from 4.3 to 7.3 mbgs
HR3-03	5005374	273160	West section of WDS	Slot 10 PVC screen – from 3.7 to 6.7 mbgs
HR4-10	5005251	273247	Directly downgradient of active waste area	Slot 10 PVC screen – 4.57 to 7.62 mbgs
HR5-10	5005256	273280	Directly downgradient of historical trench area	Slot 10 PVC screen – 5.18 to 8.22 mbgs
HR6-19	5005336	273359	East area of WDS	Slot 10 PVC screen – 4.47 to 7.52 mbgs
HR7-19	5005201	273298	70 m south-southeast of HR5-10 (footprint toe)	Slot 10 PVC screen – 4.57 to 7.62 mbgs
HR8-19	5005213	273243	45 m south of HR4-10 (footprint toe)	Slot 10 PVC screen – 4.23 to 7.28 mbgs
HR9-21	5005132	273305	130 m from south toe of footprint, 10 m from south CAZ Boundary	Slot 10 PVC screen – 4.42 to 7.48 mbgs
HR10-21	5005129	273239	130 m from southwest toe of footprint, 8 m from west CAZ Boundary	Slot 10 PVC screen – 6.1 to 9.14 mbgs

Note: Site Survey October 21, 2021, NAD 83, and Zone 18.

During the monitoring events in 2023, the conditions of groundwater monitoring wells were inspected. Any repairs, such as new locks, labels or well caps, were made as necessary. Protective casings with proper annular space seals remain in place to ensure that surface water or foreign materials cannot enter groundwater monitoring wells. Monitoring wells are fitted with a vermin-proof cap to meet the requirements of Ontario Regulation 903 and are locked to provide protection against vandalism and are in line with industry best practices.

Groundwater samples were collected on May 3 and October 17, 2023. The laboratory reports and chain of custody records are included in **Appendix D-2**. Table 3 lists the groundwater quality parameters tested as per Schedule B of the ECA. Field measurements of groundwater pH, temperature, and conductivity are collected at the time of sampling.

Table 3: Groundwater Quality Monitoring Parameters

Category	Parameters
Organic Parameters	Dissolved Organic Carbon (DOC)
Inorganic Parameters	Alkalinity, Ammonia (N)-Total, Calcium, Chloride, Sodium, Potassium, Magnesium, Nitrate, Sulphate
Metals	Aluminum, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Silicon, Silver, Strontium, Thallium, Titanium, Vanadium, Zinc
Physical/Chemical Parameters	Chemical Oxygen Demand (COD), Conductivity, pH, Total Dissolved Solids (TDS)

3.2.1.1 Groundwater Gradients and Flow Direction

During each monitoring event, groundwater elevations were collected from each monitoring well (results are presented in Table 4). Groundwater level measurements were collected using a Solinst electronic water level meter prior to the purging/sampling activity.

Table 4: Groundwater Elevation Data

Groundwater Monitor	Elevation (TPVC)* (masl)	Water Level (m) 3-May-23	Groundwater Elevation (masl) 3-May-23	Water Level (m) 17-Oct-23	Groundwater Elevation (masl) 17-Oct-23
HR1-03	363.06	3.35	359.71	6.83	356.23
HR2-03R	363.02	5.55	357.47	7.335	355.69
HR3-03	363.49	3.47	360.02	6.22	357.27
HR4-10	362.93	5.86	357.07	7.215	355.72
HR5-10	363.22	6.21	357.01	7.62	355.60
HR6-19	363.35	4.15	359.20	7.26	356.09
HR7-19	362.12	5.51	356.61	6.705	355.42
HR8-19	360.89	4.02	356.87	5.24	355.65
HR9-21	360.51	4.3	356.21	5.38	355.13

Groundwater Monitor	Elevation (TPVC)* (masl)	Water Level (m) 3-May-23	Groundwater Elevation (masl) 3-May-23	Water Level (m) 17-Oct-23	Groundwater Elevation (masl) 17-Oct-23
HR10-21	362.62	6.18	356.44	7.26	355.36

Note: Elevation survey was completed on October 21, 2021, NAD 83, and Zone 18.
*TPVC – Elevation (m) at top of PVC casing

Using the spring 2023 groundwater elevation data, the groundwater flow direction is inferred to flow towards the south with a slight east component at a horizontal gradient 0.015 m/m.

Using the fall 2023 groundwater elevation data, the groundwater flow direction is also determined to be towards the south with a slight east component at an estimated gradient of 0.006 m/m. These directions and gradients are similar to recent historic flow direction data. The overall predominant flow direction is inferred to flow southward. The spring and fall groundwater elevation contours are presented on Figures 04 and 05, respectively.

3.2.2 Surface Water Monitoring

The Hickey Road WDS is monitored on a semi-annual basis (spring and fall) for surface water, which was conducted on May 3 and October 17, 2023. The details for all four surface water samples are described in Table 5.

Table 5: Surface Water Monitoring Locations

Sample Location	Northing* (m)	Easting* (m)	Location Description
HR-SW1	5005328	273480	125 m east and upgradient of WDS (approximate 368 m elevation**)
HR-SW2	5005204	273329	70 m downgradient of waste disposal site
HR-SW3	5005096	273326	175 m downgradient of waste disposal site
HR-SW4	5005482	273450	Approximately 167 m northeast and upgradient of WDS (approximate 382 m elevation**)

Note: *NAD 83 and Zone 18, **Based on Google Earth, 2019 imagery.

Surface water was analyzed for the parameters listed in Table 6.

Table 6: Surface Water Quality Monitoring Parameters

Category	Parameters
Organic Parameters	Biochemical Oxygen Demand (BOD_5), Phosphorous (total), Total Kjeldahl Nitrogen (TKN),
Inorganic Parameters	Alkalinity, Ammonia (N)-Total, Calcium, Chloride, Nitrite, Nitrate, Sulphate, Potassium, Sodium, Magnesium
Metals	Aluminum (dissolved), Barium, Boron, Cobalt, Copper, Iron, Lead, Manganese, Zinc
Physical/Chemical Parameters	Chemical Oxygen Demand (COD), Conductivity, Hardness, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS)

Surface water flow velocity measurements were collected by using a Global Flow Probe for open channel flow. The flow velocity in meters per second (m/s) was recorded along with the width and depth of flow. Table 7 summarizes the collected flow velocity and channel measurements and presents the calculated discharge for each location.

Table 7: Surface Water Sampling Observations

Location	Date	Discharge[1] (m^3/s)	Flow & Channel Measurements & Observations
HR-SW1 (upgradient)	May 3, 2023	0.023	Depth: 0.10 m, Width: 0.65 m, Flow Velocity: 0.35 m/s Water clear
	October 17, 2023	-	Location dry
HR-SW2	May 3, 2023	0.079	Depth: 0.15 m, Width: 1.5 m, Flow Velocity: 0.35 m/s Water clear with brown colour Garbage upstream and downstream
	October 17, 2023	-	Location dry
HR-SW3	May 3, 2023	N/A	Depth: 0.25 m, Width: Flooded, Flow Velocity: No direct channel, <0.10 m/s Wide flooded area, no profile possible. Trickle noted.
	October 17, 2023	-	Location dry
HR-SW4	May 3, 2023	0.004	Depth: 0.08 m, Width: 0.35 m, Flow Velocity: 0.15 m/s Water clear
	October 17, 2023	-	Location dry

Notes: [1] Calculated assuming a simple channel with a rectangular cross-section.

Dry conditions were observed during the October 17, 2023, site visit at all locations.

3.2.3 Landfill Gas Monitoring

The primary gas present at landfill sites is methane. Methane cannot cause an explosion unless it accumulates to a concentration above its lower explosive limit (LEL) in an enclosed area. The LEL for methane is 5% in air. Regulation 232/98 methane concentration limits are:

- Less than 2.5% methane gas (25,000 ppm, LEL=50%) in the subsurface at the property boundary;
- Less than 1.0% methane gas (10,000 ppm, LEL=20%) in an on-site building, or its foundation; and
- Less than 0.05 % methane gas (500 ppm, LEL=1%) in a building, or its foundation, which is located off-site.

Routine landfill gas monitoring within any buildings or structures is required at the Site.

3.3 Monitoring Procedures and Methods

3.3.1 Groundwater Monitoring

Groundwater monitors were purged a minimum of three borehole volumes or until the monitor purged dry. In the case where a monitor was purged dry, samples were collected after sufficient water had returned for sampling purposes. Field temperature, pH, and conductivity measurements were recorded at the time of sampling using a YSI Professional Series multi-meter. The instrument was calibrated and/or checked for pH and conductivity. Samples were field filtered for DOC and metals analyses. Samples were collected in laboratory prepared and supplied bottles and submitted to AGAT Laboratories in Kingston, Ontario for analyses. AGAT is an accredited member of the Canadian Association of Laboratory Accreditation (CALA). Groundwater samples were stored at approximately 4° Celsius during shipment to AGAT for chemical analyses. Holding times for samples conformed to CCME Standards where applicable (CCME, 1993). Chain of custody forms accompanied the samples from submittal to the

laboratory until the chemical results were provided to BluMetric. Laboratory reports and chain of custody forms are compiled in **Appendix D-2**.

3.3.2 Surface Water Monitoring

Field parameters are recorded at the time of sampling, these include temperature, pH, conductivity, and dissolved oxygen measurements. During the sampling event, the field parameters were measured using a multi-meter calibrated as per the manufacturer's instructions and checked against known calibration standards. Surface water samples were field filtered for dissolved aluminum analysis.

Surface water samples were collected in laboratory prepared and supplied bottles, and submitted to AGAT Laboratories in Kingston, Ontario for analyses. Surface water samples were stored at approximately 4° Celsius during shipment to AGAT Laboratories for chemical analyses. Holding times for samples conformed to CCME Standards where applicable (CCME, 1993). Chain of custody forms accompanied the samples from submittal to the laboratory until the chemical results were provided to BluMetric. Laboratory reports and chain of custody forms are compiled in **Appendix D-3**.

3.3.3 Landfill Gas Monitoring

There are no sampling valves, ports, or vapour monitors on-site. Gas monitoring was collected from the on-site attendant's building and groundwater monitoring wells during 2023. Gas monitoring measurements from the building are collected by inserting the intake of the gas monitoring equipment through a small hole or gap within the structures while these structures remain closed. Gas monitoring measurements from the groundwater monitoring wells are collected prior to collecting groundwater levels or samples, by inserting the intake of the gas monitoring equipment under the cap of the monitoring well prior to removal of the cap and by keeping the best seal possible around the cap and gas equipment intake.

3.3.4 Field QA/QC Program

The Quality Assurance/Quality Control (QA/QC) program for the Site included the collection of field duplicate samples to demonstrate that field sampling techniques utilized by BluMetric personnel are capable of yielding reproducible results. Field duplicates were collected concurrently with the original sample. One field duplicate was collected for groundwater parameters and one field duplicate was collected for surface water parameters during the spring event. One field duplicate was collected for groundwater parameters during the fall event.
Precision is a measure of the reproducibility of analytical results and can be expressed quantitatively by the relative percent difference (RPD) between the original sample(s) and their corresponding field blind duplicate sample(s).

The RPD is defined by the following equation:

$$RPD = 2 \times \left[\frac{(S - D)}{(S + D)}\right] \times 100$$

Where: S = parameter concentration of the original sample
D = parameter concentration of the duplicate

An RPD is calculated where the average of the measured parameter concentrations of the original (S) and duplicate (D) samples are greater than 5X the laboratory reported detection limits (RDL), which represents the RPD qualification criteria. A lower level of precision is expected where the above criteria are not met. A high level of reproducibility with respect to sample results collected at the Site is indicated by an RPD value below 10% for electrical conductivity, 20% for metals and inorganics, and 30% for BTEX and PHC. These criteria are used as a general guideline and correspond to those recommended within the O. Reg. 153/04 Analytical Protocol (MOE, 2011) and by the Ontario QA/QC Interpretation Guide – Environmental Services (Maxxam, 2015). An RPD below the recommended criteria is considered acceptable, indicating that the sampling methodology is capable of producing repeatable results.

All equipment for field parameter testing and gas monitoring are calibrated in the field during each sampling event, or by the supplier.

4 Monitoring Results

4.1 Groundwater Quality

Groundwater quality has been compared to the Ontario Drinking Water Standards and Operational Guidelines (ODWSOG), the calculate Reasonable Use Values (RUVs), and the Provincial Water Quality Objectives (PWQO).

Field Measurements

The summary of the 2023 field measurements for groundwater pH, temperature, and conductivity are presented in Table 8.

Table 8: Groundwater Quality Field Measurements

Groundwater Monitor	pH		Temperature (°C)		Conductivity (µS/cm)	
	3-May-23	17-Oct-23	3-May-23	17-Oct-23	3-May-23	17-Oct-23
HR1-03	6.29	-	6.2	-	86	-
HR2-03R	6.11	6.22	7.6	9.9	1120	536
HR3-03	6.12	6.17	5.4	8.3	254	107
HR4-10	6.36	6.38	7.5	8.3	904	1985
HR5-10	6.23	6.04	8.7	9.1	604	1171
HR6-19	6.45	6.28	5.2	9.4	650	395
HR7-19	6.26	5.89	7.3	7.7	996	676
HR8-19	6.34	6.45	6.5	8.4	162	91
HR9-21	5.86	5.65	5.9	7.9	45	60
HR10-21	6.07	5.69	7.7	8.2	78	55

Notes: Insufficient water to sample HR1-03 during the fall 2023 sampling event.

Ontario Drinking Water Standards and Operational Guidelines (ODWSOG)

The summary of the 2023 groundwater results exceeding the ODWSOG criteria is summarized in Table 9. The full results are presented in Table 14 at the end of the text.

Table 9: Groundwater Quality Parameters Results Exceeding ODWSOG

Location	Parameters Exceeding
HR1-03	None
HR2-03R	Aluminum, DOC, Iron, Manganese, TDS
HR3-03	None
HR4-10	Alkalinity, DOC, Iron, Manganese, TDS
HR5-10	DOC, Iron, Manganese, TDS
HR6-19	DOC, Iron, Manganese
HR7-19	DOC, Iron, Manganese, TDS
HR8-19	Alkalinity (below criteria)
HR9-21	Alkalinity (below criteria), Manganese
HR10-21	Alkalinity (below criteria)

Reasonable Use Values (RUVs)

Reasonable Use Values (RUVs) are based on the median background groundwater (HR3-03) results from 2003 to 2023 and using the following calculation.

Cm = Cb + x(Cr-Cb); Where

Cm : maximum allowable concentration in groundwater beneath adjacent property (Reasonable Use Values)
Cb : median background concentration before any effects from human activity
Cr : maximum concentration that should be present based on use (ODWSOG)
x : constant that reduces the contamination to a level considered by the MOE to have only a negligible effect on the use of the water (0.25 for a health-related parameter and 0.5 for an aesthetic or physical parameter)

Table 10 below provides a summary of the parameters in groundwater with RUV exceedances for the Site during 2023. The results for all the chemical parameters tested are presented in Table 14 at the end of the text. It should be noted that the RUVs are used to assess compliance at the property boundary but have been used as an assessment tool at all monitoring wells.

Table 10: Groundwater Quality Results Exceeding RUV Criteria

Location	Parameters Exceeding
HR1-03	None
HR2-03R	Alkalinity, Aluminum, Barium, DOC, Iron, Manganese, TDS
HR3-03	None
HR4-10	Alkalinity, Barium, DOC, Iron, Manganese, Sodium, TDS
HR5-10	Alkalinity, Barium, DOC, Iron, Manganese, TDS
HR6-19	DOC, Iron, Manganese, TDS
HR7-19	Alkalinity, Barium, DOC, Iron, Manganese, TDS
HR8-19	None
HR9-21	Manganese
HR10-21	None

Provincial Water Quality Objectives (PWQO)

Groundwater has the potential to discharge to surface water at the Hickey Road WDS, therefore groundwater has also been compared to the PWQO criteria; the results are presented in Table 14 at the end of the text. Table 11 below summarizes the groundwater parameters that exceeded PWQO in 2023.

Table 11: Groundwater Quality Results Exceeding PWQO

Location	Parameters Exceeding
HR1-03	None
HR2-03R	Aluminum, Cobalt, Iron, Vanadium
HR3-03	Cobalt
HR4-10	Boron, Cobalt, Iron, Vanadium
HR5-10	Boron, Cobalt, Iron
HR6-19	Cobalt, Iron
HR7-19	Boron, Cobalt, Iron
HR8-19	None
HR9-21	None
HR10-21	None

4.2 Surface Water Quality

Surface water quality results were compared to PWQO, and the MECP Table A and Table B criteria of the WDS Technical Guidance. The following Table 12 summarizes the parameters that exceeded the criteria. All the surface water results are summarized in Table 15 at the end of the text.

Table 12: Surface Water Quality Results Exceeding Criteria

Surface Water Monitoring Location	Parameter Exceeding	Criteria	2023 Sampling Event
HR-SW1 (background)	Aluminum (dissolved)	PWQO	May
HR-SW2	Copper (total)	PWQO	May
HR-SW3	Aluminum (dissolved)	PWQO	May
HR-SW4 (further upstream of background)	None		

4.3 Landfill Gas Monitoring

Gas readings collected on May 3, 2023, are as follows: 0 ppm at HR1-03, HR3-03, HR4-10, and HR5-10, 90 ppm at HR2-03R, 35 ppm at HR6-19 and 0 ppm at HR7-19, HR8-19, HR9-21, and HR10-21. A gas reading of 0 ppm was collected from the attendant's building.

Gas readings collected on October 17, 2023, are as follows: 0 ppm at HR1-03, HR3-03, HR4-10 and HR5-10, 670 ppm at HR6-19, 5 ppm at HR7-19, 15 ppm at HR8-19, 30 ppm at HR9-21 and 20 ppm at HR10-21. The reading at HR2-03R was 82% LEL (lower explosive limit). A gas reading of 15 ppm was collected from the attendant's building.

4.4 QA/QC Results

The consistency of the analytical results was evaluated based on the relative percentage difference (RPD) of each field duplicate pair (see QAQC comparisons in **Appendix D-4**). The only field duplicate pairs which had higher RPD than what is considered acceptable

are the following:

- Chloride for the fall ground water sampling event (128%);
- Total Aluminum, Barium, Iron and Manganese for the spring surface water event (29%, 32%, 53% and 99%, respectively).

The maximum RPD parameter by season for groundwater was Manganese in the spring (11%) and chloride in the fall (128%). The maximum duplicate pair by season for surface water was manganese (99%) in the spring and no samples were taken in the fall.

5 Assessment, Interpretation, And Discussion

5.1 Groundwater Assessment

As mentioned previously, Table 14 at the end of the text provides the 2023 groundwater chemistry data in comparison to groundwater and surface water criteria. Historical groundwater chemistry up to and including 2023 is provided in **Appendix E-1.**

The results from HR3-03 are being used as the background monitoring location for RUV calculations. In 2023, HR3-03 had no RUV exceedances and no ODWSOG exceedances.

Monitoring well HR1-03 is located adjacent to the western side of the attendant's shack, located to the west and upgradient of the waste mound. This well has no exceedances and is not considered impacted.

Monitoring well HR6-19 was installed in the east portion of the Site to obtain information on the groundwater chemistry between the Site and surface water station HR-SW1. In 2023, monitoring well HR6-19 parameters such as DOC, iron and manganese were elevated compared to cross-gradient location HR1-03 and up-gradient location HR3-03 (background) and exceeded the ODWSOG and RUV criteria. HR6-19 also exceeded the RUV criteria for TDS. HR6-19 is considered to be impacted by the WDS.

Monitoring well HR2-03R is located within the waste footprint and between the recent active fill area and the current active fill area. This well had ODWSOG and RUV exceedances for concentrations of aluminum, DOC, iron, manganese, and TDS as well as RUV exceedances for alkalinity and barium. This well is considered leachate impacted. The groundwater chemistry results from 2023 indicate that HR4-10 and HR5-10, located immediately downgradient and to the south of the waste mound, are impacted by leachate. This is consistent with results from previous monitoring events. Parameters such as alkalinity (HR4-10 only), DOC, iron, manganese, and TDS are elevated when compared to upgradient locations HR1-03 and HR3-03 (background) and the ODWSOG. Monitoring locations HR4-10 and HR5-10 continue to show elevated concentrations of several parameters and exceeded RUVs for alkalinity, barium, DOC, iron, manganese, sodium (HR4-10 only) and TDS.

Monitoring wells HR7-19 and HR8-19, located downgradient of HR4-10 and HR5-10, were installed in 2019 to monitor downgradient impacts and to assess the natural attenuation which is occurring at the Site. Monitoring well HR8-19 is located within the 4.0 ha waste site, while HR7-19 was installed just south of the northern limit of the CAZ boundary. The results from these wells indicate that they have been impacted by leachate – particularly HR7-19, which was found to exceed the ODWSOG and RUVs for DOC, iron, manganese, and TDS as well as the RUVs for alkalinity and barium. Results from HR8-19 found that it was below the ODWSOG for alkalinity with no other exceedances for the ODWSOG or RUVs for 2023.

Monitoring wells HR9-21 and HR10-21 are located within the CAZ, approximately 10 m and 30 m, respectively, north and upgradient of the southern CAZ boundary. The results from these wells indicate ODWSOG and RUVs exceedances for manganese for HR9-21 in the fall only. Due to low concentrations of other site leachate indicator parameters, and the observed exceedance being potentially naturally occurring in the wetland and/or temporal variation in water quality rather than an indication of WDS impacts at the southern CAZ boundary, the WDS is considered to be compliant with Guideline B-7 along the south and west CAZ boundaries. There is also insufficient data to assess trends at HR9-21 and HR10-21 which were installed in 2021. It is anticipated that at least five years of semi-annual data will be required prior to analyzing trends at these newer wells.

Select trend graphs for groundwater (Graphs 1 to 5) are presented at the end of the text after the Site photographs. Based on historical data for the groundwater results and since chloride is considered a conservative parameter, parameters of chloride, DOC, iron, manganese, and sodium were selected to characterize the leachate groundwater trends. Chloride concentrations show some evidence of seasonal variation at HR2-03 and HR3-03 as well as a gradual upwards trend at HR5-10; DOC concentrations are showing an upward trend at HR5-10 and HR4-10, although concentrations at HR4-10 remain below the historic maximums reported in 2016 and 2017. HR2-03R and HR5-10 both had historic maximums for DOC concentrations with HR2-03R occurring in the spring 2023 and HR5-10 occurring in the fall 2023. Iron concentrations remain elevated but stable at HR4-10 following a large jump in concentrations in 2016, while recent iron concentrations at HR5-10 from 2019 to 2023 may indicate a slight upwards trend; manganese concentrations are showing an upward trend at HR2-03R and HR5-10, with a historic maximum occurring at HR2-03R in spring 2023. Manganese concentrations at HR7-19 appear to be trending downwards. Sodium concentrations are generally stable at all monitoring locations other than a potential slight upward trend at HR5-10.

Based on the inferred groundwater flow direction towards the south with a slight east component, the current groundwater monitoring network may not be adequately addressing potential groundwater impacts along the east and southeast property limit. An additional groundwater monitoring well may be required; this will be further assessed in 2024. It is unknown if the WDS is compliant with Guideline B-7 along the east and southeast property boundaries.

Based on the above, we recommend that a reduced semi-annual groundwater program be implemented. This will include a full round of water levels during both spring and fall events, a partial spring groundwater monitoring event, and a full fall monitoring event. The proposed groundwater monitoring program is summarized below in Table 13. Until approval is received, groundwater monitoring should continue on a semi-annual basis for the Hickey Road WDS (spring and fall) for the parameters identified in Table 3.

Table 13: Proposed Groundwater Monitoring Program

Monitoring Event	Task	Locations
Spring	Water Levels	All locations (HR1-03, HR2-03R, HR3-03, HR4-10, HR5-10, HR6-19, HR7-19, HR8-19, HR9-21, HR10-21)
	Groundwater Sampling	HR1-03, HR3-03, HR6-19, HR9-21, HR10-21
Fall	Water Levels & Groundwater Sampling	All locations (HR1-03, HR2-03R, HR3-03, HR4-10, HR5-10, HR6-19, HR7-19, HR8-19, HR9-21, HR10-21)

5.2 Surface Water Assessment

The 2023 surface water chemistry results are shown in Table 15 (end of the text). The surface water chemistry results were compared to the PWQO, and Table A and Table B from the WDS Technical Guidance (MECP, 2010). Historical surface water chemistry up to 2023 is included in **Appendix E-2.**

Three surface water monitoring stations, HR-SW1 (upgradient of the Site), and HR-SW2 and HR-SW3 (downgradient) are located along the intermittent unnamed tributary to Bird Creek, located directly east and south of the waste disposal area. Surface water monitoring was established at HR-SW1 and HR-SW2 in the spring of 2007, and at HR-SW3 in the spring of 2014. Location HR-SW4 was added in 2018 as a further upgradient monitoring location due to HR-SW1 (background location) showing more parameters exceeding than the downgradient locations. The 2018 results indicated that HR-SW4 had greater concentrations for some parameters than HR-SW1; therefore, it was not sampled in 2019. During 2019, an alternate background location was investigated but none were found. Monitoring location HR-SW4 was reintroduced in 2020 at the request of the MECP.

The 2023 data collected from HR-SW1 had a PWQO exceedance for dissolved aluminum. The more upgradient background location HR-SW4 had no exceedances during 2023. Monitoring well HR6-19, which was installed in the east portion of the Site to obtain information on the groundwater chemistry between the Site and surface water station HR-SW1, did not have a PWQO exceedance for aluminum but rather had a PWQO exceedance for iron only. The ground surface elevation at HR6-19 is 363.35 masl with the groundwater elevation between 358.09 masl and 359.2 masl. Background surface

water location HR-SW1 is at an elevation of approximately 368 masl. Based on these elevations and the 2023 results, it is unlikely that impacted groundwater at the WDS is discharging to the location of HR-SW1.

Historically, HR-SW1 proved to have better water quality than HR-SW4 (BluMetric, 2021) which supported the conclusion made in prior reports that HR-SW1 is the preferred choice for a background surface-water benchmark. However, in 2023 HR-SW1 demonstrated higher concentrations compared to HR-SW4 with HR-SW4 having no PWQO exceedances. Based on the 2023 surface water chemistry results, HR-SW4 would appear to be the better background monitoring location however when taking into account historic fluctuations between the water chemistry at both HR-SW1 and HR-SW4, there is insufficient evidence to determine which upstream location is a better background monitoring location. As a result, both HR-SW1 and HR-SW4 should continue to be used to assess background surface water quality. A detailed comparison between chemistry results at these two locations can be found in **Appendix E-3**.

A comparison of surface water chemistry at upstream location HR-SW1 to HR-SW2 and HR-SW3 (downstream and south of the Site) for the 2023 results was completed for all chemical parameters tested (**Appendix E-3**). A comparison of the spring results indicates that five parameters (potassium, sodium, copper, iron and manganese) had higher concentrations at HR-SW2, and seven parameters (chloride, sulphate, TKN, potassium, aluminum (total), iron and manganese) had higher concentrations at HR-SW3. When accounting for only differences that are more than 5X the RDL, this reduces to one parameter, iron for HR-SW2. The elevated concentrations of these parameters downstream from HR-SW1 are attributed to impacts from the WDS; with the copper concentration at HR-SW2 and the dissolved aluminum concentration at HR-SW3 exceeding the PWQO. All results were below the MECP Table A and B.

It should be noted that surface water may be influenced by groundwater at the Site. Groundwater has been observed discharging from a bedrock outcrop near HR-SW4, upgradient of the other surface water locations. Groundwater interaction with surface water at HR-SW2 and HR-SW3 seems unlikely due to the water table depth in proximal wells: approximately 5.5 mbgs at HR7-19 and approximately 4.3 mbgs at HR9-21.

It follows that the impacts observed at these surface water locations can be attributed to the current, or cumulative effects of surface runoff from the Site.

Surface water trend graphs for select parameters are shown on Graphs 6, 7, 8, 9 and 10 respectively. Spatial and/or temporal variation in water quality is observed at all surface water monitoring locations but no evidence of increasing or decreasing trends is observed.

5.3 Landfill Gas Assessment

The RKI Eagle gas results in 2023 indicate methane concentrations are generally below the concentrations of concern as identified for the subsurface (25,000 ppm, LEL = 50%) and structures on-site (10,000 ppm, LEL = 20%). An elevated methane reading was detected at monitoring well HR2-03, where gas levels were 82% LEL during the fall sampling event; this concentration exceeds the subsurface methane concentration limit however, monitoring well HR2-03 is in the centre of the property. All surrounding monitoring wells that are located closer to the property boundary have methane concentrations below the concentrations of concern. In addition, there are no structures with basements on or near the Site, so the elevated gas concentration is not considered an immediate concern. Landfill gas should continue to be monitored at the on-site structure and wells during semi-annual monitoring. Should any excavation work be carried out within the waste mound, health and safety procedures should include measures for landfill gas concerns.

5.4 Trigger Mechanisms and Contingency Plan

A Draft Surface Water and Groundwater Trigger Mechanism and Contingency Plan was developed and submitted in March 2020. The surface water plan was later revised based on MECP review comments and was finalized in November 2020. The final surface water trigger mechanism and contingency plan is provided in **Appendix F-1.** The surface water trigger plan is assessed using HR-SW2 and HR-SW3. The surface water chemical results in 2023 did not trigger the Tier 1 Contingency Plan response for surface water.

The draft groundwater Trigger Mechanism and Contingency Plan was revised in March 2021, and is provided in **Appendix F-2.** As of yet, additional MECP comments have not been received for the revised proposed groundwater plan. The groundwater assessments points are described as the future west and south CAZ boundaries, as these assessment points did not exist in March 2021. Based on the current monitoring network, the groundwater assessment points are monitoring wells HR9-21 (south CAZ boundary) and HR10-21 (west CAZ boundary). The proposed groundwater Trigger Mechanism and Contingency Plan was intended to act as a starting point for discussions with the MECP, therefore groundwater results from 2023 have been voluntarily assessed against the draft plan. The groundwater chemical results in 2023 did not trigger the Tier 1 Contingency Plan response for groundwater.

6 On-Site Operations

6.1 Annual Waste Summary

Although access to the Site is controlled via a locked security steel gate, some residents deposit garbage at the disposal site outside of the landfill's normal operating hours. This contribution is collected by site personnel, recorded, and included in the total waste volumes identified for the Site.

The annual recycling (R) and waste (W) tonnages for 2022 and 2023, excluding the segregated materials discussed in Section 6.2.1, are tabulated in Table 14. The tonnages below include recyclables and waste from both the residential and commercial sources within the municipality. Based on the estimated numbers, a total of 43.6% of residential waste was recycled in 2023, more than three times the amount from 2022.

Table 14: Annual Recycling and Waste Tonnages

Q1		**Q2**		**Q3**		**Q4**		**Year end**	
2022									
R	**W**	**R**	**W**	**R**	**W**	**R**	**W**	**R**	**W**
5.2	30.4	5.1	35.9	6.5	43.8	7.3	29.7	**24.0**	**139.8**
2023									
R	**W**	**R**	**W**	**R**	**W**	**R**	**W**	**R**	**W**
28	31.4	28	38.9	33	46.4	26	32.0	**115.00**	**148.7**

The 2023 numbers indicate an approximate 378% increase over 2022 in the residential and commercial recycling of mixed fibres and commingled containers at the Hickey Road WDS. There was a 6% increase in the amount of waste placed at the Site in 2023 over 2022. The 2023 residential and commercial waste calculations are based on bag counts at the waste site. There were 9,910 bags recorded to be deposited at the Hickey Road WDS in 2023 and an assumed 15 kg/bag (MHHs) was used in the tonnage calculations.

6.1.1 Summary of Segregated Materials Removed

In addition, there were segregated materials collected at the nine waste disposal sites in the MHHs. The breakdown of these wastes for the Hickey Road WDS in 2023 was 0 tonnes of bulky wastes, and approximately 1.89 tonnes of electronic waste. A total of 4.29 tonnes of scrap metal was collected from the Hickey Road Site in 2023. No tires were collected in 2023.

Household hazardous wastes are not collected at the Hickey Road WDS. The Municipality, however, does ensure household batteries left at the WDS are disposed of properly. No batteries were collected in 2023 at the Site.

6.2 Annual Complaints Summary

There were no documented complaints at the Hickey Road WDS and there were no emergency situations in 2023.

6.3 Capacity

The ECA approves a total Site volume of 74,100 m^3, including historic waste, daily cover, and intermediate cover (excluding final cover). According to the most recent topographical survey conducted in June 2023, as shown by Figure 06, the volume remaining was 29,573 m^3.

Waste quantities for the Site were estimated based on bag counts and an estimated mass per bag. Total waste quantities for 2023 were calculated to be approximately 298 m^3, based on an assumed 500 kg/m^3 for the waste. The amount for the second half

of 2023 (July to December) is estimated to be 156 m^3. Taking weekly cover into account, assuming 75% of waste to 25% cover material, the total volume of waste and cover placed from July 2023 to the end of 2023 is estimated to be approximately 195 m^3. The remaining capacity at the end of 2023 is estimated to be 29,378 m^3. Using a 5-year waste quantity average (2019 to 2023) of 283.2 m^3/year and taking weekly cover into account, the life expectancy of the WDS was calculated to be 82 years.

A Closure Plan must be submitted three years prior to the anticipated closure of the Site as identified in Condition 9 of the ECA.

7 Summary Statements, Conclusions, And Recommendations

The following summary statements are based on the observations and results from the 2023 monitoring program:

7.1 Site Operations

- Site operations, site conditions and the order and the management of debris have greatly improved in recent years, the Municipality should continue these efforts.
- The active face should be maintained regularly with compacted weekly cover. General maintenance and operations should include maintaining a limited amount of exposed and active landfilling area.
- Material segregation areas should be kept orderly to prevent comingling of material and should be removed from site as needed to maintain space within the segregation boundaries.
- Wind-blown litter should be cleaned up on a regular basis.
- It is recommended that waste transferred to the Site continue to be accounted for and documented by tracking the number of bags and/or vehicle loads of waste deposited at the Site. Detailed descriptions and quantities of rejected waste should continue to be documented for the Hickey Road WDS.

- Public education with respect to waste reduction and recycling should be an ongoing effort by the Municipality.
- The Site Attendant should ensure metal containers coming into the Site do not contain any hazardous materials or liquids.

7.2 Groundwater

- The groundwater flow direction is primarily to the south with a slight east component;
- We recommend that a reduced semi-annual groundwater program be implemented. This will include a full round of water levels during both spring and fall events, a partial spring groundwater monitoring event, and a full fall monitoring event. Until approval is received, groundwater monitoring should continue on a semi-annual basis for the Hickey Road WDS (spring and fall) for the parameters identified in Table 3.
- Based on the groundwater quality at HR3-03, HR9-21, and HR10-21, the WDS is considered to be compliant with Guideline B-7 along the north, west, and south property/CAZ boundaries.
- The current groundwater monitoring network may not be adequately addressing potential groundwater impacts along the east and southeast property limit. An additional groundwater monitoring well may be required and will be further assessed in 2024. It is unknown if the WDS is compliant with Guideline B-7 along the east and southeast property boundaries.

7.3 Surface Water

- Surface water monitoring should continue on a semi-annual basis for the Hickey Road WDS (spring and fall) for the parameters identified in Table 6.
- Based on the 2023 surface water chemistry results, there is insufficient evidence to determine which upstream location is a better background monitoring location. As a result, both HR-SW1 and HR-SW4 should continue to be used to assess background surface water quality.

- All surface water locations were dry during the October 2023 site visit. The fall site visit should be conducted earlier in the season or during the late summer season to ensure a second surface water sampling event is possible.
- The elevated concentrations of parameters at HR-SW2 and HR-SW3 compared to upstream HR-SW1 are attributed to impacts from the WDS; with the copper concentration at HR-SW2 and the dissolved aluminum concentration at HR-SW3 exceeding the PWQO. All results were below the MECP Table A and B. Impacts observed at these surface water locations can be attributed to the current, or cumulative effects of surface runoff from the Site.

7.4 Trigger Mechanisms and Contingency Plan

- The draft groundwater Trigger Mechanism and Contingency Plan was revised in March 2021. As of yet, additional MECP comments have not been received for the revised proposed groundwater plan. Based on the current monitoring network, the groundwater assessment points are monitoring wells HR9-21 (south CAZ boundary) and HR10-21 (west CAZ boundary). The groundwater chemical results in 2023 did not trigger the Tier 1 Contingency Plan response for groundwater.
- The Site Trigger Mechanisms and Contingency Plan for surface water was approved by the MECP in November 2020. The surface water trigger plan is assessed using HR-SW2 and HR-SW3. The surface water chemical results in 2023 did not trigger the Tier 1 Contingency Plan response for surface water.

7.5 Landfill Gas

- The RKI Eagle gas results for most locations in 2023 indicate methane concentrations are below the concentrations of concern.
- Landfill gas should continue to be monitored during semi-annual monitoring.

7.6 Landfill Capacity

- The remaining volumetric capacity of the landfill based on the 2023 survey and estimated waste generation rate is estimated to be 29,378 m^3.
- The life expectancy of the WDS was calculated to be 82 years.
- A Closure Plan must be submitted three years prior to the anticipated closure of the Site as identified in Condition 9 of the ECA.

8 Limiting Conditions

The conclusions presented in this report represent our professional opinion and are based upon the work described in this report and any limiting conditions in the terms of reference, scope of work, or conditions noted herein.

The findings presented in this report are based on conditions observed at the specified dates and locations, the analysis of samples for the specified parameters, and information obtained for this project. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, locations that were not investigated directly, or types of analysis not performed.

BluMetric Environmental Inc. makes no warranty as to the accuracy or completeness of the information provided by others, or of conclusions and recommendations predicated on the accuracy of that information. This report has been prepared for The Corporation of the Municipality of Hastings Highlands. Any use a third party makes of this report, any reliance on the report, or decisions based upon the report, are the responsibility of those third parties unless authorization is received from BluMetric Environmental Inc. in writing. BluMetric Environmental Inc. accepts no responsibility for any loss or damages suffered by any unauthorized third party as a result of decisions made or actions taken based on this report.

Respectfully submitted,
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9 References

BluMetric, 2022. 2021 *Annual Monitoring Report, Hickey Road WDS*, *The Corporation of the Township of Hastings Highland,* March 2022.

CCME (Canadian Council of Ministers of the Environment), 2011. *Protocols Manual For Water Quality Sampling in Canada.* 186p. http://www.ccme.ca/files/Resources/water/protocols_document_e_final_101.pdf

Groundwater Information Network, http://gw-info.net/ February 8, 2016.

Landfill Standards – *A Guideline on the Regulatory and Approval Requirements for New and Expanding Landfill Sites, MOE,* May 1998.

MOE, *Monitoring and Reporting for Waste Disposal Sites, Groundwater and Surface Water Technical Guidance Document*, November 2010.

MOE, *Provincial Water Quality Objectives*, 1999.

MOE, *Ontario Drinking Water Standards Objectives and Guidelines*, June 2002, Amended O.Reg. 457/16, updates effective January 2018.

Ministry of Northern Development and Mines (MNDM). Map 2556, Quaternary Geology of Ontario, Southern Sheet, 1991.

Ministry of Northern Development and Mines (MNDM). Map 2544, Bedrock Geology of Ontario, Southern Sheet, 1991.

Ontario, Map: Well records, King's Printer for Ontario, 2012-24.

Tables

Table 14: 2023 Groundwater Chemistry Results						Location	HR1-03	HR2-03R	HR2-03R	HR3-03	HR3-03	HR3-03	HR4-10	HR4-10	HR5-10	HR5-10
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR1-03	HR2-03R	HR2-03R	HR3-03	HR-QAQC-GW1 (HR3-03)	HR3-03	HR4-10	HR4-10	HR5-10	HR5-10
						Sample Date	2023-May-03	2023-May-03	2023-Oct-17	2023-May-03	2023-May-03	2023-Oct-17	2023-May-03	2023-Oct-17	2023-May-03	2023-Oct-17
Anions						Detection Limit										
Chloride	mg/L	128.5	250	-	-	0.1	4.17	89.7	35	29.3	29.6	3.9	35.4	110	38.3	38
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.05	<0.05	<0.1	1.84	1.85	0.31	<0.05	<0.1	0.19	<0.1
Sulphate	mg/L	-	500	-	-	0.1	9.52	26.8	7.3	4.6	4.53	7.2	10.6	34	43.9	52
Cations																
Calcium (diss)	mg/L	-	-	-	-	0.05	12.2	99.6	57	34.2	35.1	11	83.6	120	72.1	150
Magnesium (diss)	mg/L	-	-	-	-	0.05	0.87	13.1	4.8	1.23	1.2	0.82	12.3	21	6.72	14
Potassium (diss)	mg/L	-	-	-	-	0.2	0.69	37.6	16	1.75	1.72	1.1	41.9	58	9.51	15
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	1.26	69.9	23	12.6	12.6	9.2	54.8	150	25.8	49
General Chemistry																
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	38	403	170	69	66	34	477	660	178	430
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	5.3	1.8	<0.02	<0.02	<0.05	21.7	36	1.43	6.9
Chemical Oxygen Demand	mg/L	-	-	-	-	4	19	168	26	<5	<5	<4	88	200	37	100
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	2.7	62.5	7.8	1.7	1.5	2.5	35.6	64	10.2	33
Electrical Conductivity	uS/cm	-	-	-	-	1	84	1080	490	255	252	100	954	1700	541	1000
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.16	6.83	7.42	7.05	7.17	7.33	7.24	7.15	7.06	7.07
Total Dissolved Solids	mg/L	314	500	-	-	10	84	638	260	154	148	90	474	905	318	620
Metals																
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.018	0.205	0.046	0.013	0.02	0.0058	0.037	0.047	0.004	0.04
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.017	0.391	0.13	0.067	0.067	0.023	0.528	0.98	0.137	0.44
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.0005	<0.0005	<0.0004	<0.0005	<0.0005	<0.0004	<0.0005	<0.0004	<0.0005	<0.0004
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	<0.01	0.162	0.085	0.013	0.011	0.024	0.4	0.44	0.302	0.3
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.002	<0.002	<0.005	<0.002	<0.002	<0.005	<0.002	<0.005	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	0.0531	0.006	0.0046	0.0042	0.00071	0.0246	0.065	0.0196	0.07
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.001	0.001	<0.0009	0.001	0.001	0.0017	<0.001	0.0038	0.001	0.0034
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	0.034	**46.3**	**17**	0.012	<0.01	<0.1	**42.2**	**83**	**11.2**	**49**
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0009	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	<0.002	4.11	2.4	0.02	0.018	<0.002	1.01	2.4	1.11	3.1
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.0005	<0.002	<0.002	<0.0005	<0.002	0.00091	<0.002	0.00084
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.001	0.009	<0.001	<0.001	<0.001	<0.001	0.009	0.015	0.004	0.0081
Silicon (diss)	mg/L	-	-	-	-	0.05	4.61	5.09	7.8	3.44	3.47	4.1	9.14	10	6.11	6.4
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Strontium (diss)	mg/L	-	-	-	-	0.001	0.05	0.448	0.23	0.093	0.087	0.032	0.359	0.62	0.348	1
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003	<0.00005	<0.0003	<0.00005	<0.0003	0.000054
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	0.005	<0.005	<0.002	0.002	<0.005	0.002	<0.005	<0.002	<0.005
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	0.007	0.0034	<0.002	<0.002	<0.0005	0.006	0.0097	<0.002	0.0036
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0052

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Table 14: 2023 Groundwater Chemistry Results						Location	HR6-19	HR6-19	HR7-19	HR7-19	HR8-19	HR8-19	HR8-19	HR9-21	HR9-21	HR10-21	HR10-21
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR6-19	HR6-19	HR7-19	HR7-19	HR8-19	HR8-19	HR-QAQC-GW1	HR9-21	HR9-21	HR10-21	HR10-21
						Sample Date	2023-May-03	2023-Oct-17	2023-May-03	2023-Oct-17	2023-May-03	2023-Oct-17	2023-Oct-17	2023-May-03	2023-Oct-17	2023-May-03	2023-Oct-17
Anions						Detection Limit											
Chloride	mg/L	128.5	250	-	-	0.1	4.16	<1	38.1	22	4.64	5.9	1.3	0.79	<1	3.95	<1
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.05	<0.1	<0.05	0.36	0.63	0.22	0.22	0.45	1.28	1.85	0.4
Sulphate	mg/L	-	500	-	-	0.1	59.7	8.7	30.9	14	13.8	5.5	5.5	5.14	4.7	3.59	5.2
Cations																	
Calcium (diss)	mg/L	-	-	-	-	0.05	107	80	102	60	21	11	11	3.47	5.2	6.56	4.2
Magnesium (diss)	mg/L	-	-	-	-	0.05	4.82	2.9	8.69	6.1	2.15	1.1	1.1	0.5	0.74	1.34	0.81
Potassium (diss)	mg/L	-	-	-	-	0.2	5.82	3.4	22.2	21	1.43	1	1	0.77	1.4	1.18	1
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	6.83	3.3	37.2	39	4.88	2.9	2.8	1.67	1.8	3.16	2.2
General Chemistry																	
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	279	200	403	260	59	29	30	8	8.5	18	13
Ammonia as N	mg/L	-	-	-	-	0.02	4.28	2.7	13.7	13	<0.02	0.075	0.06	<0.02	<0.05	<0.02	<0.05
Chemical Oxygen Demand	mg/L	-	-	-	-	4	56	20	74	45	<5	8.6	9.9	<5	7.9	<5	<4
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	6.2	4.5	32.4	13	2	1.3	1.3	1.3	1.8	1.4	1.4
Electrical Conductivity	uS/cm	-	-	-	-	1	624	400	921	620	161	80	80	36	50	69	46
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.34	7.22	7.22	7.07	7.06	7.17	7.13	6.63	6.73	6.84	6.97
Total Dissolved Solids	mg/L	314	500	-	-	10	350	220	502	320	94	80	70	34	45	48	60
Metals																	
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.015	0.018	0.021	0.02	0.012	0.0069	0.0066	0.01	0.015	0.016	0.0066
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.043	0.037	0.398	0.3	0.025	0.013	0.013	0.012	0.016	0.005	0.0035
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.0005	<0.0004	<0.0005	<0.0004	<0.0005	<0.0004	<0.0004	<0.0005	<0.0004	<0.0005	<0.0004
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.103	0.069	0.502	0.29	0.022	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.002	<0.005	<0.002	<0.005	<0.002	<0.005	<0.005	<0.002	<0.005	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	0.0019	0.0572	0.042	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.001	0.0013	0.005	0.0041	0.001	<0.0009	<0.0009	<0.001	<0.0009	<0.001	<0.0009
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	**20.5**	**21**	**47.6**	**38**	0.012	<0.1	<0.1	<0.01	<0.1	<0.01	<0.1
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0.343	0.33	3.17	1.8	0.008	0.003	0.0027	0.005	0.059	<0.002	<0.002
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.0005	<0.002	0.00062	<0.002	<0.0005	<0.0005	<0.002	<0.0005	<0.002	<0.0005
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.001	0.0023	0.009	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Silicon (diss)	mg/L	-	-	-	-	0.05	3.6	5.8	9.38	11	5.66	4.6	4.5	4.43	5.1	4.53	4.1
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009	<0.00009	<0.0001	<0.00009	<0.0001	<0.00009
Strontium (diss)	mg/L	-	-	-	-	0.001	0.327	0.26	0.363	0.26	0.122	0.07	0.068	0.029	0.062	0.059	0.04
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.00005	<0.0003	0.000087	<0.0003	<0.00005	<0.00005	<0.0003	<0.00005	<0.0003	<0.00005
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	<0.005	<0.002	<0.005	<0.002	<0.005	<0.005	<0.002	<0.005	<0.002	<0.005
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	0.00084	0.003	0.0019	<0.002	<0.0005	<0.0005	<0.002	<0.0005	<0.002	<0.0005
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

-LEGEND-

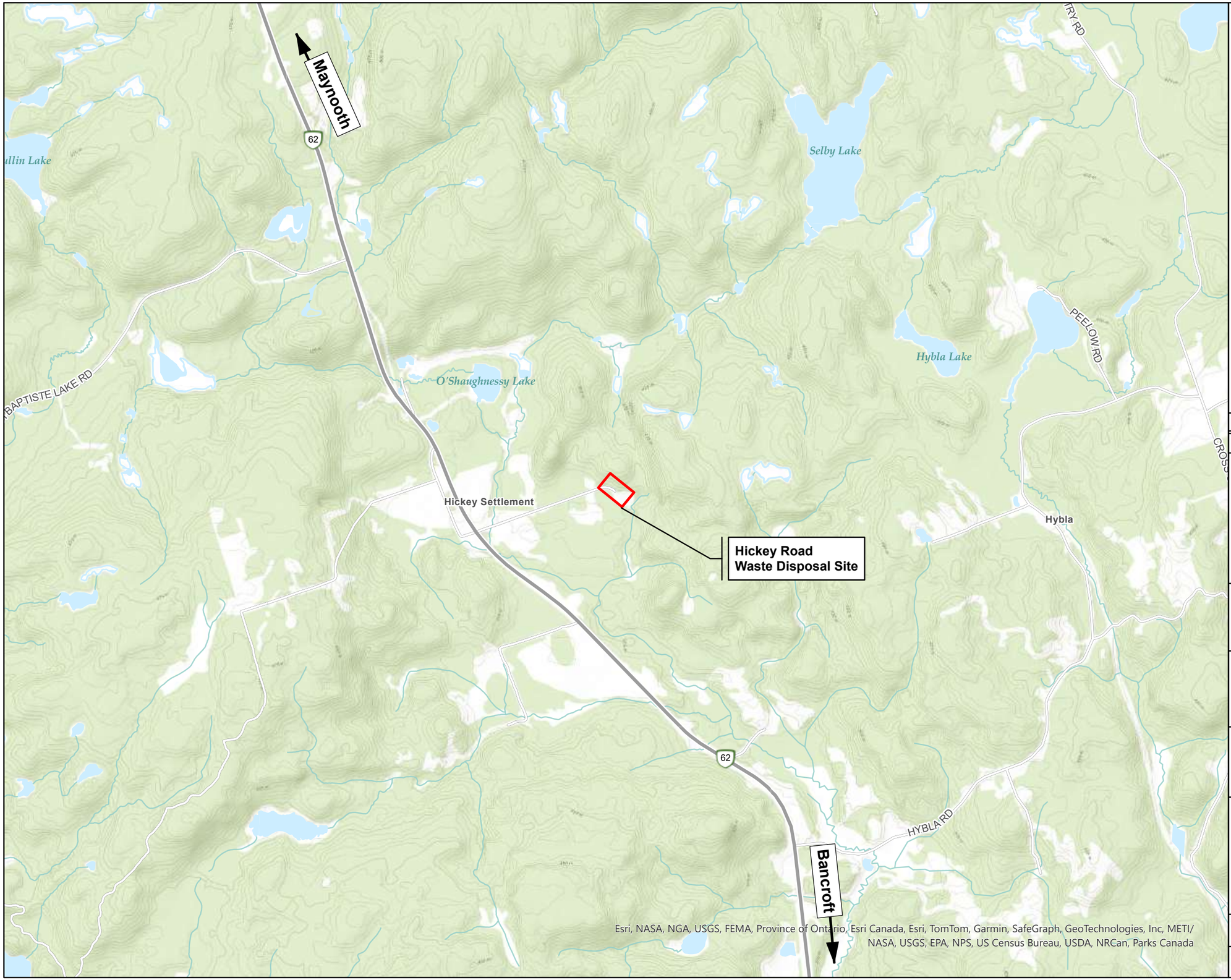
Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Table 15: 2023 Surface Water Chemistry Results - Hickey Road WDS						Location	HR-SW1	HR-SW2	HR-SW3	HR-SW3	HR-SW4
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	HR-SW1	HR-SW2	HR-SW3	HR-QAQC-SW1 (HR-SW3)	HR-SW4
						Sample Date	2023-May-03	2023-May-03	2023-May-03	2023-May-03	2023-May-03
Anions						Detection Limit					
Chloride	mg/L	-	-	180	128	0.1	0.39	0.38	0.44	0.45	0.36
Nitrate as N	mg/L	-	-	-	-	0.05	0.18	0.07	<0.05	<0.05	<0.05
Nitrite as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	4.67	4.18	4.76	4.75	3.85
Cations											
Calcium (tot)	mg/L	-	-	-	-	0.2	9.5	5.45	6.17	6.38	2.14
Magnesium (tot)	mg/L	-	-	-	-	0.1	0.86	0.76	0.63	0.79	0.62
Potassium (tot)	mg/L	-	-	-	-	0.5	0.52	1.1	0.53	<0.5	0.81
Sodium (tot)	mg/L	-	-	-	-	0.1	0.77	0.89	0.57	1.21	0.57
General Chemistry											
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	5	29	17	13	11	<5
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	<2	<2	<2	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	5	<5	<5	<5	30	<5
Electrical Conductivity	uS/cm	-	-	-	-	2	67	49	45	45	25
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.21	7.03	6.75	6.69	6.5
Total Dissolved Solids	mg/L	-	-	-	-	10	52	50	52	56	40
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.21	<0.1	0.32	0.36	0.18
Total Phosphorus	mg/L	0.03	-	-	-	0.02	<0.02	<0.02	0.02	<0.02	<0.02
Total Suspended Solids	mg/L	-	-	-	-	10	<10	<10	<10	<10	<10
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Metals											
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	0.095	0.052	0.071	0.079	0.062
Aluminum (tot)	mg/L	-	-	-	-	0.01	0.07	0.041	0.125	0.167	0.09
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.013	0.012	0.013	0.018	0.011
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.001	0.001	0.002	0.001	0.001	0.001
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.023	0.186	0.079	0.136	0.038
Lead (tot)	mg/L	-	Calculated	0.002	-	0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	<0.002	0.003	0.017	0.05	<0.002
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.02	<0.02	<0.02	<0.02	<0.02	<0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

Figures



LEGEND

Waste Disposal Site

NOTE: THE ONLY WELL RECORDS AVAILABLE WITHIN 500 m OF THE SITE ARE MONITORING WELLS.

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

DO NOT SCALE DRAWING.
THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

N W E S

0 500 1,000 Meters

CLIENT

Municipality of Hastings Highlands

PROJECT

Hickey Road Waste Disposal Site

TITLE

Site Location Map

BluMetric Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-05	February 09, 2024

DRAWN	CHECKED	FIG NO.	REV
PB	LH	01	0

LEGEND

- Groundwater Monitoring Location
- Benchmark
- Surface Water Sampling Locations
- GPS Coordinates
- Site Features
- Surveyed Boundary (4.0 ha) (PA Miller, 2018)
- Surveyed CAZ (1.12 ha) (PA Miller, 2018)

NOTES:
- Site Property Boundary: 4.0 ha
- Ortho Image taken by a UAV flight in 2017
- UTM zone used is CSRS 18

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

N W E S

0 25 50 Meters

1:1,500

CLIENT

Municipality of Hastings Highlands

PROJECT

Hickey Road
Waste Disposal Site

TITLE

Site Plan

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
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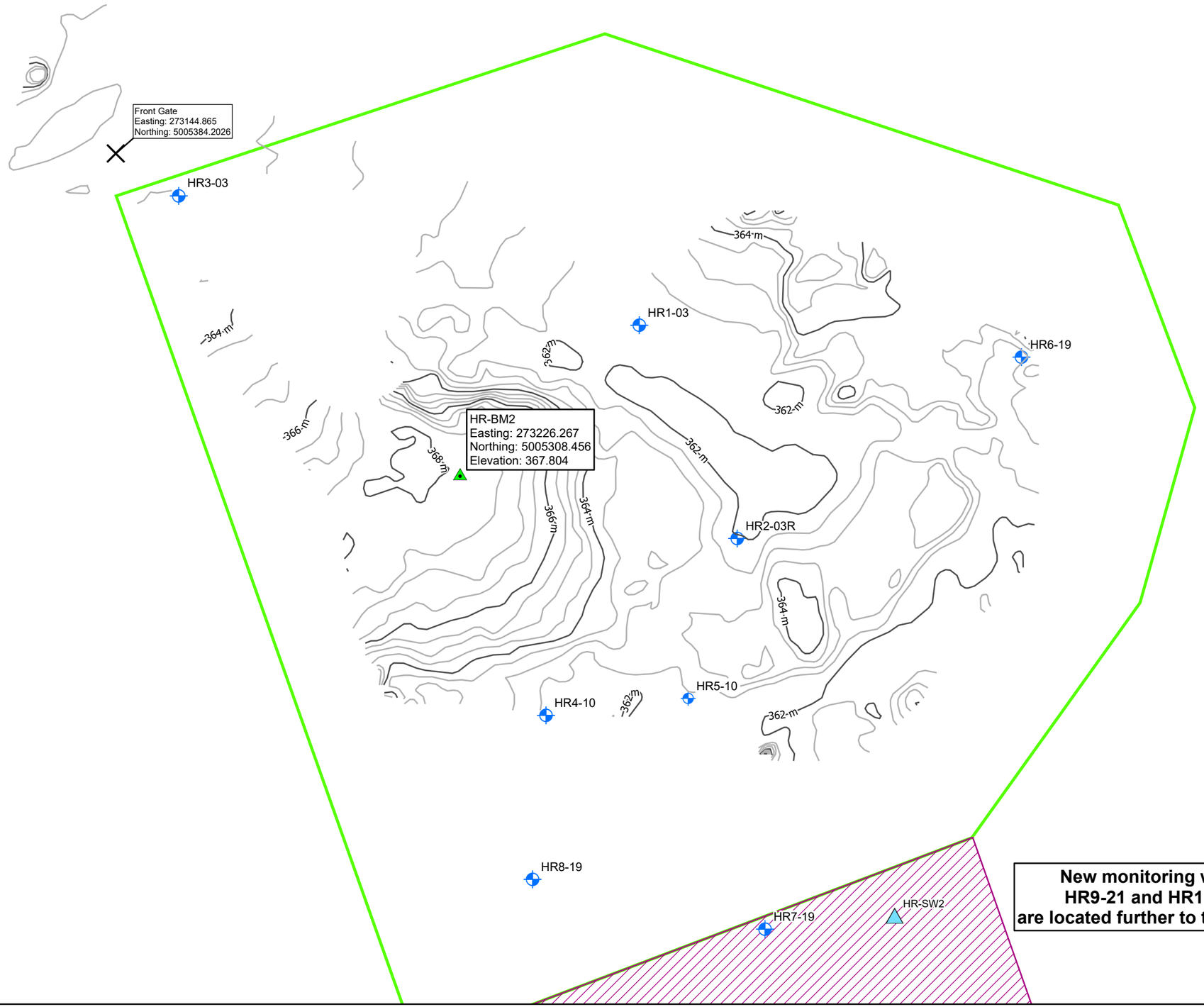
PROJECT #	DATE
230225-05	February 09, 2024

DRAWN	CHECKED	FIG NO.	REV
PB	LH	02	0



LEGEND

- Groundwater Monitoring Location
- Benchmark
- Surface Water Sampling Locations
- GPS Coordinates
- Surveyed Boundary (4.0 ha) (PA Miller, 2018)
- Surveyed CAZ (1.12 ha) (PA Miller, 2018)

2023 Elevation

- Minor Contour (0.5 masl)
- Major Contour (2.0 masl)

NOTES:
- Site Property Boundary: 4.0 ha
- All well and benchmark elevation data based on 2019 data, except for HR5-10, which is based on 2016 Survey

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

N W E S

0 20 40 Meters

1:1,000

CLIENT

Municipality of Hastings Highlands

PROJECT

Hickey Road
Waste Disposal Site

TITLE

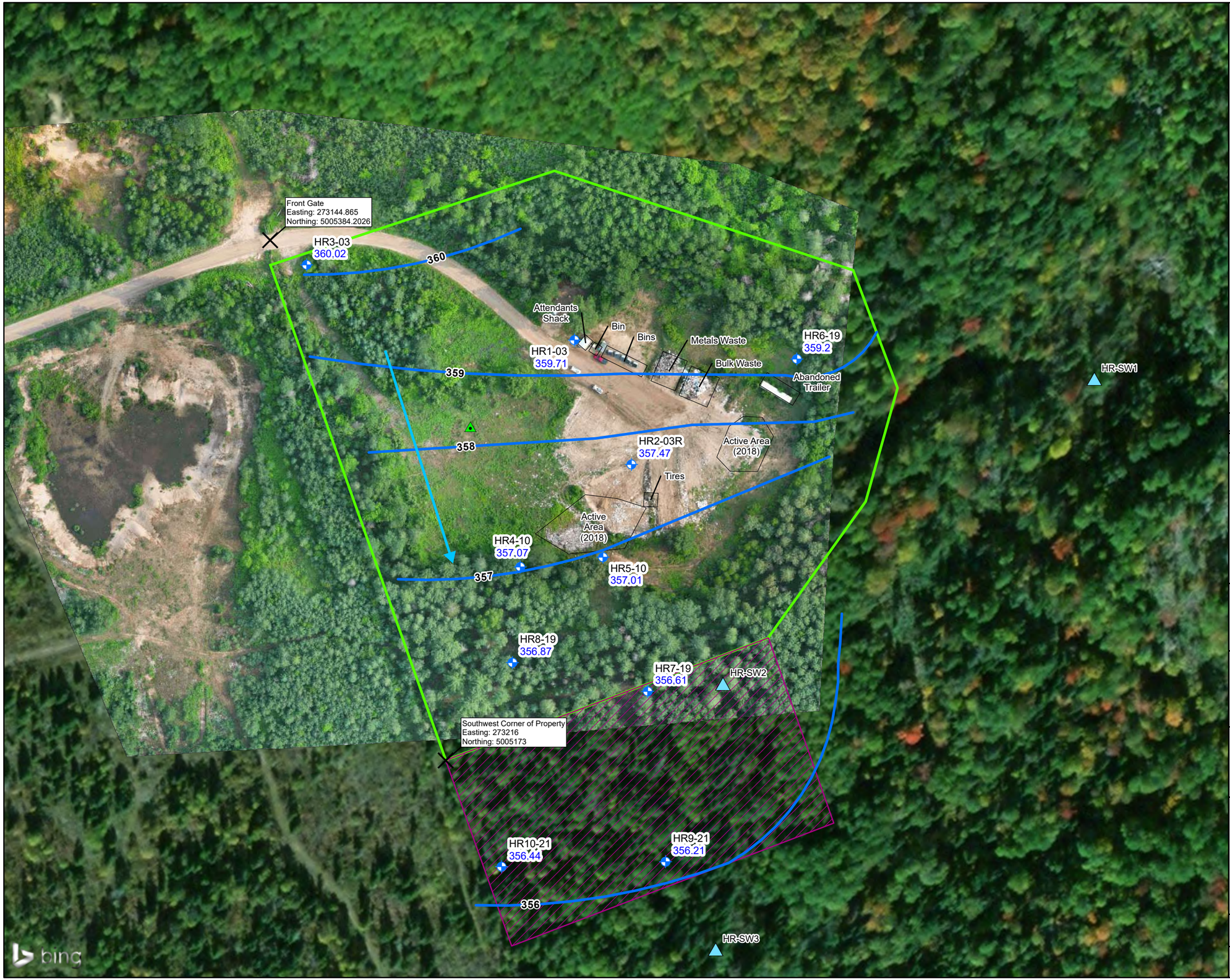
Site Topography
and Monitoring Locations

BluMetric Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-05	February 09, 2024

DRAWN	CHECKED	FIG NO.	REV
PB	LH	03	0



LEGEND

- Groundwater Monitoring Location
- Benchmark
- Surface Water Sampling Locations
- GPS Coordinates
- Site Features
- Surveyed Boundary (4.0 ha) (PA Miller, 2018)
- Surveyed CAZ (1.12 ha) (PA Miller, 2018)
- Groundwater Contour (masl)
- Inferred Direction of Groundwater Flow

NOTES:
- Site Property Boundary: 4.0 ha
- All well Elevation Data Based on 2021 Survey Data
- Ortho Image taken by a UAV flight in 2017
- UTM zone used is CSRS 18

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

DO NOT SCALE DRAWING.
THIS DRAWING MAY HAVE BEEN REDUCED. ALL SCALE NOTATIONS INDICATED ARE BASED ON 11"x17" FORMAT DRAWINGS.

0 25 50 Meters

1:1,500

CLIENT

Municipality of Hastings Highlands

PROJECT

Hickey Road
Waste Disposal Site

TITLE

Monitoring Locations and Water Levels - Spring 2023

BluMetric Environmental
The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE		
230225-05	February 09, 2024		
DRAWN	CHECKED	FIG NO.	REV
MB	LH	04	0

LEGEND

- Groundwater Monitoring Location
- Benchmark
- Surface Water Sampling Locations
- GPS Coordinates
- Site Features
- Surveyed Boundary (4.0 ha) (PA Miller, 2018)
- Surveyed CAZ (1.12 ha) (PA Miller, 2018)
- Groundwater Contour (masl)
- Inferred Direction of Groundwater Flow

NOTES:
- Site Property Boundary: 4.0 ha
- All well Elevation Data Based on 2021 Survey Data
- Ortho Image taken by a UAV flight in 2023
- UTM zone used is CSRS 18

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

N W E S

0 25 50 Meters

1:1,500

CLIENT

Municipality of Hastings Highlands

PROJECT

Hickey Road
Waste Disposal Site

TITLE

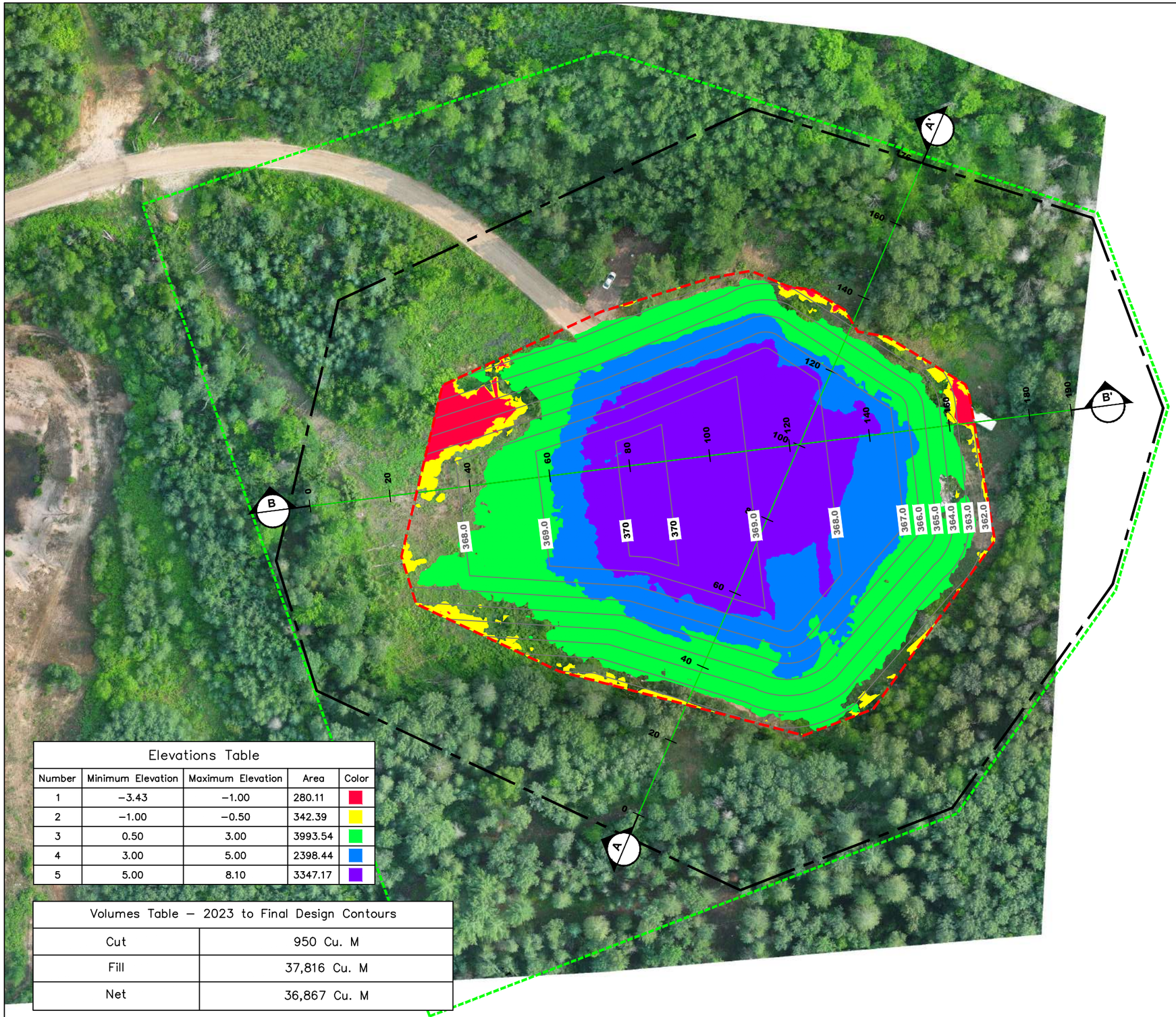
Monitoring Locations and Water Levels - Fall 2023

BluMetric Environmental

The Tower - The Woolen Mill,
4 Cataraqui St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-05	February 09, 2024

DRAWN	CHECKED	FIG NO.	REV
MB	LH	05	0



Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−3.43	−1.00	280.11	
2	−1.00	−0.50	342.39	
3	0.50	3.00	3993.54	
4	3.00	5.00	2398.44	
5	5.00	8.10	3347.17	

Volumes Table – 2023 to Final Design Contours	
Cut	950 Cu. M
Fill	37,816 Cu. M
Net	36,867 Cu. M

LEGEND

110 — **FINAL DESIGN CONTOURS (1.0 m)**

FINAL FOOTPRINT DESIGN

MINIMUM 30m BUFFER AROUND WASTE

APPROXIMATE LOCATION OF PROPERTY BOUNDARY

NOTE: VOLUME OF 600 mm CAP TO COVER THE SURFACE OF THE WASTE SITE IS 7293.01 CUBIC METRES. FINAL DESIGN CONTOURS ARE TO TOP OF CAP / UNDERSIDE OF TOP SOIL.

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

0 25 50 Meters 1:1000

N W E S

THIS SCALE TO BE USED TO OBTAIN APPROXIMATE DIMENSIONS FOR INFORMATION

CLIENT

Municipality of Hastings Highlands

PROJECT

Hickey Road Waste Disposal Site

TITLE

Remaining Fill Capacity as of June 2023

BluMetric Environmental

The Tower - The Woolen Mill
4 Cataraqui Street,
Kingston, Ontario, K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
230225-05	2024-02-14

DRAWN	CHECKED	DWG NO.	REV
PB	LH	06	0

D:\SP\Blumetric Environmental\Geomatics - GIS\GIS_PROJECTS\PROJECTS\MHH\Projects\230225 - MHHs - 2023 AMR WDS-WSTs - Maynooth,ON\05-Hickey Road\CAD\2024-02-14\230225-05_Hickey_DandO_V03.dwg

Site Photographs

Photo 1: Signage at Front Entrance– May 3, 2023

Photo 2: Front Entrance with Signage – May 3, 2023

Photo 3: Attendant's Building and Recycling Bins – May 3, 2023

Photo 4: Bulk Waste Area – May 3, 2023

Photo 5: Scrap Metal Area – May 3, 2023

Photo 6: Household Waste Landfilling Area – May 3, 2023

Photo 7: Household Waste Landfilling Area – May 3, 2023

Photo 8: Household Waste Landfilling Area – May 3, 2023

Photo 9: HR-SW1 monitoring location – May 3, 2023

Photo 10: HR-SW2 monitoring location – May 3, 2023

Photo 11: HR-SW3 monitoring location – May 3, 2023

Photo 12: HR-SW4 monitoring location – May 3, 2023

Photo 13: Front entrance and signage – October 17, 2023

Photo 14: Attendant's building and recycle bins – October 17, 2023

Photo 15: Waste Segregation Areas – October 17, 2023

Photo 16: Waste Segregation Areas – October 17, 2023

Photo 17: Household Waste Landfilling Area – October 17, 2023

Photo 18: Household Waste Landfilling Area – October 17, 2023

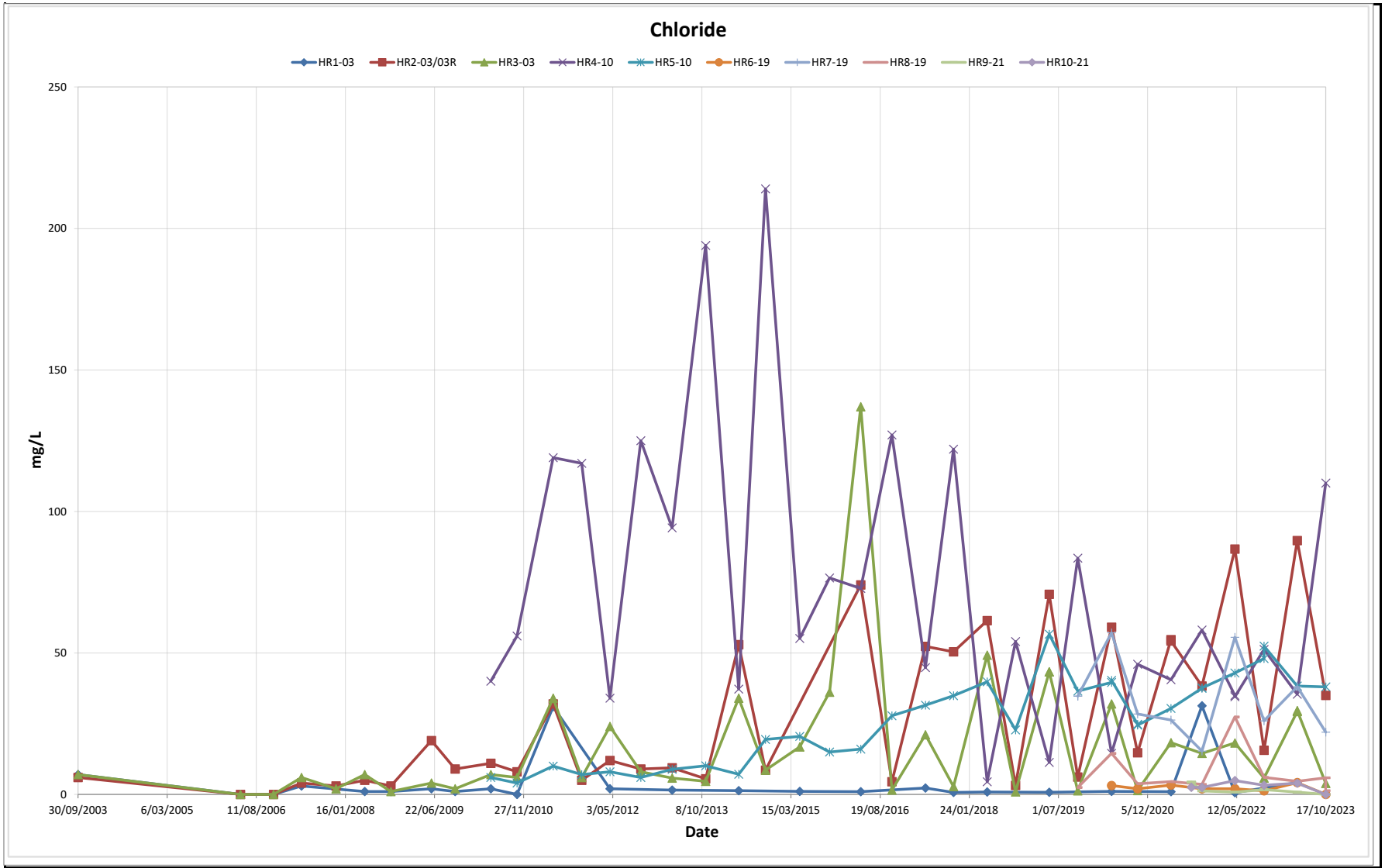
Photo 19: HR-SW1 monitoring location October 17, 2023

Photo 20: HR-SW2 monitoring location – October 17, 2023

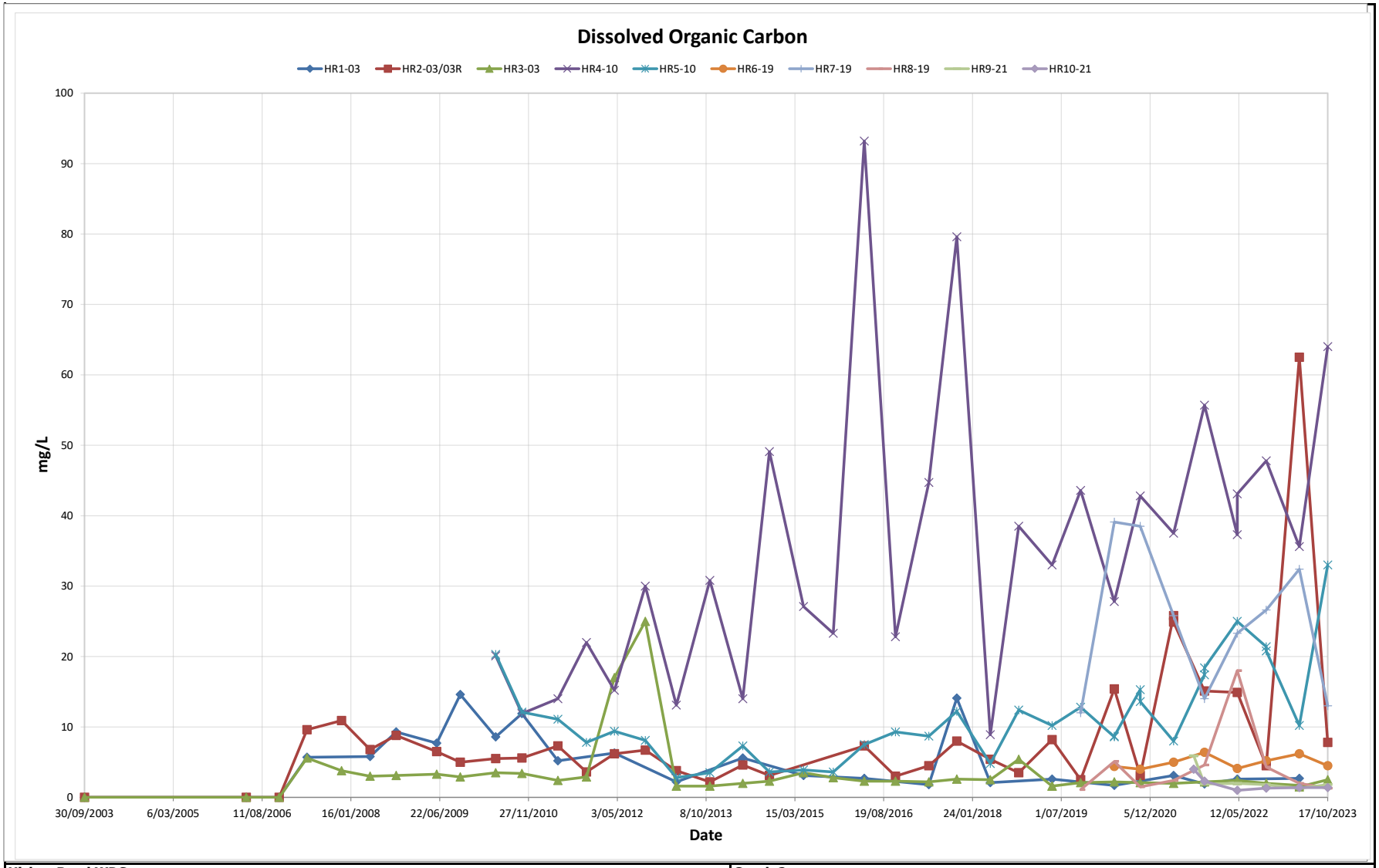
Photo 21: HR-SW3 monitoring location – October 17, 2023

Photo 22: HR-SW4 monitoring location – October 17, 2023

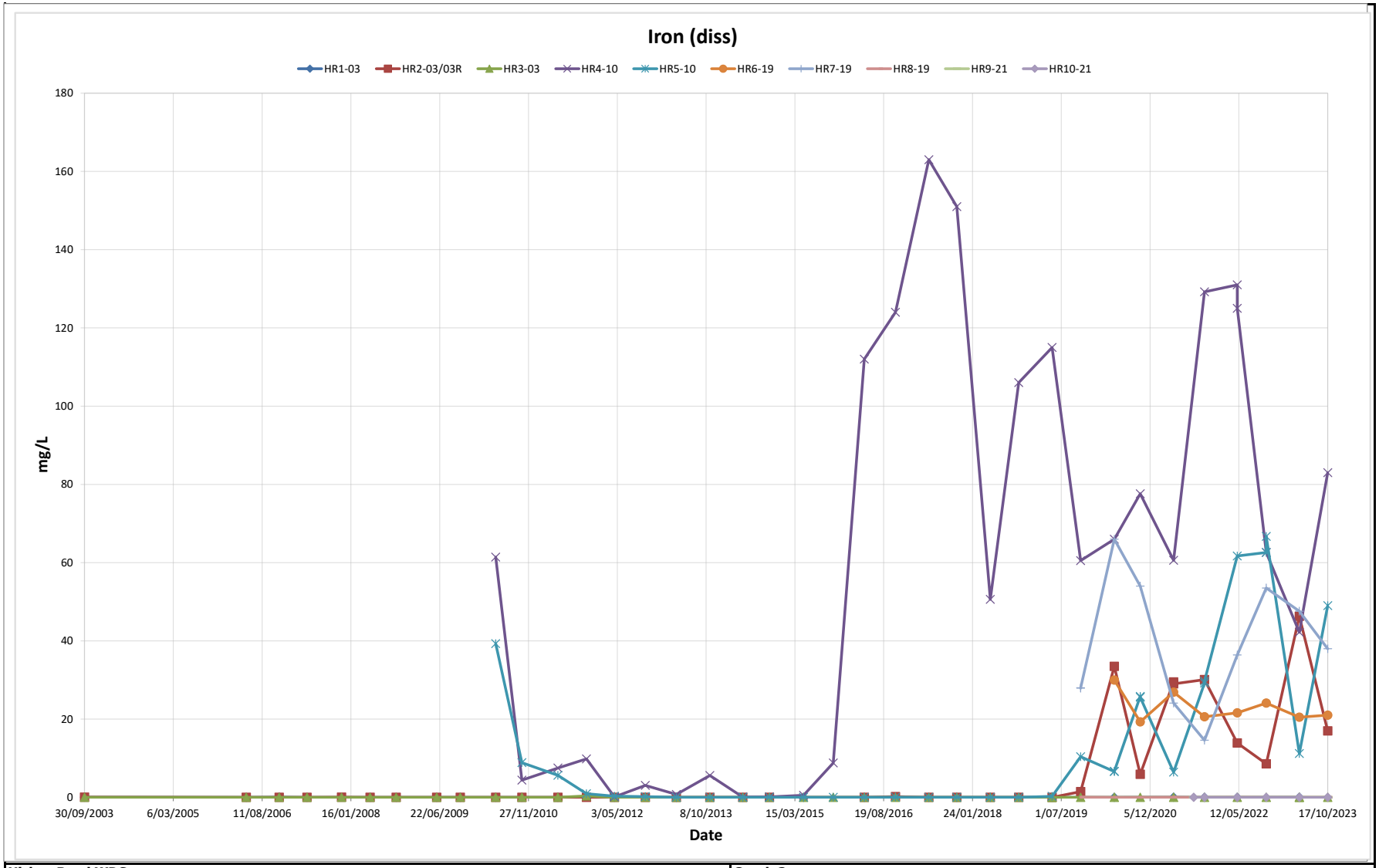
Chemistry Trend Graphs



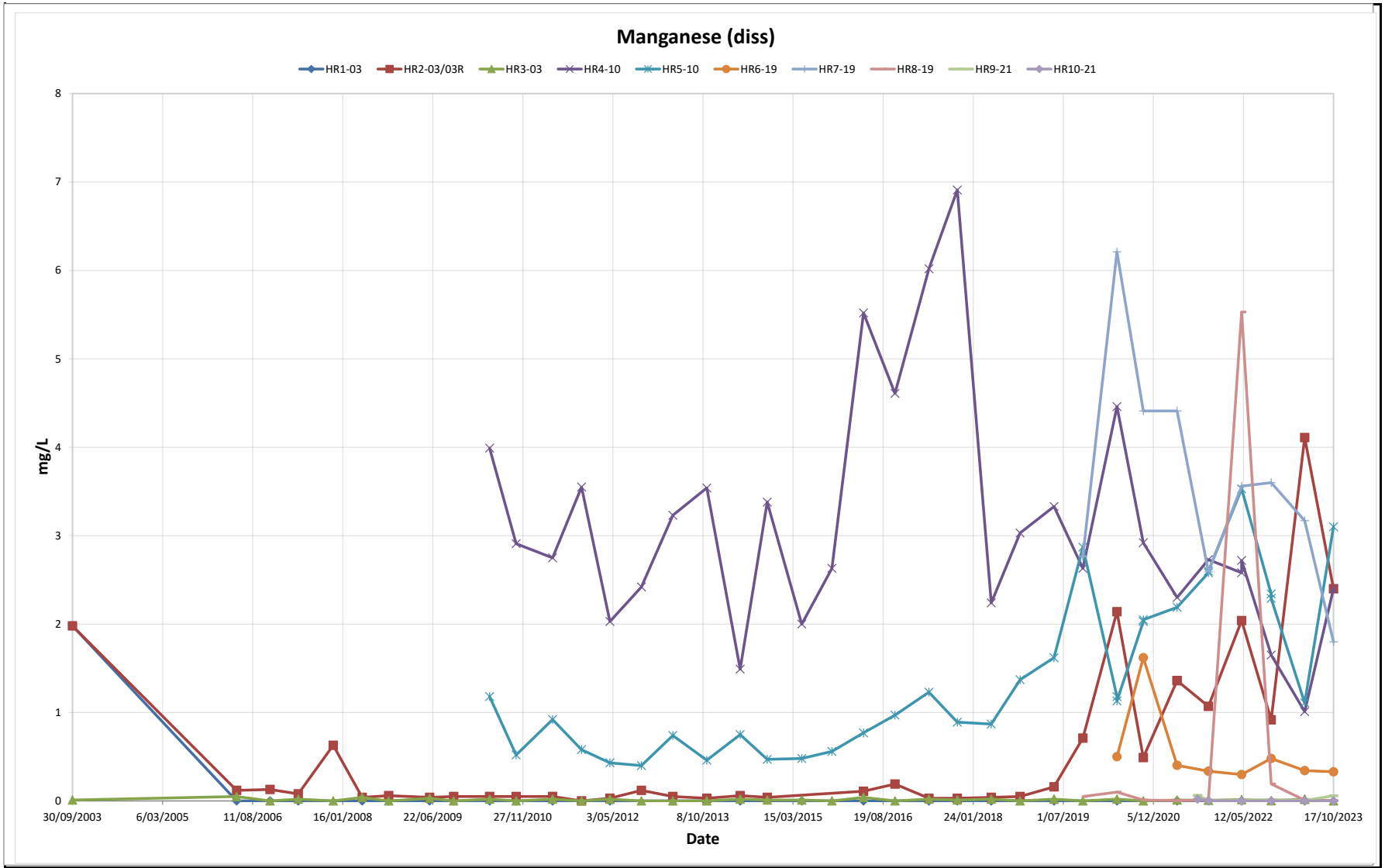
Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 1** **Chloride in Groundwater**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



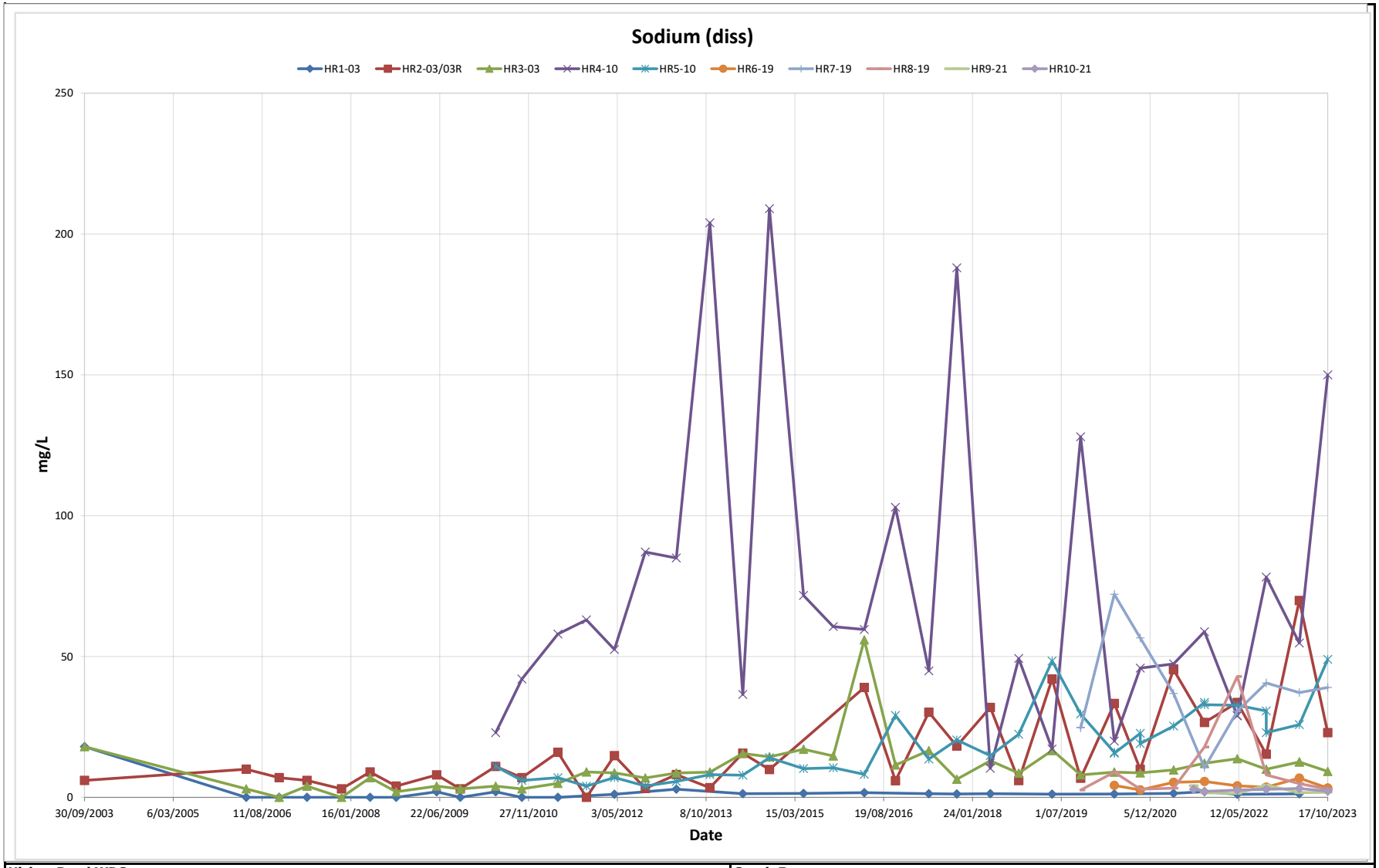
Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 2** **Dissolved Organic Carbon in Groundwater**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



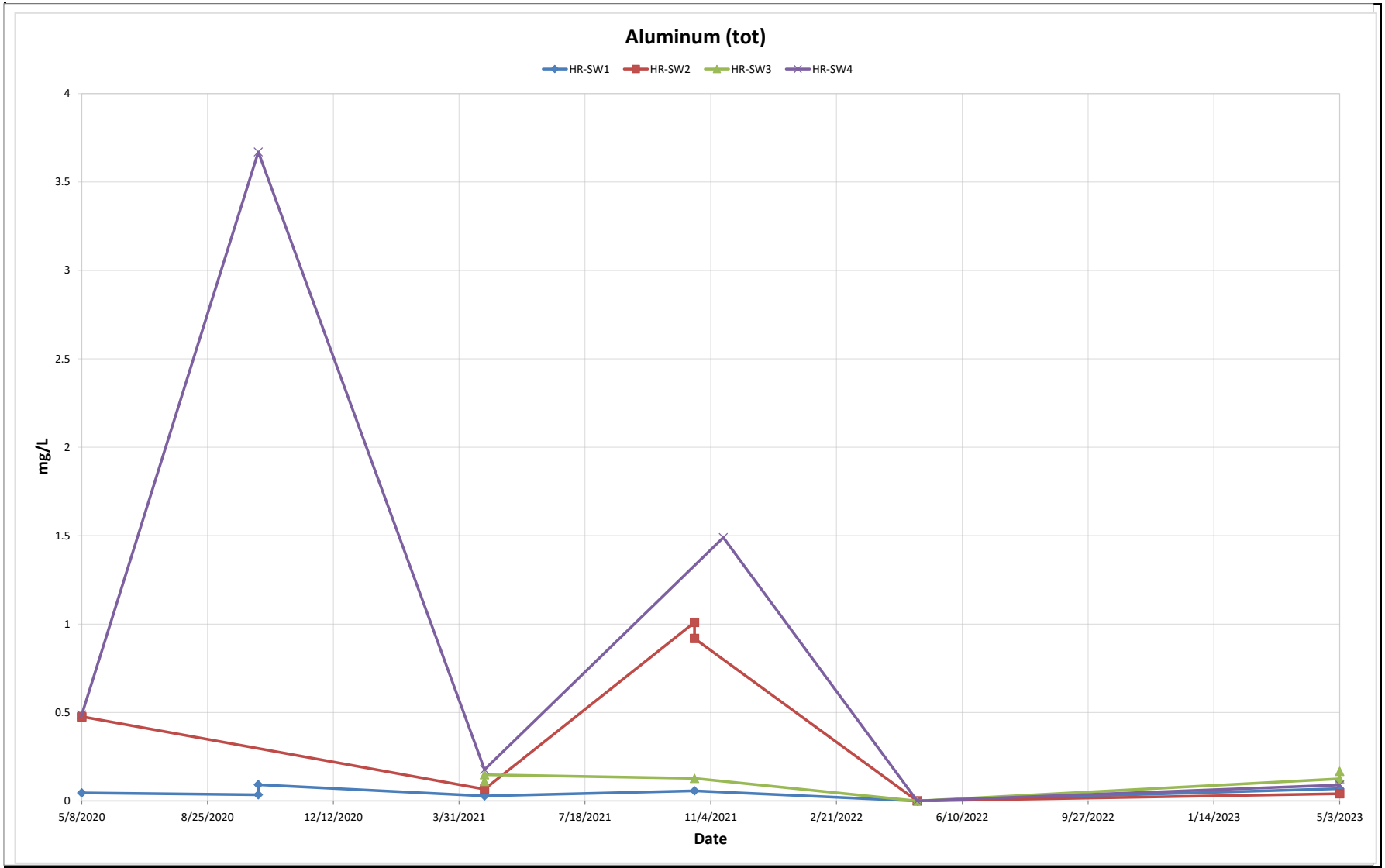
Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 3** **Dissolved Iron in Groundwater**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



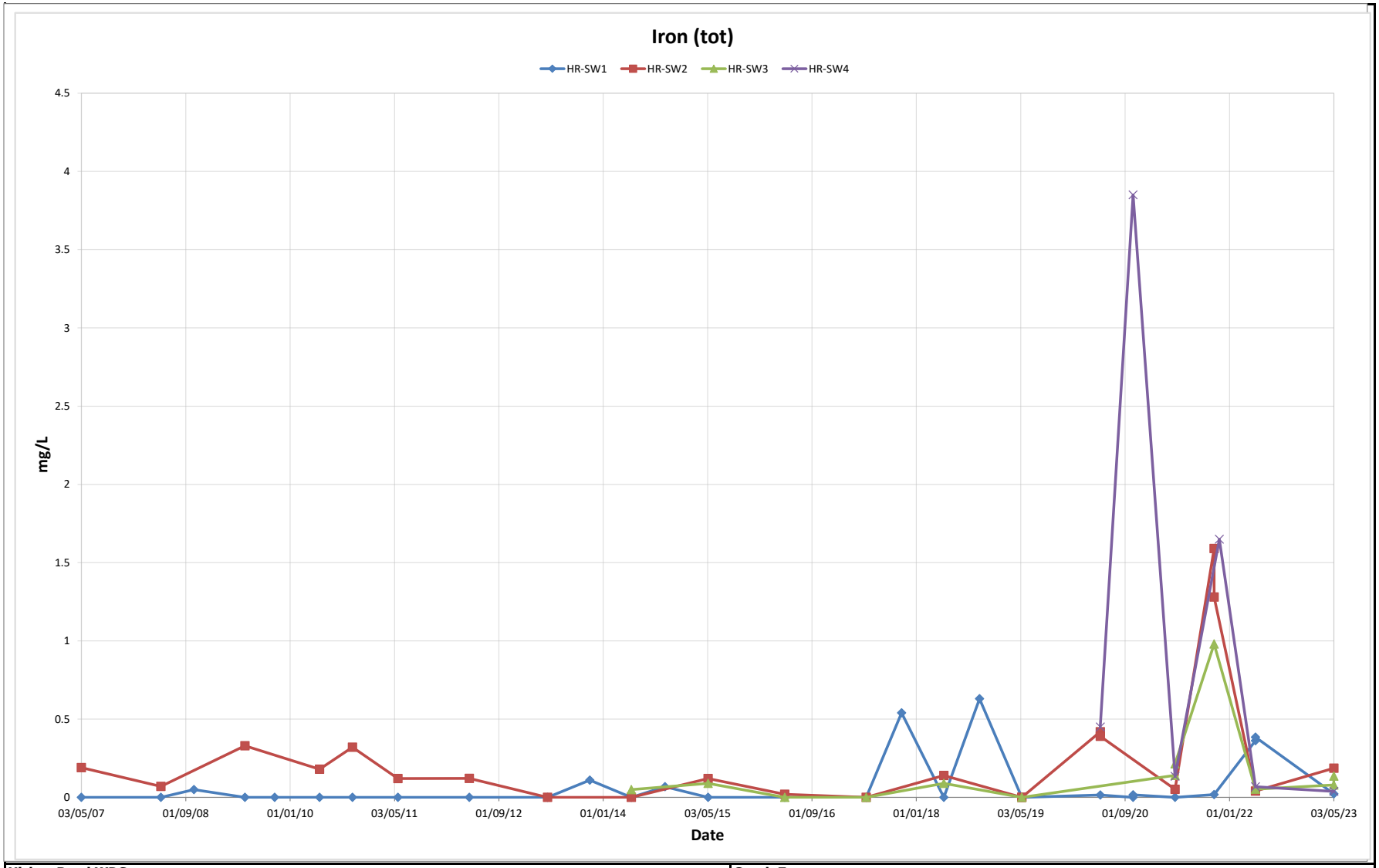
Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 4** **Dissolved Manganese in Groundwater**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



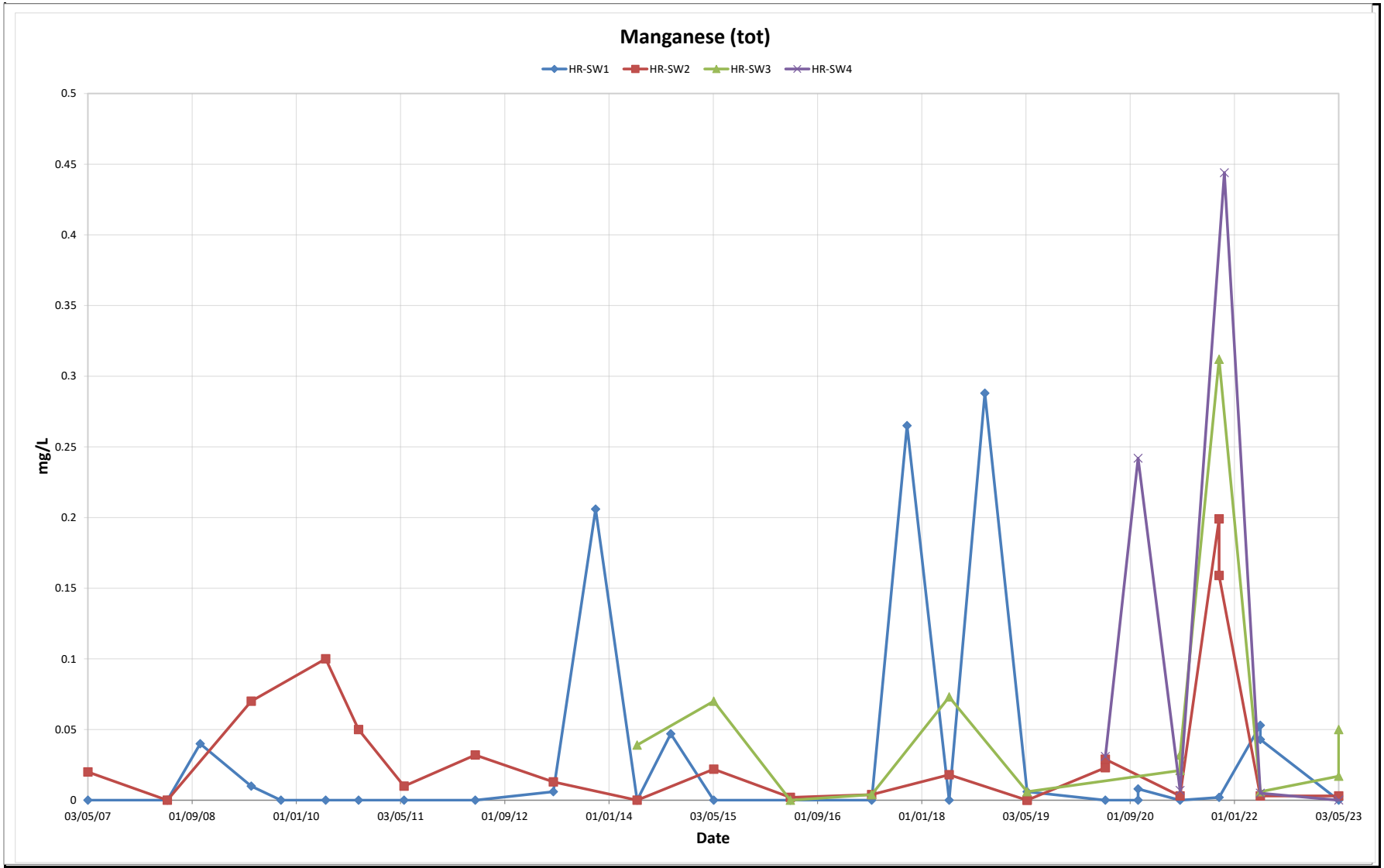
Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 5** **Dissolved Sodium in Groundwater**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



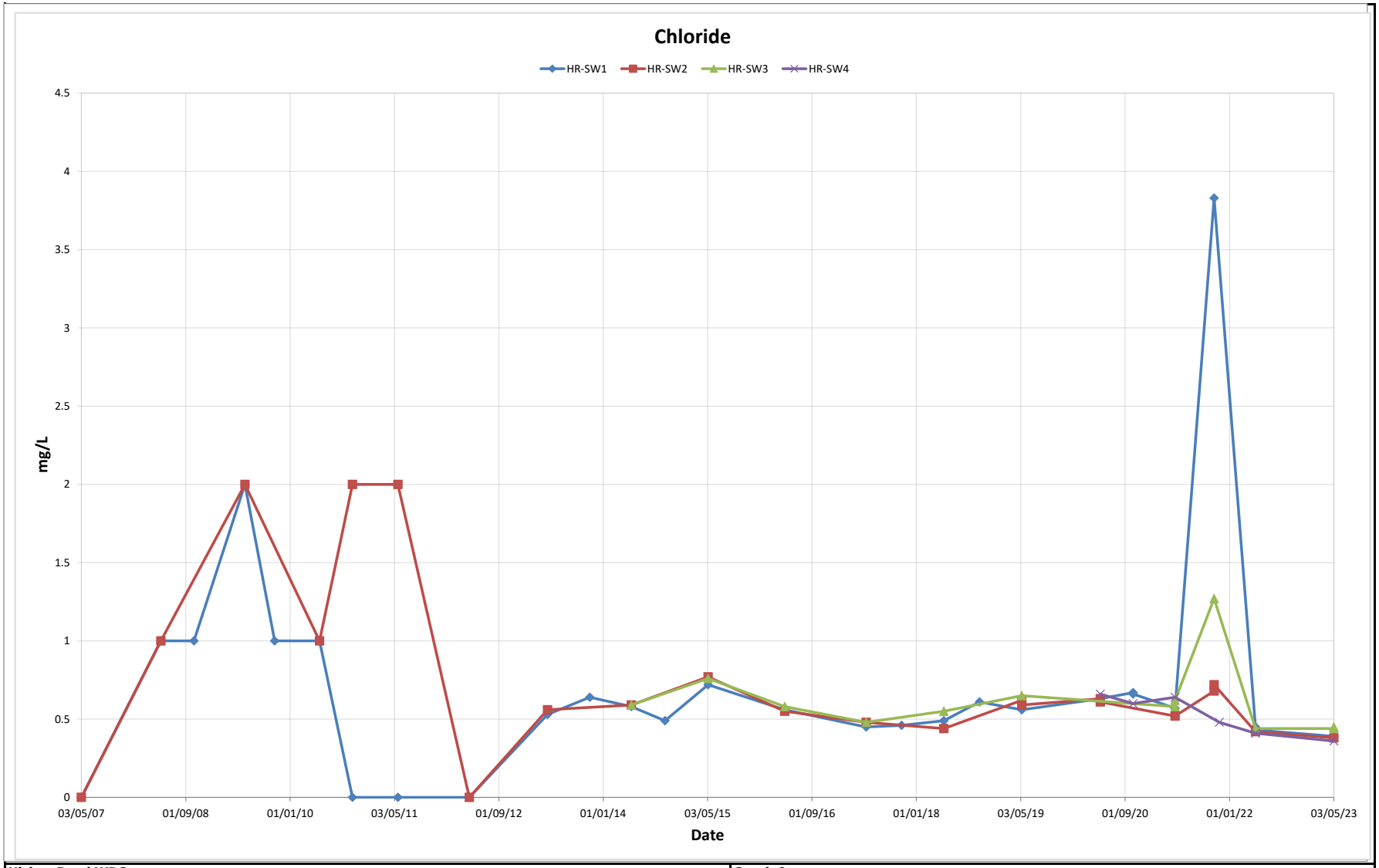
Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 6** **Total Aluminum in Surface water**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



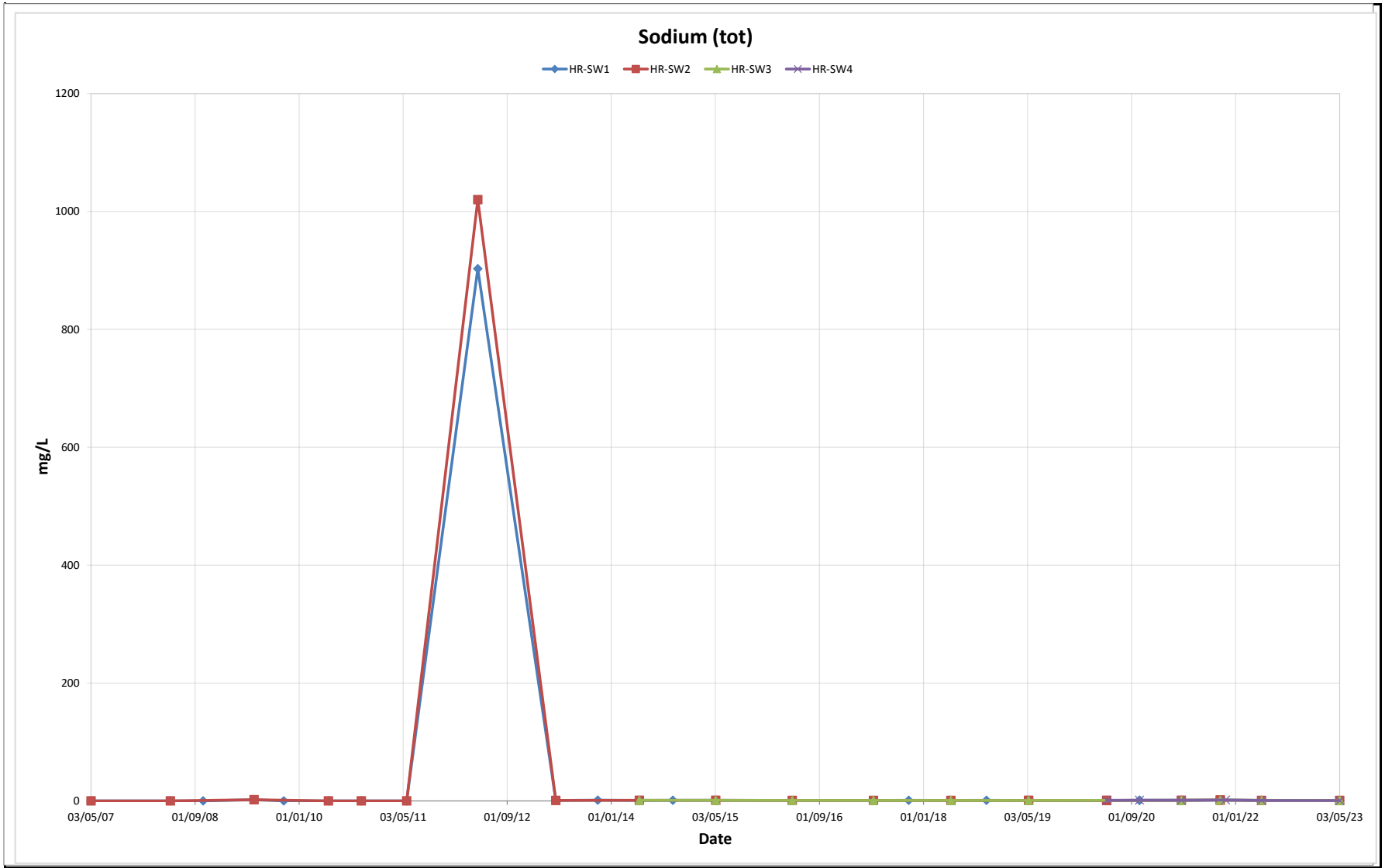
Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 7** **Total Iron in Surface water**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 8** **Total Manganese in Surface water**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 9** **Chloride in Surface water**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**



Hickey Road WDS **Municipality of Hasting's Highlands**	**Graph 10** **Total Sodium in Surface water**
BluMetric Proj No: 230225-05 **Date: February 13, 2024**	**Created by: LH** **Checked by: MS**

Appendix A

Environmental Compliance Approval

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER A362301
Issue Date: December 20, 2018

The Corporation of the Municipality of Hastings Highlands
33011 Highway 62 N
Post Office Box, No. 130
Maynooth, Ontario
K0L 2S0

Site Location: Hickey Road WDS
Lot Part of 30, Concession 8
Hastings Highlands Municipality, County of Hastings

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

the use and operation of 3.0 hectare waste disposal/transfer site within a total site area of 4.0 hectares.

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

- *"Approval"* means this Environmental Compliance Approval and any Schedules to it, including the application and supporting documentation listed in Schedule "A";
- *"Contaminating Life Span"* means contaminating life span as defined in Ontario Regulation 232/98;
- *"Director"* means any *Ministry* employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part II.1 of the *EPA;*
- *"District Manager"* means the District Manager of the local district office of the *Ministry* in which the *Site* is geographically located;
- *"EPA"* means *Environmental Protection Act* , R.S.O. 1990, c. E. 19, as amended;
- *"Ministry"* means the Ontario Ministry of the Environment, Conservation and Parks;

- *"NMA"* means *Nutrient Management Act* , 2002, S.O. 2002, c. 4, as amended;

- *"Ontario Drinking Water Quality Standards"* means Ontario Regulation 169/03 (Ontario Drinking Water Quality Standards) as amended;

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

- *"Owner"* means any person that is responsible for the establishment or operation of the *Site* being approved by this *Approval,* and includes the Corporation of the Municipality of Hastings Highlands and its successors and assigns;

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

- *"PA"* means the *Pesticides Act* , R.S.O. 1990, c. P-11, as amended;

- *"Provincial Officer"* means any person designated in writing by the Minister as a provincial officer pursuant to Section 5 of the *OWRA,* Section 5 of the *EPA,* Section 17 of the *PA,* Section 4 of the *NMA,* or Section 8 of the *SDWA;*

- *"Refrigerant Appliances"* means household appliances which use, or may use refrigerants, and which include, but is not restricted to, refrigerators, freezers and air-conditioning systems;

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

- *"Regulation 232"* means Ontario Regulation 232/98 (New Landfill Standards) made under the *EPA* , as amended from time to time;

- *"Regulation 347"* means Regulation 347, R.R.O. 1990, made under the EPA, as amended;

- *"Regulation 903"* means Regulation 903, R.R.O. 1990, made under the *OWRA,* as amended;

- *"SDWA"* means *Safe Drinking Water Act,* 2002, S.O. 2002, c. 32, as amended;

- *"Site"* means the entire waste disposal site, including the buffer lands, and contaminant attenuation zone at 202 Hickey Road, Municipality of Hastings Highlands, County of Hastings; and

- *"Trained Personnel"* means personnel knowledgeable in the following through instruction and/or practice:
  - relevant waste management legislation, regulations and guidelines;
  - major environmental concerns pertaining to the waste to be handled;
  - occupational health and safety concerns pertaining to the processes and wastes to be handled;

- o management procedures including the use and operation of equipment for the processes and wastes to be handled;
- o emergency response procedures;
- o specific written procedures for the control of nuisance conditions;
- o specific written procedures for refusal of unacceptable waste loads; and
- o the requirements of this *Approval.*

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

TERMS AND CONDITIONS

1. GENERAL

Compliance

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

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

In Accordance

(3) Except as otherwise provided by this *Approval,* the *Site* shall be designed, developed, built, operated and maintained in accordance with the documentation listed in the attached Schedule "A".

Interpretation

(4) Where there is a conflict between a provision of any document listed in Schedule "A" in this *Approval,* and the conditions of this *Approval,* the conditions in this *Approval* shall take precedence.

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

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

(7) The conditions of this *Approval* are severable. If any condition of this *Approval,* or the

application of any condition of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Approval* shall not be affected thereby.

Other Legal Obligations

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

a. relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
b. limit in any way the authority of the *Ministry* to require certain steps be taken or to require the *Owner* and *Operator* to furnish any further information related to compliance with this *Approval.*

Adverse Effect

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

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

Change of Ownership

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

a. the ownership of the *Site;*
b. the *Operator* of the *Site;*
c. the address of the *Owner or Operator;* and
d. the partners, where the *Owner or Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act* , R. S. O. 1990, c. B.17, shall be included in the notification.

(12) No portion of this *Site* shall be transferred or encumbered prior to or after closing of the *Site* unless the *Director* is notified in advance and sufficient financial assurance is deposited with the *Ministry* to ensure that these conditions will be carried out.

(13) In the event of any change in ownership of the *Site,* other than change to a successor municipality, the *Owner* shall notify the successor of and provide the successor with a

copy of this *Approval*, and the *Owner* shall provide a copy of the notification to the *District Manager* and the *Director*.

Registration on Title Requirement

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

(15) a. By March 31, 2019, the *Owner* shall submit to the *Director* a completed Certificate of Requirement which shall include:

i. a plan of survey prepared, signed and sealed by an Ontario Land Surveyor, which shows the area of the *Site* where waste has been or is to be deposited at the *Site;*

ii. proof of ownership of the *Site;*

iii. a letter signed by a member of the Law Society of Upper Canada or other qualified legal practitioner acceptable to the *Director*, verifying the legal description provided in the Certificate of Requirement;

iv. the legal abstract of the property; and

v. any supporting documents including a registerable description of the *Site*.

b. By March 31, 2019, the *Owner* shall:

i. register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and

ii. submit to the *Director* and the *District Manager*, written verification that the Certificate of Requirement has been registered on title.

Registration on Title Requirement - Contaminant Attenuation Zone (CAZ)

(16) By March 31, 2019, the *Owner* shall, submit to the *Director* documents confirming that a contaminant attenuation zone (CAZ) has been established, in either fee simple or by way of a groundwater easement.

(17) By March 31, 2019, the *Owner* shall submit to the *Director* a completed Certificate of Requirement which shall include:

a. If rights are obtained in fee simple, the *Owner* shall provide:

i. documentation evidencing ownership of the CAZ obtained in compliance with

O.Reg. 232/98, as amended;

ii. a completed Certificate of Requirement and supporting documents containing a registerable description of the CAZ; and

iii. a letter signed by a member of the Law Society of Upper Canada; or other qualified legal practitioner acceptable to the *Director*, verifying the legal description of the CAZ.

b. By February 28, 2019, the *Owner* shall:

i. register the Certificate of Requirement in the appropriate Land Registry Office on the title to the property; and

ii. submit to the *Director* and the *District Manager*, written verification that the Certificate of Requirement has been registered on title.

c. If rights are obtained by way of a groundwater easement, the Applicant shall:

i. provide a copy of the easement;

ii. provide a plan of survey signed and sealed by an Ontario Land Surveyor for the CAZ;

iii. submit proof of registration on title of the groundwater easement to the *Director;*

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

Inspections by the *Ministry*

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

a. to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this *Approval* are kept;

b. to have access to, inspect, and copy any records required to be kept by the conditions of this *Approval;*

c. to inspect the *Site*, related equipment and appurtenances;

d. to inspect the practices, procedures, or operations required by the conditions of this

Approval; and

e. to sample and monitor for the purposes of assessing compliance with the terms and conditions of this *Approval* or the *EPA*, the *OWRA*, the *PA*, the *SDWA* or the *NMA*.

Information and Record Retention

(19) a. Except as authorized in writing by the *Director*, all records required by this *Approval* shall be retained at the Municipality of Hastings Highlands Office for a minimum of two (2) years from their date of creation.

b. The *Owner* shall retain all documentation listed in Schedule "A" for as long as this *Approval* is valid.

c. All monthly summary reports of waste records collected are to be kept at the Municipality of Hastings Highlands Office until they are included in the Annual Report.

d. The *Owner* shall retain employee training records as long as the employee is working at the Municipality of Hastings Highlands Office.

e. The *Owner* shall make all of the above documents available for inspection upon request of *Ministry* staff.

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

a. an approval, waiver, or justification by the *Ministry* of any act or omission of any person that contravenes any term or condition of this *Approval* or any statute, regulation or other legal requirement; or

b. acceptance by the *Ministry* of the information's completeness or accuracy.

(21) The *Owner* shall ensure that a copy of this *Approval*, in its entirety and including all its Notices of Amendment, and documentation listed in Schedule "A", are retained at the *Site* at all times.

(22) Any information related to this *Approval* and contained in *Ministry* files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, RSO 1990, CF-31.

2. SITE OPERATION

Operation

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

Signs

(2) A sign shall be installed and maintained at the main entrance/exit to the *Site* which legibly display the following information:

a. the name of the *Site* and *Owner;*

b. the number of the *Approval;*

c. the name of the *Operator;*

d. the normal hours of operation;

e. the allowable and prohibited waste types;

f. the telephone number to which complaints may be directed;

g. a warning against unauthorized access;

h. a twenty-four (24) hour emergency telephone number (if different from above); and

i. a warning against dumping outside the *Site*.

(3) The *Owner* shall install and maintain signs to direct vehicles to working face and recycling areas.

(4) The *Owner* shall provide signs at recycling area informing users what materials are acceptable and directing users to appropriate storage areas.

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

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

Burning Waste Prohibited

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

b. Notwithstanding Condition 2. (6) (a) above, burning of segregated, clean wood and brush at the landfill may be carried out in strict compliance with the Ministry of the Environment Document titled "Guideline C-7, Burning at Landfill Sites" dated April 1994.

Site Access

(7) Waste shall only be accepted during the following time periods:

Summer (Victoria Day to Thanksgiving)

Tuesday and Friday :12:00 p.m. - 5:00 p.m.

Winter (Thanksgiving to Victoria Day)

Friday :12:00 p.m. - 5:00 p.m.

(8) On-site equipment used for site preparation and closing activities may be operated between 7 a.m. and 5 p.m. Monday to Friday.

(9) With the prior written approval from the *District Manager,* the time periods may be extended to accommodate seasonal or unusual quantities of waste.

(10) Waste/recyclables may be relocated on-site or removed off-site by registered/licensed waste haulers during the hours of 7 a.m. and 5 p.m. Monday to Friday. These activities shall only be carried out by trained personnel of registered/licensed waste haulers.

Site Security

(11) No waste shall be received, landfilled or removed from the *Site* unless a site supervisor or an attendant is present and supervises the operations during operating hours. The *Site* shall be closed when a site attendant is not present to supervise landfilling operations.

(12) The *Site* shall be operated and maintained in a safe and secure manner. During non-operating hours, the *Site* entrance and exit gates shall be locked and the *Site* shall be secured against access by unauthorized persons.

3. EMPLOYEE TRAINING

(1) A training plan for all employees that operate any aspect of the *Site* shall be developed

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

4. COMPLAINTS RESPONSE PROCEDURE

(1) If at any time the *Owner* receives complaints regarding the operation of the *Site*, the *Owner* shall respond to these complaints according to the following procedure:

a. The *Owner* shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint;

b. The *Owner*, upon notification of the complaint, shall initiate appropriate steps to determine possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and

c. The *Owner* shall complete and retain on-site a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.

5. EMERGENCY RESPONSE

(1) All Spills as defined in the *EPA* shall be immediately reported to the **Ministry's Spills Action Centre at 1-800-268-6060** and shall be recorded in the log book as to the nature of the emergency situation, and the action taken for clean-up, correction and prevention of future occurrences.

(2) In addition, the *Owner* shall submit, to the *District Manager* a written report within three (3) business days of the emergency situation, outlining the nature of the incident, remedial measures taken, handling of waste generated as a result of the emergency situation and the measures taken to prevent future occurrences at the *Site*.

(3) All wastes resulting from an emergency situation shall be managed and disposed of in accordance with *Reg. 347*.

(4) All equipment and materials required to handle the emergency situations shall be:

a. kept on hand at all times that waste landfilling and/or handling is undertaken at the *Site;* and

b. adequately maintained and kept in good repair.

(5) The *Owner* shall ensure that the emergency response personnel are familiar with the use of such equipment and its location(s).

6. INSPECTIONS, RECORD KEEPING AND REPORTING

Daily Log Book

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

a. the type, date and time of arrival, hauler, and quantity (tonnes) of all waste and cover material received at the *Site;*

b. the area of the *Site* in which waste disposal operations are taking place;

c. a record of litter collection activities and the application of any dust suppressants;

d. a record of the daily inspections; and

e. a description of any out-of-service period of any control, treatment, disposal or monitoring facilities, the reasons for the loss of service, and action taken to restore and maintain service.

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

Daily Inspections and Log Book

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

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

a. the name and signature of person that conducted the inspection;

b. the date and time of the inspection;

c. the list of any deficiencies discovered;

d. the recommendations for remedial action; and

e. the date, time and description of actions taken.

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

Annual Report

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

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

a. the results and an interpretive analysis of the results of all leachate, groundwater surface water and landfill gas monitoring, including an assessment of the need to amend the monitoring programs;

b. an assessment of the operation and performance of all engineered facilities, the need to amend the design or operation of the *Site,* and the adequacy of and need to implement the contingency plans;

c. site plans showing the existing contours of the *Site;* areas of landfilling operation during the reporting period; areas of intended operation during the next reporting period; areas of excavation during the reporting period; the progress of final cover, vegetative cover, and any intermediate cover application; facilities existing, added or removed during the reporting period; and site preparations and facilities planned for installation during the next reporting period;

d. calculations of the volume of waste, daily and intermediate cover, and final cover deposited or placed at the *Site* during the reporting period and a calculation of the total volume of *Site* capacity used during the reporting period;

e. a calculation of the remaining capacity of the *Site* and an estimate of the remaining *Site* life;

f. a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the *Site;*

g. a summary of any complaints received and the responses made;

h. a discussion of any operational problems encountered at the *Site* and corrective action

taken;

i. any changes to the Design and Operations Report and the Closure Plan that have been approved by the *Director* since the last *Annual Report;*

j. a report on the status of all monitoring wells and a statement as to compliance with *Ontario Regulation 903;* and

k. any other information with respect to the *Site* which the *District Manager* may require from time to time.

7. LANDFILL DESIGN AND DEVELOPMENT

Approved Waste Types

(1) Only municipal waste as defined under *Reg.* 347 being solid non-hazardous shall be accepted at the *Site* for landfilling.

(2) The *Owner* shall develop and implement a program to inspect waste to ensure that the waste received at the *Site* is of a type approved for acceptance under this *Approval.*

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

Capacity

(4) Maximum volumetric capacity approved for the *Site,* consisting of the waste, daily cover and intermediate cover, but excluding the final cover is 74,100 cubic meters. This volume includes the historical waste volume of 32,300 cubic meters as of 2016.

(5) This approval is for the design, operation and use of 41,800 cubic meters of the calculated theoretical maximum volumetric capacity of the *Site* as described in documents in Schedule "A".

Service Area

(6) Only waste that is generated within the boundaries of the Municipality of Hastings Highlands may be accepted at the *Site.*

Cover

(7) Alternative materials to soil may be used as weekly and interim cover material, based on an application with supporting information and applicable fee for a trial use or permanent use, submitted by the *Owner* to the *Director,* copied to the *District Manager* and as approved by the *Director* via an amendment to this *Approval.* The alternative material shall be non-hazardous according to *Reg. 347* and will be expected to perform at least as well as soil in relation to the following functions:

a. Control of blowing litter, odours, dust, landfill gas, gulls, vectors, vermin and fires;

b. Provision for an aesthetic condition of the landfill during the active life of the *Site;*

c. Provision for vehicle access to the active tipping face; and

d. Compatibility with the design of the *Site* for groundwater protection, leachate management and landfill gas management.

(8) Cover material shall be applied as follows:

a. Weekly Cover - Weather permitting, deposited waste shall be covered **weekly** in a manner acceptable to the *District Manager* so that no waste is exposed to the atmosphere;

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

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

(9) Approved wastes from Universal Seal Incorporated shall be placed in an excavation in an area remote from burning areas and covered with clean earth fill immediately

(10) When frozen ground conditions do not permit excavation, all approved wastes from Universal Seal Incorporated may be disposed on in trenches prepared ahead of time and cover immediately.

(11) No waste from Universal Seal Incorporated shall be burned.

8. LANDFILL MONITORING

Landfill Gas

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

Compliance

(2) The *Site* shall be operated in such a way as to ensure compliance with the following:

a. Reasonable Use Guideline B-7 for the protection of the groundwater at the *Site;* and

b. Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives*, as amended from time to time or limits set by the *Regional Director*, for the protection of the surface water at and off the *Site*.

Surface Water and Groundwater

(3) The *Owner* shall monitor surface water and ground water in accordance with the monitoring programs outlined in the attached Schedule "B" and the documents in Schedule "A".

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

Groundwater Wells and Monitors

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

(6) Where landfilling is to proceed around monitoring wells, suitable extensions shall be added to the wells and the wells shall be properly re-secured.

(7) Any groundwater monitoring well included in the on-going monitoring program that is damaged shall be assessed, repaired, replaced or decommissioned by the *Owner*, as required.

a. The *Owner* shall repair or replace any monitoring well which is destroyed or in any way

made to be inoperable for sampling such that no more than one regular sampling event is missed.

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

Trigger Mechanisms and Contingency Plans

(8) a. Within one (1) year from the date of this *Approval*, the *Owner* shall submit to the *Director*, for approval, and copies to the *District Manager*, details of a trigger mechanisms plan for surface water and groundwater quality monitoring for the purpose of initiating investigative activities into the cause of increased contaminant concentrations.

b. Within one (1) year from the date of this *Approval*, the *Owner* shall submit to the *Director* for approval, and copies to the *District Manager*, details of a contingency plan to be implemented in the event that the surface water or groundwater quality exceeds any trigger mechanism.

(9) In the event of a confirmed exceedance of a site-specific trigger level relating to leachate mounding or groundwater or surface water impacts due to leachate, the *Owner* shall immediately notify the *District Manager*, and an investigation into the cause and the need for implementation of remedial or contingency actions shall be carried out by the *Owner* in accordance with the approved trigger mechanisms and associated contingency plans.

(10) If monitoring results, investigative activities and/or trigger mechanisms indicate the need to implement contingency measures, the *Owner* shall ensure that the following steps are taken:

a. The *Owner* shall notify the *District Manager*, in writing of the need to implement contingency measures, no later than 30 days after confirmation of the exceedances;

b. Detailed plans, specifications and descriptions for the design, operation and maintenance of the contingency measures shall be prepared and submitted by the *Owner* to the *Director* for approval; and

c. The contingency measures shall be implemented by the *Owner* upon approval by the *Director*.

(11) *The Owner shall* ensure that any proposed changes to the site-specific trigger levels for

leachate impacts to the surface water or groundwater, are approved in advance by the *Director* via an amendment to this *Approval.*

Changes to the Monitoring Plan

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

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

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

Action Plan

(15) The Owner shall adhere to the action plan proposed in the e-mail dated December 10, 2018 (9:04 AM) from Iris O'Connor, Blumetric, to Ranjani Munasinghe, Ministry of the Environment, Conservation and Parks.

9. CLOSURE PLAN

(1) At least three (3) years prior to the anticipated date of closure of this *Site,* the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager,* a detailed *Site* closure plan pertaining to the termination of landfilling operations at this *Site,* post-closure inspection, maintenance and monitoring, and end use. The plan shall include but not be limited to the following information:

a. a plan showing *Site* appearance after closure;

b. a description of the proposed end use of the *Site;*

c. a description of the procedures for closure of the *Site,* including:

i. advance notification of the public of the landfill closure;

ii. posting of a sign at the *Site* entrance indicating the landfill is closed and identifying any alternative waste disposal arrangements;

iii. completion, inspection and maintenance of the final cover and landscaping;

iv. *Site* security;

v. removal of unnecessary landfill-related structures, buildings and facilities;

vi. final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas; and

vii. a schedule indicating the time-period for implementing sub-conditions (i) to (vi) above;

d. descriptions of the procedures for post-closure care of the *Site,* including:

i. operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;

ii. record keeping and reporting; and

iii. complaint contact and response procedures;

e. an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas; and

f. an updated estimate of the *contaminating life span* of the *Site,* based on the results of the monitoring programs to date.

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

10. WASTE DIVERSION

(1) The *Owner* shall ensure that:

a. all bins and waste storage areas are clearly labelled;

b. all lids or doors on bins shall be kept closed during non-operating hours and during high wind events; and

c. if necessary to prevent litter, waste storage areas shall be covered during high winds

events.

(2) The *Owner* shall provide a segregated area for the storage of *Refrigerant Appliances* so that the following are ensured:

a. all *Refrigerant Appliances* have been tagged to indicate that the refrigerant has been removed by a licensed technician. The tag number shall be recorded in the log book and shall remain affixed to the appliance until transferred from the *Site;* **or**

b. all *Refrigerant Appliances* accepted at the *Site,* which have not been tagged by a licensed technician to verify that the equipment no longer contains refrigerants, are stored segregated, in a clearly marked area, in an upright position and in a manner which allows for the safe handling and transfer from the *Site* for removal of refrigerants as required by O.Reg. 189; and

c. all *Refrigerant Appliances* received on-site shall either have the refrigerant removed prior to being transferred from the *Site* or shall be shipped off-site only to facilities where the refrigerants can be removed by a licensed technician in accordance with O.Reg. 189.

(3) Household batteries shall be kept at the attendant's shed in leak-proof, non-metallic or lined metal containers, in a manner which prevents contact with stormwater.

(4) The *Owner* shall transfer waste and recyclable materials from the *Site* as follows:

a. recyclable materials shall be transferred off-site once their storage bins are full;

b. scrap metal shall be transferred off-site at least twice a year;

c. tires shall be transferred off-site as soon as a load for the contractor hired by the *Owner* has accumulated or as soon as the accumulated volume exceeds the storage capacity of its bunker; and

d. immediately, in the event that waste is creating an odour or vector problem.

(5) The *Owner* shall notify the appropriate contractors that waste and recyclable wastes that are to be transferred off-site are ready for removal. Appropriate notice time, as determined by the contract shall be accommodated in the notification procedure.

(6) Collection, storage and transfer of Waste Electrical and Electronic Equipment shall be in accordance with the documents in the Schedule "A". If there is any discrepancy between the guideline titled "Collection Site Organizing & Operating Waste Electrical and Electronic Equipment (WEEE) Guidebook" dated November 2012 as amended prepared by Ontario Electronic Stewardship and the documents in Schedule "A", the guideline shall take precedence.

SCHEDULE "A"

1. Application for Provisional Certificate of Approval for a Waste Disposal Site dated September 27, 1989 and the supporting information submitted therewith.

2. Letter from J,W, Tooley, MOE, to E,N. Tully, Township of Monteagle, dated November 21, 1989.

3. Letter from E.N. Tully, Township of Monteagle, to J.W. Tooley, MOE, dated December 8, 1989.

4. Agreement dated August 4, 1992, between The Centre & South Hastings Waste Management Board and The Corporation of the Township of Monteagle of the Province of Ontario, Re·: Recycling facility.

5. Letter dated February 18, 1993, from Eleanor N. Tully, Monteagle Township, to Jim Mulder, Ministry of Environment and Energy, Re: Application for· a Transfer Site to .allow recycling site at landfill and site plan entitled "Land Use Permit Area, situate in part of the N.W. Portion of Lot 30, Con. VIII Monteagle Twp. Hastings County".

6. Letter dated March 3, 1993, from Eleanor N. Tully, Monteagle Township, to Brian Nickel, Ministry of Environment and Energy, Re:Reply to Brian Nickel's faxed letter of March 3, 1993.

7. Ministry of Natural Resources Land Use Permit No. LUP 5201075 dated March 26, 1,993.

8. Letter dated July 20, 1993, from Eleanor N. Tully, Monteagle Township, to D.E.Graham, Ministry of Environment and Energy, Re: Submission of application requirements as requested by D.E. Graham's letter of May 7, 1993.

9. Application form for a Certificate of Approval for a Waste Disposal Site (Transfer) dated July 20, 1993.

10. Letter dated July 26, 1994, from Eleanor N . Tully, Monteagle Township, to Ed Tarvicz, Ministry of Environment and .Energy, Re: Withdrawal of application.

11. Letter dated November 6, 1996, from Eleanor N . Tully, Monteagle Township, to D.E.Graham, Ministry of Environment and Energy, Re:Re-submission of application package previously returned by the Ministry.

12. Letter and application form dated December 13, 1996, from Eleanor N. Tully, Monteagle Township, to Jim Mulder, Ministry .of Environment and Energy, Re: Submission of application form to amend certificate of Approval.

13. Application for amendment to Environmental Compliance Approval dated March 22, 2016 prepared by Blumetric Environmental

14. Email dated September 15, 2016 from Iris O'Connor, Senior Engineer, Blumetric Environmental to

Hirva Vyas, P.Eng, Senior Review Engineer MOECC.

15. Environmental Compliance Approval Application dated February 9, 2018 and signed Pat Pilgrim, CAO, the Corporation of the Municipality of Hastings Highlands, including the attached supporting documentation.

16. Report titled "Development and Operations Plan, Hickey Road Waste Disposal Site, Environmental Compliance Approval No. A362301" dated January 2018 and prepared by BluMetric Environmental Inc.

17. Electronic mail dated December 10, 2018 (9:04 AM) from Iris O'Connor, Blumetric, to Ranjani Munasinghe, Ministry of the Environment, Conservation and Parks responding to comments from Technical Support Section, Ministry of the Environment, Conservation and Parks.

Schedule "B"

Surface water and Groundwater Monitoring Program

Table 1: Spring and Fall Surface Water Analysis

Category	Parameters
Organic Parameters	Biological Oxygen Demand (BOD_5), Total Phosphorus, Total Kjeldahl Nitrogen (TKN)
Inorganic Parameters	Ammonia, Chloride, Nitrate, Nitrite, Major Ions (Sodium, Calcium, Magnesium, Sulphate, Alkalinity, Potassium)
Metals	Aluminum (dissolved), Barium, Boron, Cobalt, Copper, Iron, Lead, Manganese, Zinc
Physical/Chemical Parameters	Chemical Oxygen Demand (COD), Conductivity, pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Hardness

Schedule "B" Continued next page...

Schedule "B"

Table 2: Spring and Fall Groundwater Analysis

Category	Parameters
Organic Parameters	Dissolved Organic Carbon (DOC)
Inorganic Parameters	Ammonia, Chloride, Nitrate, Major Ions (Sodium, Potassium, Calcium, Magnesium, Sulphate, Alkalinity)
Metals	Aluminum, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Molybdenum, Nickel, Silicon, Silver, Strontium, Thallium, Titanium, Vanadium, Zinc
Physical/Chemical Parameters	Chemical Oxygen Demand (COD), Conductivity, pH, Total Dissolved Solids (TDS)

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

- The reason for Conditions 1(1), (2), (4), (5), (6), (7), (8), (9), (10), (19), (20) and (21) is to clarify the legal rights and responsibilities of the *Owner* and *Operator* under this *Approval.*

- The reasons for Condition 1(3) are to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner,* and not in a manner which the *Director* has not been asked to consider.

- The reasons for Condition 1(11) are to ensure that the *Site* is operated under the corporate name which appears on the application form submitted for this *approval* and to ensure that the *Director* is informed of any changes.

- The reasons for Condition 1(12) are to restrict potential transfer or encumbrance of the *Site* without the approval of the *Director* and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this *Approval.*

- The reason for Condition 1(13) is to ensure that the successor is aware of its legal responsibilities.

- The reasons for Conditions 1(14), 1(15), 1(16) and 1(17) are that the Part II.1 *Director* is an individual with authority pursuant to Section 197 of the Environmental Protection Act to require registration on title and provide any person with an interest in property before dealing with the property in any way to give a copy of the *Approval* to any person who will acquire an interest in the property as a result of the dealing.

- The reason for Condition 1(18) is to ensure that appropriate Ministry staff has ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this

Approval. This Condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the *Act*, the *OWRA*, the *PA*, the *NMA* and the *SDWA*.

- Condition 1 (22) has been included in order to clarify what information may be subject to the *Freedom of Information Act*.

SITE OPERATION

- The reasons for Conditions 2(1), 2(5) and 6(3) are to ensure that the *Site* is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.

- The reason for Conditions 2 (2), 2(3) and 2(4) is to ensure that users of the *Site* are fully aware of important information and restrictions related to *Site* operations and access under this *Approval*.

- The reasons for Condition 2(6) are open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance effects, and the potential fire hazard and to make sure burning of brush and wood are carried out in accordance with *Ministry* guidelines.

- The reasons for Condition 2(7), 2(8), 2(9) and 2(10) are to specify the hours of operation for the landfill site and a mechanism for amendment of the hours of operation, as required.

- The reasons for Condition 2(11) and 2(12) are to ensure that the *Site* is supervised by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person and to ensure the controlled access and integrity of the *Site* by preventing unauthorized access when the Site is closed and no site attendant is on duty.

EMPLOYEE TRAINING

- The reason for Condition 3(1) is to ensure that the *Site* is supervised and operated by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.

COMPLAINTS RESPONSE PROCEDURE

- The reason for Condition 4(1) is to ensure that any complaints regarding landfill operations at this *Site* are responded to in a timely and efficient manner.

EMERGENCY RESPONSE

- Conditions 5(1) and 5(2) are included to ensure that emergency situations are reported to the Ministry to ensure public health and safety and environmental protection.

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

environmental protection.

RECORD KEEPING AND REPORTING

- The reason for Conditions 6(1) and 6(2) is to ensure that accurate waste records are maintained to ensure compliance with the conditions in this *Approval* (such as fill rate, site capacity, record keeping, annual reporting, and financial assurance requirements), the *EPA* and its regulations.

- The reason for Conditions 6(4) and 6(5) is to ensure that detailed records of *Site* inspections are recorded and maintained for inspection and information purposes.

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

LANDFILL DESIGN AND DEVELOPMENT

- The reason for Conditions 7(1) to 7(6) inclusive is to specify the approved areas from which waste may be accepted at the *Site* and the types and amounts of waste that may be accepted for disposal at the *Site*, based on the *Owner's* application and supporting documentation.

- Condition 7(7) is to provide the *Owner* the process for getting the approval for alternative daily and intermediate cover material.

- The reasons for Condition 7(8) are to ensure that daily/weekly and intermediate cover are used to control potential nuisance effects, to facilitate vehicle access on the *Site*, and to ensure an acceptable site appearance is maintained. The proper closure of a landfill site requires the application of a final cover which is aesthetically pleasing, controls infiltration, and is suitable for the end use planned for the *Site*.

- The reasons for Condition 7(9), 7(10) and 7(11) are to ensure that waste from Universal Seal Incorporated is properly managed in order to prevent environmental detriment and to ensure the safety of the general public and site personal.

LANDFILL MONITORING

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

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

- Conditions 8(3) and 8(4) are included to require the Owner to demonstrate that the *Site* is performing

as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.

- Conditions 8(5), 8(6) and 8(7) are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.

- Conditions 8(8) to 8(11) inclusive are added to ensure the *Owner* has a plan with an organized set of procedures for identifying and responding to potential issues relating to groundwater and surface water contamination at the *Site's* compliance point.

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

- Condition 8(15) was included to ensure the *Owner* complete the tasks and work towards bringing the Site into compliance as proposed by the *Owner*.

CLOSURE PLAN

- The reasons for Condition 9 are to ensure that final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term protection of the health and safety of the public and the environment.

WASTE DIVERSION

- Condition 10 is included to ensure that the recyclable materials are stored in their temporary storage location and transferred off-site in a manner as to minimize a likelihood of an adverse effect or a hazard to the natural environment or any person.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A362301 issued on October 6, 1997

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

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

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

The Notice should also include:

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

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

This Notice must be served upon:

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

AND

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

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

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

DATED AT TORONTO this 20th day of December, 2018

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

RM/
c: Area Manager, MECP Belleville
c: District Manager, MECP Kingston - District
Iris O'Connor, BluMetric Environmental Inc.

Appendix B

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 (WDS) Name	Hickey Rd. Waste Disposal Site
Location (e.g. street address, lot, concession)	202 Hickey Road
GPS Location (taken within the property boundary at front gate/ front entry)	273138 m E, 5005376 m N
Municipality	Municipality of Hastings Highlands
Client and/or Site Owner	Municipality of Hastings Highlands
Monitoring Period (Year)	2023
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval (ECA) Number (formerly "Certificate of Approval" (C of A)) :	A362301
Director's Order No.:	
Provincial Officer's Order No.:	

Other:			
Report Submission Frequency	(•) **Annual** ( ) **Other**	Due on March 31st in the year following the reporting period.	
The site is: **(Operation Status)**	(•) **Open** ( ) **Inactive** ( ) **Closed**		
Is there an active waste transfer station at the site?	(•) **Yes** ( ) **No**		
Does this WDS have a Closure Plan?	(•) **Not yet submitted** ( ) **Submitted and under review** ( ) **Submitted and approved**		
Total Approved Capacity	74100	*Units*	Cubic Metres
Maximum Approved Fill Rate	0	*Units*	
Total Waste Received within Monitoring Period (Year)	148.7	*Units*	Tonnes
Total Waste Received within Monitoring Period (Year) *Describe the methodology used to determine this quantity*	Estimated based on bag counts and assumed mass per bag and contracting tonnages.		
Estimated Remaining Capacity	29,378	*Units*	Cubic Metres
Estimated Remaining Capacity *Describe the methodology used to determine this quantity*	UAV topographic survey in June 2023 with estimated bag counts and assumed mass per bag and c		
Estimated Remaining Capacity *Date Last Determined*	31-Dec-2023		
Non-Hazardous Approved Waste Types	[X] Domestic [X] Industrial, Commercial & Institutional (IC&I) [X] Source Separated Organics (Green Bin) [X] Tires	[X] Contaminated Soil [X] Wood Waste [X] Blue Box Material [ ] Processed Organics [X] Leaf and Yard Waste	[ ] Food Processing/Preparation Operations Waste [ ] Hauled Sewage Other:
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial *(separate waste classes by comma)*			

Year Site Opened *(enter the Calendar Year only)*		**Current ECA Issue Date**	20-Dec-2018
Is your Site required to submit Financial Assurance?		○ **Yes** ◉ **No**	
Describe how your WDS is designed.		◉ Natural Attenuation only ○ Fully engineered Facility ○ Partially engineered Facility	
Does your Site have an approved Contaminant Attenuation Zone?		◉ **Yes** ○ **No**	
If closed, specify ECA, control or authorizing document closure date:		Select Date	
Has the nature of the operations at the site changed during this monitoring period?	○ **Yes** ◉ **No**		
If yes, provide details:			

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**	Based on the inferred groundwater flow direction towards the south with a slight east component, the current groundwater monitoring network may not be adequately addressing potential groundwater impacts along the east and southeast property limit. An additional groundwater monitoring well may be required; this will be further assessed in 2024. All monitoring wells are in good condition and secure.
2) All groundwater, leachate and landfill gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by ECA or other relevant authorizing/ control document(s):	○ **Yes** ◉ **No** ○ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
HR1-03	Insufficient water to sample	17-Oct-2023

3) a) Some or all groundwater, leachate and landfill gas sampling and monitoring requirements have been established or defined outside of a ministry ECA, authorizing, or control document.	○ **Yes** ◉ **No** ○ **Not Applicable**

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

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

4) All field work for groundwater investigations was done in accordance with Standard Operating Procedures (SOP) as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	(●) **Yes** ( ) **No**	If no, specify (Type Here):
Sampling and Monitoring Program Results/WDS Conditions and Assessment:		
5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/ or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.	(●) **Yes** ( ) **No**	The current CAZ appears to be of adequate size; however, groundwater quality along the east and southeast property boundaries is unknown and must be investigated prior to further assessing the CAZ.
6) The site meets compliance and assessment criteria.	(●) **Yes** ( ) **No**	The WDS is considered to be compliant with Guideline B-7 along the south and west CAZ boundaries. It is unknown if the WDS is compliant with Guideline B-7 along the east and southeast property boundaries.
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**	Minor trends are observed and discussed in the report.

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**	The draft groundwater Trigger Mechanism and Contingency Plan was revised in March 2021. As of yet, additional MECP comments have not been received for the revised proposed groundwater plan. The groundwater chemical results in 2023 did not trigger the Tier 1 Contingency Plan response for groundwater.	

Groundwater CEP Declaration:

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

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

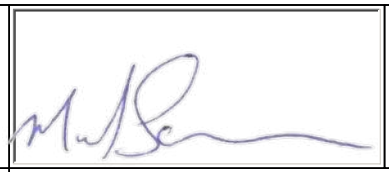
If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances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

1/03/24

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:**	The current groundwater monitoring network may not be adequately addressing potential groundwater impacts along the east and southeast property limit. An additional groundwater monitoring well may be required; this will be further assessed in 2024. We recommend that a reduced semi-annual groundwater program be implemented. This will include a full round of water levels during both spring and fall events, a partial spring groundwater monitoring event, and a full fall monitoring event.
◉ **No Changes to site design and operation are recommended**	
○ **The following change(s) to the site design and operation is/are recommended:**	
Name:	Mark Somers, P.Eng
Seal:	

Signature:		**Date:**	25-Mar-2024
CEP Contact Information:			
Company:	BluMetric Environmental Inc.		
Address:	1682 Woodward Drive, Ottawa, ON K2C 3R8		
Telephone No.:	(877)-487-8436 ext. 246	Fax No. :	
E-mail Address:	msomers@blumetric.ca		
Co-signers for additional expertise provided:			
Signature:		**Date:**	
Signature:		**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)	Bird Creek, Un-named tributary

Distance(s)	0.7 km to the south, 0.125 km southeast

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**	
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the ECA or relevant authorizing/control document(s) (if applicable):	○ **Yes** ◉ **No** ○ **Not applicable**	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
HR-SW1, HR-SW2, HR-SW3, HR-SW4	Dry conditions were observed on October 17, 2023.	Fall 2023

3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry ECA or authorizing/control document.	○ **Yes** ◉ **No** ○ **Not Applicable**	
b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:	○ **Yes** ○ **No** ◉ **Not Applicable**	If no, specify below or provide details in an attachment.

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

4) All field work for surface water investigations was done in accordance with SOP, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	(●) Yes ( ) No	If no, specify (Type Here):

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

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

If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table on the following page or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. ECA limit, PWQO, background	e.g. X% above PWQO
Dissolved Aluminum at HR-SW1 and HR-SW3	Calculated PWQO	Max. 0.095 mg/L (HR-SW1) and 0.079 mg/L (HR-SW3)
Copper at HR-SW2	Calculated PWQO	Max. 0.002 mg/L
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**	One exceedance listed above is at background location (HR-SW1). It is unlikely that impacted groundwater at the WDS is discharging to the location of HR-SW1 based on the respective water elevations at HR-SW1 and nearby HR6-19. As a result, this exceedance is likely related to non-WDS influences.

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**	Spatial and/or temporal variation in water quality is observed at all surface water monitoring locations but no evidence of increasing or decreasing trends is observed.
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	It is unlikely that impacted groundwater at the WDS is discharging to the location of HR-SW1 based on the respective water elevations at HR-SW1 and nearby HR6-19. Groundwater interaction with surface water at HR-SW2 and HR-SW3 seems unlikely due to the water table depth in proximal wells: approximately 6 mbgs at HR7-19 and approximately 5 mbgs at HR9-21.
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	( ) **Yes** (●) **No** ( ) **Not Applicable**	The surface water chemical results in 2023 did not trigger the Tier 1 Contingency Plan response for surface water.

Surface Water CEP Declaration:

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

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

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

22-Mar-2023

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

CEP Signature	
Relevant Discipline	Environmental Engineer
Date:	25-Mar-2024
CEP Contact Information:	Mark Somers, P.Eng
Company:	BluMetric Environmental Inc.
Address:	1682 Woodward Drive, Ottawa, ON K2C 3R8
Telephone No.:	(877) 487 - 8436 ext. 246
Fax No. :	
E-mail Address:	msomers@blumetric.ca

Save As		**Print Form**

Appendix C

Groundwater Monitoring Well Logs

Project No: KB1946-5

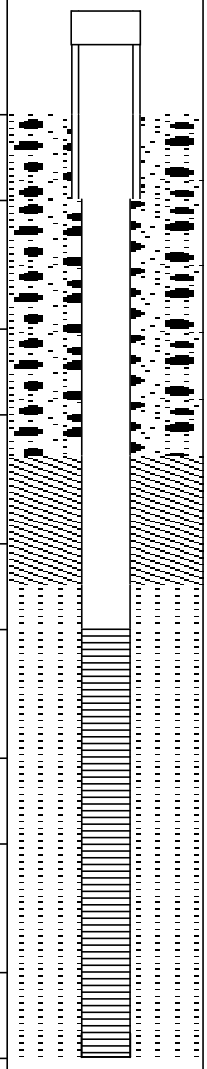
Project: Hickey Road WDS

Client: Municipality of Hastings Highlands

Site Coordinates: Zone 18 T North 5005343, East 273268

Log of Borehole: HR1-03

Field Personnel: B. M.

SUBSURFACE PROFILE				SAMPLE				WELL INSTALLATION	
Depth (ft / m)	Elevation	Symbol	Description	Number	Type	SPT N-Value	Recovery	Well Construction	Comments
0 / 0	100.49		Ground Surface						Steel locking protective cover and casing Stick-up: 0.73m
0 – 3 / 0 – 1			Brown SAND, trace small gravel, dry.	SS1	SS	7	16"		
3 – 6 / 1 – 2				SS2	SS	29	16"		51mm (2") I.D. Sch. 40 PVC pipe Native backfill
6 – 10 / 2 – 3	97.44								3/8" Bentonite holeplug
10 – 14 / 3 – 4			Brown SAND, dry.	SS3	SS	14	18"		#3 Silica sand pack
14 – 16 / 4 – 5	95.92		Brown SAND to grey SILTY SAND, wet to saturated.	SS4	SS	7	11"		10' Slot 10 PVC screen (2")
16 – 20 / 5 – 6	94.39								
20 – 22 / 6	93.78		Grey Silty SAND to SAND and GRAVEL, wet to saturated.	SS5	SS	32	10"		
22 – 23 / 7			End of Borehole						

Drill Method: 8" Hollow Stem Auger

Hole Size: 8" (205mm)

Drill Date: July 21/03

Datum: Elevation TPVC - 101.22 m

Checked by:

Sheet: 1 of 1

Project No: KB1946-5

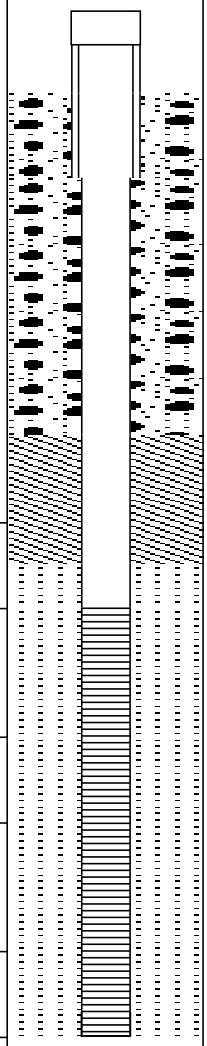
Project: Hickey Road WDS

Client: Municipality of Hastings Highlands

Site Coordinates: Zone 18 T North 5005299, East 273288

Log of Borehole: HR2-03

Field Personnel: B. M.

SUBSURFACE PROFILE				SAMPLE				WELL INSTALLATION	
Depth (ft / m)	Elevation	Symbol	Description	Number	Type	SPT N-Value	Recovery	Well Construction	Comments
0 / 0	99.64		Ground Surface						Steel locking protective cover and casing Stick-up: 0.58m
0 – 10 / 0 – 3			SAND mixed with GARBAGE (plastic, metal).						51mm (2") I.D. Sch. 40 PVC pipe Native backfill 3/8" Bentonite holeplug
10 / 3	96.59		Brown SAND with trace Gravel, dry.	SS1	SS	13	16"		#3 Silica sand pack
15 / 4	95.07		Brown SAND with trace Gravel, wet to saturated.	SS2	SS	14	10"		10' Slot 10 PVC screen (2")
20 / 6	93.54		Brown SAND, saturated.	SS3	SS	13			
23 / 7	92.93		End of Borehole						

Drill Method: 8" Hollow Stem Auger

Hole Size: 8" (205mm)

Drill Date: July 21/03

Datum: Elevation TPVC - 100.22 m

Checked by:

Sheet: 1 of 1

Project No: KB5082-05

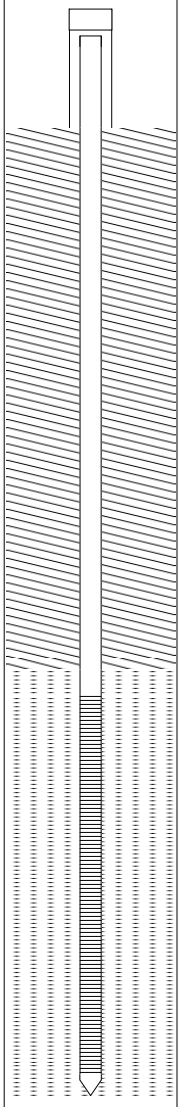
Project: Hickey Road WDS

Client: Municipality of Hastings Highlands

Site Coordinates: Zone 18 T North 5005259, East 273284

Log of Borehole: HR2-03 R

Field Personnel: B. M.

SUBSURFACE PROFILE				SAMPLE				WELL INSTALLATION	
Depth (ft / m)	Elevation	Symbol	Description	Number	Type	SPT N-Value	Recovery	Well Construction	Comments
-3 / -1	0.00		Ground Surface						Steel locking protective cover and casing PVC S/U - 0.60m
1 / 3 / 5 / 7 / 9 / 11 / 13 / 15 / 17 / 19 / 21 / 23 / 25 (2 / 4 / 6)			HR2-03 damaged by vehicle traffic. Replacement Monitor Drilling Detail: Protective casing and top section of PVC pipe removed. Centred augers over existing hole and overdrilled to depth. Drilled to refusal at 24'6" on assumed bedrock/boulder. Original bottom depth was 22'. Replacement Monitor installed as detailed. Protective cement barrier installed around monitor. MOE Well Tag A163241						51mm (2") I.D. Sch. 40 PVC pipe Bentonite Holeplug #3 Silica sand pack 10' Slot 10 PVC screen (2")
	-7.41		End of Borehole						

Drill Method: 8" Hollow Stem Auger

Hole Size: 8" (205mm)

Drill Date: January 5, 2016

Ground Elevation: 0

T.O.P.:

Static WL:

Checked by:

Sheet: 1 of 1

Project No: KB1946-5

Project: Hickey Road WDS

Client: Municipality of Hastings Highlands

Site Coordinates: Zone 18 T North 5005379, East 273159

Log of Borehole: HR3-03

Field Personnel: B. M.

SUBSURFACE PROFILE				SAMPLE				WELL INSTALLATION	
Depth (ft / m)	Elevation	Symbol	Description	Number	Type	SPT N-Value	Recovery	Well Construction	Comments
0	101.11		Ground Surface						Steel locking protective cover and casing Stick-up: 0.53m
0 – 3			Brown SAND, trace Gravel, dry.						51mm (2") I.D. Sch. 40 PVC pipe
3 – 6				SS1	SS	15	15"		Native backfill
									3/8" Bentonite holeplug
3 – 4	98.06		Brown SAND, dry.	SS2	SS	18	17"		#3 Silica sand pack
4 – 6	96.54		Brown SAND, wet to saturated.	SS3	SS	18	15"		10' Slot 10 PVC screen (2")
6 – 7	95.01		Brown SAND, saturated.	SS4	SS	9	18"		
7	94.40		End of Borehole						

Drill Method: 8" Hollow Stem Auger

Hole Size: 8" (205mm)

Drill Date: July 21/03

Datum: Elevation TPVC - 101.64 m

Checked by:

Project No: KB1946-5

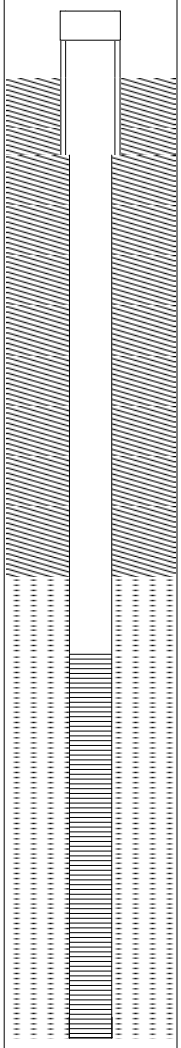
Project: Hickey Road WDS

Client: Municipality of Hastings Highlands

Site Coordinates: Zone 18 T North 5005255, East 273244

Log of Borehole: HR4-10

Field Personnel: B. M.

SUBSURFACE PROFILE				SAMPLE				WELL INSTALLATION	
Depth (ft / m)	Elevation	Symbol	Description	Number	Type	SPT N-Value	Recovery	Well Construction	Comments
-3 / -1	100.39		Ground Surface						Steel locking protective cover and casing PVC S/U - 0.72m
1	99.78		Brown Sandy TOPSOIL - some organics						
3 / 5 / 7 / 2			Brown SAND, dry.						51mm (2") I.D. Sch. 40 PVC pipe Bentonite Holeplug
9	97.34								
11 / 13 / 4			Brown SAND, dry to moist						
15	95.82								
17	95.21		Brown SAND, moist to wet						#3 Silica sand pack
19 / 6	94.29		Brown SAND, trace small gravel, wet to saturated						10' Slot 10 PVC screen (2")
21 / 23			Grey/Brown SAND, trace small gravel, saturated						
25	92.77		End of Borehole						

Drill Method: 8" Hollow Stem Auger

Hole Size: 8" (205mm)

Drill Date: April 21, 2010

Ground Elevation: 100.39

T.O.P.:

Static WL:

Checked by:

Sheet: 1 of 1

Project No: KB1946-5

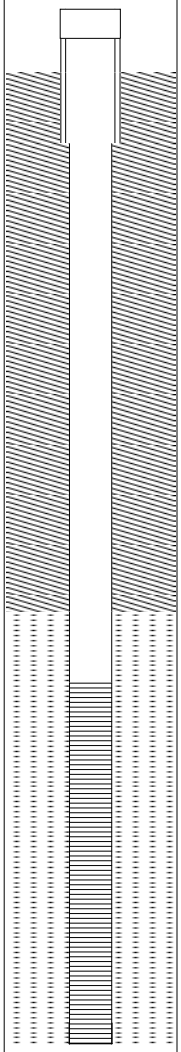
Project: Hickey Road WDS

Client: Municipality of Hastings Highlands

Site Coordinates: Zone 18 T North 5005259, East 273284

Log of Borehole: HR5-10

Field Personnel: B. M.

SUBSURFACE PROFILE				SAMPLE				WELL INSTALLATION	
Depth (ft / m)	Elevation	Symbol	Description	Number	Type	SPT N-Value	Recovery	Well Construction	Comments
-3 / -1	100.59		Ground Surface						Steel locking protective cover and casing PVC S/U - 0.78m
1 / 3	99.06		Brown SAND - trace organics near surface, dry						51mm (2") I.D. Sch. 40 PVC pipe
5 / 7 / 2	97.54		Brown SAND, dry.						Bentonite Holeplug
9 / 11 / 13 / 4	96.02		Grey/Brown SAND, dry to moist						
15 / 17 / 19 / 6	94.49		Grey/Brown SAND - trace small gravel, moist to wet						#3 Silica sand pack
21 / 23 / 25 / 8	92.36		Grey/Brown SAND, trace gravel, saturated						10' Slot 10 PVC screen (2")
27			End of Borehole						

Drill Method: 8" Hollow Stem Auger

Hole Size: 8" (205mm)

Drill Date: April 21, 2010

Ground Elevation: 100.588

T.O.P.:

Static WL:

Checked by:

Sheet: 1 of 1

Well ID: HR6-19

Project No.: 190495-03
Client: Municipality of Hastings Highlands
Report: 2019 Monitoing well Installations
Site Address: Hickey Road W.D.S.
202 Hickey Rd. East, Maynooth, Ontario

Elevation Ground: *362.57 m*
TOP: *363.34 m*
MOECC Well Tag: A259052
UTM NAD83 (Zone 18T): 5005336 N
273359 E

SUBSURFACE PROFILE | SAMPLE | WELL COMPLETION

Depth (m)	Description	Depth (m) / Elev. (m.a.s.l.)	Notes
	Ground Surface	0.00 / 362.57	4 in. sq. steel monument with lock PVC Stickup = 0.79m
0	**Sand Fill** Light brown, dry.		
1			
2	- medium browm, dry, trace waste (wood, plastic).		bentonite gravel seal
3		3.05 / 359.52	
	Waste Dry, sand and waste (wood, plastic, metal).		
4			
5	- plastic waste. - wet.		
6			3.05m x 50mm slot 10 PVC screen within No. 2 silica sand pack
7		7.52 / 355.05	
	End of well at 7.52 m		
8	Well Completion Details: Screened interval from 4.47 m to 7.52 m below surface Elevation at top of pipe (TOP) = 363.34 m		

Sample ID | Type | Blow Counts | Recovery (%) | Lab Analysis | Headspace Vapour Level (ppm) 10 100 1000 10000 | Construction

Drill Date: 2019 July 15
Drilled By: Canadian Environmental Drilling
Drilling Method: Hollow Stem Auger
Hole Diameter: 0.2 m (OD)
Datum: HR-BM2 367.80 m
Logged By: B.M.
Checked By: I.O'C.

Notes: AUGER SAMPLE

Sheet 1 of 1

BH MW OB LOGV1.0 190495-03 HICKEY ROAD.GPJ WESA TEMPLATE V1.2.GDT 20-3-5

Well ID: HR7-19

Project No.: 190495-03
Client: Municipality of Hastings Highlands
Report: 2019 Monitoing well Installations
Site Address: Hickey Road W.D.S.
202 Hickey Rd. East, Maynooth, Ontario

Elevation Ground: *361.30 m*
TOP: *362.09 m*

UTM NAD83 (Zone 18T): 5005201 N
273298 E

SUBSURFACE PROFILE				SAMPLE						WELL COMPLETION	
Depth (m)	Symbol	Description	Depth (m) / Elev. (m.a.s.l.)	Sample ID	Type	Blow Counts	Recovery (%)	Lab Analysis	Headspace Vapour Level (ppm) 10 100 1000 10000	Construction	Notes
		Ground Surface	0.00 / 361.30								4 in. sq. steel monument with lock PVC Stickup = 0.78m
0		**Sand** Light brown, dry.									
1		- medium brown, dry.									
2											bentonite gravel seal
3		- moist									
4		- wet									
5											
6		- brown/grey, saturated.									3.05m x 50mm slot 10 PVC screen within No. 2 silica sand pack
7			7.62 / 353.68								
8		End of well at 7.62 m Well Completion Details: Screened interval from 4.57 m to 7.62 m below surface Elevation at top of pipe (TOP) = 362.09 m									

Drill Date: 2019 July 15
Drilled By: Canadian Environmental Drilling
Drilling Method: Hollow Stem Auger
Hole Diameter: 0.2 m (OD)
Datum: HR-BM2 367.80 m
Logged By: B.M.
Checked By: I.O'C.

Notes: AUGER SAMPLE

Sheet 1 of 1

BH MW OB LOGV1.0 190495-03 HICKEY ROAD.GPJ WESA TEMPLATE V1.2.GDT 20-3-5

Well ID: HR8-19

Project No.: 190495-03
Client: Municipality of Hastings Highlands
Report: 2019 Monitoing well Installations
Site Address: Hickey Road W.D.S.
202 Hickey Rd. East, Maynooth, Ontario

Elevation Ground: *360.11 m*
TOP: *360.89 m*

UTM NAD83 (Zone 18T): 5005213 N
273243 E

SUBSURFACE PROFILE | SAMPLE | WELL COMPLETION

Depth (m)	Description	Depth (m) / Elev. (m.a.s.l.)	Sample ID	Type	Blow Counts	Recovery (%)	Lab Analysis	Headspace Vapour Level (ppm)	Notes
	Ground Surface	0.00 / 360.11							4 in. sq. steel monument with lock PVC Stickup = 0.77m
0	**Sand** Light brown, dry, trace roots fibres.								
1									
2									bentonite gravel seal
3									
4									
5	- light brownish grey, saturated.								
6									3.05m x 50mm slot 10 PVC screen within No. 2 silica sand pack
7		7.62 / 352.49							native soil collaspe
8	End of well at 7.62 m Well Completion Details: Screened interval from 4.23 m to 7.28 m below surface Elevation at top of pipe (TOP) = 360.89 m								

Headspace Vapour Level (ppm): 10 | 100 | 1000 | 10000

Drill Date: 2019 July 15
Drilled By: Canadian Environmental Drilling
Drilling Method: Hollow Stem Auger
Hole Diameter: 0.2 m (OD)
Datum: HR-BM2 367.80 m
Logged By: B.M.
Checked By: I.O'C.

Notes: AUGER SAMPLE

Sheet 1 of 1

BH MW OB LOGV1.0 190495-03 HICKEY ROAD.GPJ WESA TEMPLATE V1.2.GDT 20-3-5

Monitoring Well ID: HR9-21

Project No.: 210217-02
Client: Municipality of Hastings Highlands
Report: Hickey Road WDS
Site Address: 202 Hickey Road East
Maynooth, ON

Elevation Ground: *359.67 m*
TOP: *360.51 m*

UTM NAD-83 (Zone 18): 5005132.000 N
273305.000 E

SUBSURFACE PROFILE					SAMPLE						WELL COMPLETION	
Depth (m)	Elevation (m)	Symbol	Description	Depth (m) / Elev. (m.a.s.l.)	Type	Recovery (%)	Blow Counts	Sample ID	Lab Analysis	Headspace Vapour Level PID IBL ▲ ppm 0 0 0 0	Construction	Notes
-1	360		Ground Surface	0.0 / 359.7								J-Plug; Monument Well Casing Stickup
0			**GRAVELLY SAND** Brown medium coarse sand with trace amounts of gravel									Granular Drainage Layer
1	359											
2	358											Bentonite Seal
3	357											
4	356			[7.6]								
5	355											4.75 m bgs (354.92 m)
6	354		Saturated ▼ 5.5 m: Saturated soils									Silica Sand Filter; 50 mm 010 Slot PVC Screen
7	353											
8	352		Observations made from auger. EOH at 7.62 mbgs.	7.6 / 352.1								Cuttings Backfill

Drill Date: 2021 August 19
Drilled By: Canadian Environmental Drilling
Drilling Method: Tri-Cone
Hole Diameter (OD):
Logged By: BM
Checked By: IO

▽ Perched Groundwater Strike / Unstabilized Groundwater Level
▼ True Groundwater Strike / Stabilized Groundwater Level

BH MW OB LOG 210217-02 HICKEY RD BH LOGS.GPJ BLUMETRIC STANDARD.GDT 22-2-1

Monitoring Well ID: HR10-21

Project No.: 210217-02
Client: Municipality of Hastings Highlands
Report: Hickey Road WDS
Site Address: 202 Hickey Road East, Maynooth, ON

Elevation Ground: *361.81 m*
TOP: *362.62 m*

UTM NAD-83 (Zone 18): 5005129.000 N, 273239.000 E

SUBSURFACE PROFILE					SAMPLE						WELL COMPLETION	
Depth (m)	Elevation (m)	Symbol	Description	Depth (m) / Elev. (m.a.s.l.)	Type	Recovery (%)	Blow Counts	Sample ID	Lab Analysis	Headspace Vapour Level PID IBL ▲ ppm (0 0 0 0)	Construction	Notes
-1	362		Ground Surface	0.0 / 361.8								J-Plug; Monument Well Casing Stickup
0			**GRAVELLY SAND** Brown coarse sand with trace amounts of gravel									
1	361											Granular Drainage Layer
2	360											
3	359											
4	358											Bentonite Seal
5	357		Saturated ▼ 4.9 m: Saturated soils	[9.1]								
6	356											
7	355											6.66 m bgs (355.15 m); Silica Sand Filter; 50 mm 010 Slot PVC Screen
8	354											
9	353			9.1 / 352.7								
			Observations made from auger. EOH at 9.14 mbgs.									

Drill Date: 2021 August 19
Drilled By: Canadian Environmental Drilling
Drilling Method: Tri-Cone
Hole Diameter (OD):
Logged By: SD
Checked By: IO

▽ Perched Groundwater Strike / Unstabilized Groundwater Level
▼ True Groundwater Strike / Stabilized Groundwater Level

Appendix D

Field Forms, Laboratory Reports, and Chain of Custody Records

Appendix D

D-1 Site Observation Forms

SMALL LANDFILL
OPERATION AND INSPECTION FORM

BluMetric Environmental

Site Name: Hickey Road WDS, MHHs	Date: May 3. 2023	Weather: RAIN - 5°C
Project #: 230225-05	BluMetric Staff: BM/MO	

Photographs of each item below should be collected during site visits.

OVERALL INSPECTION AND OPERATION REVIEW

❑ Signage in good condition	Yes ✓	No _	
❑ ECA and emergency numbers on signage	Yes ✓	No _	
❑ Hour of operation observed	Yes ✓	No _	Township in working waste face and delivering cover material
❑ Site open under normal operating hours	Yes _	No _	
❑ Perimeter fencing and gate in good condition	Yes ✓	No _	
❑ Gate locked if closed	Yes _	No _	

DESIGNATED WASTE AREA

❑ Working active/trench area (moderate size, daily cover, compacted)	Yes ✓	No _	Being worked/ covered when onsite
❑ Designated waste areas are properly signed and easily accessed by public	Yes ✓	No _	

RECYCLING OPERATION (if applicable)

❑ Proper signage and bins present	Yes ✓	No _	
❑ Clearly signed	Yes ✓	No _	
❑ Overall neat in appearance	Yes ✓	No _	

SEGREGATED SCRAP PILES (metal, tires, brush, etc.)

❑ Metals neat and appropriate size	Yes ✓	No _	
❑ Tires neat and appropriate size	Yes ✓	No _	
❑ Bulky Items neat and appropriate size	Yes ✓	No _	
❑ Brush pile neat and appropriate size	Yes _	No _	NA ✓ not at this site
❑ Construction debris neat and appropriate size	Yes _	No _	NA ✓

MONITORING WELL CONDITION

❑ Casing conditions (frost heave, lock, cap)	Yes ✓	No _
❑ Monitor condition (capped, vented)	Yes ✓	No _
❑ Wells clearly labeled (re-label as required)	Yes ✓	No _
❑ Well clearly visible (clear brush if necessary)	Yes ✓	No _

LANDFILL GAS MONITORING

❑ Conducted at structures	Yes ✓	No _
❑ Conducted at monitoring wells	Yes ✓	No _

REPAIRS: Provide details of repairs made or materials required for repairs upon next site visit:

OBSERVATIONS OF PHYSICAL ENVIRONMENT: Please comment on any changes to the local environment (e.g. settling or slumping of waste/cover, new or altered drainage, presence of seeps, changes in vegetation cover, etc.)

This form is intended as a general reminder of information that should recorded during monitoring activities. The above information is a minimum guide. Any information deemed important should be recorded in the field notes for each site.

Identify any changes to site layout on drawing and/or comment:

This form is intended as a general reminder of information that should recorded during monitoring activities. The above information is a minimum guide. Any information deemed important should be recorded in the field notes for each site.

SMALL LANDFILL
OPERATION AND INSPECTION FORM

BluMetric™ Environmental

Site Name: Hickey Road WDS, MHHs	Date: Oct 17/2023	Weather: sunny 15°C
Project #: 230225	BluMetric Staff: BM/MD	

Photographs of each item below should be collected during site visits.

OVERALL INSPECTION AND OPERATION REVIEW

❑ Signage in good condition	Yes ✓	No _
❑ ECA and emergency numbers on signage	Yes ✓	No _
❑ Hour of operation observed	Yes ✓	No _
❑ Site open under normal operating hours	Yes ✓	No _
❑ Perimeter fencing and gate in good condition	Yes ✓	No _
❑ Gate locked if closed	Yes ✓	No _

DESIGNATED WASTE AREA

❑ Working active/trench area (moderate size, daily cover, compacted)	Yes _	No ✓
❑ Designated waste areas are properly signed and easily accessed by public	Yes ✓	No _

RECYCLING OPERATION (if applicable)

❑ Proper signage and bins present	Yes ✓	No _
❑ Clearly signed	Yes ✓	No _
❑ Overall neat in appearance	Yes ✓	No _

SEGREGATED SCRAP PILES (metal, tires, brush, etc.)

❑ Metals neat and appropriate size	Yes ✓	No _ – not very neat though
❑ Tires neat and appropriate size	Yes ✓	No _
❑ Bulky Items neat and appropriate size	Yes _	No ✓ overflowing
❑ Brush pile neat and appropriate size	Yes _	No _ NA
❑ Construction debris neat and appropriate size	Yes _	No _ NA

MONITORING WELL CONDITION

❑ Casing conditions (frost heave, lock, cap)	Yes ✓	No _
❑ Monitor condition (capped, vented)	Yes ✓	No _
❑ Wells clearly labeled (re-label as required)	Yes ✓	No _
❑ Well clearly visible (clear brush if necessary)	Yes ✓	No _

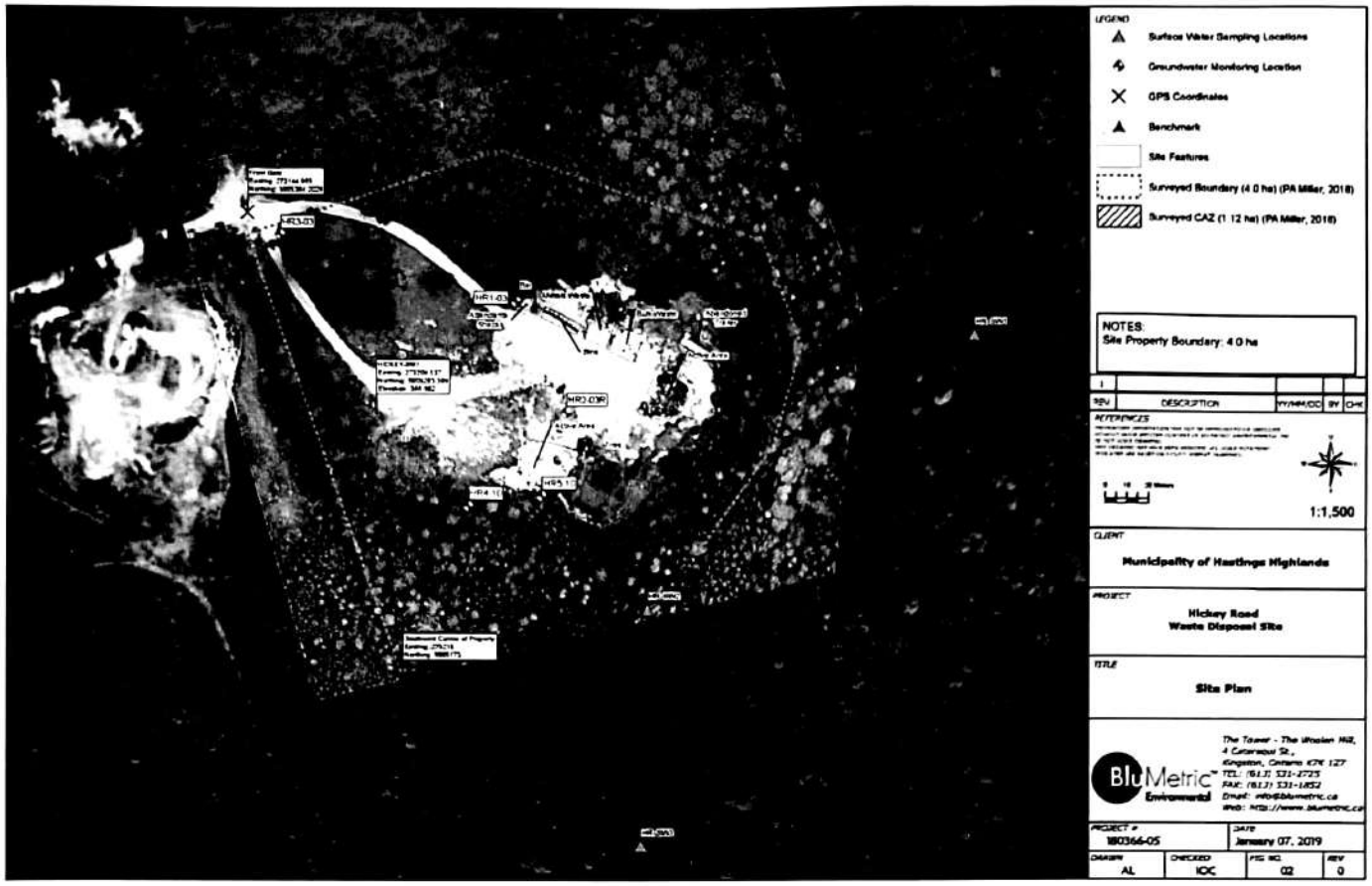
LANDFILL GAS MONITORING

❑ Conducted at structures	Yes ✓	No _ 15 ppm
❑ Conducted at monitoring wells	Yes ✓	No _

REPAIRS: Provide details of repairs made or materials required for repairs upon next site visit:

OBSERVATIONS OF PHYSICAL ENVIRONMENT: Please comment on any changes to the local environment (e.g. settling or slumping of waste/cover, new or altered drainage, presence of seeps, changes in vegetation cover, etc.)

This form is intended as a general reminder of information that should recorded during monitoring activities. The above information is a minimum guide. Any information deemed important should be recorded in the field notes for each site.



Identify any changes to site layout on drawing and/or comment: Berms that separate bulk from metals should be expanded/increased.

Waste piles not properly covered or compacted.

This form is intended as a general reminder of information that should recorded during monitoring activities. The above information is a minimum guide. Any information deemed important should be recorded in the field notes for each site.

Appendix D

D-2 Groundwater Laboratory Reports

AGAT Laboratories

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

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
4 Cataraqui Street
Kingston, ON K7K1Z7
(613) 531-2725
ATTENTION TO: Carolyn Miller
PROJECT: 230225-05
AGAT WORK ORDER: 23T021603
WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer
DATE REPORTED: May 17, 2023
PAGES (INCLUDING COVER): 12
VERSION*: 1

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

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Groundwater Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

		SAMPLE DESCRIPTION:		HR1-03		HR2-03R		HR3-03		HR4-10
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		2023-05-03 13:21		2023-05-03 13:34		2023-05-03 13:10		2023-05-03 13:50
Parameter	Unit	G / S	RDL	4965954	RDL	4965959	RDL	4965960	RDL	4965961
pH	pH Units		NA	7.16	NA	6.83	NA	7.05	NA	7.24
Alkalinity (as CaCO3)	mg/L		5	38	5	403	5	69	5	477
Electrical Conductivity	µS/cm		2	84	2	1080	2	255	2	954
Total Dissolved Solids	mg/L		10	84	10	638	10	154	10	474
Chloride	mg/L		0.10	4.17	0.12	89.7	0.10	29.3	0.12	35.4
Nitrate as N	mg/L		0.05	<0.05	0.05	<0.05	0.05	1.84	0.05	<0.05
Sulphate	mg/L		0.10	9.52	0.10	26.8	0.10	4.60	0.10	10.6
Ammonia as N	mg/L		0.02	<0.02	0.03	5.30	0.02	<0.02	0.16	21.7
Chemical Oxygen Demand	mg/L		5	19	10	168	5	<5	5	88
Dissolved Organic Carbon	mg/L		0.5	2.7	0.5	62.5	0.5	1.7	0.5	35.6
Dissolved Calcium	mg/L		0.05	12.2	0.05	99.6	0.05	34.2	0.05	83.6
Dissolved Magnesium	mg/L		0.05	0.87	0.05	13.1	0.05	1.23	0.05	12.3
Dissolved Potassium	mg/L		0.50	0.69	0.50	37.6	0.50	1.75	0.50	41.9
Dissolved Sodium	mg/L		0.05	1.26	0.05	69.9	0.05	12.6	0.05	54.8
Dissolved Aluminum	mg/L		0.004	0.018	0.004	0.205	0.004	0.013	0.004	0.037
Dissolved Barium	mg/L		0.002	0.017	0.002	0.391	0.002	0.067	0.002	0.528
Dissolved Beryllium	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005
Dissolved Boron	mg/L		0.010	<0.010	0.010	0.162	0.010	0.013	0.010	0.400
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Dissolved Cobalt	mg/L		0.0005	<0.0005	0.0005	0.0531	0.0005	0.0046	0.0005	0.0246
Dissolved Copper	mg/L		0.001	<0.001	0.001	0.001	0.001	0.001	0.001	<0.001
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	0.0009
Dissolved Iron	mg/L		0.010	0.034	0.010	46.3	0.010	0.012	0.010	42.2
Dissolved Manganese	mg/L		0.002	<0.002	0.002	4.11	0.002	0.020	0.002	1.01
Dissolved Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002
Dissolved Nickel	mg/L		0.001	<0.001	0.001	0.009	0.001	<0.001	0.001	0.009
Dissolved Silicon	mg/L		0.05	4.61	0.25	5.09	0.05	3.44	0.25	9.14
Dissolved Silver	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Groundwater Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

		SAMPLE DESCRIPTION:		HR1-03		HR2-03R		HR3-03		HR4-10
		SAMPLE TYPE:		Water		Water		Water		Water
		DATE SAMPLED:		2023-05-03 13:21		2023-05-03 13:34		2023-05-03 13:10		2023-05-03 13:50
Parameter	Unit	G / S	RDL	4965954	RDL	4965959	RDL	4965960	RDL	4965961
Dissolved Strontium	mg/L		0.005	0.050	0.005	0.448	0.005	0.093	0.005	0.359
Dissolved Thallium	mg/L		0.0003	<0.0003	0.0003	<0.0003	0.0003	<0.0003	0.0003	<0.0003
Dissolved Titanium	mg/L		0.002	<0.002	0.002	0.005	0.002	<0.002	0.002	0.002
Dissolved Vanadium	mg/L		0.002	<0.002	0.002	0.007	0.002	<0.002	0.002	0.006
Dissolved Zinc	mg/L		0.005	0.005	0.005	<0.005	0.005	<0.005	0.005	<0.005

Certified By:

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AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Groundwater Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

		SAMPLE DESCRIPTION:		HR5-10		HR6-19		HR7-19		HR8-19	HR9-21
		SAMPLE TYPE:		Water		Water		Water		Water	Water
		DATE SAMPLED:		2023-05-03 14:00		2023-05-03 13:43		2023-05-03 14:48		2023-05-03 14:10	2023-05-03 14:30
Parameter	Unit	G / S	RDL	4965962	RDL	4965963	RDL	4965964	RDL	4965965	4965966
pH	pH Units		NA	7.06	NA	7.34	NA	7.22	NA	7.06	6.63
Alkalinity (as CaCO3)	mg/L		5	178	5	279	5	403	5	59	8
Electrical Conductivity	µS/cm		2	541	2	624	2	921	2	161	36
Total Dissolved Solids	mg/L		10	318	10	350	10	502	10	94	34
Chloride	mg/L		0.10	38.3	0.10	4.16	0.12	38.1	0.10	4.64	0.79
Nitrate as N	mg/L		0.05	0.19	0.05	<0.05	0.05	<0.05	0.05	0.63	0.45
Sulphate	mg/L		0.10	43.9	0.10	59.7	0.10	30.9	0.10	13.8	5.14
Ammonia as N	mg/L		0.02	1.43	0.03	4.28	0.06	13.7	0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L		5	37	5	56	5	74	5	<5	<5
Dissolved Organic Carbon	mg/L		0.5	10.2	0.5	6.2	0.5	32.4	0.5	2.0	1.3
Dissolved Calcium	mg/L		0.05	72.1	0.05	107	0.05	102	0.05	21.0	3.47
Dissolved Magnesium	mg/L		0.05	6.72	0.05	4.82	0.05	8.69	0.05	2.15	0.50
Dissolved Potassium	mg/L		0.50	9.51	0.50	5.82	0.50	22.2	0.50	1.43	0.77
Dissolved Sodium	mg/L		0.05	25.8	0.05	6.83	0.05	37.2	0.05	4.88	1.67
Dissolved Aluminum	mg/L		0.004	0.004	0.004	0.015	0.004	0.021	0.004	0.012	0.010
Dissolved Barium	mg/L		0.002	0.137	0.002	0.043	0.002	0.398	0.002	0.025	0.012
Dissolved Beryllium	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	<0.0005
Dissolved Boron	mg/L		0.010	0.302	0.010	0.103	0.010	0.502	0.010	0.022	<0.010
Dissolved Cadmium	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Dissolved Cobalt	mg/L		0.0005	0.0196	0.0005	<0.0005	0.0005	0.0572	0.0005	<0.0005	<0.0005
Dissolved Copper	mg/L		0.001	0.001	0.001	<0.001	0.001	0.005	0.001	0.001	<0.001
Dissolved Lead	mg/L		0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	0.0005	<0.0005	<0.0005
Dissolved Iron	mg/L		0.010	11.2	0.010	20.5	0.010	47.6	0.010	0.012	<0.010
Dissolved Manganese	mg/L		0.002	1.11	0.002	0.343	0.002	3.17	0.002	0.008	0.005
Dissolved Molybdenum	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Dissolved Nickel	mg/L		0.001	0.004	0.001	<0.001	0.001	0.009	0.001	<0.001	<0.001
Dissolved Silicon	mg/L		0.05	6.11	0.05	3.60	0.25	9.38	0.05	5.66	4.43
Dissolved Silver	mg/L		0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Groundwater Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

		SAMPLE DESCRIPTION:		HR5-10		HR6-19		HR7-19		HR8-19	HR9-21
		SAMPLE TYPE:		Water		Water		Water		Water	Water
		DATE SAMPLED:		2023-05-03 14:00		2023-05-03 13:43		2023-05-03 14:48		2023-05-03 14:10	2023-05-03 14:30
Parameter	Unit	G / S	RDL	4965962	RDL	4965963	RDL	4965964	RDL	4965965	4965966
Dissolved Strontium	mg/L		0.005	0.348	0.005	0.327	0.005	0.363	0.005	0.122	0.029
Dissolved Thallium	mg/L		0.0003	<0.0003	0.0003	<0.0003	0.0003	<0.0003	0.0003	<0.0003	<0.0003
Dissolved Titanium	mg/L		0.002	<0.002	0.002	<0.002	0.002	<0.002	0.002	<0.002	<0.002
Dissolved Vanadium	mg/L		0.002	<0.002	0.002	<0.002	0.002	0.003	0.002	<0.002	<0.002
Dissolved Zinc	mg/L		0.005	<0.005	0.005	<0.005	0.005	<0.005	0.005	<0.005	<0.005

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Groundwater Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

		SAMPLE DESCRIPTION:		HR10-21	HR-QAQC-GW1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2023-05-03 14:20	2023-05-03 13:10
Parameter	Unit	G / S	RDL	4965967	4965968
pH	pH Units		NA	6.84	7.17
Alkalinity (as CaCO3)	mg/L		5	18	66
Electrical Conductivity	µS/cm		2	69	252
Total Dissolved Solids	mg/L		10	48	148
Chloride	mg/L		0.10	3.95	29.6
Nitrate as N	mg/L		0.05	1.85	1.85
Sulphate	mg/L		0.10	3.59	4.53
Ammonia as N	mg/L		0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L		5	<5	<5
Dissolved Organic Carbon	mg/L		0.5	1.4	1.5
Dissolved Calcium	mg/L		0.05	6.56	35.1
Dissolved Magnesium	mg/L		0.05	1.34	1.20
Dissolved Potassium	mg/L		0.50	1.18	1.72
Dissolved Sodium	mg/L		0.05	3.16	12.6
Dissolved Aluminum	mg/L		0.004	0.016	0.020
Dissolved Barium	mg/L		0.002	0.005	0.067
Dissolved Beryllium	mg/L		0.0005	<0.0005	<0.0005
Dissolved Boron	mg/L		0.010	<0.010	0.011
Dissolved Cadmium	mg/L		0.0001	<0.0001	<0.0001
Dissolved Chromium	mg/L		0.002	<0.002	<0.002
Dissolved Cobalt	mg/L		0.0005	<0.0005	0.0042
Dissolved Copper	mg/L		0.001	<0.001	0.001
Dissolved Lead	mg/L		0.0005	<0.0005	<0.0005
Dissolved Iron	mg/L		0.010	<0.010	<0.010
Dissolved Manganese	mg/L		0.002	<0.002	0.018
Dissolved Molybdenum	mg/L		0.002	<0.002	<0.002
Dissolved Nickel	mg/L		0.001	<0.001	<0.001
Dissolved Silicon	mg/L		0.05	4.53	3.47
Dissolved Silver	mg/L		0.0001	<0.0001	<0.0001

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Groundwater Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

		SAMPLE DESCRIPTION:		HR10-21	HR-QAQC-GW1
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		2023-05-03 14:20	2023-05-03 13:10
Parameter	Unit	G / S	RDL	4965967	4965968
Dissolved Strontium	mg/L		0.005	0.059	0.087
Dissolved Thallium	mg/L		0.0003	<0.0003	<0.0003
Dissolved Titanium	mg/L		0.002	<0.002	0.002
Dissolved Vanadium	mg/L		0.002	<0.002	<0.002
Dissolved Zinc	mg/L		0.005	<0.005	<0.005

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

4965954-4965968 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Water Analysis

RPT Date: May 17, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Groundwater Parameters															
pH	4965913		7.58	7.48	1.3%	NA	103%	90%	110%						
Alkalinity (as CaCO3)	4965913		43	41	4.8%	< 5	96%	80%	120%						
Electrical Conductivity	4965913		210	211	0.5%	< 2	108%	90%	110%						
Total Dissolved Solids	4965959	4965959	638	650	1.9%	< 10	102%	80%	120%						
Chloride	4965959	4965959	89.7	90.8	1.2%	< 0.10	95%	70%	130%	99%	80%	120%	102%	70%	130%
Nitrate as N	4965959	4965959	<0.05	<0.05	NA	< 0.05	95%	70%	130%	97%	80%	120%	94%	70%	130%
Sulphate	4965959	4965959	26.8	27.7	3.3%	< 0.10	94%	70%	130%	97%	80%	120%	97%	70%	130%
Ammonia as N	4964680		<0.02	<0.02	NA	< 0.02	107%	70%	130%	101%	80%	120%	97%	70%	130%
Chemical Oxygen Demand	4965954	4965954	19	20	NA	< 5	99%	80%	120%	106%	90%	110%	107%	70%	130%
Dissolved Organic Carbon	4965954	4965954	2.7	2.7	0.0%	< 0.5	105%	90%	110%	96%	90%	110%	94%	80%	120%
Dissolved Calcium	4965954	4965954	12.2	12.4	1.6%	< 0.05	101%	70%	130%	109%	80%	120%	103%	70%	130%
Dissolved Magnesium	4965954	4965954	0.87	0.85	2.3%	< 0.05	102%	70%	130%	101%	80%	120%	99%	70%	130%
Dissolved Potassium	4965954	4965954	0.69	0.67	NA	< 0.50	101%	70%	130%	108%	80%	120%	98%	70%	130%
Dissolved Sodium	4965954	4965954	1.26	1.33	5.4%	< 0.05	98%	70%	130%	109%	80%	120%	100%	70%	130%
Dissolved Aluminum	4965954	4965954	0.018	0.016	NA	< 0.004	94%	70%	130%	103%	80%	120%	96%	70%	130%
Dissolved Barium	4965954	4965954	0.017	0.017	0.0%	< 0.002	100%	70%	130%	99%	80%	120%	95%	70%	130%
Dissolved Beryllium	4965954	4965954	<0.0005	<0.0005	NA	< 0.0005	95%	70%	130%	109%	80%	120%	106%	70%	130%
Dissolved Boron	4965954	4965954	<0.010	<0.010	NA	< 0.010	98%	70%	130%	111%	80%	120%	107%	70%	130%
Dissolved Cadmium	4965954	4965954	<0.0001	<0.0001	NA	< 0.0001	100%	70%	130%	97%	80%	120%	100%	70%	130%
Dissolved Chromium	4965954	4965954	<0.002	<0.002	NA	< 0.002	95%	70%	130%	96%	80%	120%	94%	70%	130%
Dissolved Cobalt	4965954	4965954	<0.0005	<0.0005	NA	< 0.0005	98%	70%	130%	95%	80%	120%	94%	70%	130%
Dissolved Copper	4965954	4965954	<0.001	<0.001	NA	< 0.001	97%	70%	130%	95%	80%	120%	93%	70%	130%
Dissolved Lead	4965954	4965954	<0.0005	<0.0005	NA	< 0.0005	98%	70%	130%	93%	80%	120%	87%	70%	130%
Dissolved Iron	4965954	4965954	0.034	0.015	NA	< 0.010	94%	70%	130%	98%	80%	120%	96%	70%	130%
Dissolved Manganese	4965954	4965954	<0.002	<0.002	NA	< 0.002	99%	70%	130%	96%	80%	120%	97%	70%	130%
Dissolved Molybdenum	4965954	4965954	<0.002	<0.002	NA	< 0.002	101%	70%	130%	100%	80%	120%	98%	70%	130%
Dissolved Nickel	4965954	4965954	<0.001	<0.001	NA	< 0.001	96%	70%	130%	95%	80%	120%	93%	70%	130%
Dissolved Silicon	4965954	4965954	4.61	4.58	0.7%	< 0.05	104%	70%	130%	106%	80%	120%	110%	70%	130%
Dissolved Silver	4965954	4965954	<0.0001	<0.0001	NA	< 0.0001	97%	70%	130%	95%	80%	120%	95%	70%	130%
Dissolved Strontium	4965954	4965954	0.050	0.055	9.5%	< 0.005	96%	70%	130%	91%	80%	120%	92%	70%	130%
Dissolved Thallium	4965954	4965954	<0.0003	<0.0003	NA	< 0.0003	99%	70%	130%	97%	80%	120%	95%	70%	130%
Dissolved Titanium	4965954	4965954	<0.002	<0.002	NA	< 0.002	102%	70%	130%	101%	80%	120%	100%	70%	130%
Dissolved Vanadium	4965954	4965954	<0.002	<0.002	NA	< 0.002	95%	70%	130%	97%	80%	120%	96%	70%	130%
Dissolved Zinc	4965954	4965954	0.005	<0.005	NA	< 0.005	98%	70%	130%	95%	80%	120%	93%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Groundwater Parameters															
Ammonia as N	4965965	4965965	<0.02	<0.02	NA	< 0.02	99%	70%	130%	101%	80%	120%	97%	70%	130%

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Water Analysis (Continued)

RPT Date: May 17, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH3 H	LACHAT FIA
Chemical Oxygen Demand	INOR-93-6042	modified from SM 5220 A and SM 5220 D	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	modified from SM 5310 B	SHIMADZU CARBON ANALYZER
Dissolved Calcium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Magnesium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Dissolved Potassium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Sodium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP/MS
Dissolved Aluminum	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Barium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Beryllium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Boron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cadmium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Chromium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Cobalt	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Copper	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Lead	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Iron	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Manganese	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Molybdenum	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Nickel	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Silicon	MET-93-6105	modified from EPA 6010D	ICP/OES
Dissolved Silver	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Strontium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Thallium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS

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Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021603

PROJECT: 230225-05

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Dissolved Titanium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Vanadium	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Dissolved Zinc	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS

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

Chain of Custody Record

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

Laboratory Use Only
Work Order #: 23T021603
Cooler Quantity: 1 large
Arrival Temperatures: 4.9 | 5.0 | 5.1
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes: bagged ice

Report Information:
Company: BluMetric
Contact: Carolyn Miller
Address: 4 Cataraqui St
Kingston, ON, K7K1Z7
Phone: 613-328-0243 Fax:
Reports to be sent to:
1. Email: cmiller@blumetric.ca
2. Email: cbandler@blumetric.ca

Regulatory Requirements:
(Please check all applicable boxes)
☐ Regulation 153/04 — Table (Indicate One) ☐Ind/Com ☐Res/Park ☐Agriculture — Soil Texture (Check One) ☐Coarse ☐Fine
☐ Excess Soils R406 — Table (Indicate One)
☐ Regulation 558
☐ CCME
☐ Sewer Use ☐Sanitary ☐Storm — Region
☐ Prov. Water Quality Objectives (PWQO)
☒ Other ODWS (Indicate One)

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

Report Guideline on Certificate of Analysis ☑ Yes ☐ No

Turnaround Time (TAT) Required:
Regular TAT ☒ 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day
OR Date Required (Rush Surcharges May Apply):
Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays
For 'Same Day' analysis, please contact your AGAT CPM

Project Information:
Project: 230225-05
Site Location: Hickey Road
Sampled By:
AGAT Quote #: 740800 PO: 230225-05
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:
Bill To Same: Yes ☒ No ☐
Company:
Contact:
Address:
Email: ap@blumetric.ca

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered (Metals, Hg, CrVI, DOC) Y/N	O. Reg 153: Metals & Inorganics	Metals - ☐CrVI, ☐Hg, ☐HWSB	BTEX, F1-F4 PHCs Analyze F4G if required ☐Yes ☐No	PAHs	PCBs	VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐M&I ☐VOCs ☐ABNs ☐B(a)P ☐PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐Metals ☐VOCs ☐SVOCs	Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	93-262 Groundwater	Potentially Hazardous or High Concentration (Y/N)
HR1-03	May 3/23	13:21 AM/PM	4	GW		Y											☑	
HR2-03R	May 3/23	13:34 AM/PM	4	GW	Field Filter: Metals, DOC	Y											☑	
HR3-03	May 3/23	13:10 AM/PM	4	GW		Y											☑	
HR4-10	May 3/23	13:50 AM/PM	4	GW		Y											☑	
HR5-10	May 3/23	14:00 AM/PM	4	GW		Y											☑	
HR6-19	May 3/23	13:43 AM/PM	4	GW		Y											☑	
HR7-19	May 3/23	14:48 AM/PM	4	GW		Y											☑	
HR8-19	May 3/23	14:10 AM/PM	4	GW		Y											☑	
HR9-21	May 3/23	14:30 AM/PM	4	GW		Y											☑	
HR10-21	May 3/23	14:20 AM/PM	4	GW		Y											☑	
HR-QAQC-GW1	May 3/23	13:10 AM/PM	4	GW		Y											☑	

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Brad McCallum / Brad McCall	May 4, 2023	8:00 AM	T. Persaud	May 5	8:40 AM
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1
N°:

Your Project #: 230225-05
Site Location: Hickey Road
Your C.O.C. #: 781220

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/10/27
Report #: R7881990
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3W5762
Received: 2023/10/19, 10:36

Sample Matrix: Water
Samples Received: 10

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity	10	N/A	2023/10/25	CAM SOP-00448	SM 23 2320 B m
Chloride by Automated Colourimetry	10	N/A	2023/10/24	CAM SOP-00463	SM 23 4500-Cl E m
Chemical Oxygen Demand	10	N/A	2023/10/25	CAM SOP-00416	SM 23 5220 D m
Conductivity	10	N/A	2023/10/25	CAM SOP-00414	SM 23 2510 m
Dissolved Organic Carbon (DOC) (1)	10	N/A	2023/10/27	CAM SOP-00446	SM 23 5310 B m
Dissolved Metals by ICPMS	10	N/A	2023/10/26	CAM SOP-00447	EPA 6020B m
Total Ammonia-N	10	N/A	2023/10/26	CAM SOP-00441	USGS I-2522-90 m
Nitrate & Nitrite as Nitrogen in Water (2)	8	N/A	2023/10/24	CAM SOP-00440	SM 23 4500-NO3I/NO2B
Nitrate & Nitrite as Nitrogen in Water (2)	2	N/A	2023/10/25	CAM SOP-00440	SM 23 4500-NO3I/NO2B
pH	10	2023/10/21	2023/10/25	CAM SOP-00413	SM 4500H+ B m
Sulphate by Automated Turbidimetry	10	N/A	2023/10/24	CAM SOP-00464	SM 23 4500-SO42- E m
Total Dissolved Solids	10	2023/10/24	2023/10/25	CAM SOP-00428	SM 23 2540C m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Your Project #: 230225-05
Site Location: Hickey Road
Your C.O.C. #: 781220

Attention: Cecilia Bandler

BluMetric Environmental Inc
The Tower - The Woolen Mill
4 Cataraqui St
Kingston, ON
CANADA K7K 1Z7

Report Date: 2023/10/27
Report #: R7881990
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3W5762

Received: 2023/10/19, 10:36

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.

(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Christine Gripton, Senior Project Manager
Email: Christine.Gripton@bureauveritas.com
Phone# (519)652-9444

==========

This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas Job #: C3W5762
Report Date: 2023/10/27

BluMetric Environmental Inc
Client Project #: 230225-05
Site Location: Hickey Road
Sampler Initials: CM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XIM224			XIM224			XIM225		
Sampling Date		2023/10/17 14:50			2023/10/17 14:50			2023/10/17 14:30		
COC Number		781220			781220			781220		
	UNITS	HR2-03R	RDL	QC Batch	HR2-03R Lab-Dup	RDL	QC Batch	HR3-03	RDL	QC Batch
Inorganics										
Total Ammonia-N	mg/L	1.8	0.050	9001740				ND	0.050	9001740
Total Chemical Oxygen Demand (COD)	mg/L	26	4.0	9000852	25	4.0	9000852	ND	4.0	9000852
Conductivity	umho/cm	490	1.0	8997978				100	1.0	8997978
Total Dissolved Solids	mg/L	260	10	8998333				90	10	8998333
Dissolved Organic Carbon	mg/L	7.8	0.4	8999278				2.5	0.4	8999278
pH	pH	7.42		8997977				7.33		8997977
Dissolved Sulphate (SO4)	mg/L	7.3	1.0	8997920				7.2	1.0	8997920
Alkalinity (Total as CaCO3)	mg/L	170	1.0	8997974				34	1.0	8997974
Dissolved Chloride (Cl-)	mg/L	35	1.0	8997913				3.9	1.0	8997913
Nitrate (N)	mg/L	ND	0.10	8998023				0.31	0.10	8998023

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas ID		XIM225			XIM226			XIM227		
Sampling Date		2023/10/17 14:30			2023/10/17 15:20			2023/10/17 15:10		
COC Number		781220			781220			781220		
	UNITS	HR3-03 Lab-Dup	RDL	QC Batch	HR4-10	RDL	QC Batch	HR5-10	RDL	QC Batch
Inorganics										
Total Ammonia-N	mg/L				36	0.25	9001740	6.9	0.050	9001740
Total Chemical Oxygen Demand (COD)	mg/L				200	12	9000852	100	4.0	9000852
Conductivity	umho/cm	100	1.0	8997978	1700	1.0	8997978	1000	1.0	8998021
Total Dissolved Solids	mg/L				905	10	8998333	620	10	8998333
Dissolved Organic Carbon	mg/L				64	0.4	8999278	33	0.4	8999278
pH	pH	7.30		8997977	7.15		8997977	7.07		8998020
Dissolved Sulphate (SO4)	mg/L				34	1.0	8997920	52	1.0	8997731
Alkalinity (Total as CaCO3)	mg/L	35	1.0	8997974	660	1.0	8997974	430	1.0	8998017
Dissolved Chloride (Cl-)	mg/L				110	1.0	8997913	38	1.0	8997726
Nitrate (N)	mg/L				ND	0.10	8997678	ND	0.10	8997678

RDL = Reportable Detection Limit
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Lab-Dup = Laboratory Initiated Duplicate
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Bureau Veritas Job #: C3W5762
Report Date: 2023/10/27

BluMetric Environmental Inc
Client Project #: 230225-05
Site Location: Hickey Road
Sampler Initials: CM

RESULTS OF ANALYSES OF WATER

Bureau Veritas ID		XIM228	XIM229		XIM230		XIM231		
Sampling Date		2023/10/17 16:20	2023/10/17 14:00		2023/10/17 15:35		2023/10/17 15:45		
COC Number		781220	781220		781220		781220		
	UNITS	HR6-19	HR7-19	QC Batch	HR8-19	QC Batch	HR9-21	RDL	QC Batch
Inorganics									
Total Ammonia-N	mg/L	2.7	13	9001740	0.075	9001740	ND	0.050	9001740
Total Chemical Oxygen Demand (COD)	mg/L	20	45	9000852	8.6	9000852	7.9	4.0	9000852
Conductivity	umho/cm	400	620	8998021	80	8998021	50	1.0	8998021
Total Dissolved Solids	mg/L	220	320	8998333	80	8998333	45	10	8998333
Dissolved Organic Carbon	mg/L	4.5	13	8999278	1.3	8999278	1.8	0.4	8999278
pH	pH	7.22	7.07	8998020	7.17	8998020	6.73		8998020
Dissolved Sulphate (SO4)	mg/L	8.7	14	8997731	5.5	8997920	4.7	1.0	8997731
Alkalinity (Total as CaCO3)	mg/L	200	260	8998017	29	8998017	8.5	1.0	8998017
Dissolved Chloride (Cl-)	mg/L	ND	22	8997726	5.9	8997913	ND	1.0	8997726
Nitrate (N)	mg/L	ND	0.36	8997678	0.22	8997678	1.28	0.10	8997678

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
ND = Not Detected at a concentration equal or greater than the indicated Detection Limit.

Bureau Veritas ID		XIM232	XIM233		
Sampling Date		2023/10/17 15:55	2023/10/17 15:35		
COC Number		781220	781220		
	UNITS	HR10-21	HR-QAQC-GW1	RDL	QC Batch
Inorganics					
Total Ammonia-N	mg/L	ND	0.060	0.050	9001740
Total Chemical Oxygen Demand (COD)	mg/L	ND	9.9	4.0	9000852
Conductivity	umho/cm	46	80	1.0	8998021
Total Dissolved Solids	mg/L	60	70	10	8998333
Dissolved Organic Carbon	mg/L	1.4	1.3	0.4	8999278
pH	pH	6.97	7.13		8998020
Dissolved Sulphate (SO4)	mg/L	5.2	5.5	1.0	8997920
Alkalinity (Total as CaCO3)	mg/L	13	30	1.0	8998017
Dissolved Chloride (Cl-)	mg/L	ND	1.3	1.0	8997913
Nitrate (N)	mg/L	0.40	0.22	0.10	8997678

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Bureau Veritas Job #: C3W5762
Report Date: 2023/10/27

BluMetric Environmental Inc
Client Project #: 230225-05
Site Location: Hickey Road
Sampler Initials: CM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XIM224	XIM225		XIM226	XIM227		XIM228		
Sampling Date		2023/10/17 14:50	2023/10/17 14:30		2023/10/17 15:20	2023/10/17 15:10		2023/10/17 16:20		
COC Number		781220	781220		781220	781220		781220		
	UNITS	HR2-03R	HR3-03	QC Batch	HR4-10	HR5-10	QC Batch	HR6-19	RDL	QC Batch
Metals										
Dissolved Aluminum (Al)	ug/L	46	5.8	8997068	47	40	8997066	18	4.9	8997068
Dissolved Barium (Ba)	ug/L	130	23	8997068	980	440	8997066	37	2.0	8997068
Dissolved Beryllium (Be)	ug/L	ND	ND	8997068	ND	ND	8997066	ND	0.40	8997068
Dissolved Boron (B)	ug/L	85	24	8997068	440	300	8997066	69	10	8997068
Dissolved Cadmium (Cd)	ug/L	ND	ND	8997068	ND	ND	8997066	ND	0.090	8997068
Dissolved Calcium (Ca)	ug/L	57000	11000	8997068	120000	150000	8997066	80000	200	8997068
Dissolved Chromium (Cr)	ug/L	ND	ND	8997068	ND	ND	8997066	ND	5.0	8997068
Dissolved Cobalt (Co)	ug/L	6.0	0.71	8997068	65	70	8997066	1.9	0.50	8997068
Dissolved Copper (Cu)	ug/L	ND	1.7	8997068	3.8	3.4	8997066	1.3	0.90	8997068
Dissolved Iron (Fe)	ug/L	17000	ND	8997068	83000	49000	8997066	21000	100	8997068
Dissolved Lead (Pb)	ug/L	ND	ND	8997068	ND	ND	8997066	ND	0.50	8997068
Dissolved Magnesium (Mg)	ug/L	4800	820	8997068	21000	14000	8997066	2900	50	8997068
Dissolved Manganese (Mn)	ug/L	2400	ND	8997068	2400	3100	8997066	330	2.0	8997068
Dissolved Molybdenum (Mo)	ug/L	ND	ND	8997068	0.91	0.84	8997066	ND	0.50	8997068
Dissolved Nickel (Ni)	ug/L	ND	ND	8997068	15	8.1	8997066	2.3	1.0	8997068
Dissolved Potassium (K)	ug/L	16000	1100	8997068	58000	15000	8997066	3400	200	8997068
Dissolved Silicon (Si)	ug/L	7800	4100	8997068	10000	6400	8997066	5800	50	8997068
Dissolved Silver (Ag)	ug/L	ND	ND	8997068	ND	ND	8997066	ND	0.090	8997068
Dissolved Sodium (Na)	ug/L	23000	9200	8997068	150000	49000	8997066	3300	100	8997068
Dissolved Strontium (Sr)	ug/L	230	32	8997068	620	1000	8997066	260	1.0	8997068
Dissolved Thallium (Tl)	ug/L	ND	ND	8997068	ND	0.054	8997066	ND	0.050	8997068
Dissolved Titanium (Ti)	ug/L	ND	ND	8997068	ND	ND	8997066	ND	5.0	8997068
Dissolved Vanadium (V)	ug/L	3.4	ND	8997068	9.7	3.6	8997066	0.84	0.50	8997068
Dissolved Zinc (Zn)	ug/L	ND	ND	8997068	ND	5.2	8997066	11	5.0	8997068

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Bureau Veritas Job #: C3W5762
Report Date: 2023/10/27

BluMetric Environmental Inc
Client Project #: 230225-05
Site Location: Hickey Road
Sampler Initials: CM

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Bureau Veritas ID		XIM229	XIM230	XIM231		XIM232		XIM233		
Sampling Date		2023/10/17 14:00	2023/10/17 15:35	2023/10/17 15:45		2023/10/17 15:55		2023/10/17 15:35		
COC Number		781220	781220	781220		781220		781220		
	UNITS	HR7-19	HR8-19	HR9-21	QC Batch	HR10-21	QC Batch	HR-QAQC-GW1	RDL	QC Batch
Metals										
Dissolved Aluminum (Al)	ug/L	20	6.9	15	8997068	6.6	8997066	6.6	4.9	8997068
Dissolved Barium (Ba)	ug/L	300	13	16	8997068	3.5	8997066	13	2.0	8997068
Dissolved Beryllium (Be)	ug/L	ND	ND	ND	8997068	ND	8997066	ND	0.40	8997068
Dissolved Boron (B)	ug/L	290	10	ND	8997068	ND	8997066	10	10	8997068
Dissolved Cadmium (Cd)	ug/L	ND	ND	ND	8997068	ND	8997066	ND	0.090	8997068
Dissolved Calcium (Ca)	ug/L	60000	11000	5200	8997068	4200	8997066	11000	200	8997068
Dissolved Chromium (Cr)	ug/L	ND	ND	ND	8997068	ND	8997066	ND	5.0	8997068
Dissolved Cobalt (Co)	ug/L	42	ND	ND	8997068	ND	8997066	ND	0.50	8997068
Dissolved Copper (Cu)	ug/L	4.1	ND	ND	8997068	ND	8997066	ND	0.90	8997068
Dissolved Iron (Fe)	ug/L	38000	ND	ND	8997068	ND	8997066	ND	100	8997068
Dissolved Lead (Pb)	ug/L	ND	ND	ND	8997068	ND	8997066	ND	0.50	8997068
Dissolved Magnesium (Mg)	ug/L	6100	1100	740	8997068	810	8997066	1100	50	8997068
Dissolved Manganese (Mn)	ug/L	1800	3.0	59	8997068	ND	8997066	2.7	2.0	8997068
Dissolved Molybdenum (Mo)	ug/L	0.62	ND	ND	8997068	ND	8997066	ND	0.50	8997068
Dissolved Nickel (Ni)	ug/L	8.0	ND	ND	8997068	ND	8997066	ND	1.0	8997068
Dissolved Potassium (K)	ug/L	21000	1000	1400	8997068	1000	8997066	1000	200	8997068
Dissolved Silicon (Si)	ug/L	11000	4600	5100	8997068	4100	8997066	4500	50	8997068
Dissolved Silver (Ag)	ug/L	ND	ND	ND	8997068	ND	8997066	ND	0.090	8997068
Dissolved Sodium (Na)	ug/L	39000	2900	1800	8997068	2200	8997066	2800	100	8997068
Dissolved Strontium (Sr)	ug/L	260	70	62	8997068	40	8997066	68	1.0	8997068
Dissolved Thallium (Tl)	ug/L	0.087	ND	ND	8997068	ND	8997066	ND	0.050	8997068
Dissolved Titanium (Ti)	ug/L	ND	ND	ND	8997068	ND	8997066	ND	5.0	8997068
Dissolved Vanadium (V)	ug/L	1.9	ND	ND	8997068	ND	8997066	ND	0.50	8997068
Dissolved Zinc (Zn)	ug/L	ND	ND	ND	8997068	ND	8997066	ND	5.0	8997068

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TEST SUMMARY

Bureau Veritas ID: XIM224
Sample ID: HR2-03R
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8997974	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997913	N/A	2023/10/24	Massarat Jan
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8997978	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997068	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998023	N/A	2023/10/25	Chandra Nandlal
pH	AT	8997977	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997920	N/A	2023/10/24	Massarat Jan
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM224 Dup
Sample ID: HR2-03R
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh

Bureau Veritas ID: XIM225
Sample ID: HR3-03
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8997974	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997913	N/A	2023/10/24	Massarat Jan
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8997978	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997068	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8998023	N/A	2023/10/25	Chandra Nandlal
pH	AT	8997977	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997920	N/A	2023/10/24	Massarat Jan
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM225 Dup
Sample ID: HR3-03
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8997974	N/A	2023/10/25	Nachiketa Gohil
Conductivity	AT	8997978	N/A	2023/10/25	Nachiketa Gohil
pH	AT	8997977	2023/10/21	2023/10/25	Nachiketa Gohil

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Bureau Veritas Job #: C3W5762
Report Date: 2023/10/27

BluMetric Environmental Inc
Client Project #: 230225-05
Site Location: Hickey Road
Sampler Initials: CM

TEST SUMMARY

Bureau Veritas ID: XIM226
Sample ID: HR4-10
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8997974	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997913	N/A	2023/10/24	Massarat Jan
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8997978	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997066	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8997977	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997920	N/A	2023/10/24	Massarat Jan
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM227
Sample ID: HR5-10
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998017	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997726	N/A	2023/10/24	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8998021	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997066	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8998020	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997731	N/A	2023/10/24	Alina Dobreanu
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM228
Sample ID: HR6-19
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998017	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997726	N/A	2023/10/24	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8998021	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997068	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8998020	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997731	N/A	2023/10/24	Alina Dobreanu

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Bureau Veritas Job #: C3W5762
Report Date: 2023/10/27

BluMetric Environmental Inc
Client Project #: 230225-05
Site Location: Hickey Road
Sampler Initials: CM

TEST SUMMARY

Bureau Veritas ID: XIM228
Sample ID: HR6-19
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM229
Sample ID: HR7-19
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998017	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997726	N/A	2023/10/24	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8998021	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997068	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8998020	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997731	N/A	2023/10/24	Alina Dobreanu
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM230
Sample ID: HR8-19
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998017	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997913	N/A	2023/10/24	Massarat Jan
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8998021	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997068	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8998020	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997920	N/A	2023/10/24	Massarat Jan
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM231
Sample ID: HR9-21
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998017	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997726	N/A	2023/10/24	Alina Dobreanu
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh

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TEST SUMMARY

Bureau Veritas ID: XIM231
Sample ID: HR9-21
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Conductivity	AT	8998021	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997068	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8998020	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997731	N/A	2023/10/24	Alina Dobreanu
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM232
Sample ID: HR10-21
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998017	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997913	N/A	2023/10/24	Massarat Jan
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8998021	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997066	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8998020	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997920	N/A	2023/10/24	Massarat Jan
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

Bureau Veritas ID: XIM233
Sample ID: HR-QAQC-GW1
Matrix: Water

Collected: 2023/10/17
Shipped:
Received: 2023/10/19

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Alkalinity	AT	8998017	N/A	2023/10/25	Nachiketa Gohil
Chloride by Automated Colourimetry	KONE	8997913	N/A	2023/10/24	Massarat Jan
Chemical Oxygen Demand	SPEC	9000852	N/A	2023/10/25	Nimarta Singh
Conductivity	AT	8998021	N/A	2023/10/25	Nachiketa Gohil
Dissolved Organic Carbon (DOC)	TOCV/NDIR	8999278	N/A	2023/10/27	Gyulshen Idriz
Dissolved Metals by ICPMS	ICP/MS	8997068	N/A	2023/10/26	Nan Raykha
Total Ammonia-N	LACH/NH4	9001740	N/A	2023/10/26	Prabhjot Kaur
Nitrate & Nitrite as Nitrogen in Water	LACH	8997678	N/A	2023/10/24	Chandra Nandlal
pH	AT	8998020	2023/10/21	2023/10/25	Nachiketa Gohil
Sulphate by Automated Turbidimetry	KONE	8997920	N/A	2023/10/24	Massarat Jan
Total Dissolved Solids	BAL	8998333	2023/10/24	2023/10/25	Razieh Tabesh

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	3.7°C
Package 2	4.0°C

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8997066	Dissolved Aluminum (Al)	2023/10/26	104	80 - 120	105	80 - 120	ND, RDL=4.9	ug/L		
8997066	Dissolved Barium (Ba)	2023/10/26	NC	80 - 120	104	80 - 120	ND, RDL=2.0	ug/L	0.79	20
8997066	Dissolved Beryllium (Be)	2023/10/26	106	80 - 120	103	80 - 120	ND, RDL=0.40	ug/L		
8997066	Dissolved Boron (B)	2023/10/26	102	80 - 120	97	80 - 120	ND, RDL=10	ug/L	2.7	20
8997066	Dissolved Cadmium (Cd)	2023/10/26	103	80 - 120	101	80 - 120	ND, RDL=0.090	ug/L		
8997066	Dissolved Calcium (Ca)	2023/10/26	NC	80 - 120	106	80 - 120	ND, RDL=200	ug/L	2.8	20
8997066	Dissolved Chromium (Cr)	2023/10/26	100	80 - 120	101	80 - 120	ND, RDL=5.0	ug/L		
8997066	Dissolved Cobalt (Co)	2023/10/26	96	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L		
8997066	Dissolved Copper (Cu)	2023/10/26	106	80 - 120	106	80 - 120	ND, RDL=0.90	ug/L		
8997066	Dissolved Iron (Fe)	2023/10/26	NC (1)	80 - 120	104	80 - 120	ND, RDL=100	ug/L	0.17	20
8997066	Dissolved Lead (Pb)	2023/10/26	100	80 - 120	102	80 - 120	ND, RDL=0.50	ug/L		
8997066	Dissolved Magnesium (Mg)	2023/10/26	100	80 - 120	106	80 - 120	ND, RDL=50	ug/L	1.1	20
8997066	Dissolved Manganese (Mn)	2023/10/26	NC	80 - 120	101	80 - 120	ND, RDL=2.0	ug/L	0.71	20
8997066	Dissolved Molybdenum (Mo)	2023/10/26	109	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L		
8997066	Dissolved Nickel (Ni)	2023/10/26	97	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L		
8997066	Dissolved Potassium (K)	2023/10/26	100	80 - 120	108	80 - 120	ND, RDL=200	ug/L		
8997066	Dissolved Silicon (Si)	2023/10/26	105	80 - 120	107	80 - 120	ND, RDL=50	ug/L		
8997066	Dissolved Silver (Ag)	2023/10/26	85	80 - 120	103	80 - 120	ND, RDL=0.090	ug/L		
8997066	Dissolved Sodium (Na)	2023/10/26	NC	80 - 120	106	80 - 120	ND, RDL=100	ug/L	0.83	20
8997066	Dissolved Strontium (Sr)	2023/10/26	97	80 - 120	101	80 - 120	ND, RDL=1.0	ug/L		
8997066	Dissolved Thallium (Tl)	2023/10/26	102	80 - 120	104	80 - 120	ND, RDL=0.050	ug/L		
8997066	Dissolved Titanium (Ti)	2023/10/26	107	80 - 120	103	80 - 120	ND, RDL=5.0	ug/L		
8997066	Dissolved Vanadium (V)	2023/10/26	99	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L		
8997066	Dissolved Zinc (Zn)	2023/10/26	98	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L		
8997068	Dissolved Aluminum (Al)	2023/10/26	108	80 - 120	107	80 - 120	ND, RDL=4.9	ug/L	NC	20
8997068	Dissolved Barium (Ba)	2023/10/26	108	80 - 120	107	80 - 120	ND, RDL=2.0	ug/L	0.76	20
8997068	Dissolved Beryllium (Be)	2023/10/26	105	80 - 120	107	80 - 120	ND, RDL=0.40	ug/L		
8997068	Dissolved Boron (B)	2023/10/26	98	80 - 120	100	80 - 120	ND, RDL=10	ug/L	NC	20
8997068	Dissolved Cadmium (Cd)	2023/10/26	103	80 - 120	102	80 - 120	ND, RDL=0.090	ug/L		
8997068	Dissolved Calcium (Ca)	2023/10/26	114	80 - 120	108	80 - 120	ND, RDL=200	ug/L	1.1	20
8997068	Dissolved Chromium (Cr)	2023/10/26	105	80 - 120	103	80 - 120	ND, RDL=5.0	ug/L		

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8997068	Dissolved Cobalt (Co)	2023/10/26	103	80 - 120	100	80 - 120	ND, RDL=0.50	ug/L		
8997068	Dissolved Copper (Cu)	2023/10/26	108	80 - 120	103	80 - 120	ND, RDL=0.90	ug/L		
8997068	Dissolved Iron (Fe)	2023/10/26	105	80 - 120	104	80 - 120	ND, RDL=100	ug/L	NC	20
8997068	Dissolved Lead (Pb)	2023/10/26	101	80 - 120	98	80 - 120	ND, RDL=0.50	ug/L	NC	20
8997068	Dissolved Magnesium (Mg)	2023/10/26	107	80 - 120	108	80 - 120	ND, RDL=50	ug/L	0.28	20
8997068	Dissolved Manganese (Mn)	2023/10/26	103	80 - 120	102	80 - 120	ND, RDL=2.0	ug/L	NC	20
8997068	Dissolved Molybdenum (Mo)	2023/10/26	108	80 - 120	105	80 - 120	ND, RDL=0.50	ug/L		
8997068	Dissolved Nickel (Ni)	2023/10/26	100	80 - 120	98	80 - 120	ND, RDL=1.0	ug/L		
8997068	Dissolved Potassium (K)	2023/10/26	110	80 - 120	108	80 - 120	ND, RDL=200	ug/L	0.87	20
8997068	Dissolved Silicon (Si)	2023/10/26	113	80 - 120	110	80 - 120	ND, RDL=50	ug/L		
8997068	Dissolved Silver (Ag)	2023/10/26	104	80 - 120	103	80 - 120	ND, RDL=0.090	ug/L		
8997068	Dissolved Sodium (Na)	2023/10/26	107	80 - 120	107	80 - 120	ND, RDL=100	ug/L	0.28	20
8997068	Dissolved Strontium (Sr)	2023/10/26	101	80 - 120	100	80 - 120	ND, RDL=1.0	ug/L		
8997068	Dissolved Thallium (Tl)	2023/10/26	102	80 - 120	103	80 - 120	ND, RDL=0.050	ug/L		
8997068	Dissolved Titanium (Ti)	2023/10/26	111	80 - 120	107	80 - 120	ND, RDL=5.0	ug/L		
8997068	Dissolved Vanadium (V)	2023/10/26	103	80 - 120	101	80 - 120	ND, RDL=0.50	ug/L		
8997068	Dissolved Zinc (Zn)	2023/10/26	102	80 - 120	102	80 - 120	ND, RDL=5.0	ug/L		
8997678	Nitrate (N)	2023/10/24	99	80 - 120	100	80 - 120	ND, RDL=0.10	mg/L	NC	20
8997726	Dissolved Chloride (Cl-)	2023/10/24	NC	80 - 120	94	80 - 120	ND, RDL=1.0	mg/L	1.4	20
8997731	Dissolved Sulphate (SO4)	2023/10/24	NC	75 - 125	93	80 - 120	ND, RDL=1.0	mg/L	0.39	20
8997913	Dissolved Chloride (Cl-)	2023/10/24	94	80 - 120	101	80 - 120	ND, RDL=1.0	mg/L	NC	20
8997920	Dissolved Sulphate (SO4)	2023/10/24	96	75 - 125	102	80 - 120	ND, RDL=1.0	mg/L	0.55	20
8997974	Alkalinity (Total as CaCO3)	2023/10/25			97	85 - 115	ND, RDL=1.0	mg/L	2.1	20
8997977	pH	2023/10/25			102	98 - 103			0.34	N/A
8997978	Conductivity	2023/10/25			101	85 - 115	ND, RDL=1.0	umho/cm	0.29	10
8998017	Alkalinity (Total as CaCO3)	2023/10/25			96	85 - 115	ND, RDL=1.0	mg/L	0.22	20
8998020	pH	2023/10/25			102	98 - 103			0.54	N/A
8998021	Conductivity	2023/10/25			101	85 - 115	ND, RDL=1.0	umho/cm	0	10
8998023	Nitrate (N)	2023/10/25	98	80 - 120	100	80 - 120	ND, RDL=0.10	mg/L	NC	20
8998333	Total Dissolved Solids	2023/10/25			102	90 - 110	ND, RDL=10	mg/L	0	20
8999278	Dissolved Organic Carbon	2023/10/27	NC	80 - 120	93	80 - 120	ND, RDL=0.4	mg/L	2.1	20

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QUALITY ASSURANCE REPORT(CONT'D)

			Matrix Spike		SPIKED BLANK		Method Blank		RPD	
QC Batch	Parameter	Date	% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
9000852	Total Chemical Oxygen Demand (COD)	2023/10/25	90	80 - 120	97	80 - 120	ND, RDL=4.0	mg/L	2.6	20
9001740	Total Ammonia-N	2023/10/26	100	75 - 125	102	80 - 120	ND, RDL=0.050	mg/L	NC	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) The recovery in the matrix spike was not calculated (NC). Because of the high concentration of this analyte in the parent sample, the relative difference between the spiked and unspiked concentrations is not sufficiently significant to permit a reliable recovery calculation.

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VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

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Custody Tracking Form

T781220

Please use this form for custody tracking when submitting the work instructions via eCOC (electronic Chain of Custody). Please ensure your form has a barcode or a Bureau Veritas eCOC confirmation number in the top right hand side. This number links your electronic submission to your samples. This form should be placed in the cooler with your samples.

First Sample: HR1-03
Last Sample: HR-QAQC-GW1
Sample Count: 11

Relinquished By				Received By			
Brad McCallum	Brad McCal	Date	2023/10/18	RAVNEET KAUR BRAR	Ravneet	Date	2023/10/19
		Time (24 HR)	08:00			Time (24 HR)	10:36
Print	Sign	Date	YYYY/MM/DD	Print	Sign	Date	YYYY/MM/DD
		Time (24 HR)	HH:MM			Time (24 HR)	HH:MM
Print	Sign	Date	YYYY/MM/DD	Print	Sign	Date	YYYY/MM/DD
		Time (24 HR)	HH:MM			Time (24 HR)	HH:MM

Unless otherwise agreed to, submissions and use of services are governed by Bureau Veritas' standard terms and conditions which can be found at www.bvna.com.

Triage Information

Sampled By (Print): Brad McCallum / Matt DeGeer

# of Coolers/Pkgs: 2

Rush ☐ Micro ☐ Immediate Test ☐ Food Residue ☐ Food Chemistry ☐

*** LABORATORY USE ONLY ***

Received At

Labeled By

Verified By

Lab Comments:

Custody Seal		Cooling Media	Temperature °C		
Present (Y/N)	Intact (Y/N)	Present (Y/N)	1	2	3
Y	Y	Y	3	4	4
Y	Y	Y	5	4	3

Drinking Water Metals Preservation Check Done (Circle) **YES** **NO**

19-Oct-23 10:36
Christine Gripton
C3W5762
JDK ENV-1492

COR FCD-00383/4

Page 1 of 1

Appendix D

D-3 Surface Water Laboratory Reports

AGAT Laboratories

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

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
4 Cataraqui Street
Kingston, ON K7K1Z7
(613) 531-2725

ATTENTION TO: Carolyn Miller

PROJECT: 230225-05

AGAT WORK ORDER: 23T021607

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: May 17, 2023

PAGES (INCLUDING COVER): 7

VERSION*: 1

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

*Notes

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021607

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Surface Water Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

		SAMPLE DESCRIPTION:		HR-SW1	HR-SW2	HR-SW3	HR-SW4	HR-QAQC-SW1
		SAMPLE TYPE:		Water	Water	Water	Water	Water
		DATE SAMPLED:		2023-05-03 15:12	2023-05-03 14:58	2023-05-03 14:38	2023-05-03 15:20	2023-05-03 14:38
Parameter	Unit	G / S	RDL	4965579	4965634	4965635	4965636	4965637
BOD (5)	mg/L		2	<2	<2	<2	<2	<2
pH	pH Units		NA	7.21	7.03	6.75	6.50	6.69
Alkalinity (as CaCO3)	mg/L		5	29	17	13	<5	11
Electrical Conductivity	µS/cm		2	67	49	45	25	45
Hardness (as CaCO3) (Calculated)	mg/L		0.5	27.3	16.7	18.0	7.9	19.2
Total Dissolved Solids	mg/L		10	52	50	52	40	56
Total Suspended Solids	mg/L		10	<10	<10	<10	<10	<10
Chloride	mg/L		0.10	0.39	0.38	0.44	0.36	0.45
Nitrate as N	mg/L		0.05	0.18	0.07	<0.05	<0.05	<0.05
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L		0.10	4.67	4.18	4.76	3.85	4.75
Ammonia as N	mg/L		0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ammonia-Un-ionized (Calculated)	mg/L		0.000002	<0.000002	<0.000002	<0.000002	<0.000002	<0.000002
Total Kjeldahl Nitrogen	mg/L		0.10	0.21	<0.10	0.32	0.18	0.36
Total Phosphorus	mg/L		0.02	<0.02	<0.02	0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L		5	<5	<5	<5	<5	30
Total Calcium	mg/L		0.20	9.50	5.45	6.17	2.14	6.38
Total Magnesium	mg/L		0.10	0.86	0.76	0.63	0.62	0.79
Total Potassium	mg/L		0.50	0.52	1.10	0.53	0.81	<0.50
Total Sodium	mg/L		0.10	0.77	0.89	0.57	0.57	1.21
Aluminum-dissolved	mg/L		0.004	0.095	0.052	0.071	0.062	0.079
Total Aluminum	mg/L		0.010	0.070	0.041	0.125	0.090	0.167
Total Barium	mg/L		0.002	0.013	0.012	0.013	0.011	0.018
Total Boron	mg/L		0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Total Cobalt	mg/L		0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Total Copper	mg/L		0.001	0.001	0.002	0.001	0.001	0.001
Total Iron	mg/L		0.010	0.023	0.186	0.079	0.038	0.136
Total Lead	mg/L		0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Manganese	mg/L		0.002	<0.002	0.003	0.017	<0.002	0.050

Certified By:

AGAT Laboratories

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

Certificate of Analysis

AGAT WORK ORDER: 23T021607

PROJECT: 230225-05

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

Surface Water Parameters

DATE RECEIVED: 2023-05-05

DATE REPORTED: 2023-05-17

				SAMPLE DESCRIPTION:	HR-SW1	HR-SW2	HR-SW3	HR-SW4	HR-QAQC-SW1
				SAMPLE TYPE:	Water	Water	Water	Water	Water
				DATE SAMPLED:	2023-05-03 15:12	2023-05-03 14:58	2023-05-03 14:38	2023-05-03 15:20	2023-05-03 14:38
Parameter	Unit	G / S	RDL		4965579	4965634	4965635	4965636	4965637
Total Zinc	mg/L		0.020		<0.020	<0.020	<0.020	<0.020	<0.020
Lab Filtration Aluminum Dissolved					2023/05/09	2023/05/09	2023/05/09	2023/05/09	2023/05/09

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

4965579-4965637 Dissolved Aluminum analysis completed on a lab filtered sample.

The calculation of Un-ionized Ammonia: was based on field measured parameters (pH and temperature); Value is reported as calculated.

Un-ionized Ammonia detection limit is a calculated RDL

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
AGAT WORK ORDER: 23T021607
PROJECT: 230225-05
ATTENTION TO: Carolyn Miller
SAMPLING SITE:Hickey Road
SAMPLED BY:

Water Analysis

RPT Date: May 17, 2023

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
Surface Water Parameters															
BOD (5)	4964639		4	4	NA	< 2	102%	75%	125%						
pH	4965913		7.58	7.48	1.3%	NA	103%	90%	110%						
Alkalinity (as CaCO3)	4965913		43	41	4.8%	< 5	96%	80%	120%						
Electrical Conductivity	4965913		210	211	0.5%	< 2	108%	90%	110%						
Total Dissolved Solids	4966062		452	468	3.5%	< 10	102%	80%	120%						
Total Suspended Solids	4965528		<10	<10	NA	< 10	98%	80%	120%						
Chloride	4968526		168	169	0.6%	< 0.10	97%	70%	130%	103%	80%	120%	NA	70%	130%
Nitrate as N	4968526		<0.05	<0.05	NA	< 0.05	98%	70%	130%	97%	80%	120%	95%	70%	130%
Nitrite as N	4968526		<0.05	<0.05	NA	< 0.05	94%	70%	130%	97%	80%	120%	97%	70%	130%
Sulphate	4968526		27.5	27.6	0.4%	< 0.10	101%	70%	130%	101%	80%	120%	97%	70%	130%
Ammonia as N	4965579	4965579	<0.02	<0.02	NA	< 0.02	106%	70%	130%	103%	80%	120%	98%	70%	130%
Total Kjeldahl Nitrogen	4964678		<0.10	<0.10	NA	< 0.10	102%	70%	130%	97%	80%	120%	95%	70%	130%
Total Phosphorus	4968519		0.02	<0.02	NA	< 0.02	94%	70%	130%	98%	80%	120%	97%	70%	130%
Chemical Oxygen Demand	4965954		19	20	NA	< 5	99%	80%	120%	106%	90%	110%	107%	70%	130%
Total Calcium	4965521		1.53	1.71	11.1%	< 0.20	92%	70%	130%	92%	80%	120%	90%	70%	130%
Total Magnesium	4965521		0.24	0.21	NA	< 0.10	85%	70%	130%	100%	80%	120%	84%	70%	130%
Total Potassium	4965521		<0.50	0.65	NA	< 0.50	98%	70%	130%	96%	80%	120%	110%	70%	130%
Total Sodium	4965521		1.43	1.69	16.7%	< 0.10	90%	70%	130%	103%	80%	120%	87%	70%	130%
Aluminum-dissolved	4965579	4965579	0.095	0.078	19.7%	< 0.004	88%	70%	130%	102%	80%	120%	101%	70%	130%
Total Aluminum	4965521		0.125	0.115	8.3%	< 0.010	97%	70%	130%	99%	80%	120%	87%	70%	130%
Total Barium	4965521		0.012	0.013	8.0%	< 0.002	98%	70%	130%	105%	80%	120%	112%	70%	130%
Total Boron	4965521		0.013	0.014	NA	< 0.010	102%	70%	130%	105%	80%	120%	111%	70%	130%
Total Cobalt	4965521		<0.0005	<0.0005	NA	< 0.0005	94%	70%	130%	103%	80%	120%	99%	70%	130%
Total Copper	4965521		0.001	<0.001	NA	< 0.001	97%	70%	130%	98%	80%	120%	94%	70%	130%
Total Iron	4965521		0.085	0.084	1.1%	< 0.010	96%	70%	130%	103%	80%	120%	102%	70%	130%
Total Lead	4965521		<0.001	<0.001	NA	< 0.001	108%	70%	130%	118%	80%	120%	105%	70%	130%
Total Manganese	4965521		0.003	0.005	NA	< 0.002	95%	70%	130%	99%	80%	120%	95%	70%	130%
Total Zinc	4965521		<0.020	<0.020	NA	< 0.020	106%	70%	130%	101%	80%	120%	122%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
Surface Water Parameters															
Total Phosphorus	4965636	4965636	<0.02	0.02	NA	< 0.02	97%	70%	130%	103%	80%	120%	101%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

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Quality Assurance

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.
AGAT WORK ORDER: 23T021607
PROJECT: 230225-05
ATTENTION TO: Carolyn Miller
SAMPLING SITE:Hickey Road
SAMPLED BY:

Water Analysis (Continued)

RPT Date: May 17, 2023			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Certified By:

AGAT Laboratories

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MISSISSAUGA, ONTARIO
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Method Summary

CLIENT NAME: BLUMETRIC ENVIRONMENTAL INC.

AGAT WORK ORDER: 23T021607

PROJECT: 230225-05

ATTENTION TO: Carolyn Miller

SAMPLING SITE:Hickey Road

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
BOD (5)	INOR-93-6006	Modified from SM 5210 B	DO METER
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE
Electrical Conductivity	INOR-93-6000	modified from SM 2510 B	PC TITRATE
Hardness (as CaCO3) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540C,D	BALANCE
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	modified from SM 4500-NH3 H	LACHAT FIA
Ammonia-Un-ionized (Calculated)		MOE REFERENCE, PWQOs Tab 2	CALCULATION
Total Kjeldahl Nitrogen	INOR-93-6048	modified from EPA 351.2 and SM 4500-NORG D	LACHAT FIA
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Chemical Oxygen Demand	INOR-93-6042	modified from SM 5220 A and SM 5220 D	SPECTROPHOTOMETER
Total Calcium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Magnesium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Potassium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Total Sodium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Aluminum-dissolved	MET-93-6103	modified from EPA 200.8 and EPA 3005A	ICP-MS
Total Aluminum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Iron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Manganese	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Lab Filtration Aluminum Dissolved	SR-78-9001		FILTRATION

AGAT Laboratories

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

Chain of Custody Record

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

Laboratory Use Only

Work Order #: 23T021607

Cooler Quantity: 1 large

Arrival Temperatures: 7.2 | 7.1 | 6.9

Custody Seal Intact: ☐ Yes ☐ No ☑ N/A

Notes: bagged ice

Report Information:

Company: BluMetric
Contact: Carolyn Miller
Address: 4 Cataraqui St
Kingston, ON, K7K1Z7
Phone: 613-328-0243 Fax:
Reports to be sent to:
1. Email: cmiller@blumetric.ca
2. Email: cbandler@blumetric.ca

Regulatory Requirements:

(Please check all applicable boxes)

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

☐ Excess Soils R406
Table (Indicate One)

☐ Regulation 558

☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm
(Region)

☑ Prov. Water Quality Objectives (PWQO)

☐ Other
(Indicate One)

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

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

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

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

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

Project Information:

Project: 230225-05
Site Location: Hickey Road
Sampled By:
AGAT Quote #: 740800 PO: 230225-05
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact:
Address:
Email: ap@blumetric.ca

Sample Matrix Legend

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

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC (Y/N)	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs, Analyze F4G if required ☐ Yes ☐ No	O. Reg 153: PAHs	O. Reg 153: PCBs	O. Reg 153: VOC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 406: Excess Soils SPLP Rainwater Leach SPLP: ☐ Metals ☐ VOCs ☐ SVOCs	O. Reg 406: Excess Soils Characterization Package pH, ICPMS Metals, BTEX, F1-F4	Salt - EC/SAR	93-263 Surface water	121-405 BOD		Field Temp		Field pH		Potentially Hazardous or High Concentration (Y/N)
HR-SW1	May 3, 2023	15:12 AM/PM	7	SW		N											☑	☑		6.6		6.83		
HR-SW2	May 3, 2023	14:58 AM/PM	7	SW		N											☑	☑		6.5		6.99		
HR-SW3	May 3, 2023	14:38 AM/PM	7	SW	Lab Filter: Diss. Aluminium	N											☑	☑		6.4		6.05		
HR-SW4	May 3, 2023	15:20 AM/PM	7	SW		N											☑	☑		5.3		6.64		
HR-QAQC-SW1	May 3, 2023	14:38 AM/PM	7	SW		N											☑	☑		6.4		6.05		
		AM/PM																						
		AM/PM																						
		AM/PM																						
		AM/PM																						
		AM/PM																						
		AM/PM																						

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Brad McCallum Brad McCallum	May 4, 2023	8:00	[illegible]	May 5	8:40 am

Page 1 of 1

N°:

Appendix D

D-4 QAQC Calculations

2023 Groundwater Sampling Quality Assurance and Quality Control
(Spring)

Sample Description		MDL	HR3-03	HR-QAQC-GW1 (HR3-03)	Relative Percent Difference
Date Sampled			3-May-23	3-May-23	
Parameter	Unit				
pH	pH Units	NA	7.05	7.17	NA
Alkalinity (as CaCO3)	mg/L	5	69	66	4%
Electrical Conductivity	uS/cm	2	255	252	1%
Total Dissolved Solids	mg/L	10	154	148	4%
Chloride	mg/L	0.10	29.3	29.6	1%
Nitrate as N	mg/L	0.05	1.84	1.85	1%
Sulphate	mg/L	0.10	4.6	4.53	2%
Ammonia as N	mg/L	0.18	<0.02	<0.02	NA
Chemical Oxygen Demand	mg/L	5	<5	<5	NA
Dissolved Organic Carbon	mg/L	0.5	1.7	1.5	NA
Dissolved Calcium	mg/L	0.05	34.2	35.1	3%
Dissolved Magnesium	mg/L	0.05	1.23	1.2	2%
Dissolved Potassium	mg/L	0.50	1.75	1.72	NA
Dissolved Sodium	mg/L	0.05	12.6	12.6	0%
Dissolved Aluminum	mg/L	0.004	0.013	0.02	NA
Dissolved Barium	mg/L	0.002	0.067	0.067	0%
Dissolved Beryllium	mg/L	0.001	<0.0005	<0.0005	NA
Dissolved Boron	mg/L	0.010	0.013	0.011	NA
Dissolved Cadmium	mg/L	0.0001	<0.0001	<0.0001	NA
Dissolved Chromium	mg/L	0.003	<0.002	<0.002	NA
Dissolved Cobalt	mg/L	0.0005	0.0046	0.0042	9%
Dissolved Copper	mg/L	0.002	0.001	0.001	NA
Dissolved Iron	mg/L	0.10	0.012	<0.01	NA
Dissolved Lead	mg/L	0.001	<0.0005	<0.0005	NA
Dissolved Manganese	mg/L	0.002	0.02	0.018	11%
Dissolved Molybdenum	mg/L	0.002	<0.002	<0.002	NA
Dissolved Nickel	mg/L	0.001	<0.001	<0.001	NA
Dissolved Silicon	mg/L	0.05	3.44	3.47	1%
Dissolved Silver	mg/L	0.0001	<0.0001	<0.0001	NA
Dissolved Strontium	mg/L	0.005	0.093	0.087	7%
Dissolved Thallium	mg/L	0.0003	<0.0003	<0.0003	NA
Dissolved Titanium	mg/L	0.002	<0.002	0.002	NA
Dissolved Vanadium	mg/L	0.002	<0.002	<0.002	NA
Dissolved Zinc	mg/L	0.005	<0.005	<0.005	NA

Yellow shading indicates RPD value is above the percentage for a high level of reproducibility:

10% for electrical conductivity

20% for metals and inorganics

30% for BTEX and PHC.

2023 Groundwater Sampling Quality Assurance and Quality Control
(Fall)

Sample Description		MDL	HR5-10	HR-QAQC GW-F22	Relative Percent Difference
Date Sampled			17-Oct-23	17-Oct-23	
Parameter	Unit				
pH	pH Units	NA	7.17	7.13	NA
Alkalinity (as CaCO3)	mg/L	5	29	30	3%
Electrical Conductivity	uS/cm	2	80	80	0%
Total Dissolved Solids	mg/L	10	80	70	13%
Chloride	mg/L	0.10	5.9	1.3	128%
Nitrate as N	mg/L	0.05	0.22	0.22	NA
Sulphate	mg/L	0.10	5.5	5.5	0%
Ammonia as N	mg/L	0.18	0.075	0.06	NA
Chemical Oxygen Demand	mg/L	5	8.6	9.9	NA
Dissolved Organic Carbon	mg/L	0.5	1.3	1.3	NA
Dissolved Calcium	mg/L	0.05	11	11	0%
Dissolved Magnesium	mg/L	0.05	1.1	1.1	0%
Dissolved Potassium	mg/L	0.50	1	1	NA
Dissolved Sodium	mg/L	0.05	2.9	2.8	4%
Dissolved Aluminum	mg/L	0.004	0.0069	0.0066	NA
Dissolved Barium	mg/L	0.002	0.013	0.013	0%
Dissolved Beryllium	mg/L	0.001	<0.0004	<0.0004	NA
Dissolved Boron	mg/L	0.010	0.01	0.01	NA
Dissolved Cadmium	mg/L	0.0001	<0.00009	<0.00009	NA
Dissolved Chromium	mg/L	0.003	<0.005	<0.005	NA
Dissolved Cobalt	mg/L	0.0005	<0.0005	<0.0005	NA
Dissolved Copper	mg/L	0.002	<0.0009	<0.0009	NA
Dissolved Iron	mg/L	0.10	<0.1	<0.1	NA
Dissolved Lead	mg/L	0.001	<0.0005	<0.0005	NA
Dissolved Manganese	mg/L	0.002	0.003	0.0027	NA
Dissolved Molybdenum	mg/L	0.002	<0.0005	<0.0005	NA
Dissolved Nickel	mg/L	0.001	<0.001	<0.001	NA
Dissolved Silicon	mg/L	0.05	4.6	4.5	2%
Dissolved Silver	mg/L	0.0001	<0.00009	<0.00009	NA
Dissolved Strontium	mg/L	0.005	0.07	0.068	3%
Dissolved Thallium	mg/L	0.0003	<0.00005	<0.00005	NA
Dissolved Titanium	mg/L	0.002	<0.005	<0.005	NA
Dissolved Vanadium	mg/L	0.002	<0.0005	<0.0005	NA
Dissolved Zinc	mg/L	0.005	<0.005	<0.005	NA

Yellow shading indicates RPD value is above the percentage for a high level of reproducibility:
10% for electrical conductivity
20% for metals and inorganics
30% for BTEX and PHC.

2023 Surface Water Sampling Quality Assurance and Quality Control
(Spring)

Sample Description		MDL	HR-SW3	HR-QAQC-SW1 (HR-SW3)	Relative Percent Difference
Date Sampled			3-May-23	3-May-23	
Parameter	Unit				
pH	pH Units	0.01	6.75	6.69	1%
Alkalinity (as CaCO3)	mg/L	5	13	11	NA
Electrical Conductivity	uS/cm	2	45	45	0%
Hardness (as CaCO3) (Calculate	mg/L	0.5			NA
Total Dissolved Solids	mg/L	10	52	56	7%
Total Suspended Solids	mg/L	10	<10	<10	NA
Chloride	mg/L	0.10	0.44	0.45	NA
Nitrate as N	mg/L	0.05	<0.05	<0.05	NA
Nitrite as N	mg/L	0.05	<0.05	<0.05	NA
Sulphate	mg/L	0.10	4.76	4.75	0%
Ammonia as N	mg/L	0.02	<0.02	<0.02	NA
Total Kjeldahl Nitrogen	mg/L	0.10	0.32	0.36	NA
Total Phosphorus	mg/L	0.02	0.02	<0.02	NA
Chemical Oxygen Demand	mg/L	5	<5	30	NA
Total Calcium	mg/L	0.32	6.17	6.38	3%
Total Magnesium	mg/L	0.34	0.63	0.79	NA
Total Potassium	mg/L	1.15	0.53	<0.5	NA
Total Sodium	mg/L	0.45	0.57	1.21	NA
Aluminum-dissolved	mg/L	0.004	0.071	0.079	11%
Total Aluminum	mg/L	0.01	0.125	0.167	29%
Total Barium	mg/L	0.002	0.013	0.018	32%
Total Boron	mg/L	0.010	<0.01	<0.01	NA
Total Cobalt	mg/L	0.0005	<0.0005	<0.0005	NA
Total Copper	mg/L	0.002	0.001	0.001	NA
Total Iron	mg/L	0.010	0.079	0.136	53%
Total Lead	mg/L	0.001	<0.001	<0.001	NA
Total Manganese	mg/L	0.002	0.017	0.05	99%
Total Zinc	mg/L	0.020	<0.02	<0.02	NA
Biochemical Oxygen Demand,	mg/L	2	<2	<2	NA

Yellow shading indicates RPD value is above the percentage for a high level of reproducibility:

10% for electrical conductivity

20% for metals and inorganics

30% for BTEX and PHC.

Appendix E

Historical Groundwater and Surface Water Chemistry

Appendix E

E-1 Historical Groundwater Chemistry

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03
						Sample Date	2003-May-23	2003-Sep-30	2006-May-10	2006-Nov-20	2007-May-03	2008-May-08	2008-Oct-09	2009-Jun-04	2009-Oct-21	2010-May-18	2010-Oct-19	2011-May-19	2012-Apr-16	2013-Apr-16	2014-May-12	2015-May-05
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	4.17	7	-	-	3	1	1	2	1	2	<1	31	2	1.52	1.3	1.06
Fluoride	mg/L	-	1.5	-	-	0.01	-	0.59	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.05	1.83	<0.1	<0.1	<0.1	<0.1	0.23	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	0.12	<0.05	0.1
Sulphate	mg/L	-	500	-	-	0.1	9.52	49	8	31	12	8	11	10	12	11	12	12	6	15.1	6.8	12.5
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	12.2	85	10	18	31	12	19	12	20	27	24	22	13.3	28.7	9.61	28.1
Magnesium (diss)	mg/L	-	-	-	-	0.05	0.87	9	1	2	2	<1	2	2	4	3	2	2	995	2.29	0.73	2.74
Potassium (diss)	mg/L	-	-	-	-	0.05	0.69	4	2	2	1	<1	1	1	1	<1	<1	<1	752	1.27	0.87	1.12
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	1.26	18	<2	<2	<2	<2	<2	2	<2	2	<2	<2	1.12	2.93	1.33	1.39
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	38	215	22	46	75	29	54	31	64	81	71	57	36	65	20	67
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	-	-	-	0.06	0.03	<0.02	<0.02	0.02	0.03	<0.02	<0.02	0.02	0.14	0.02	<0.02
Chemical Oxygen Demand	mg/L	-	-	-	-	4	19	-	-	-	<5	16	25	15	34	25	30	18	61	8	<5	9
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	2.7	-	-	-	5.7	5.8	9.3	7.7	14.6	8.6	11.9	5.2	6.3	2.2	5.6	3.1
Electrical Conductivity	uS/cm	-	-	-	-	1	84	481	64	123	171	78	135	90	153	190	166	133	103	168	64	168
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.16	7.02	6.71	6.63	6.67	7.38	6.9	6.73	6.87	7.84	6.89	7.34	7.1	7.52	7.18	7.69
Total Dissolved Solids	mg/L	314	500	-	-	10	84	-	-	-	111	51	88	59	100	123	108	86	133	118	90	120
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.018	0.01	0.05	0.06	0.02	0.03	0.03	0.04	0.01	<0.01	0.02	0.01	0.02	0.02	0.02	0.01
Antimony (diss)	mg/L	-	0.006	-	0.02		-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.017	0.05	<0.01	0.01	0.04	0.02	0.02	0.03	0.04	0.04	0.03	0.02	0.02	0.04	0.02	0.04
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.0005	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	<0.01	0.1	0.01	0.01	0.02	<0.01	0.01	0.01	0.01	<0.01	0.01	<0.01	<0.01	0.02	<0.01	0.01
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	0	<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	<0.002
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.002	0	<0.001	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0	<0.001	<0.001	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	0.01	<0.0002	0	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0	0	<0.0002	<0.0005	<0.001	<0.001	<0.001
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.001	0	0	0	0	0	0	<0.001	0	<0.001	0	<0.001	0	<0.003	<0.003	<0.003
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	0.034	0.03	<0.03	0.07	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.1	<0.01	<0.01	<0.01
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.0005	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.002	<0.002	<0.002
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	<0.002	1.98	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	0	<0.002	0
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0	<0.002	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.001	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.003	<0.003	<0.003
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	4.61	7.4	3.9	5.2	4	4.3	5.4	3.6	4.9	4.4	4.9	4.1	3.21	4.56	4.17	3.82
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	0	<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	<0.002
Strontium (diss)	mg/L	-	-	-	-	0.001	0.05	0.39	0.05	0.11	0.12	0.05	0.09	0.08	0.12	0.15	0.15	0.1	0.07	0.16	0.05	0.13
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.006	<0.006	<0.006
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.002	<0.002	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0	<0.001	<0.001	<0.001	<0.0005	<0.002	<0.002	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	0.005	0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR1-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03
						Sample Date	2016-Apr-27	2017-May-12	2017-Oct-24	2018-May-09	2019-May-08	2020-May-08	2021-Apr-22	2021-Oct-21	2022-May-02	2023-May-03	2003-Sep-30	2006-May-10	2006-Nov-20	2007-May-03	2007-Nov-22	2008-May-08
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	0.94	2.28	0.68	0.84	0.77	1.06	0.97	31.3	0.58	4.17	6	-	-	4	3	5
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.05	0.08	<0.05	<0.05	<0.05	<0.05	0.06	1.06	<0.05	<0.05	0.21	5.24	5.12	4.54	0.42	4.58
Sulphate	mg/L	-	500	-	-	0.1	7.05	7.91	11.4	2.1	5.08	7.51	7.07	7.16	8.89	9.52	45	88	51	44	26	48
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	10.5	10.5	24.3	15.4	9.16	8.43	18.6	33.8	27.7	12.2	85	72	64	51	51	62
Magnesium (diss)	mg/L	-	-	-	-	0.05	1.63	1.51	4.33	2.62	1.31	1.31	2.05	4.22	1.99	0.87	6	11	6	5	4	7
Potassium (diss)	mg/L	-	-	-	-	0.05	1.9	1.13	0.95	1.11	0.93	0.61	0.78	1.36	0.9	0.69	4	21	18	14	5	11
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	1.66	1.32	1.21	1.32	1.15	1.18	1.39	2.01	1.09	1.26	6	10	7	6	3	9
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	30	31	79	51	35	26	58	71	73	38	215	161	135	108	138	128
Ammonia as N	mg/L	-	-	-	-	0.02	0.07	<0.02	<0.02	0.04	<0.02	0.03	<0.02	0.1	<0.02	<0.02	-	-	-	0.04	0.07	<0.02
Chemical Oxygen Demand	mg/L	-	-	-	-	4	<5	<5	21	<5	<5	7	<5	12	<5	19	-	-	-	5	10	<5
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	2.7	1.8	14.1	2.1	2.6	1.7	3.1	1.9	2.6	2.7	-	-	-	9.6	10.9	6.8
Electrical Conductivity	uS/cm	-	-	-	-	1	74	86	155	107	68	79	124	245	165	84	481	547	437	350	322	406
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.5	7.77	7.62	6.83	6.57	6.68	7.06	6.35	6.86	7.16	6.86	6.86	6.71	6.42	6.88	7.12
Total Dissolved Solids	mg/L	314	500	-	-	10	76	72	92	58	72	60	150	178	114	84	-	-	-	228	209	264
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.03	0.01	0.01	0.01	0.02	0.02	0.023	0.04	0.007	0.018	<0.01	0.1	0.02	0.04	0.02	0.04
Antimony (diss)	mg/L	-	0.006	-	0.02		-	0.02	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.02	0.02	0.04	0.03	0.02	0.02	0.023	0.065	0.039	0.017	0.05	0.24	0.13	0.14	0.06	0.19
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	0.03	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.248	<0.01	<0.01	0.1	0.32	0.23	0.21	0.07	0.15
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.002	<0.001	<0.001	<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
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.001	0	0	0	<0.001	0
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.01	0.01	0.01	0.01	0	0.01
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.003	<0.003	<0.003	<0.003	0	<0.002	<0.002	<0.002	<0.002	<0.001	0	0.01	0	0.01	0	0.01
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.035	<0.01	<0.01	0.034	0.03	<0.03	<0.03	<0.03	0.04	<0.03
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	0	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	1.98	0.12	0.13	0.08	0.63	0.04
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	<0.0001	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	0	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.001	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	4.51	4.96	4.29	3.99	4.07	2.78	3.47	4.95	3.61	4.61	7.4	3.6	5.7	4.1	7.6	3
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (diss)	mg/L	-	-	-	-	0.001	0.05	0.06	0.12	0.08	0.05	0.04	0.082	0.15	0.139	0.05	0.39	0.4	0.29	0.18	0.21	0.26
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.006	<0.006	<0.006	<0.006	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.001	0	0	0	<0.0001	<0.0001
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.006	0.003	0.007	<0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	0	0	0	0	0
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.01	<0.01	<0.01	<0.01	<0.01	<0.01

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03	HR2-03
						Sample Date	2008-Oct-09	2009-Jun-04	2009-Oct-21	2010-May-18	2010-Oct-19	2011-May-19	2011-Nov-03	2012-Apr-16	2012-Oct-15	2013-Apr-16	2013-Oct-30	2014-May-12	2014-Oct-16	2016-Apr-27	2016-Oct-27	2017-May-12
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	3	19	9	11	8	32	5	12	9	9.39	5.52	52.9	8.56	74	4.48	52.3
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01
Nitrate as N	mg/L	3.4525	10	-	-	0.05	3.15	5.43	4.97	8.46	4.65	6.79	1.81	3.7	1.4	4.96	1.48	8.22	5.09	9.75	1.04	6.36
Sulphate	mg/L	-	500	-	-	0.1	47	54	33	48	40	43	21	34	57	40.2	33.1	47.3	36.3	84.2	35.8	56.1
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	49	60	43	55	50	64	54	40.4	51.3	65.7	70.2	74.9	52.4	94.1	67.2	62.9
Magnesium (diss)	mg/L	-	-	-	-	0.05	4	6	4	5	4	6	4	3.46	6.03	6.03	5.52	6.56	1.21	8.96	5.31	5.8
Potassium (diss)	mg/L	-	-	-	-	0.05	17	15	10	8	9	8	3	6.7	4.91	10.5	4.67	11.4	8.18	11.2	6.92	7.67
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	4	8	3	11	7	16	<2	14.8	3.15	8.09	3.45	15.7	9.91	39	5.92	30.2
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	107	111	99	113	104	122	129	120	178	138	147	113	100	164	164	129
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	0.02	<0.02	<0.02	0.02	0.04	0.02	0.05	0.09	<0.02	0.02	0.08	0.1	0.08	<0.02
Chemical Oxygen Demand	mg/L	-	-	-	-	4	20	15	17	18	8	28	20	21	98	8	12	10	10	31	23	14
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	8.8	6.5	5	5.5	5.6	7.3	3.6	6.2	6.7	3.8	2.2	4.6	3.1	7.3	3	4.5
Electrical Conductivity	uS/cm	-	-	-	-	1	353	442	340	434	355	511	305	405	460	405	369	561	396	754	416	625
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		6.6	6.57	6.71	7.61	6.48	7.28	6.54	6.9	6.4	7.17	7.21	7.01	6.75	7.47	7.92	7.91
Total Dissolved Solids	mg/L	314	500	-	-	10	229	287	221	282	231	332	198	345	243	262	266	358	<0.002	436	246	312
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.03	0.04	0.03	0.03	0.03	0.04	<0.01	0.03	0.01	0.03	0.02	0.04	0.02	0.05	0.16	0.05
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.16
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.17	0.22	0.13	0.16	0.12	0.17	0.05	0.12	0.1	0.11	0.07	0.16	0.1	0.24	0.09	0.16
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.17	0.2	0.12	0.11	0.11	0.11	0.04	0.2	0.07	0.31	0.07	0.15	0.09	0.22	0.06	0.14
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.001	0	0	<0.001	0	0	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0	0.01	0.01	0.01	0	0.01	0	0	0	0	0	0.01	0	0.01	0	0.01
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0	0.01	0	0	0	0.01	0	0	0	<0.003	<0.003	0	<0.003	0.01	<0.003	0.01
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	0.2	<0.01
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0.06	0.04	0.05	0.05	0.05	0.05	<0.01	0.03	0.12	0.05	0.03	0.06	0.04	0.11	0.19	0.03
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0005	0	<0.002	<0.002	<0.002	<0.002	0	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0	<0.004	<0.003	<0.003	<0.003	<0.003	<0.003	0	<0.003
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.94
Silicon (diss)	mg/L	-	-	-	-	0.05	5.3	3.7	5.7	3.6	5.4	3.8	7.7	3.53	5.21	4.13	5.99	3.44	5.05	3.07	5.69	2.94
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Strontium (diss)	mg/L	-	-	-	-	0.001	0.16	0.34	0.25	0.27	0.23	0.3	0.27	0.22	0.37	0.29	0.28	0.37	0.26	0.34	0.28	0.31
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	0	0	0	0	0	0	<0.0001	0	0	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	0.01	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.001	0	0	<0.001	<0.001	0	0	0	<0.0005	<0.002	<0.002	<0.002	234	<0.002	<0.002	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	0.01	0.05	<0.005	<0.005	0.05	<0.005	0.01

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR2-03	HR2-03	HR2-03	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR3-03
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR2-03	HR2-03	HR2-03	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR2-03R	QC GW-S21 (HR	HR2-03R	HR2-03R	HR2-03R	HR2-03R	HR3-03
						Sample Date	2017-Oct-24	2018-May-09	2018-Oct-23	2003-May-23	2019-May-08	2019-Oct-23	2020-May-08	2020-Oct-08	2021-Apr-22	2021-Apr-22	2021-Oct-21	2022-May-02	2022-Oct-20	2023-May-03	2023-Oct-17	2003-May-23
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	50.4	61.4	3.18	89.7	70.7	6.15	59.1	14.7	54.7	54.2	38.3	86.7	15.6	89.7	35	29.3
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	2.62	8.56	0.75	<0.05	2.16	0.1	<0.25	<0.05	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.1	1.84
Sulphate	mg/L	-	500	-	-	0.1	18.4	5.4	22.3	26.8	35	23	35.4	23.7	26	26.3	10.9	26.9	24.8	26.8	7.3	4.6
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	55.1	61.5	45.2	99.6	76	39.9	73.1	44.6	72	72.7	90.9	93.8	57	99.6	57	34.2
Magnesium (diss)	mg/L	-	-	-	-	0.05	3.81	4.76	3.8	13.1	6.92	3.44	6.31	3.82	6.85	6.87	7.15	6.94	4.67	13.1	4.8	1.23
Potassium (diss)	mg/L	-	-	-	-	0.05	13.1	19.6	6.44	37.6	15.7	5.99	15.9	6.38	14.5	14.3	11.8	12.5	6.85	37.6	16	1.75
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	18.2	31.9	5.94	69.9	42	6.81	33.3	9.95	45.6	45.3	26.6	33.7	15.3	69.9	23	12.6
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	131	138	113	403	245	130	226	140	243	232	274	229	148	403	170	69
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	0.08	<0.02	5.3	<0.02	0.06	0.08	0.04	0.21	0.26	0.33	0.18	0.32	5.3	1.8	<0.02
Chemical Oxygen Demand	mg/L	-	-	-	-	4	14	<5	<5	168	15	<5	47	11	48	51	35	43	11	168	26	<5
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	8	5.4	3.5	62.5	8.2	2.5	15.4	3.1	25.8	24.9	15.1	14.9	4.5	62.5	7.8	1.7
Electrical Conductivity	uS/cm	-	-	-	-	1	420	563	325	1080	706	292	811	312	688	682	679	762	400	1080	490	255
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.76	7.11	7.78	6.83	6.73	7.56	6.51	7.65	6.81	6.86	6.54	6.65	7.05	6.83	7.42	7.05
Total Dissolved Solids	mg/L	314	500	-	-	10	254	328	192	638	410	178	360	170	354	348	390	444	222	638	260	154
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.02	0.05	0.01	0.205	0.06	0.36	0.16	0.03	0.092	0.088	0.096	0.081	0.063	0.205	0.046	0.013
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.13	0.26	0.07	0.391	0.23	0.07	0.19	0.06	0.167	0.162	0.149	0.186	0.068	0.391	0.13	0.067
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	0.26	<0.001	<0.0005	0	<0.0005	<0.001	<0.01	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0004	<0.0005
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.14	0.19	0.05	0.162	0.12	0.06	0.11	0.06	0.152	0.156	0.191	0.1	0.071	0.162	0.085	0.013
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.001	0	<0.0001	<0.0001	0	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	0.01	<0.003	<0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	<0.003	<0.002	<0.002	<0.005	<0.002
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0	0.01	0	0.0531	0.01	0.01	0.04	0.01	0.0281	0.0278	0.0135	0.0173	0.0042	0.0531	0.006	0.0046
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0	0	<0.003	0.001	0.01	0.01	0	0	<0.002	<0.002	<0.002	<0.002	<0.001	0.001	<0.0009	0.001
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	<0.01	<0.01	<0.01	46.3	<0.01	1.47	33.5	5.89	29.5	29	30.1	13.9	8.58	46.3	17	0.012
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.002	<0.001	<0.001	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0.03	0.04	0.05	4.11	0.16	0.71	2.14	0.49	1.36	1.36	1.07	2.04	0.918	4.11	2.4	0.02
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.003	<0.003	<0.003	0.009	<0.003	0	0.01	0	0.009	0.008	0.003	0.008	0.002	0.009	<0.001	<0.001
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	4.04	4.43	5.34	5.09	3.24	5.88	3.69	6.27	5.29	5.58	7.21	4.55	6.49	5.09	7.8	3.44
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.002	<0.002	<0.0001	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.00009	<0.0001
Strontium (diss)	mg/L	-	-	-	-	0.001	0.24	0.34	0.22	0.448	0.38	0.19	0.32	0.21	0.372	0.362	0.479	0.535	0.3	0.448	0.23	0.093
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.006	<0.006	<0.006	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	<0.002	<0.002	0.005	<0.002	0.03	0	<0.002	<0.002	0.006	<0.002	0.01	0.005	0.005	<0.005	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	0.007	<0.002	<0.002	0	<0.002	0.002	0.004	0.004	0.002	<0.002	0.007	0.0034	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	0.01	0.01	0.01	<0.005	0.02	0.01	0.01	<0.005	0.005	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	QAQC-GW1 (HR3	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03
						Sample Date	2003-May-23	2003-Sep-30	2006-May-10	2006-Nov-20	2007-May-03	2007-Nov-22	2008-May-08	2008-Oct-09	2009-Jun-04	2009-Oct-21	2010-May-18	2010-Oct-19	2011-May-19	2011-Nov-03	2012-Apr-16	2012-Oct-15
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	29.6	7	-	-	6	2	7	1	4	2	7	6	34	6	24	8
Fluoride	mg/L	-	1.5	-	-	0.01	-	0.47	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	1.85	1.83	2.97	<0.1	2.96	0.19	1.87	0.17	1	1.35	4.82	1.88	1.98	0.61	2.6	0.7
Sulphate	mg/L	-	500	-	-	0.1	4.53	49	20	33	35	17	27	21	25	13	27	20	10	14	11	12
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	35.1	35	47	15	40	18	43	18	39	21	37	33	47	26	30.4	10.3
Magnesium (diss)	mg/L	-	-	-	-	0.05	1.2	3	2	1	3	2	2	2	2	2	3	3	2	2	1.88	1.88
Potassium (diss)	mg/L	-	-	-	-	0.05	1.72	4	3	2	3	2	4	2	2	2	3	3	3	3	3.06	1.75
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	12.6	18	3	<2	4	<2	7	2	4	3	4	3	5	9	8.72	6.89
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	66	69	98	37	71	51	81	36	88	56	75	79	84	65	60	45
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	-	-	-	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.02	<0.01
Chemical Oxygen Demand	mg/L	-	-	-	-	4	<5	-	-	-	<5	<5	5	10	13	12	10	5	10	30	3.7	2.4
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	1.5	-	-	-	5.6	3.8	3	3.1	3.3	2.9	3.5	3.4	2.4	2.9	17	25
Electrical Conductivity	uS/cm	-	-	-	-	1	252	247	295	111	256	143	257	128	250	159	270	231	320	171	278	151
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.17	7.02	7.14	6.67	6.38	6.85	7.19	6.91	7	6.9	7.74	6.92	7.2	6.41	6.5	6.4
Total Dissolved Solids	mg/L	314	500	-	-	10	148	-	-	-	166	93	167	83	163	103	176	150	208	111	250	89
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.02	<0.01	0.03	<0.01	0.02	0.02	0.02	0.01	0.01	<0.01	<0.01	0.01	0.01	0.23	0.01	0
Antimony (diss)	mg/L	-	0.006	-	0.02		-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.067	0.05	0.1	0.04	0.14	0.05	0.17	0.04	0.09	0.06	0.14	0.07	0.15	0.05	0.18	0.04
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.011	0.01	0.05	0.03	0.03	0.01	0.03	0.06	0.05	0.03	0.04	0.04	0.02	0.02	0.03	0.02
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<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
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.002	<0.001	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0	<0.001	<0.001	<0.001
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.0042	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0.001	0	0	0	0.01	0	0	0	0	0	0	0	0	0	0	0
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	<0.01	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.37	<0.1	<0.1
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.0005	0	<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	<0.0001
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0.018	0.01	0.05	<0.01	0.02	<0.01	0.04	<0.01	0.03	<0.01	0.02	<0.01	0.02	<0.01	0.02	<0.005
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<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	<0.0005	<0.001
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.001	<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	<0.001
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	3.47	4.3	4	4.6	5.3	5.2	4.6	3.7	3.1	4.7	4	4.7	4.1	4.2	3.91	3.2
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<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
Strontium (diss)	mg/L	-	-	-	-	0.001	0.087	0.12	0.13	0.05	0.12	0.06	0.12	0.06	0.12	0.08	0.13	0.11	0.14	0.06	0.13	0.06
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.001	<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
Titanium (diss)	mg/L	-	-	-	-	0.002	0.002	<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	<0.005	<0.005
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.001	0	<0.001	0	0	0	<0.001	<0.001	0	<0.001	<0.001	<0.001	0	0	<0.0005
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<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	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	AQC GW-S19 (HF	HR3-03	HR3-03
						Sample Date	2013-Apr-16	2013-Oct-30	2014-May-12	2014-Oct-16	2015-May-05	2015-Oct-27	2016-Apr-27	2016-Oct-27	2017-May-12	2017-Oct-24	2018-May-09	2018-Oct-23	2019-May-08	2019-May-08	2019-Oct-23	2020-May-08
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	5.79	4.64	34	8.56	16.8	36.1	137	1.52	21.1	2.77	49.2	0.92	43.3	43.3	1.26	32
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	1.19	0.38	1.43	0.68	1.43	1.46	0.81	0.16	0.29	0.26	0.76	0.09	2.97	2.9	0.4	2.62
Sulphate	mg/L	-	500	-	-	0.1	15.5	10.1	10.5	16.9	15.1	14.7	4.08	10.5	16.5	17.6	2.5	9.74	2.7	2.64	12.4	22.6
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	29.1	14.4	30.1	16.8	23.1	28.7	40.9	6.6	24.8	19.4	42.9	9.86	28.3	28.6	8.73	37
Magnesium (diss)	mg/L	-	-	-	-	0.05	3.47	1.37	1.31	1.21	1.6	2.77	1.95	0.53	1.17	1.43	2.74	0.7	1.26	1.24	0.64	2.31
Potassium (diss)	mg/L	-	-	-	-	0.05	2.49	2.09	2.87	2.26	2.73	2.41	3.75	1.34	1.7	1.65	1.94	1.43	1.65	1.66	1.23	1.44
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	8.66	8.95	15.6	14.4	17.1	14.7	55.9	11.5	16.6	6.42	13	8.59	16.6	16.8	8	8.98
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	71	42	54	52	61	51	57	36	69	53	84	36	72	72	34	73
Ammonia as N	mg/L	-	-	-	-	0.02	0.19	<0.02	<0.02	0.1	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	<0.02
Chemical Oxygen Demand	mg/L	-	-	-	-	4	<5	5	<5	7	<5	<5	<5	<5	6	<5	<5	<5	<5	<5	<5	5
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	1.6	1.6	2	2.3	3.5	2.8	2.3	2.3	2.2	2.6	2.5	5.4	1.6	1.6	2.1	2.2
Electrical Conductivity	uS/cm	-	-	-	-	1	198	122	259	180	219	260	553	102	262	138	324	111	273	276	97	359
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.61	7.08	7.14	6.65	6.96	7.13	7.49	7.28	7.74	7.43	7.08	7.32	6.59	6.57	7.11	6.51
Total Dissolved Solids	mg/L	314	500	-	-	10	128	94	158	106	128	162	322	56	128	94	194	70	172	180	62	176
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.03	0.01	0.01	0.05	0.02
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	0.11	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	<0.001	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.04	0.03	0.14	0.07	0.14	0.06	0.3	0.02	0.11	0.06	0.16	0.03	0.11	0.11	0.03	0.11
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.16	<0.001	<0.0005	<0.0005	<0.0005	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.03	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.24	0.04	0.02	0.02	0.02	0.02	0.03	0.01
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0	<0.001	0	0	0	0	0.01	<0.001	0	0	0	<0.001	0	0	0	0
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.003	0	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0	0	0	0
Iron (diss)	mg/L	0.15375	0.3	0.3	-	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	<0.01	<0.01	0.01	<0.01
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0	0	0.02	0.01	0.01	0	0.04	<0.002	0.02	0.01	0.02	0	0.02	0.02	0	0.02
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	3.06	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	5.32	4.11	3.52	3.82	4.86	4.26	2.95	3.5	3.06	3.34	4.01	3.59	2.83	2.54	3.37	2.44
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (diss)	mg/L	-	-	-	-	0.001	0.1	0.05	0.1	0.07	0.1	0.11	0.15	0.03	0.07	0.07	0.13	0.04	0.09	0.09	0.04	0.11
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.0003	<0.0003	<0.0003	<0.0003
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	0.05	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	HR3-03	QAQC-GW1 (HR3	HR3-03	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10
						Sample Date	2020-Oct-08	2021-Apr-22	2021-Oct-21	2022-May-02	2022-Oct-20	2023-May-03	2023-May-03	2023-Oct-17	2003-May-23	2010-May-18	2010-Oct-19	2011-May-19	2011-Nov-03	2012-Apr-16	2012-Oct-15	2013-Apr-16
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	1.38	18.3	14.5	18.2	5.75	29.3	29.6	3.9	35.4	40	56	119	117	34	125	94.2
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	0.42	1.97	1.74	2.04	0.59	1.84	1.85	0.31	<0.05	<0.1	0.27	0.7	<0.1	6.6	<0.1	0.44
Sulphate	mg/L	-	500	-	-	0.1	7.56	7.74	10.4	10	8.97	4.6	4.53	7.2	10.6	39	50	56	91	57	63	76.2
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	10.7	31	20.5	34.2	20.2	34.2	35.1	11	83.6	85	74	93	107	52.5	56.4	84
Magnesium (diss)	mg/L	-	-	-	-	0.05	0.8	2.06	1.29	2.01	1.55	1.23	1.2	0.82	12.3	7	9	9	14	5.26	10.6	13.5
Potassium (diss)	mg/L	-	-	-	-	0.05	1.23	1.52	1.64	1.61	<0.5	1.75	1.72	1.1	41.9	14	16	18	25	18.5	25	33.9
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	8.71	9.74	12.1	13.7	10	12.6	12.6	9.2	54.8	23	42	58	63	52.5	87.1	85
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	43	71	58	88	57	69	66	34	477	248	228	231	288	237	301	292
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	0.07	<0.02	0.03	<0.02	<0.02	<0.05	21.7	3.49	3.2	2.51	2.82	2.02	3.29	0.65
Chemical Oxygen Demand	mg/L	-	-	-	-	4	<5	<5	<5	<5	<5	<5	<5	<4	88	65	33	53	88	53	145	40
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	2.1	2	2.2	2.4	2	1.7	1.5	2.5	35.6	20.1	11.9	14	22	15.2	30	13.1
Electrical Conductivity	uS/cm	-	-	-	-	1	102	232	194	268	161	255	252	100	954	692	705	963	1080	752	1050	986
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		6.75	6.79	6.57	6.76	7.14	7.05	7.17	7.33	7.24	7.65	6.92	7.16	6.69	6.7	6.5	7.49
Total Dissolved Solids	mg/L	314	500	-	-	10	54	114	112	204	84	154	148	90	474	450	458	626	702	540	564	572
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.02	0.008	0.027	0.021	<0.004	0.013	0.02	0.0058	0.037	0.02	<0.01	0.01	<0.01	0.01	0.01	0.02
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.03	0.101	0.096	0.098	0.027	0.067	0.067	0.023	0.528	0.32	0.17	0.32	0.35	0.26	0.39	0.32
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0004	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.02	0.02	0.049	0.012	0.023	0.013	0.011	0.024	0.4	0.28	0.25	0.22	0.23	0.26	0.38	0.38
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	0	<0.0001	<0.0001	<0.0001	<0.002
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	<0.002	<0.001	0	0.01	0	<0.001	0	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	0.0029	0.002	0.0037	0.0009	0.0046	0.0042	0.00071	0.0246	0.08	0.03	0.04	0.03	0.02	0.02	0.02
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0	0.002	0.003	0.002	0.003	0.001	0.001	0.0017	<0.001	<0.001	0	0.01	0	0.02	0	0.03
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	<0.1	42.2	61.4	4.42	7.51	9.83	0.11	3.05	0.77
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	0.0009	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.002
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	<0.002	0.01	0.007	0.015	0.002	0.02	0.018	<0.002	1.01	3.99	2.91	2.75	3.55	2.03	2.42	3.23
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.002	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.003	<0.003	<0.003	0.001	<0.001	<0.001	<0.001	<0.001	0.009	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	3.78	3.75	4.57	3.37	3.88	3.44	3.47	4.1	9.14	10	7.8	8.2	8	7.77	6.22	8.14
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002
Strontium (diss)	mg/L	-	-	-	-	0.001	0.04	0.088	0.076	0.094	0.068	0.093	0.087	0.032	0.359	0.47	0.46	0.54	0.65	0.23	0.39	0.55
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003	<0.0001	0	0	<0.0001	0	<0.0001	<0.006
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	0.013	<0.002	0.003	0.003	<0.002	0.002	<0.005	0.002	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	0.006	0	0	0	0.01	0	0	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10
						Sample Date	2013-Oct-30	2014-May-12	2014-Oct-16	2015-May-05	2015-Oct-27	2016-Apr-27	2016-Oct-27	2017-May-12	2017-Oct-24	2018-May-09	2018-Oct-23	2019-May-08	2019-Oct-23	2020-May-08	2020-Oct-08	2021-Apr-22
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	194	37.2	214	55.1	76.5	72.8	127	44.8	122	4.46	54	11.3	83.5	14.5	46	40.5
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	163	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.5	6.34	0.2	1.27	<0.25	<0.25	<0.25	<0.05	<0.25	<0.05	<0.25	<0.05	<0.25	<0.25	<0.25	<0.25
Sulphate	mg/L	-	500	-	-	0.1	68.8	36.9	82.7	36.3	17.2	5.82	35.7	5.43	44.2	8.9	50.8	6.45	61.1	5.3	47	7.44
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	120	69.8	143	76.6	81.6	84.3	94	39.8	87.1	22.6	65	34.8	75.6	48.9	73	78.9
Magnesium (diss)	mg/L	-	-	-	-	0.05	18.8	7.57	18.7	12.9	13.7	9.27	15.8	4.3	21.1	2.77	14.5	5.39	17.3	8.6	14.5	13.4
Potassium (diss)	mg/L	-	-	-	-	0.05	54.3	27.5	48.5	56.8	51.5	27.9	48	22.7	68	18.6	53.2	24.6	67.5	37.1	45.5	46.3
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	204	36.5	209	71.7	60.6	59.6	103	44.9	188	10.3	49.3	17.2	128	20	45.9	47.4
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	479	221	703	392	349	345	464	239	790	154	328	349	571	364	373	424
Ammonia as N	mg/L	-	-	-	-	0.02	8.3	0.54	11.9	14	8.4	4.96	14.2	7.2	33.8	9.26	23.6	11.2	20	20.2	20.6	25.5
Chemical Oxygen Demand	mg/L	-	-	-	-	4	99	33	138	57	83	217	144	145	286	38	104	95	132	48	91	74
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	30.8	14	49.1	27.1	23.3	93.2	22.8	44.7	79.6	8.9	38.5	33	43.6	27.8	42.8	37.5
Electrical Conductivity	uS/cm	-	-	-	-	1	1620	674	2010	1020	968	859	1380	689	1660	317	1030	619	1350	911	886	968
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.2	7.17	6.83	7.27	7.29	7.22	7.17	7.33	7.82	7.27	7.62	6.5	7.48	6.51	7.04	6.79
Total Dissolved Solids	mg/L	314	500	-	-	10	1000	332	1130	568	496	522	774	358	976	142	572	300	802	348	486	486
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.02	0.02	0.01	0.01	0.02	0.05	0.02	0.04	0.18	0.03	0.03	0.04	0.05	0.04	0.07	0.042
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.6	0.35	0.56	0.4	0.42	0.51	0.64	0.41	1.41	0.45	0.88	0.68	0.91	0.78	0.77	0.618
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.45	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.37	0.26	0.52	0.51	0.31	0.23	0.36	0.27	0.57	0.11	0.42	0.26	0.55	0.28	0.43	0.421
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	0	<0.003	<0.003	0	0	<0.003	0.01	0	0	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.03	0.01	0.03	0.02	0.04	0.1	0.17	0.16	0.15	0.08	0.1	0.09	0.08	0.07	0.05	0.036
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0.01	0.01	0.06	0.05	0.01	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0	<0.001	0	<0.002	<0.002
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	5.59	0.07	0.11	0.53	8.8	112	124	163	151	50.6	106	115	60.5	66	77.6	60.577
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	3.54	1.49	3.38	2	2.63	5.52	4.61	6.02	6.91	2.24	3.03	3.33	2.63	4.46	2.92	2.3
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03	<0.003	0.01	0.02	0.02	0.02	0.01	0.012
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	8.09	7.56	5.26	7.49	8.84	11.6	11.8	11.9	12.1	10.4	10.6	10.9	8.92	9.44	10.7	9.42
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (diss)	mg/L	-	-	-	-	0.001	0.86	0.36	0.77	0.42	0.51	0.51	0.73	0.32	0.75	0.18	0.45	0.28	0.46	0.35	0.44	0.483
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0	0	<0.002	0	<0.002	<0.002	<0.002	0	<0.002	0	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	<0.002	0	0.01	0.01	0.01	0.02	0	0.01	0.01	0.01	0	0.01	0.005
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	0.01	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR4-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR4-10	HR4-10	AQC GW-S22 (HI	HR4-10	HR4-10	HR4-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10
						Sample Date	2021-Oct-21	2022-May-02	2022-May-02	2022-Oct-20	2023-May-03	2023-Oct-17	2003-May-23	2010-May-18	2010-Oct-19	2011-May-19	2011-Nov-03	2012-Apr-16	2012-Oct-15	2013-Apr-16	2013-Oct-30	2014-May-12
Anions						Detection Limit															
Chloride	mg/L	128.5	250	-	-	0.1	58.1	35	34.5	51.2	35.4	110	38.3	6	4	10	7	8	6	8.85	10.1	7.09
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	0.19	<0.1	0.68	1.06	<0.1	1.2	0.3	2.31	<0.5	2.57
Sulphate	mg/L	-	500	-	-	0.1	8.99	6.91	6.14	36.5	10.6	34	43.9	39	33	32	20	26	18	26	22.3	32.4
Cations																					
Calcium (diss)	mg/L	-	-	-	-	0.05	54.1	49.6	49.6	81.6	83.6	120	72.1	59	50	54	54	41.2	50.7	55.8	50.8	54.3
Magnesium (diss)	mg/L	-	-	-	-	0.05	9.98	8.25	8.15	14.3	12.3	21	6.72	5	4	5	4	4.52	3.97	5.47	4.78	4.84
Potassium (diss)	mg/L	-	-	-	-	0.05	31.5	24.6	24	29.7	41.9	58	9.51	10	11	8	11	9.15	9.91	11.1	12.8	9.16
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	58.8	29	28.9	78.2	54.8	150	25.8	11	6	7	4	7.04	4.03	5.63	8.07	7.85
General Chemistry																					
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	395	325	323	357	477	660	178	175	146	157	158	139	152	134	135	130
Ammonia as N	mg/L	-	-	-	-	0.02	25.2	18.9	17.9	19.6	21.7	36	1.43	2.07	1	1.18	0.39	0.33	0.38	0.19	1.37	0.14
Chemical Oxygen Demand	mg/L	-	-	-	-	4	164	153	157	60	88	200	37	58	28	23	35	44	54	1190	18	8
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	55.7	37.3	43.1	47.8	35.6	64	10.2	20.3	12.1	11.1	7.8	9.4	8.1	2.8	3.5	7.3
Electrical Conductivity	uS/cm	-	-	-	-	1	990	774	773	1040	954	1700	541	445	370	408	352	386	348	356	341	374
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		6.74	6.72	6.72	7.02	7.24	7.15	7.06	7.43	7	7.04	6.53	6.5	6.3	7.43	7.19	6.99
Total Dissolved Solids	mg/L	314	500	-	-	10	506	386	378	514	474	905	318	289	241	265	229	294	198	224	210	194
Metals																					
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.073	0.052	0.032	0.103	0.037	0.047	0.004	0.01	<0.01	<0.01	<0.01	0	0	0.01	0.01	0.01
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.709	0.553	0.621	0.691	0.528	0.98	0.137	0.19	0.18	0.15	0.12	0.16	0.1	0.14	0.17	0.14
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0004	<0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.45	0.232	0.226	0.336	0.4	0.44	0.302	0.14	0.12	0.1	0.11	0.17	0.14	0.13	0.15	0.13
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	0.006	<0.003	<0.003	0.002	<0.002	<0.005	<0.002	<0.001	<0.001	0	0	<0.001	<0.001	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.0968	0.0338	0.0375	0.0464	0.0246	0.065	0.0196	0.05	0.02	0.02	0.01	0.01	0.01	0	0	0.01
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.002	<0.002	<0.002	<0.001	<0.001	0.0038	0.001	<0.001	0	0	0	0	0	<0.003	<0.003	<0.003
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	129.2	131	125	62.6	42.2	83	11.2	39.3	8.87	5.65	0.93	0.3	0.2	<0.01	<0.01	<0.01
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.0005	0.0009	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	2.73	2.58	2.72	1.65	1.01	2.4	1.11	1.18	0.52	0.92	0.58	0.43	0.4	0.74	0.46	0.75
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	0.00091	<0.002	<0.005	<0.005	<0.005	<0.005	<0.0005	<0.0005	<0.002	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	0.038	0.007	0.008	0.011	0.009	0.015	0.004	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0	0.01
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	11.5	8.65	8.07	8.71	9.14	10	6.11	9.2	6.7	6.8	6.4	5.59	4.88	5.73	5.38	5.93
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.002	<0.002	<0.002
Strontium (diss)	mg/L	-	-	-	-	0.001	0.294	0.267	0.261	0.434	0.359	0.62	0.348	0.3	0.27	0.25	0.27	0.22	0.23	0.24	0.23	0.25
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003	<0.0001	<0.0001	<0.0001	<0.0001	0	<0.0001	<0.006	<0.006	<0.006
Titanium (diss)	mg/L	-	-	-	-	0.002	0.002	0.003	0.003	<0.002	0.002	<0.005	<0.002	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.002	<0.002	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	0.008	0.007	0.006	0.007	0.006	0.0097	<0.002	<0.001	<0.001	0	0	0	0	<0.002	<0.002	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	0.09	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	QAQC GW-S20 (	HR5-10	AQC GW-F20 (HF	HR5-10
						Sample Date	2014-Oct-16	2015-May-05	2015-Oct-27	2016-Apr-27	2016-Oct-27	2017-May-12	2017-Oct-24	2018-May-09	2018-Oct-23	2019-May-08	2019-Oct-23	2020-May-08	2020-May-08	2020-Oct-08	2020-Oct-08	2021-Apr-22
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	19.4	20.5	15	16	27.8	31.5	34.9	39.8	22.8	56.6	36.5	39.6	40.3	24.8	24.5	30.4
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	0.23	2.77	0.05	1.61	<0.25	4.56	1.13	5.81	0.35	3.22	<0.25	0.32	0.37	<0.05	<0.05	0.22
Sulphate	mg/L	-	500	-	-	0.1	21.1	27.3	24.7	30.8	145	137	79.8	4.8	52.2	329	101	80.1	78.8	44.9	44.8	96.7
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	53.3	57.9	57.3	58.8	92.2	97.2	78.9	80.3	87.9	159	120	52.1	51.5	63.6	52.4	86.3
Magnesium (diss)	mg/L	-	-	-	-	0.05	4.39	5.57	5.43	5.65	7.04	7.94	6.58	7.2	6.62	12.6	9.37	4.84	4.82	5.44	4.3	8.2
Potassium (diss)	mg/L	-	-	-	-	0.05	13.2	9.22	10.1	8.02	12.9	11.4	12.9	7.92	11.5	13.4	13.6	8.18	8.2	11.6	9.45	11
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	14.1	10.2	10.5	8.16	29.1	13.6	20.4	14.8	22.4	48.4	29.6	16	15.7	22.7	19.1	25.3
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	162	132	156	154	163	149	180	137	211	227	317	165	161	234	232	163
Ammonia as N	mg/L	-	-	-	-	0.02	2.88	0.13	0.35	0.09	1.36	0.04	3.04	0.2	1.05	0.02	1.77	1.13	1.12	3.2	3.54	0.89
Chemical Oxygen Demand	mg/L	-	-	-	-	4	12	<5	16	10	20	21	32	<5	31	<5	39	36	31	55	53	<5
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	3.6	3.9	3.6	7.5	9.3	8.7	12.2	4.8	12.4	10.2	12.8	8.6	8.7	15.3	13.6	8
Electrical Conductivity	uS/cm	-	-	-	-	1	436	405	401	389	707	737	555	553	663	1160	818	621	617	552	551	611
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		6.73	6.84	7.31	7.19	7.05	7.49	7.32	7.05	7.6	6.61	7.14	6.42	6.46	6.77	6.68	6.57
Total Dissolved Solids	mg/L	314	500	-	-	10	234	234	218	236	406	400	390	340	390	782	486	288	286	346	316	336
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.01	0.01	0.01	0.01	<0.004	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	<0.004
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	0.24	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.22	0.12	0.11	0.15	0.24	0.24	0.19	0.13	0.19	0.16	0.23	0.14	0.14	0.24	0.23	0.128
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.13	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.18	0.17	0.14	0.11	0.28	0.23	0.62	0.18	0.38	1.08	0.34	0.08	0.08	0.29	0.28	0.529
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.0001	<0.0001	0	0	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.04	0.02	0.02	0.05	0.05	0.0195
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.003	<0.003	<0.003	<0.003	0	0	0.01	<0.003	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.005
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	0.02	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	0.27	10.4	6.61	6.69	25.8	25.6	6.46
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0.47	0.48	0.56	0.77	0.97	1.23	0.89	0.87	1.37	1.62	2.87	1.18	1.13	2.03	2.05	2.19
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.003	0.01	0.01	0	0.01	0.01	0.01	<0.003	0.01	0.01	0.01	0.01	0	0.01	0.01	0.008
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	7.19	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	5.01	4.82	4.81	6.21	5.51	<0.002	6.37	6.6	4.06	5.75	5.45	4.69	4.26	5.61	5.42	6.5
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (diss)	mg/L	-	-	-	-	0.001	0.27	0.28	0.36	0.25	0.6	0.45	0.41	0.38	0.48	0.63	0.77	0.32	0.31	0.4	0.4	0.414
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	<0.002	<0.002	<0.002	0	<0.002	<0.002	<0.002	<0.002	0	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR5-10	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR5-10	AQC-GW-F21 (HI	HR5-10	HR5-10	QC-GW1-F22 (H	HR5-10	HR5-10	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19	HR6-19
						Sample Date	2021-Oct-21	2021-Oct-21	2022-May-02	2022-Oct-20	2022-Oct-20	2023-May-03	2023-Oct-17	2003-May-23	2020-May-08	2020-Oct-08	2021-Apr-22	2021-Oct-21	2022-May-02	2022-Oct-20	2023-May-03	2023-Oct-17
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	37.5	37.6	42.9	48	52.4	38.3	38	4.16	3.12	1.99	3.27	2.01	2	1.26	4.16	<1
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.05	<0.05	0.08	<0.05	<0.05	0.19	<0.1	<0.05	<0.1	<0.05	<0.1	<0.05	<0.05	<0.05	<0.05	<0.1
Sulphate	mg/L	-	500	-	-	0.1	155	156	42.1	22.5	23.5	43.9	52	59.7	68.4	10.9	42.2	13.8	26.3	12.2	59.7	8.7
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	125	122	81.9	105	89.3	72.1	150	107	111	84.7	116	120	88.9	92.2	107	80
Magnesium (diss)	mg/L	-	-	-	-	0.05	10.9	10.5	8.66	7.71	7.88	6.72	14	4.82	4.28	2.61	4.32	3.64	3.06	2.74	4.82	2.9
Potassium (diss)	mg/L	-	-	-	-	0.05	13.9	13.3	18.6	13.6	19.5	9.51	15	5.82	4.59	3.15	4.35	4.56	3.52	2.04	5.82	3.4
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	33.7	32.9	32.7	30.7	23	25.8	49	6.83	4.27	2.64	5.35	5.66	4.1	3.64	6.83	3.3
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	297	296	277	273	263	178	430	279	271	261	272	333	232	180	279	200
Ammonia as N	mg/L	-	-	-	-	0.02	1.79	1.85	4.92	1.82	1.8	1.43	6.9	4.28	2.67	1.36	1.92	3.4	1.54	1.23	4.28	2.7
Chemical Oxygen Demand	mg/L	-	-	-	-	4	64	68	65	56	73	37	100	56	26	23	<5	20	22	30	56	20
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	17.4	18.4	25	21.4	20.8	10.2	33	6.2	4.4	4	5	6.4	4.1	5.2	6.2	4.5
Electrical Conductivity	uS/cm	-	-	-	-	1	959	962	742	798	777	541	1000	624	777	452	606	650	503	396	624	400
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		6.7	6.75	6.73	6.79	6.86	7.06	7.07	7.34	6.62	7.14	7.08	6.91	6.82	7.08	7.34	7.22
Total Dissolved Solids	mg/L	314	500	-	-	10	590	596	402	426	404	318	620	350	334	280	322	356	218	218	350	220
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.018	0.018	0.062	0.091	0.05	0.004	0.04	0.015	0.01	0.01	<0.004	0.207	0.03	0.046	0.015	0.018
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.197	0.2	0.37	0.379	0.384	0.137	0.44	0.043	0.06	0.05	0.059	0.084	0.056	0.04	0.043	0.037
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0004	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0004
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	1.12	1.15	0.273	0.311	0.285	0.302	0.3	0.103	0.09	0.06	0.119	0.155	0.064	0.064	0.103	0.069
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	0.0001	0.0004	<0.0001	<0.00009	<0.0001	0	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	<0.002	<0.003	<0.003	<0.003	0.003	<0.003	<0.002	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.0585	0.0593	0.0467	0.0465	0.0459	0.0196	0.07	<0.0005	<0.0005	0	<0.0005	0.0008	<0.0005	0.002	<0.0005	0.0019
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0.003	0.004	<0.002	<0.001	0.002	0.001	0.0034	<0.001	<0.002	0	<0.002	0.003	<0.002	<0.001	<0.001	0.0013
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	29.2	29.7	61.7	62.6	66.7	11.2	49	20.5	30	19.3	26.9	20.6	21.6	24.1	20.5	21
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	0.001	<0.001	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	2.58	2.6	3.53	2.34	2.29	1.11	3.1	0.343	0.5	1.62	0.402	0.336	0.298	0.48	0.343	0.33
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00084	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005
Nickel (diss)	mg/L	-	-	0.025	-	0.001	0.008	0.008	0.009	0.005	0.006	0.004	0.0081	<0.001	<0.003	0	<0.003	<0.003	0.001	0.003	<0.001	0.0023
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	6.86	6.9	5.37	7.06	6.32	6.11	6.4	3.6	3.07	6.77	3.53	5.13	3.29	6.41	3.6	5.8
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009
Strontium (diss)	mg/L	-	-	-	-	0.001	0.566	0.573	0.411	0.503	0.458	0.348	1	0.327	0.42	0.3	0.39	0.458	0.371	0.348	0.327	0.26
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.000054	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00005
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	<0.002	0.003	0.003	0.003	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	0.007	<0.002	0.003	<0.002	<0.005
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	0.003	0.002	0.002	<0.002	0.0036	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.00084
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0052	<0.005	<0.005	0.01	0.005	0.009	<0.005	<0.005	<0.005	0.011

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR8-19	HR8-19	HR8-19	HR8-19	HR8-19
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR7-19	HR7-19	AQC GW-F19 (HI	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR7-19	HR8-19	HR8-19	HR8-19	HR8-19	HR8-19
						Sample Date	2003-May-23	2019-Oct-23	2019-Oct-23	2020-May-08	2020-Oct-08	2021-Apr-22	2021-Oct-21	2022-May-02	2022-Oct-20	2023-May-03	2023-Oct-17	2003-May-23	2019-Oct-23	2020-May-08	2020-Oct-08	2021-Apr-22
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	38.1	34.7	34.7	57.1	28.4	26.3	15.3	55.5	26	38.1	22	4.64	2.44	14.5	3.78	4.53
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	<0.05	0.46	0.46	0.85	<0.25	0.8	0.43	0.07	<0.05	<0.05	0.36	0.63	0.21	0.1	0.25	0.42
Sulphate	mg/L	-	500	-	-	0.1	30.9	12	12	67.7	23	71.1	57.6	25	33.2	30.9	14	13.8	6.84	13.9	8.53	13.3
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	102	44.7	44.4	114	56.9	116	35.9	83.4	137	102	60	21	8.05	41.5	12.6	25.2
Magnesium (diss)	mg/L	-	-	-	-	0.05	8.69	5.9	5.79	15.8	7.92	13.1	3.93	7.52	8.97	8.69	6.1	2.15	0.99	4.54	1.37	2.7
Potassium (diss)	mg/L	-	-	-	-	0.05	22.2	20.6	20.3	28.5	24.9	27.7	1.97	18	20.3	22.2	21	1.43	1.04	2.07	1.25	1.5
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	37.2	24.9	24.7	72.1	56.6	36.9	10.5	30.6	40.6	37.2	39	4.88	2.61	8.98	2.9	3.25
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	403	225	226	401	431	367	246	278	329	403	260	59	27	117	36	63
Ammonia as N	mg/L	-	-	-	-	0.02	13.7	11	10.9	12.4	19.9	16.4	6.94	7.92	7.4	13.7	13	<0.02	0.06	<0.02	<0.02	<0.02
Chemical Oxygen Demand	mg/L	-	-	-	-	4	74	66	69	114	95	43	35	55	14	74	45	<5	24	18	14	<5
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	32.4	12.6	12	39.1	38.5	25.8	14	23.3	26.6	32.4	13	2	1.1	5.1	1.5	2.4
Electrical Conductivity	uS/cm	-	-	-	-	1	921	555	557	1320	862	926	633	759	861	921	620	161	75	359	91	171
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		7.22	7.02	7.09	6.5	7.33	6.96	6.84	6.78	6.95	7.22	7.07	7.06	6.69	6.44	6.66	6.83
Total Dissolved Solids	mg/L	314	500	-	-	10	502	286	274	584	432	512	360	402	454	502	320	94	84	138	54	108
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.021	0.04	0.04	0.18	0.05	0.01	0.034	0.037	0.012	0.021	0.02	0.012	0.02	0.02	0.02	<0.004
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.398	0.32	0.33	0.6	0.44	0.494	0.286	0.273	0.326	0.398	0.3	0.025	0.01	0.07	0.01	0.031
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0004	<0.0005	<0.0005	<0.001	<0.001	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.502	0.23	0.23	0.73	0.59	0.98	0.579	0.206	0.728	0.502	0.29	0.022	0.02	0.09	0.02	0.028
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.002	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.005	<0.002	<0.003	<0.003	<0.003	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	0.0572	0.07	0.07	0.08	0.08	0.0445	0.031	0.0586	0.0575	0.0572	0.042	<0.0005	<0.0005	0	<0.0005	<0.0005
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0.005	0.01	0.01	0.01	0	0.01	0.008	0.004	0.008	0.005	0.0041	0.001	0	0	<0.002	<0.002
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	47.6	27.9	28	66	54	24.1	14.6	36.4	53.5	47.6	38	0.012	0.03	0.01	0.02	0.03
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.0005	<0.001	0	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	3.17	2.76	2.77	6.21	4.41	4.41	2.59	3.56	3.6	3.17	1.8	0.008	0.05	0.1	0.01	0.004
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.00062	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	0.009	0.01	0.01	0.01	0.01	0.012	0.006	0.012	0.002	0.009	0.008	<0.001	<0.003	<0.003	<0.003	<0.003
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	9.38	9.39	9.49	7.29	10.9	8.27	8.12	7.77	7.94	9.38	11	5.66	4.29	5.56	4.77	4.97
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (diss)	mg/L	-	-	-	-	0.001	0.363	0.28	0.27	0.59	0.49	0.556	0.318	0.378	0.405	0.363	0.26	0.122	0.07	0.3	0.09	0.178
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.0003	0	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	0.000087	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	0	<0.002	0.01	<0.002	0.007	<0.002	0.007	0.004	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	0.003	<0.002	<0.002	0	0.01	0.002	<0.002	0.003	0.003	0.003	0.0019	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.035	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR8-19	HR8-19	HR8-19	HR8-19	HR8-19	HR8-19	HR9-21	HR9-21	HR9-21	HR9-21	HR9-21	HR9-21	HR9-21	HR10-21	HR10-21
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR8-19	HR8-19	HR8-19	HR8-19	HR8-19	HR-QAQC-GW1	HR9-21	HR9-21	QC-GW-SU21 (H	HR9-21	HR9-21	HR9-21	HR9-21	HR9-21	HR10-21	HR10-21
						Sample Date	2021-Oct-21	2022-May-02	2022-Oct-20	2023-May-03	2023-Oct-17	2023-Oct-17	2003-May-23	2021-Aug-19	2021-Aug-19	2021-Oct-21	2022-May-02	2022-Oct-20	2023-May-03	2023-Oct-17	2003-May-23	2021-Aug-19
Anions						Detection Limit																
Chloride	mg/L	128.5	250	-	-	0.1	3.56	27.4	6.05	4.64	5.9	1.3	0.79	4.33	4.35	1.21	0.82	1.67	0.79	<1	3.95	2.52
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	0.65	0.07	0.48	0.63	0.22	0.22	0.45	0.48	0.47	0.1	0.1	0.59	0.45	1.28	1.85	0.28
Sulphate	mg/L	-	500	-	-	0.1	10.2	6.46	10.6	13.8	5.5	5.5	5.14	5.06	5.04	5.72	4.83	6.41	5.14	4.7	3.59	3.48
Cations																						
Calcium (diss)	mg/L	-	-	-	-	0.05	77.7	54.2	44.1	21	11	11	3.47	8.6	8.39	3.53	2.89	7.1	3.47	5.2	6.56	8.97
Magnesium (diss)	mg/L	-	-	-	-	0.05	6.03	7.6	3.81	2.15	1.1	1.1	0.5	1.24	1.22	0.54	0.48	0.94	0.5	0.74	1.34	1.46
Potassium (diss)	mg/L	-	-	-	-	0.05	14.7	12.5	1.97	1.43	1	1	0.77	1.48	1.47	0.96	0.66	1.85	0.77	1.4	1.18	1.24
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	17.9	42.9	7.98	4.88	2.9	2.8	1.67	4.12	4.1	1.62	1.4	4.34	1.67	1.8	3.16	2.84
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	122	276	79	59	29	30	8	33	32	13	10	18	8	8.5	18	33
Ammonia as N	mg/L	-	-	-	-	0.02	0.07	5.85	0.03	<0.02	0.075	0.06	<0.02	<0.02	<0.02	0.09	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
Chemical Oxygen Demand	mg/L	-	-	-	-	4	<5	34	13	<5	8.6	9.9	<5	<5	<5	<5	5	9	<5	7.9	<5	<5
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	4.6	18	4.3	2	1.3	1.3	1.3	5.9	5.9	1.9	2	1.8	1.3	1.8	1.4	4
Electrical Conductivity	uS/cm	-	-	-	-	1	260	627	210	161	80	80	36	89	89	40	34	64	36	50	69	83
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		6.78	7	7.08	7.06	7.17	7.13	6.63	6.59	6.52	6.43	6.37	6.61	6.63	6.73	6.84	7.02
Total Dissolved Solids	mg/L	314	500	-	-	10	164	334	120	94	80	70	34	72	66	36	<10	52	34	45	48	66
Metals																						
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.018	0.022	0.013	0.012	0.0069	0.0066	0.01	0.028	0.029	0.034	0.127	0.038	0.01	0.015	0.016	0.043
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.053	0.399	0.032	0.025	0.013	0.013	0.012	0.02	0.02	0.011	0.012	0.015	0.012	0.016	0.005	0.005
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.0005	<0.0005	<0.0004	<0.0004	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0004	<0.0005	<0.001
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	0.062	0.147	0.039	0.022	0.01	0.01	<0.01	0.016	0.019	<0.01	<0.01	0.013	<0.01	<0.01	<0.01	<0.01
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	<0.0001
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.002	<0.002	<0.005	<0.005	<0.002	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.005	<0.002	<0.003
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	0.0051	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0012	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	0.005	0.035	0.006	0.001	<0.0009	<0.0009	<0.001	<0.002	<0.002	0.003	<0.002	0.002	<0.001	<0.0009	<0.001	0.002
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	<0.01	0.09	0.025	0.012	<0.1	<0.1	<0.01	0.023	<0.01	<0.01	0.046	<0.01	<0.01	<0.1	<0.01	0.02
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0.01	5.53	0.193	0.008	0.003	0.0027	0.005	0.06	0.063	0.006	0.008	0.015	0.005	0.059	<0.002	0.02
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.002	<0.002
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.003	0.022	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	6.77	6.74	4.94	5.66	4.6	4.5	4.43	6.49	5.07	5.13	3.24	5.14	4.43	5.1	4.53	4.85
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.00009	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009	<0.0001	0.0002
Strontium (diss)	mg/L	-	-	-	-	0.001	0.276	0.669	0.208	0.122	0.07	0.068	0.029	0.109	0.104	0.042	0.032	0.072	0.029	0.062	0.059	0.079
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.00005	<0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.00005	<0.0003	<0.0003
Titanium (diss)	mg/L	-	-	-	-	0.002	<0.002	0.003	<0.002	<0.002	<0.005	<0.005	<0.002	0.008	<0.002	<0.002	0.003	<0.002	<0.002	<0.005	<0.002	<0.002
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.002	<0.002
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	0.02	<0.005	<0.005	<0.005	<0.005	0.016	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E-1: Historical Groundwater Chemistry Results						Location	HR10-21	HR10-21	HR10-21	HR10-21	HR10-21
Parameter	Units	RUV-HR	ODWQS	PWQO-GENERAL	PWQO-INTERIM	Sample ID	HR10-21	HR10-21	HR10-21	HR10-21	HR10-21
						Sample Date	2021-Oct-21	2022-May-02	2022-Oct-20	2023-May-03	2023-Oct-17
Anions						Detection Limit					
Chloride	mg/L	128.5	250	-	-	0.1	2.46	4.87	3.23	3.95	<1
Fluoride	mg/L	-	1.5	-	-	0.01	-	-	-	-	-
Nitrate as N	mg/L	3.4525	10	-	-	0.05	0.2	0.45	0.38	1.85	0.4
Sulphate	mg/L	-	500	-	-	0.1	3.8	3.21	3.92	3.59	5.2
Cations											
Calcium (diss)	mg/L	-	-	-	-	0.05	3.5	4.4	5.12	6.56	4.2
Magnesium (diss)	mg/L	-	-	-	-	0.05	0.71	0.9	0.89	1.34	0.81
Potassium (diss)	mg/L	-	-	-	-	0.05	0.97	1.04	0.67	1.18	1
Sodium (diss)	mg/L	104.4825	200	-	-	0.05	2.13	2.59	2.88	3.16	2.2
General Chemistry											
Alkalinity (as CaCO3)	mg/L	280.25	30 - 500	See Factsheet	-	1	14	8	15	18	13
Ammonia as N	mg/L	-	-	-	-	0.02	0.14	<0.02	<0.02	<0.02	<0.05
Chemical Oxygen Demand	mg/L	-	-	-	-	4	<5	<5	<5	<5	<4
Dissolved Organic Carbon	mg/L	3.7	5	-	-	0.4	2.3	1	1.3	1.4	1.4
Electrical Conductivity	uS/cm	-	-	-	-	1	42	53	51	69	46
pH	pH units	-	6.5 - 8.5	6.5 - 8.5	-		6.41	6.27	6.76	6.84	6.97
Total Dissolved Solids	mg/L	314	500	-	-	10	62	22	54	48	60
Metals											
Aluminum (diss)	mg/L	0.055	0.1	-	Calculated	0.004	0.047	0.016	0.061	0.016	0.0066
Antimony (diss)	mg/L	-	0.006	-	0.02		-	-	-	-	-
Arsenic (diss)	mg/L	-	0.01	-	0.005	0.003	-	-	-	-	-
Barium (diss)	mg/L	0.3025	1	-	-	0.002	0.004	0.004	0.004	0.005	0.0035
Beryllium (diss)	mg/L	-	-	Calculated	-	0.0004	<0.001	<0.001	<0.0005	<0.0005	<0.0004
Boron (diss)	mg/L	1.265	5	-	0.2	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (diss)	mg/L	0.0012875	0.005	-	Calculated	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009
Chromium (diss)	mg/L	0.013625	0.05	-	-	0.002	<0.003	<0.003	<0.002	<0.002	<0.005
Cobalt (diss)	mg/L	-	-	-	0.0009	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (diss)	mg/L	0.5	1	-	Calculated	0.0009	<0.002	<0.002	0.002	<0.001	<0.0009
Iron (diss)	mg/L	0.15375	0.3	0.3	-	0.01	<0.01	0.018	0.016	<0.01	<0.1
Lead (diss)	mg/L	0.002875	0.01	-	Calculated	0.0005	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Manganese (diss)	mg/L	0.03	0.05	-	-	0.002	0.003	<0.002	<0.002	<0.002	<0.002
Mercury (diss)	mg/L	-	0.001	0.0002	-	0.0001	-	-	-	-	-
Molybdenum (diss)	mg/L	-	-	-	0.04	0.0005	<0.002	<0.002	<0.002	<0.002	<0.0005
Nickel (diss)	mg/L	-	-	0.025	-	0.001	<0.003	0.001	<0.001	<0.001	<0.001
Selenium (diss)	mg/L	-	0.05	0.1	-	0.004	-	-	-	-	-
Silicon (diss)	mg/L	-	-	-	-	0.05	3.87	3.46	5.61	4.53	4.1
Silver (diss)	mg/L	-	-	0.0001	-	0.00009	<0.0001	<0.0001	<0.0001	<0.0001	<0.00009
Strontium (diss)	mg/L	-	-	-	-	0.001	0.032	0.057	0.054	0.059	0.04
Thallium (diss)	mg/L	-	-	-	0.0003	0.00005	<0.0003	<0.0003	<0.0003	<0.0003	<0.00005
Titanium (diss)	mg/L	-	-	-	-	0.002	0.003	<0.002	0.005	<0.002	<0.005
Vanadium (diss)	mg/L	-	-	-	0.006	0.0005	<0.002	<0.002	<0.002	<0.002	<0.0005
Zinc (diss)	mg/L	2.50125	5	-	0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds RUV-HR	Reasonable Use Values Hickey Road
Concentration exceeds ODWQS	Ontario Drinking Water Quality Standards
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim

Appendix E

E-2 Historical Surface Water Chemistry

Appendix E-2: Historical Surface Water Chemistry Results						Location	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1
						Sample Date	2007-May-03	2008-May-08	2008-Oct-09	2009-Jun-04	2009-Oct-21	2010-May-18	2010-Oct-19	2011-May-19	2012-Apr-16	2013-Apr-16	2013-Oct-30	2014-May-12	2014-Oct-16	2015-May-05	2016-Apr-27	2017-May-12
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	<1	1	1	2	1	1	<1	<1	<1	0.53	0.64	0.58	0.49	0.72	0.56	0.45
Nitrate as N	mg/L	-	-	-	-	0.05	<0.1	<0.1	<0.1	0.14	<0.1	<0.1	<0.1	0.25	0.2	0.16	0.78	0.16	<0.05	0.28	0.18	0.11
Nitrite as N	mg/L	-	-	-	-	0.05	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	9	9	10	9	8	9	8	7	9	5.95	12.2	7.59	9.13	-	6.83	6.52
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.16	4	12	24	16	17	17	18	14	14.7	8.55	25.7	14.9	24.3	16.7	12	12.2
Magnesium (tot)	mg/L	-	-	-	-	0.1	1	1	2	2	2	1	2	1	1630	1.04	2.07	1.45	1.91	1.52	1.2	1.18
Potassium (tot)	mg/L	-	-	-	-	0.25	<1	<1	<1	<1	<1	<1	<1	<1	795	0.73	1.12	0.84	1.04	0.9	0.7	0.65
Sodium (tot)	mg/L	-	-	-	-	0.1	<2	<2	<2	2	<2	<2	<2	<2	903	0.74	1.22	0.9	1.16	0.97	0.79	0.78
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	5	7	28	61	43	56	50	53	43	42	17.7	51	37	63	36	34	38
Ammonia as N	mg/L	-	-	-	-	0.02	0.03	<0.02	<0.02	<0.02	<0.02	0.00007	<0.02	0.1	<0.01	<0.02	0.00002	<0.02	0.18	<0.02	<0.02	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<1	<1	2	<1	<1	<1	<1	<1	<2	<5	12	<5	<5	<5	<5	<5
Chemical Oxygen Demand	mg/L	-	-	-	-	5	-	5	5	8	6	8	8	13	<10	<5	311	<5	9	<5	-	6
Electrical Conductivity	uS/cm	-	-	-	-	2	39	79	145	105	125	124	123	99	118	55	141	93	152	98	79	95
Lab Filtration Aluminum (diss)		-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH units	6.5 - 8.5	-	6 - 9	-		6	7.36	7.62	7.41	7.56	7.78	7.66	7.41	7.4	7.08	7.65	7.54	7.21	7.7	7.71	7.21
Phenols	mg/L	0.001	-	0.04	0.004	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	-
Total Dissolved Solids	mg/L	-	-	-	-	10	25	51	94	68	81	81	80	64	414	36	98	58	98	62	56	44
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.24	0.29	0.21	<0.1	<0.1	0.11	0.15	0.35	<0.1	0.39	9.04	0.4	1	0.22	0.27	0.13
Total Phosphorus	mg/L	0.03	-	-	-	0.02	0.04	<0.01	0.07	0.06	<0.01	<0.01	0.01	<0.01	<0.01	0.02	0.49	<0.02	0.05	<0.01	0.01	<0.01
Total Suspended Solids	mg/L	-	-	-	-	10	36	17	570	85	5	<2	3	<2	9	<10	164	<10	<10	<10	<10	<10
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.11	0.02	0.24	0.17	0.04	0.02	0.02	0.02	0.015	0.049	0.019	0.019	0.011	0.018	0.02	0.022
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.014	0.009	0.044	0.012	0.022	0.012	0.011	0.014
Beryllium (tot)	mg/L	Calculated	-	-	-	0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	<0.01	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.017	0.015	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0007	<0.0001	<0.0001	<0.0001	<0.0001	-
Chromium (tot)	mg/L	-	-	0.064	-	0.003	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	0.0008	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.001	0.001	0.001	0.003	0.003	0.001	0.001	0.001	0.001	0.0011	<0.002	0.017	<0.002	0.004	<0.002	<0.002	<0.002
Iron (tot)	mg/L	0.3	-	1	-	0.01	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	<0.03	<0.03	<0.1	<0.01	0.11	<0.01	0.068	<0.01	<0.01	<0.01
Lead (tot)	mg/L	-	Calculated	0.002	-	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	<0.01	<0.01	0.04	0.01	<0.01	<0.01	<0.01	<0.01	<0.005	0.006	0.206	<0.002	0.047	<0.002	<0.002	<0.002
Molybdenum (tot)	mg/L	-	0.04	-	-	0.0005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0012	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.003	0.003	<0.003	0.007	<0.003	<0.003	-
Silicon (tot)	mg/L	-	-	-	-	0.1	3.8	3.4	5.5	3.8	4.5	3.9	4.2	3.4	3.22	2.95	4.57	3.13	4.36	3.03	3	-
Silver (tot)	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	-
Strontium (tot)	mg/L	-	-	-	-	0.001	0.035	0.06	0.093	0.103	0.105	0.101	0.114	0.091	0.089	0.047	0.169	0.077	0.129	0.072	0.066	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	-
Titanium (tot)	mg/L	-	-	-	-	0.002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	0.39	<0.005	0.007	<0.005	<0.005	<0.005

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Chemistry Results						Location	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW2	HR-SW2	HR-SW2	HR-SW2
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	HR-SW1	AQC SW-F20 (HR	HR-SW1	HR-SW1	HR-SW1	AQC SW-S22 (HR	HR-SW1	HR-SW2	HR-SW2	HR-SW2	HR-SW2
						Sample Date	2017-Oct-24	2018-May-09	2018-Oct-23	2019-May-08	2020-May-08	2020-Oct-08	2020-Oct-08	2021-Apr-22	2021-Oct-21	2022-May-02	2022-May-02	2023-May-03	2007-May-03	2008-May-08	2009-Jun-04	2010-May-18
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	0.46	0.49	0.61	0.56	0.63	0.67	0.66	0.57	3.83	0.45	0.43	0.39	<1	1	2	1
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	0.25	0.68	0.93	0.4	0.39	0.43	0.46	0.07	0.34	0.33	0.18	<0.1	<0.1	<0.1	<0.1
Nitrite as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.1	<0.1	<0.1
Sulphate	mg/L	-	-	100	-	0.1	9.27	5.74	8.38	5.26	7.24	6.87	6.84	7.14	5.85	5.93	5.82	4.67	9	9	7	7
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.16	22.4	12.6	21	11.1	13.03	20.81	19.24	15.4	23	14.5	15.4	9.5	10	10	10	12
Magnesium (tot)	mg/L	-	-	-	-	0.1	1.92	1.14	1.62	1.17	1.35	1.73	1.59	1.49	2.08	1.46	1.56	0.86	1	1	1	2
Potassium (tot)	mg/L	-	-	-	-	0.25	1.13	0.75	1.02	0.78	0.73	1.06	1	1	1.61	<1.15	1.2	0.52	<1	<1	<1	<1
Sodium (tot)	mg/L	-	-	-	-	0.1	1.08	0.75	1.02	0.8	0.84	1.18	1.08	1.29	1.38	0.96	0.67	0.77	<2	<2	2	<2
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	5	61	36	65	36	41	52	51	35	58	33	31	29	27	23	31	32
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	0.0000396	0.0000745	<0.02	<0.02	<0.02	<0.02	<0.02	0.11	<0.02	<0.02	<0.02	0.12	<0.00057	0.02	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	7	<5	<5	<5	<5	<2	<2	<2	<2	<2	<2	<2	<1	<1	1	<1
Chemical Oxygen Demand	mg/L	-	-	-	-	5	394	<5	251	<5	<5	15	10	<5	7	7	<5	<5	-	10	15	20
Electrical Conductivity	uS/cm	-	-	-	-	2	124	88	142	81	101	112	111	93	115	87	86	67	71	65	73	86
Lab Filtration Aluminum (diss)		-	-	-	-		-	-	-	-	-	-	-	-	-	-	-		-	-	-	-
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.34	7.19	7.64	6.64	7.44	6.84	6.87	7.62	7.37	6.96	6.85	7.21	6.42	7.31	7.11	7.43
Phenols	mg/L	0.001	-	0.04	0.004	0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001
Total Dissolved Solids	mg/L	-	-	-	-	10	74	40	78	70	52	74	68	38	80	60	54	52	46	42	48	56
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.32	0.31	0.47	<0.1	0.29	0.26	0.24	<0.1	0.15	0.13	0.14	0.21	0.23	0.29	0.16	0.16
Total Phosphorus	mg/L	0.03	-	-	-	0.02	0.94	<0.02	0.73	0.02	<0.02	<0.02	0.03	<0.02	<0.02	0.06	0.04	<0.02	0.02	<0.01	0.06	<0.01
Total Suspended Solids	mg/L	-	-	-	-	10	468	<10	26	<10	<10	15	46	<10	<10	27	49	<10	71	<2	20	4
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	-	-	-	-	-	<0.000002	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.017	0.02	0.01	-	0.022	0.051	0.017	0.018	0.021	0.029	0.015	-	0.34	0.05	0.27	0.09
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	0.095	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	-	-	-	0.046	0.035	0.092	0.028	0.057	-	-	0.07	-	-	-	-
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.052	0.013	0.056	0.014	0.01	0.017	0.019	0.011	0.016	0.019	0.021	0.013	0.02	0.01	0.02	0.03
Beryllium (tot)	mg/L	Calculated	-	-	-	0.0005	-	0.056	0.013	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	0.094	<0.01	<0.01	<0.01	<0.01	0.018	0.012	<0.01	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Chromium (tot)	mg/L	-	-	0.064	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	0.001	<0.001	<0.001
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	0.001	<0.0005	0.0011	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0002	<0.0002	0.0005	0.0004
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.001	0.022	0.001	0.022	<0.002	0.002	0.003	0.003	<0.002	<0.002	0.006	0.005	0.001	0.002	0.001	0.001	0.001
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.54	<0.01	0.63	<0.01	0.015	<0.01	0.016	<0.01	0.018	0.362	0.385	0.023	0.19	0.07	0.33	0.18
Lead (tot)	mg/L	-	Calculated	0.002	-	0.001	0.004	<0.001	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.265	<0.002	0.288	0.006	<0.002	<0.002	0.008	<0.002	0.002	0.053	0.043	<0.002	0.02	<0.01	0.07	0.1
Molybdenum (tot)	mg/L	-	0.04	-	-	0.0005	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	-	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005
Silicon (tot)	mg/L	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-	-	-	2.1	3.1	3.1	3
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (tot)	mg/L	-	-	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	0.053	0.054	0.076	0.082
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Titanium (tot)	mg/L	-	-	-	-	0.002	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01
Vanadium (tot)	mg/L	-	0.006	-	-	0.001	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.001	<0.001	<0.001
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.005	0.008	<0.005	0.044	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Chemistry Results						Location	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	HR-SW2	AQC-SW-S19 (HR	HR-SW2	QAQC SW-S20 (	HR-SW2	HR-SW2	AQC SW-F21 (HR
						Sample Date	2010-Oct-19	2011-May-19	2012-Apr-16	2013-Apr-16	2014-May-12	2015-May-05	2016-Apr-27	2017-May-12	2018-May-09	2019-May-08	2019-May-08	2020-May-08	2020-May-08	2021-Apr-22	2021-Oct-21	2021-Oct-21
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	2	2	<1	0.56	0.59	0.77	0.55	0.48	0.44	0.62	0.59	0.63	0.61	0.52	0.68	0.72
Nitrate as N	mg/L	-	-	-	-	0.05	<0.1	<0.1	<0.1	0.1	<0.05	<0.05	<0.05	<0.05	0.06	0.3	0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	-	-	-	-	0.05	<0.1	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	7	6	9	5.21	6.69	-	5.73	6.11	4.49	5.02	4.98	6.1	6.11	6.02	3.29	2.82
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.16	8	8	12.6	5.52	9.04	8.92	6.44	7.8	7.13	7.5	7.55	8.21	8.13	9.27	13.7	11.6
Magnesium (tot)	mg/L	-	-	-	-	0.1	1	1	1330	0.8	1.14	1.14	0.86	1.04	0.8	0.99	0.98	1.03	1.05	1.17	1.97	1.69
Potassium (tot)	mg/L	-	-	-	-	0.25	<1	<1	818	0.77	0.78	0.76	0.59	0.51	0.64	0.71	0.73	0.84	0.66	0.98	2.19	1.7
Sodium (tot)	mg/L	-	-	-	-	0.1	<2	<2	1020	0.76	0.99	1.01	0.82	0.87	0.7	0.82	0.83	0.84	0.89	1.13	1.49	1.25
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	5	23	27	23	10.2	19	18	18	25	31	27	25	23	17	24	35	32
Ammonia as N	mg/L	-	-	-	-	0.02	0.00001	<0.02	0.03	0.11	0.0001	0.000125196	<0.02	<0.02	0.05	<0.02	<0.02	<0.02	<0.02	<0.02	0.09	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	3	<1	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	5	5
Chemical Oxygen Demand	mg/L	-	-	-	-	5	18	23	30	<5	6	14	-	7	<5	<5	<5	<5	<5	<5	101	23
Electrical Conductivity	uS/cm	-	-	-	-	2	60	63	82	38	62	60	48	67	52	59	58	69	69	62	72	72
Lab Filtration Aluminum (diss)		-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	pH units	6.5 - 8.5	-	6 - 9	-		7.09	7.11	6.8	6.72	7.24	7.35	7.35	7.48	6.89	6.53	6.54	6.79	6.67	7.25	6.99	6.89
Phenols	mg/L	0.001	-	0.04	0.004	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	39	41	166	30	<20	40	42	30	22	62	48	40	44	<20	60	58
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	6.66	0.43	0.3	0.16	5.2	0.57	0.71	0.17	0.37	<0.1	<0.1	0.35	0.41	0.19	0.64	0.28
Total Phosphorus	mg/L	0.03	-	-	-	0.02	0.01	<0.01	0.04	<0.02	<0.02	0.07	<0.01	0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.49	0.52
Total Suspended Solids	mg/L	-	-	-	-	10	617	3	13	<10	21	35	<10	<10	<10	<10	<10	134	154	<10	650	96
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.46	0.04	0.207	0.069	0.044	0.05	0.05	0.049	0.042	-	-	0.048	0.047	0.037	0.054	0.057
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	-	-	-	-	-	-	-	-	-	-	0.472	0.477	0.066	1.01	0.919
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.02	0.01	0.017	0.008	0.013	0.014	0.01	0.015	0.013	0.013	0.013	0.013	0.013	0.012	0.024	0.023
Beryllium (tot)	mg/L	Calculated	-	-	-	0.0005	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	<0.01	<0.01	0.016	<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
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-
Chromium (tot)	mg/L	-	-	0.064	-	0.003	<0.001	<0.001	<0.001	<0.003	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	0.0004	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0016	0.0015
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.001	0.003	0.001	0.0016	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.003	0.003	<0.002	0.003	0.003
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.32	0.12	0.121	<0.01	<0.01	0.12	0.02	<0.01	0.14	<0.01	<0.01	0.419	0.39	0.051	1.59	1.28
Lead (tot)	mg/L	-	Calculated	0.002	-	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	<0.001	0.001	0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.05	0.01	0.032	0.013	<0.002	0.022	0.002	0.004	0.018	<0.002	<0.002	0.023	0.029	0.003	0.199	0.159
Molybdenum (tot)	mg/L	-	0.04	-	-	0.0005	<0.005	<0.005	<0.0005	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	<0.005	<0.005	<0.001	<0.003	0.007	<0.003	<0.003	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.1	3.9	1.9	3.03	2.81	2.37	2.24	2.61	-	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.001	0.059	0.049	0.06	0.032	0.054	0.052	0.043	-	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	<0.0001	<0.0001	<0.0001	<0.0003	<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.002	<0.01	<0.01	<0.005	<0.002	<0.002	0.003	<0.002	-	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.001	0.001	<0.001	0.0008	<0.002	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.005	<0.01	<0.01	<0.005	0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02	<0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Chemistry Results						Location	HR-SW2	HR-SW2	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW4	HR-SW4
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	HR-SW2	HR-SW2	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	HR-SW3	AQC SW-S21 (HR	HR-SW3	HR-SW3	HR-SW3	AQC-SW1 (HR-S	HR-SW4	HR-SW4
						Sample Date	2022-May-02	2023-May-03	2014-May-12	2015-May-05	2016-Apr-27	2017-May-12	2018-May-09	2019-May-08	2021-Apr-22	2021-Apr-22	2021-Oct-21	2022-May-02	2023-May-03	2023-May-03	2020-May-08	2020-Oct-08
Anions						Detection Limit																
Chloride	mg/L	-	-	180	128	0.1	0.42	0.38	0.59	0.76	0.58	0.48	0.55	0.65	0.58	0.62	1.27	0.44	0.44	0.45	0.66	0.6
Nitrate as N	mg/L	-	-	-	-	0.05	<0.05	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	0.21	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.13	0.28
Nitrite as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	4.76	4.18	6.67	-	6.36	6	4.64	5.55	5.44	5.37	0.71	4.64	4.76	4.75	6.56	5.3
Cations																						
Calcium (tot)	mg/L	-	-	-	-	0.16	7.71	5.45	8.69	8.63	6.96	7.8	6.98	7.01	8.82	9.07	13.1	8.01	6.17	6.38	3.47	6.88
Magnesium (tot)	mg/L	-	-	-	-	0.1	0.93	0.76	1.1	1.08	0.91	1.04	0.82	0.92	1.13	1.1	1.63	1.07	0.63	0.79	1.35	2.92
Potassium (tot)	mg/L	-	-	-	-	0.25	<1.15	1.1	0.69	0.72	0.56	0.58	0.64	0.67	0.82	0.84	1.73	<1.15	0.53	<0.5	1.11	1.82
Sodium (tot)	mg/L	-	-	-	-	0.1	0.81	0.89	1.01	1.02	0.85	0.86	0.79	0.9	1.17	1.15	1.48	1	0.57	1.21	0.97	1.41
General Chemistry																						
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	5	21	17	18	18	18	26	30	23	18	20	37	20	13	11	12	16
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	<0.02	<0.02	0.000171463	<0.02	<0.02	0.00002	<0.02	<0.02	<0.02	0.11	<0.02	<0.02	<0.02	<0.02	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	<2	<5	<5	<5	<5	<5	<5	<2	2	4	<2	<2	<2	<5	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	5	<5	<5	12	21	-	9	<5	<5	<5	<5	31	<5	<5	30	9	35
Electrical Conductivity	uS/cm	-	-	-	-	2	56	49	59	58	51	70	53	56	55	55	83	56	45	45	44	46
Lab Filtration Aluminum (diss)		-	-	-	-		-		-	-	-	-	-	-	-	-	-	-			-	-
pH	pH units	6.5 - 8.5	-	6 - 9	-		6.73	7.03	7.07	6.85	7.38	7.67	6.82	6.47	7.12	7.05	6.83	6.66	6.75	6.69	6.83	6.48
Phenols	mg/L	0.001	-	0.04	0.004	0.001	-	-	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	36	50	40	46	38	40	<20	50	<20	32	76	40	52	56	30	32
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.15	<0.1	0.58	0.69	1.85	0.18	0.39	<0.1	0.29	0.31	0.62	0.18	0.32	0.36	0.31	0.28
Total Phosphorus	mg/L	0.03	-	-	-	0.02	<0.02	<0.02	0.03	0.11	<0.01	0.01	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	0.02	<0.02	0.03	0.12
Total Suspended Solids	mg/L	-	-	-	-	10	<10	<10	13	25	<10	<10	<10	10	<10	<10	<10	<10	<10	<10	17	280
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	<0.000002	-	-	-	-	-	-	-	-	-	-	<0.000002	<0.000002	-	-
Metals																						
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.043	-	0.053	0.07	0.054	0.047	0.045	-	0.078	0.073	0.097	0.051	-	-	0.068	0.071
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	0.052	-	-	-	-	-	-	-	-	-	-	0.071	0.079	-	-
Aluminum (tot)	mg/L	-	-	-	-	0.004	-	0.041	-	-	-	-	-	-	0.11	0.148	0.128	-	0.125	0.167	0.487	3.67
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.011	0.012	0.014	0.015	0.011	0.016	0.014	0.013	0.012	0.013	0.025	0.012	0.013	0.018	0.014	0.065
Beryllium (tot)	mg/L	Calculated	-	-	-	0.0005	-	-	<0.001	<0.001	<0.001	-	-	-	-	-	-	-	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	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	<0.01	<0.01	<0.01	0.018
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.0001	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-
Chromium (tot)	mg/L	-	-	0.064	-	0.003	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	0.0012	<0.0005	<0.0005	<0.0005	0.0006	0.0039
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.001	0.005	0.002	<0.002	<0.002	<0.002	<0.002	0.001	<0.002	<0.002	0.002	<0.002	<0.002	0.001	0.001	0.004	0.017
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.04	0.186	0.05	0.09	<0.01	<0.01	0.09	<0.01	0.141	0.214	0.98	0.052	0.079	0.136	0.45	3.85
Lead (tot)	mg/L	-	Calculated	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	<0.001	0.003
Manganese (tot)	mg/L	-	-	-	-	0.002	0.003	0.003	0.039	0.07	<0.002	0.004	0.073	0.006	0.021	0.032	0.312	0.006	0.017	0.05	0.031	0.242
Molybdenum (tot)	mg/L	-	0.04	-	-	0.0005	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	<0.003	<0.003	<0.003	-	-	-	-	-	-	-	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.1	-	-	2.39	1.72	2.75	-	-	-	-	-	-	-	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	<0.0001	<0.0001	<0.0001	-	-	-	-	-	-	-	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.001	-	-	0.052	0.048	0.043	-	-	-	-	-	-	-	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	-	<0.0003	<0.0003	<0.0003	-	-	-	-	-	-	-	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.002	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.001	-	-	<0.002	<0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.005	<0.02	<0.02	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.02	<0.02	<0.02	<0.02	<0.005	0.026

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E-2: Historical Surface Water Chemistry Results						Location	HR-SW4	HR-SW4	HR-SW4	HR-SW4
Parameter	Units	PWQO-GENERAL	PWQO-INTERIM	MECP-GD-TA	MECP-GD-TB	Sample ID	HR-SW4	HR-SW4	HR-SW4	HR-SW4
						Sample Date	2021-Apr-22	2021-Nov-15	2022-May-02	2023-May-03
Anions						Detection Limit				
Chloride	mg/L	-	-	180	128	0.1	0.64	0.48	0.41	0.36
Nitrate as N	mg/L	-	-	-	-	0.05	0.15	0.08	0.06	<0.05
Nitrite as N	mg/L	-	-	-	-	0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	-	-	100	-	0.1	5.53	4.7	4.69	3.85
Cations										
Calcium (tot)	mg/L	-	-	-	-	0.16	3.79	8.2	2.93	2.14
Magnesium (tot)	mg/L	-	-	-	-	0.1	1.28	2.36	1.13	0.62
Potassium (tot)	mg/L	-	-	-	-	0.25	1.27	2.05	<1.15	0.81
Sodium (tot)	mg/L	-	-	-	-	0.1	1.11	1.57	0.9	0.57
General Chemistry										
Alkalinity (as CaCO3)	mg/L	See Factsheet	-	-	-	5	8	25	7	<5
Ammonia as N	mg/L	-	-	-	-	0.02	<0.02	0.1	<0.02	<0.02
Biochemical Oxygen Demand	mg/L	-	-	-	-	2	<2	4	<2	<2
Chemical Oxygen Demand	mg/L	-	-	-	-	5	<5	277	<5	<5
Electrical Conductivity	uS/cm	-	-	-	-	2	36	53	34	25
Lab Filtration Aluminum (diss)		-	-	-	-		-	-	-	
pH	pH units	6.5 - 8.5	-	6 - 9	-		6.76	6.57	6.37	6.5
Phenols	mg/L	0.001	-	0.04	0.004	0.001	-	-	-	-
Total Dissolved Solids	mg/L	-	-	-	-	10	36	38	50	40
Total Kjeldahl Nitrogen	mg/L	-	-	-	-	0.1	0.12	8.04	0.17	0.18
Total Phosphorus	mg/L	0.03	-	-	-	0.02	0.05	0.66	0.08	<0.02
Total Suspended Solids	mg/L	-	-	-	-	10	<10	190	13	<10
Unionized Ammonia (Calc)	mg/L	-	-	-	-	0.000002	-	-	-	<0.000002
Metals										
Aluminum (diss)	mg/L	-	Calculated	-	-	0.004	0.062	0.048	0.049	-
Aluminum (diss, PWQO)	mg/L	-	Calculated	-	-	0.004	-	-	-	0.062
Aluminum (tot)	mg/L	-	-	-	-	0.004	0.177	1.49	-	0.09
Barium (tot)	mg/L	-	-	2.3	-	0.002	0.011	0.037	0.011	0.011
Beryllium (tot)	mg/L	Calculated	-	-	-	0.0005	-	-	-	-
Boron (tot)	mg/L	-	0.2	3.55	1.5	0.01	<0.01	<0.01	<0.01	<0.01
Cadmium (tot)	mg/L	-	Calculated	0.00021	0.000017	0.0001	-	-	-	-
Chromium (tot)	mg/L	-	-	0.064	-	0.003	-	-	-	-
Cobalt (tot)	mg/L	-	0.0009	-	-	0.0005	<0.0005	0.0018	<0.0005	<0.0005
Copper (tot)	mg/L	-	Calculated	0.0069	-	0.001	<0.002	0.009	<0.002	0.001
Iron (tot)	mg/L	0.3	-	1	-	0.01	0.134	1.65	0.068	0.038
Lead (tot)	mg/L	-	Calculated	0.002	-	0.001	<0.001	0.002	<0.001	<0.001
Manganese (tot)	mg/L	-	-	-	-	0.002	0.007	0.444	0.005	<0.002
Molybdenum (tot)	mg/L	-	0.04	-	-	0.0005	-	-	-	-
Nickel (tot)	mg/L	0.025	-	-	-	0.003	-	-	-	-
Silicon (tot)	mg/L	-	-	-	-	0.1	-	-	-	-
Silver (tot)	mg/L	0.0001	-	-	-	0.0001	-	-	-	-
Strontium (tot)	mg/L	-	-	-	-	0.001	-	-	-	-
Thallium (tot)	mg/L	-	0.0003	-	-	0.0001	-	-	-	-
Titanium (tot)	mg/L	-	-	-	-	0.002	-	-	-	-
Vanadium (tot)	mg/L	-	0.006	-	-	0.001	-	-	-	-
Zinc (tot)	mg/L	-	0.02	0.089	0.03	0.005	<0.005	0.021	<0.02	<0.02

-LEGEND-

Detection Limit	DL: May vary between sample locations and events
DL exceeds criteria	
Concentration exceeds PWQO-GENERAL	Provincial Water Quality Objectives General
Concentration exceeds PWQO-INTERIM	Provincial Water Quality Objectives Interim
Concentration exceeds MECP-GD-TA	MECP Guidance Document Table A
Concentration exceeds MECP-GD-TB	MECP Guidance Document Table B

*Please double check with Factsheet for all calculated criteria/guidelines.

Appendix E

E-3 2023 Surface Water Monitoring Locations Comparisons

E-3: Spring 2023 Surface Water Results Comparison

Sample Description			HR-SW1	HR-SW2	Comparison	HR-SW3	Comparison	HR-SW4	Comparison
Date Sampled			3-May-23	3-May-23	SW1 to SW2	3-May-23	SW1 to SW3	3-May-23	SW4 to SW1
Parameter	Unit	RDL			% change		% change		% change
Biochemical Oxygen Demand, Total	mg/L	2	2	2	0%	2	0%	2	0%
pH	pH Units	NA	7.21	7.03	2%	6.75	6%	6.50	-11%
Alkalinity (as CaCO3)	mg/L	5	29	17	41%	13	55%	5	-480%
Electrical Conductivity	uS/cm	2	67	49	27%	45	33%	25	-168%
Hardness (as CaCO3) (Calculated)	mg/L	0.5	27.3	16.7	39%	18	34%	7.9	-246%
Total Dissolved Solids	mg/L	20	52	50	4%	52	0%	40	-30%
Total Suspended Solids	mg/L	10	10	10	0%	10	0%	10	0%
Chloride	mg/L	0.10	0.39	0.38	3%	0.44	-13%	0.36	-8%
Nitrate as N	mg/L	0.05	0.18	0.07	61%	0.05	72%	0.05	-260%
Nitrite as N	mg/L	0.05	0.05	0.05	0%	0.05	0%	0.05	0%
Sulphate	mg/L	0.10	4.67	4.18	10%	4.76	-2%	3.85	-21%
Ammonia as N	mg/L	0.02	0.02	0.02	0%	0.02	0%	0.02	0%
Total Kjeldahl Nitrogen	mg/L	0.10	0.21	0.1	52%	0.32	-52%	0.18	-17%
Total Phosphorus	mg/L	0.02	0.02	0.02	0%	0.02	0%	0.02	0%
Chemical Oxygen Demand	mg/L	5	5	5	0%	5	0%	5	0%
Total Calcium	mg/L	0.16	9.5	5.45	43%	6.17	35%	2.14	-344%
Total Magnesium	mg/L	0.17	0.86	0.76	12%	0.63	27%	0.62	-39%
Total Potassium	mg/L	0.58	0.52	1.1	-112%	0.53	-2%	0.81	36%
Total Sodium	mg/L	0.22	0.77	0.89	-16%	0.57	26%	0.57	-35%
Aluminum-dissolved	mg/L	0.004	0.095	0.052	45%	0.071	25%	0.062	-53%
Total Aluminum	mg/L	0.010	0.07	0.041	41%	0.125	-79%	0.09	22%
Total Barium	mg/L	0.002	0.013	0.012	8%	0.013	0%	0.011	-18%
Total Boron	mg/L	0.010	0.01	0.01	0%	0.01	0%	0.01	0%
Total Cobalt	mg/L	0.0005	0.0005	0.0005	0%	0.0005	0%	0.0005	0%
Total Copper	mg/L	0.002	0.001	0.002	-100%	0.001	0%	0.001	0%
Total Iron	mg/L	0.010	0.023	0.186	-709%	0.079	-243%	0.038	39%
Total Lead	mg/L	0.001	0.001	0.001	0%	0.001	0%	0.001	0%
Total Manganese	mg/L	0.002	0.002	0.003	-50%	0.017	-750%	0.002	0%
Total Zinc	mg/L	0.005	0.02	0.02	0%	0.02	0%	0.02	0%

- value indicates an increase in downstream concentration

red font indicates < removed

Appendix F

Trigger Mechanisms and Contingency Plan

Appendix F

F-1 Surface Water Trigger Mechanisms and Contingency Plan

HICKEY ROAD WASTE DISPOSAL SITE
TRIGGER MECHANISMS
20-NOV-2020
FINAL

OBJECTIVE AND BACKGROUND

The objective of the trigger mechanisms and contingency plan for the Hickey Road Waste Disposal Site (WDS) is to identify the off-site migration of leachate impacted surface water and groundwater, and ensure timely action to prevent and mitigate any adverse impacts to the environment.

OBJECTIVE 1: SURFACE WATER IMPACTS

To identify migration of impacted surface water or leachate impacted groundwater discharging to adjacent surface water bodies; to identify surface water run-off impacts to surface water bodies; and ensure timely action to prevent and mitigate any adverse impacts to the environment.

South Property Boundary-Surface Water

Assessment Points- SW2, SW3
Trigger Mechanisms- Alkalinity, Chloride, Iron, Manganese, TKN and Un-ionized Ammonia
Frequency-Sampling twice per year (Spring and Fall)
Contingency Plan is activated if three or more of the following triggers occur at the assessment point during one sampling event: Alkalinity, Chloride, Iron, Manganese, TKN, and un-ionized ammonia exceeds the values in Table 1. The 75th percentile for SW1 (background) sampling location based on the sampling results from May 2007 to May 2019 (20 results).

Table 1: SW2 and SW3 Trigger Values for Select Parameters

Parameter	SW1 75th Percentile Concentration mg/L	Surface Water Criteria (PWQO/CWQG) mg/L
Alkalinity	54.5	
Chloride	1.0	
Iron		0.3
Manganese	0.0175	
Sodium		128
TKN	0.36	
Unionized Ammonia		0.02

Notes: Should Tier 1 sampling be triggered based on surface water sampling results the contingency sampling will be carried out at the location having results that triggered the Tier 1 sampling.

Surface water samples are quite frequently dry, should dry conditions be encountered during Tier 1 or Tier 2 sampling events, then follow-up sampling will be carried out during the next semi-annual sampling event should water be present.

CONTINGENCY PLAN – SURFACE WATER

Tier 1: If three or more triggers are exceeded at the SW2 or SW3 surface water assessment point during one sampling event; the following Tier 1 sampling will be undertaken:

- Within two weeks of receipt of laboratory results, a Toxicity test (Single Concentration – Acute Lethality) sample will be collected from SW2 or SW3 (as per notes above) to determine the impacts to surface water. Tier 2 Contingency Plan is activated if result of the Toxicity test is greater than 50%.

Tier 2: Within one week of receipt of laboratory results indicting a failed toxicity test the following will be undertaken:

- A second Toxicity test will be collected at the sample location having failed Toxicity test results. Upon receipt of a confirmed second Toxicity test result the following will be undertaken:
- Identification of other potential causes of elevated concentrations through additional studies to be completed within two months of the second failed test. Following the two months, if no other potential causes for the elevated concentrations have been identified then proceed to Tier 3.

Tier 3: If the increased sampling and/or additional studies indicate a continuing issue resulting in impacts or potential significant impacts to the environment, then mitigation/remediation measures will be implemented to prevent further impact. These measures would be aimed at intercepting or diverting the impacted surface water/groundwater before it reaches a receptor. The specifics of the plan will be dependent on the nature of the impact.

References:

1. Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/13 Second Edition – December 2000, including May 2007 and February 2016 Amendments.
2. Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia mangna", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/14 Second Edition – December 2000, including February 2016 Amendment.

Appendix F

F-2 Draft Groundwater Trigger Mechanisms and Contingency Plan

HICKEY ROAD WASTE DISPOSAL SITE
TRIGGER MECHANISMS
DRAFT FOR DISCUSSION – REV. 05-MARCH-2021

OBJECTIVE AND BACKGROUND

The objective of the trigger mechanisms and contingency plan for the Hickey Road Waste Disposal Site (WDS) is to identify the off-site migration of leachate impacted and groundwater, and ensure timely action to prevent and mitigate any adverse impacts to the environment.

OBJECTIVE 2: GROUNDWATER IMPACTS

To identify migration of leachate impacted groundwater and to ensure timely action to prevent any adverse impacts to the environment.

West and South CAZ Boundary-Groundwater

Assessment Points- Future West and South CAZ Boundaries
Trigger Mechanisms- Barium, Chloride, Iron and TDS
Frequency-Sampling twice per year (Spring and Fall)

Contingency Plan is activated if three or more of the following triggers occur for two consecutive sampling events: Barium, Chloride, Iron, and TDS exceed the RUV criteria for the assessment point.

Table 4: Trigger Values for Select Parameters

Parameter	RUV mg/L
Barium	0.303
Chloride	129
Iron	0.25
TDS	314

CONTINGENCY PLAN – GROUNDWATER

Tier 1: If three or more triggers are exceeded at one assessment point for two consecutive sampling events, a repeat sampling will be conducted within one (1) month of receipt of the laboratory results to confirm or refute the results at that location.

Tier 2: If three or more triggers are exceeded at one assessment point and are confirmed through Tier 1 additional sampling then the following measures will be implemented depending on the nature of the trigger activation:

a. Increase monitoring frequency to twice monthly, for four months (if exceedances continue). Revert back to typical annual monitoring sampling frequency if there are two consecutive sampling results that do not show exceedances; and/or
b. Identification of other potential causes for elevated concentrations through additional studies.

Tier 3: If the increased sampling indicates a continuing issue resulting in impacts or potential significant impacts to the environment, then mitigation/remediation measures will be implemented to prevent further impact. These measures would be aimed at intercepting or diverting the impacted groundwater before it reaches a receptor. The specifics of the plan will be dependent on the nature of the impact.

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