

2022 Annual Report, Hall's Glen Waste Transfer Station

Provisional Compliance Approval No. A341004

March 23, 2023

Prepared for:

The Corporation of the Township of Douro-
Dummer



Cambium Reference: 12987-002

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Executive Summary

The Hall's Glen Waste Transfer Station is owned and operated by the Township of Douro-Dummer under Ministry of the Environment, Conservation and Parks Provisional Certificate of Approval No. A341004. The site is on Lot 25, Concession 4, geographic Township of Dummer, Township of Douro-Dummer, County of Peterborough. The municipal address is 1951 County Road 6, about 10 km north of the community of Warsaw. The total site area is 48.5 ha and has an approved landfill area of 1.0 ha. Closure activities were completed at the site from 2003 to 2005. Currently the site operates as a non-hazardous solid waste and materials transfer station.

This report presents the results of the 2022 activities that were completed at the Hall's Glen Waste Transfer Station. The report and activities have been completed and reported on in general conformance with the November 2010 Ministry of the Environment Technical Guidance Document entitled "*Monitoring and Reporting for Waste Disposal Sites – Groundwater and Surface Water*". The "*Monitoring and Screening Checklist*" is provided in Appendix A.

The water level measurements indicated that the predominant direction of groundwater flow in all overburden and bedrock aquifers is to the southeast.

Natural attenuation is occurring at the site as concentrations decreased with distance from the waste mound. Impacts were generally restricted to the overburden and shallow bedrock aquifer due to upward vertical gradients in the down-gradient monitors, southeast of the waste mound. Non-waste related sources may be influencing groundwater quality in some areas of the Site. There were no detectable volatile organic compound concentrations at any wells in 2022.

Groundwater is interpreted to discharge to surface down-gradient of the waste mound for at least a portion of the year. As such, groundwater results are compared against the Provincial Water Quality Objectives and Canadian Water Quality Guidelines. Results indicated minor impacts and were attributed, at least in part, to non-waste related sources such as saturated organic soils, decaying organic vegetation or naturally varying conditions. An investigation was



completed in the autumn to establish a downgradient surface water station in the area of monitor MW12. Field staff noted dry conditions in this area and no samples were collected.

Groundwater samples collected from MW08, MW09, MW10, MW11, MW12, and R1 were used to assess compliance with Ministry Guideline B-7 - Reasonable Use. Due to numerous exceedances which were at least partially not attributed to the site, a supplementary groundwater monitoring program for Per- and Polyfluoroalkyl substances was proposed by the Ministry of the Environment, Conservation and Parks to determine groundwater compliance.

The Ministry of the Environment, Conservation and Parks agreed with Cambium's interpretation of the surface water monitoring program. The historical background station (S2) was considered to be impacted from waste related sources by either surface water runoff and/or potential groundwater discharge. This station will remain in the monitoring program but is considered a downstream monitoring location. Former down-gradient station S1 (unimpacted) will be the new background station going forward.

About 975 tonnes of waste was accepted at the Site in 2022 and transferred to the Peterborough Waste Management Facility. About 105 tonnes of divertible materials (e.g., blue box recyclables, scrap metal, electronics, etc.) was collected at the Site.

Support from the Ministry of the Environment, Conservation and Parks was received for reductions to the groundwater monitoring program including a reduction in sampling locations, frequency, and parameters. Additional reductions may receive Ministry approval contingent on the results of the supplementary monitoring program for Per- and Polyfluoroalkyl substances.

The Township operated the Hall's Glen waste transfer station in compliance with the Provisional Certificate of Approval in 2022; however, the site must be brought into compliance with the Reasonable Use Policy.

Recommendations have been made regarding the future operation of the Hall's Glen waste transfer station and work to be completed in 2023.



Respectfully submitted,

Cambium Inc.

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1.0 Introduction

The Corporation of the Township of Douro-Dummer (Township) retained Cambium Inc. (Cambium) to complete the 2022 annual monitoring program for the Hall's Glen Waste Transfer Station (Site). The Site operates under the Ontario Ministry of the Environment, Conservation and Parks (Ministry) Provisional Certificate of Approval (PC of A) No. A341004, most recently amended August 22, 2016 (Appendix B).

To aid in the understanding of the history and development of the Site, the following information is included digitally in the report package:

- *Closure Report* (TSH, 2002a)
- *Design, Operations, Maintenance and Closure Report* (TSH, 2002b)

1.1 Site Location

The Site is on Lot 25, Concession 4, geographic Township of Dummer, Township of Douro-Dummer, County of Peterborough (Figure 1). The municipal address for the Site is 1951 County Road 6, about 10 km north of the community of Warsaw. The Universal Transverse Mercator (UTM) coordinates for the site entrance area Zone 17, 727911 m east, 4933207 m north, North American Datum (NAD) 83.

1.2 Site Description

The Township has owned and operated the Site as a natural attenuation landfill since 1970. The PC of A which approved landfill operations was granted in 1980. Closure activities began in the summer of 2003, where the landfill area was mounded and capped. Final closure activities were completed from 2003 to 2005. An area of Fill Beyond Acceptable Limits (FBAL) on the north side of the waste mound was identified in Drawing 1 of the *Closure Report* (TSH, 2002a). It is understood that the Township addressed the FBAL in 2004 and 2005. To Cambium's knowledge there is no FBAL at the Site. Currently the Site operates as a non-hazardous solid waste and materials transfer station.



The Site is in a rural area and is surrounded by agricultural fields and forest; surrounding land use is primarily passive agriculture. Site details are in Embedded Table 1. A Local Topography Plan and an Existing Conditions Plan are included as Figure 2 and Figure 3, respectively.

Embedded Table 1 Site Details

Total Site Area	48.5 ha
Approved Area of Refuse Placement	1.0 ha

1.3 Scope of Work

The scope of the 2022 work program was based on the results of the 2021 groundwater monitoring program (Cambium, 2022), requirements outlined in the PC of A, and included:

- Groundwater elevation monitoring
- Surface water and groundwater sampling and analysis
- Evaluation of groundwater quality against the Ontario Drinking Water Quality Standards (ODWQS) and Reasonable Use Concept (RUC) values developed in accordance with Ministry Guideline B-7
- Evaluation of groundwater quality at select monitoring wells against the Provincial Water Quality Objectives (PWQO)
- Evaluation of surface water quality against the PWQO
- An overview of site development and operations
- Preparation of this annual report

This report presents the results of the 2022 work program, provides an assessment of the current landfill impact of the Site on the surrounding groundwater and surface water environments, and a summary of the operational activities. Cambium has provided recommendations for the 2023 monitoring program and site operations based on the 2022 results and assessment. Furthermore, this report addresses on-going discussions with the Ministry throughout 2022 which includes comments received from the Ministry's Technical



Support Section following their review's of the *2021 Annual Monitoring Report, Hall's Glen Waste Disposal Site* (Cambium, 2022) (Appendix C):

- Groundwater review comments from Nick Battye, Hydrogeologist, Technical Support Section, Eastern Region, dated June 22, 2022
- Surface water review comments from Laurel Rudd, Surface Water Evaluator, Technical Support Section, Eastern Region, dated June 2, 2022



2.0 Methodology

The 2022 work program was completed to maintain compliance with the PC of A and Ministry requirements. As such, the environmental monitoring work program was completed consistent with *Guidance Manual for Landfill Sites Receiving Municipal Waste* (MOEE, 1993) and *Monitoring and Reporting for Waste Disposal Sites, Groundwater and Surface Water, Technical Guidance Document* (MOE, 2010).

Field tasks were completed following Cambium's Standard Operating Procedures developed from recognized standard procedures such as those listed above and *Guidance on Sampling and Analytical Methods for use at Contaminated Sites in Ontario* (MOEE, 1996). A health and safety program was developed for site-specific conditions and all Cambium personnel working on the project were familiarized and required to follow the identified protocol.

Groundwater and surface water samples were stored in coolers with freezer packs and maintained at less than 10°C during transport to Caduceon Environmental Laboratories (Caduceon) in Kingston, Ontario. Caduceon is accredited by the Canadian Association for Laboratory Accreditation Inc. for specific environmental tests listed in the scope of accreditation. Groundwater and surface water samples were submitted at the frequency and for analysis of the parameters outlined in Table 1.

2.1 Groundwater Monitoring Program

The following tasks were completed as part of the 2022 groundwater monitoring program:

- Prior to sampling, water levels were measured at each monitoring well using an electronic water level tape.
- The purge volume was calculated on-site during each monitoring event using the measured water level, well depth, and the borehole diameter. Each groundwater monitoring well to be sampled was purged of about three well bore volumes. For wells with low recovery, at least one saturated borehole volume was purged prior to sampling. Purged water was disposed on-site, down-gradient of each respective well.



- Samples were collected using dedicated polyethylene tubing equipped with inertial-lift foot valves.
- Groundwater samples for metals and dissolved organic carbon (DOC) analysis were field filtered.
- Field measurements were recorded for pH, conductivity, temperature, dissolved oxygen (DO), and oxygen reduction potential (ORP).

Groundwater samples were collected on April 12, and October 25 from the on-site monitoring wells listed below.

- MW01-1 • MW03-2 • MW06-1 • MW08-2 • MW 11-1 • MW 13-1
- MW01-2 • MW04-1 • MW06-2 • MW09-1 • MW 11-2 • MW 13-2
- MW02-1 • MW04-2 • MW07-1 • MW09-2 • MW 12-1
- MW02-2 • MW05-1 • MW07-2 • MW 10-1 • MW 12-2
- MW03-1 • MW05-2 • MW08-1 • MW 10-2 • MW 12-3

The following deviations from the monitoring program detailed in Table 1 were noted:

- No samples were collected from MW02-1 as the well was reported to be compromised (specifically, the measured depth was approximately 8 metres below ground surface (mbgs), whereas the installation depth was 15 mbgs). This indicates that there is a blockage in the well pipe, or that sediment is infilling the well.
- MW02-2 had insufficient volumes for sample collection during the spring sampling event.
- No samples were collected from MW01-2, MW02-1, MW02-2, MW03-2, and MW05-2 during the autumn sampling event as they were reported to be dry.

Monitoring wells included in the groundwater monitoring program are shown on Figure 2. The UTM coordinates for the monitoring locations are in Table 2. Groundwater results are discussed in Section 4.2. Field data sheets are in Appendix D. Laboratory Certificates of Analysis are in Appendix E. Photographs of each monitoring location are in Appendix F.



Blind duplicate groundwater samples were collected from the following locations listed in Embedded Table 2 as part of the Quality Assurance/Quality Control (QA/QC) program. As these field duplicates equate to at least 10% of the total samples collected, this is an adequate QA/QC program for groundwater. In addition to these samples, the laboratory completes internal QA/QC. The results of the QA/QC program are presented in Section 4.1.

Embedded Table 2 Groundwater QA/QC Duplicate Locations

Spring	Autumn
QA/QC #1: MW05-1	QA/QC #1: MW04-2
QA/QC #2: MW05-2	QA/QC #2: MW07-2
QA/QC #3: MW13-2	QA/QC #3: MW05-1
QA/QC VOCs #1: MW05-1	QA/QC VOCs #1: MW04-2
QA/QC VOCs #2: MW05-2	QA/QC VOCs #2: MW07-2

Notes:

Extended VOC suite analysed on QA/QC VOC duplicates.

2.2 Residential Well Monitoring Program

Residential well sampling was completed on April 12 and October 25 at the locations listed below. Samples were only collected from R1 and R4 in the spring, and R1 in the autumn as residents were not home during the time of sample collection.

- R1
- R2
- R3
- R4

Well locations are on Figure 2. It is noted that R1 is not technically a residential supply well. R1 is a 0.05 m diameter PVC monitoring well that was installed to replace the abandoned stone dug well that was sampled historically (also identified as R1). To Cambium's knowledge the original R1 well has not recently been used as a private water supply and the existing R1 (monitoring well) is not used as a water supply. The suspected Ministry well record for R1 is no.:7338879 (MECP, 2021). The record indicates that gravel overburden was encountered to a depth of 2.7 m bgs (below ground surface). Limestone bedrock extended from 2.7 mbgs to 4.7 mbgs. R1 was installed to a depth of 4.7 mbgs and the screen crosses the overburden bedrock interface.



The other three residential wells are water supply wells for single-family residences to the east and west of the Site. Installation details and age of the wells R2, R3 and R4 are not known, and specific well records could not be assigned to each location. However, suspected well records for these locations were identified (7265867, 5106571 and 5110084 (MECP, 2021)) and indicated that the wells are likely installed in bedrock and ranged in depth between 10.7 mbgs and 16.2 mbgs. Results from the residential well sampling are discussed in Section 4.3. Field data sheets are in Appendix D and Laboratory Certificates of Analysis as provided by Caduceon are in Appendix E.

2.3 Surface Water Monitoring Program

The following tasks were completed as part of the 2022 surface water monitoring program:

- Weather conditions prior to and during field events were recorded.
- Surface water samples were collected by immersing the sample container into the water body.
- When sample bottles were prefilled with preservatives, a clean bottle was used to collect and decant the water directly into the sample bottle.
- Surface water samples for mercury (0.45 µm) analysis were filtered by the laboratory.
- Field measurements including pH, conductivity, temperature, DO, and ORP were recorded at each sample location.
- Where possible, depth, width, and flow velocity measurements were collected at each surface water location.

The surface water monitoring program included attempted sample collection from on-site surface water sample stations S1 and S2 on April 12 and October 25. The following deviations from the monitoring program were noted:

- Station S2 was dry in April.
- Stations S1 and S2 were dry in October.



In addition to the above, Cambium field staff completed a field reconnaissance visit during the autumn sampling event to identify any surface water channels where groundwater is anticipated to discharge to surface (i.e., between wells MW11 and MW12). No suitable location was identified. Further discussion regarding the reconnaissance visit is detailed in Section 3.1.

Surface water sampling locations are shown on Figure 2. The UTM coordinates for the monitoring locations are in Embedded Table 3. Surface water results are discussed in Section 4.4. Field data sheets are in Appendix D. Laboratory Certificates of Analysis provided by Caduceon are in Appendix E. Photographs of each surface water sample location are in Appendix F.

Blind duplicate surface water samples were collected from station S1 in April as part of the QA/QC program. As these field duplicates equate to at least 10% of the total samples obtained, this is an adequate QA/QC program for surface water. The results of the QA/QC program are presented in Section 4.1.

2.4 Landfill Gas Monitoring Program

Landfill gas monitoring was conducted at all existing groundwater monitoring wells in 2022 in conjunction with the spring and autumn monitoring events. The purpose of the monitoring is to assess compliance with Section 4.10 of *Landfill Standards, A Guideline on the Regulatory and Approval Requirements for New and Expanding Landfilling Sites* (MOEE, 1998), which states the concentration of methane gas in the subsurface may not exceed 2.5% by volume at the property boundary.

Methane and hydrogen sulfide concentrations were measured at each location, prior to collecting groundwater levels or samples, using a calibrated portable gas meter. LFG monitoring is conducted on an annual basis at the Site; the LFG concentrations for the 2022 monitoring program are discussed in Section 4.5.

2.5 Site Review and Operations Overview

Operations were observed during site visits completed in April and October 2022. During these visits, the items listed below were inspected on the accessed areas of the Site and



observations were noted in the field file. In February 2023, the Township provided additional 2022 site operations information. Site inspection results are presented in Section 5.0.

- Litter control
- Condition and layout of recycling bins
- Status of monitoring well security
- Condition and layout of access roads, access gates
- Final cover integrity



3.0 Geological and Hydrogeological Context

3.1 Topography and Drainage

The Site is in the Otonabee River tertiary watershed and the Indian River quaternary watershed. The surface water drainage systems on and near the Site have generally been characterized as stagnant and discontinuous. The local area around the Site is poorly drained and surface water generally pools and is interpreted to infiltrate into the subsurface or evaporate. An unevaluated wetland is within the central portion of the Site, east of the waste mound, and extends to the north and south. Various disconnected unevaluated wetlands have also been identified to the north, southeast, and southwest. In general, surface water flow is only interpreted to occur during wetter times of the year. The nearest mapped watercourse is an unnamed tributary about 1.5 km south of the Site which eventually discharges into the Indian River. Topographic maps suggest that surface water flow within the area is generally south (during times of year when surface water flow occurs).

During the 2022 autumn sampling event, Cambium staff completed a surface water reconnaissance. The purpose was to identify any defined surface water channels between monitoring wells MW11 and MW12 which has been an area speculated to receive groundwater discharge. The presence of a surface water channel would identify a primary flow path; however, no channels were observed during the reconnaissance. As such, it is likely that any groundwater discharging to surface will remain ponded and either evaporate or re-infiltrate the subsurface (as water levels fluctuate throughout the year). No defined flow channels have been observed by Cambium staff anywhere on-site.

There are two surface water monitoring stations included in the existing monitoring program (labelled as S1 and S2). Both stations are established within topographic depressions which exhibit periods of low or no flow. The following describes the surface water stations in the approved monitoring program:

- S1 is 700 m southeast of the waste mound and adjacent to residential well R1.



- S2 is 200 m east-northeast of the waste mound and has historically monitored the background surface water quality. Station S2 is where, according to available mapping, surface water flows south onto the Site from areas north of the property (making this location a background surface water monitoring station). Due to the proximity of station S2 to the waste mound, and the discontinuous nature of the flow surface water systems on-site, this station may be influenced from landfill leachate. Alternatively, this station may be in an area where impacted groundwater discharges to surface. See Section 4.3 for more details.

The geospatial coordinates (NAD 83) for the surface water monitoring stations are outlined in Embedded Table 3. Flow and discharge rates measured during the monitoring events are included in Appendix D. There was no staining observed at any of the surface water monitoring stations that would be indicative of leachate impacted groundwater discharge.

Embedded Table 3 Surface Water Stations Coordinates

Surface Water Station	UTM (Zone 17)
S1	729187, 4933099
S2	728686, 4933486

3.1.1 Precipitation Data

A review of the 2022 precipitation data for Trent U (Government of Canada, 2023) in comparison to the average precipitation data for 1981 to 2010 for Peterborough A (Government of Canada, 2015) indicated that the annual precipitation was slightly below normal; however, varied month to month. In 2022, the wettest months of the year were February, August, and December which had above average precipitation when compared to the climate normal. There was notable dry spell from September to November which received about half the climate precipitation than normal. The monthly precipitation, as well as the amount of precipitation during and in the three days prior to the sampling events is summarized in Embedded Table 4. Refer to Appendix D for field sheets and climate data.



Embedded Table 4 Historical and 2022 Precipitation Data

Sampling Date	Average Monthly Precipitation (mm) (1981 – 2010)	2022 Monthly Precipitation (mm)	Precipitation During and Prior to Sampling (mm)
April 12	68.6	56.8	1.2
October 25	76.9	45.6	0.0

3.2 Hydrogeology

Based on the assessment completed by GHD and prior consultants, the following summary of the hydrogeology of the Site is provided (GHD, 2021). The Site is in the physiographic region known as the Dummer Moraine. This area can be characterized as relatively flat, stoney ground covered with shallow deposits of glacial till. The average overburden depth in the area is 3.25 mbgs. The overburden unit is underlain by limestone bedrock from the Lindsay Formation. The bedrock is part of the Trenton-Black River Group and is of Middle Ordovician age.

The current monitoring program consist of 13 multi-level groundwater monitors. Available information indicates that the monitoring wells intercepted four water bearing units (an overburden aquifer and three bedrock aquifers; Appendix G). The aquifers in which each well has been installed are outlined below. It is noted that the well groupings listed below were based off available information. In some cases, the water bearing strata in which a well is installed was estimated based on available information and assumptions regarding well construction.

- Overburden: MW01-2, MW02-2, MW03-2, MW04-2, MW05-2, MW06-2, MW07-2, and MW13-2
- Shallow Bedrock (determined to be either the first bedrock aquifer encountered beneath overburden, or the shallowest bedrock well in a multi-level bedrock well grouping): MW01-1, MW02-1, MW03-1, MW04-1, MW05-1, MW06-1, MW07-1, MW08-2, MW09-2, MW10-2, MW11-2, MW12-1, and MW13-1
- Deep Bedrock: MW08-1, MW09-1, MW10-1, MW11-1, and MW12-2



- Monitoring well MW12-3 is the deepest well installed in bedrock from the MW12 multilevel well. This well was not included in any of the other aquifer groupings outlined above as no other wells were installed beneath the deep aquifer system.

3.2.1 Well Records

A well record search completed in 2021 indicated that there are 30 wells within 500 m of the Site (MECP, 2021)(Appendix H); 14 well records indicate they are used for domestic water supply, 14 records were for monitoring wells, and two records are for drilled test holes. The wells were reported to be from 4.3 to 44.8 mbgs and completed in bedrock (Appendix H). There are 12 well records plotted within the Site boundaries; all of which are identified as monitoring wells that are included in the existing groundwater monitoring program.

3.2.2 Groundwater Flow Direction

Historically, the regional direction of groundwater flow within the overburden and bedrock deposits has been to the southeast towards Indian River (GHD, 2021). To determine the current groundwater elevation, water table gradient, and groundwater flow direction, water level measurements were collected in the spring and autumn. The water level data was used to calculate the groundwater elevations summarized in Table 2 and shown on Figure 4 (overburden), Figure 5 (shallow bedrock) and Figure 6 (deep bedrock). Groundwater elevation contours and flow directions are shown on Figure 7 (overburden), Figure 8 (shallow bedrock) and Figure 9 (deep bedrock). The predominant direction of groundwater flow in all three aquifers is to the east/southeast. It is noted that a portion of flow in the deep aquifer radiates away to the north, west and south from well MW09-1. The water chemistry at monitor MW01-1, northwest of the waste mound, suggested that there is likely a degree of groundwater mounding within the waste mound which would contribute a component of radial flow away from the waste mound in all directions. Refer to Section 4.2.1 for additional detail.

Background monitoring wells MW13-1 and MW13-2 were surveyed in 2022 and confirmed that groundwater flow from these monitors was toward the Site (i.e., up-gradient).

Embedded Table 5 provides the ranges of horizontal hydraulic gradients calculated in 2022.



Embedded Table 5 Summary of Horizontal Hydraulic Gradients

Unit	April	October
Overburden (southeast)	0.012 – 0.019 m/m	0.015 m/m
Shallow Bedrock (east/southeast)	0.003 – 0.015 m/m	0.005 – 0.012 m/m
Deep Bedrock (variable)	0.002 - 0.005 m/m	0.000(flat) – 0.002 m/m

3.2.3 Hydraulic Conductivity

Slug tests were conducted in 2009 by GHD on four wells to assess the permeability of some of the water bearing strata on-site. The results of the slug tests indicated that the overburden soils were silty sand with a relatively high hydraulic conductivity. The bedrock results indicated that the underlying limestone was fractured, also yielding a high conductivity.

Embedded Table 6 summarizes the results of the slug tests as reported by GHD (GHD, 2021) .

Embedded Table 6 Summary of Hydraulic Conductivity

Well	Test Type	Hydraulic Conductivity (cm/s)	Geometric Mean, K (cm/s)	Aquifer
MW03-1	Falling Head	6×10^{-3}	10×10^{-3}	Fractured limestone
	Rising Head	3×10^{-3}		
MW07-2	Falling Head	3×10^{-2}	10×10^{-2}	Silty sand, clean sand
	Rising Head	2×10^{-2}		
MW08-2	Falling Head	2×10^{-2}	10×10^{-2}	Silty sand, clean sand
	Rising Head	4×10^{-2}		
MW08-1	Falling Head	4×10^{-3}	10×10^{-3}	Fractured limestone
	Rising Head	2×10^{-3}		

3.2.4 Vertical Gradients

Vertical hydraulic gradients were calculated between all clustered wells at the Site (Table 3). In general, hydraulic gradients for the wells near the waste mound were downwards (at MW03, MW04, MW05, MW06 and MW07), between overburden and the shallow bedrock aquifer.

Farther away from the waste mound, at wells MW08, MW09, MW10, MW11, MW12, and MW13 vertical gradients were upward between shallow and deep bedrock aquifers. Wells MW08, MW09, MW10, MW11, and MW12 do not include overburden monitors, as such the



hydraulic gradient between overburden and bedrock aquifers in the areas south and east of the waste mound cannot be confirmed. However, the shallow bedrock is considered to be hydraulically connected to the overburden and the consistent upwards vertical hydraulic gradients reported at wells MW08, MW09, MW10, MW11, and MW12 suggest that groundwater may discharge to surface for at least a portion of the year.

3.3 Conceptual Site Model

The Site is underlain by a thin veneer of overburden soils identified as silty-sand till. Underlying the soil is regionally extensive sedimentary rock of the Lindsay Formation of Middle Ordovician age, with trending drumlins and moraines in a northeast-southwest orientation. These features create natural basins and poor drainage conditions.

In general, precipitation infiltrates the overburden soil around the waste mound. Leachate impacted groundwater migrates down into the overburden and bedrock aquifers, where it then migrates, to the southeast. Infiltration of leachate laden groundwater into deeper bedrock aquifer units is restricted (as evidenced by the upwards vertical hydraulic gradients observed at wells MW08 through MW12). The vertical hydraulic gradients between the bedrock and overburden around wells MW08 through MW12 have not been confirmed since there were no overburden monitors included at these locations. However, it is possible that groundwater discharges to surface during at least some periods of the year when conditions permit. Furthermore, the consistent upwards vertical gradients suggest that deep bedrock groundwater quality at these wells may also be influenced by non-waste related sources.

Groundwater flow in the overburden and shallow bedrock aquifers are generally to the southeast. Groundwater flow in the deeper bedrock aquifer is also considered to be toward the southeast, but with variable portions of flow directed to the north and south, around MW09-1. Based on this conceptual model, primary receptors of leachate impacted water are the downstream surface water systems and potentially overburden/shallow bedrock groundwater users.



4.0 Results and Discussion

Water quality results from the monitoring program are used to assess the existence, extent, and degree of impacts to the groundwater and surface water environments related to waste disposal site activities at the Site.

To ensure appropriate actions are in place to respond to degradation in surface water or groundwater quality beyond an acceptable level, site-specific trigger levels and contingency measures aid in the assessment of impacts from leachate contamination and help to prevent adverse impacts to the environments surrounding the waste disposal site. This section presents the results of the 2022 monitoring program.

4.1 Quality Assurance / Quality Control

Results from the analyses completed on the blind duplicate QA/QC samples were evaluated. Parameter concentrations were considered significantly different if the relative percent difference (RPD) between the duplicate and the parent samples was greater than 30% when both results were greater than five times the reported detection limit (RDL).

The duplicate groundwater and surface water analyses were compared to the originals. Overall, the duplicate samples correlated well with the parent samples and met the data quality objective of 30%. The only exceptions were iron at S1 in April and chemical oxygen demand (COD) at TW07-2 in October.

Parent/duplicate samples with only one measurable concentration or with results reporting less than five times the RDL were assessed qualitatively. Evaluation of these parent/duplicate samples did not identify significant data quality issues. Considering the low variation between the parent and duplicate groundwater and surface water samples, the results were interpreted with confidence.

4.2 Groundwater Quality

Groundwater analysis data for 2011 to 2022 are in Table 4 through Table 8.



To assess water quality impacts related to landfill site operations, the analytical results for groundwater samples collected were compared to background water quality and historical data, and site compliance was assessed using the ODWQS (MOE, 2006) and RUC (MOEE, 1994a). Furthermore, as groundwater is interpreted to discharge to surface for at least a portion of the year, results from select monitors were also compared against the PWQO (MOEE, 1994b) and boron concentrations were compared to the Canadian Water Quality Guideline (CWQG) (CCME, 2007).

4.2.1 Background Groundwater Quality

When evaluating the impact of any waste disposal site on a groundwater resource, a reference point or value must be established to assist in determining the magnitude of the impact. In this respect, the quality of the groundwater that is not impacted by the waste disposal site operation (background water quality) should be used for comparison purposes. Nested wells MW01 and MW13 are about 53 m and 105 m up-gradient/cross-gradient of the waste mound, respectively. These well locations are considered representative of background groundwater conditions due to their location in respect to the direction of groundwater flow; however, water levels suggest a component of radial flow away from the waste mound toward MW01-1. Monitoring wells MW01-1 and MW13-1 are installed in the bedrock, and MW01-2 and MW13-2 are installed in the overburden (or at/just within the overburden/bedrock interface).

Historical water quality results reported from MW01-1 indicated low but detectable concentrations of most metals. Numerous parameters associated with road de-icing activities were elevated at this monitor including sodium, magnesium, calcium, chloride, hardness, alkalinity, and total dissolved solids (TDS). This location is within 10 m of the landfill access road, so road salt impacts were not unexpected. Water chemistry results in 2022 were generally consistent with historical ranges except for chloride, conductivity, total Kjeldahl nitrogen (TKN, October), and COD (October) concentrations which were greater than the historical ranges since November 2011.



The first sample collected at MW01-2 since installation occurred in April 2022 as this well has historically been reported dry. Initial results indicated most metal concentrations and parameters associated with road de-icing activities were less than adjacent monitor MW01-1.

The water quality at monitoring well MW13-1 is generally similar to or better than MW01-1. In most cases, parameters concentrations were significantly less than MW01-1. Iron is the only notable parameter which is greater at MW13-1 compared to MW01-1. Water quality results in 2022 were consistent with historical concentrations ranges apart from nitrate in April which was elevated greater than the historical range since May 2012.

Historical results at monitoring well MW13-2 indicate similar water quality to adjacent monitor MW13-1. Results in 2022 were generally consistent with historical concentrations ranges.

Cambium agrees with the Ministry Groundwater reviewer regarding potential impacts to background nested monitors MW01. As mentioned above, the water quality at monitors MW13-1 was similar to or better than MW01-1 including parameters that were not associated with road de-icing activities (i.e., arsenic, boron, and barium). Given the proximity of nested well MW01 to the historical waste mound, there is potential that this well(s) may be impacted by a component of groundwater radial flow or run-off from transfer station operations. As such, caution should be used when comparing down-gradient water quality to nested background wells MW01.

4.2.2 Leachate Characteristics

Nested wells MW02 were installed centrally within the waste mound to characterize leachate quality. From the data available, no samples have been collected from these wells as was the case in 2022.

Nested wells MW05 and MW06 were installed on the northeastern and southern toe of the waste mound for the purpose of leachate characterization, respectively. A parameter was considered a Leachate Indicator Parameter (LIP) if it has been regularly reported at concentrations greater than background water quality. Identified LIPs are outlined in



Embedded Table 7, and were chosen if the average concentration from the leachate wells was at least two times greater than the average concentration from the background wells.

Embedded Table 7 Leachate Indicator Parameters

arsenic	barium	boron	alkalinity	iron
ammonia	manganese	magnesium	phosphorus	potassium
COD	DOC			

Groundwater results indicated that all LIP concentrations at MW05-1 (shallow bedrock) were generally similar to or less than the overburden monitor MW05-2. It should be noted that only a limited number of samples have been collected from monitor MW05-2 and observations may change as additional samples are collected. While the water quality at MW05-1 has historically exhibited variability, the water chemistry is considered stable. The only exception is COD which may be developing an increasing trend. The water quality in 2022 was consistent with historical concentration ranges. Of note, TKN (non-LIP) concentrations have been significantly elevated at this monitor since June 2021. Further monitoring is required to determine the significance of the elevated TKN concentrations and to assess the potential increasing COD trend.

Only five samples have been collected from monitoring well MW05-2 since installation as this well has historically reported low volumes of water. One sample was collected from this monitor in 2022 as dry conditions were present in the autumn. Groundwater chemistry results in 2022 were generally less than those reported since the first sample collected in 2019. Further monitoring is required to fully assess impacts at this monitor.

Similar to nested monitors MW05, impacts in the shallow bedrock aquifer at MW06-1 were less than those reported in the overburden monitor MW06-2. Furthermore, impacts were a bit more elevated at shallow bedrock monitor MW05 on the northeast toe of the waste mound than to the south. Historical water quality results at MW06-1 were highly variable with no increasing or decreasing trends evident. Groundwater results in 2022 were consistent with historical ranges; however, TKN and COD concentrations were elevated greater than the historical range since at least May 2015.



Overburden monitor MW06-2 has historically reported highly variable water chemistry. As such, it is difficult to discern trends at this monitor; however, ammonia concentrations have been slowly increasing at this monitor since May 2019. The water quality results in 2022 were consistent with historical ranges. Ammonia concentrations should be reviewed annually to determine the significance of the potential increasing concentrations.

Overall, it is evident that site-related impacts were in somewhat greater concentration in the overburden at monitors MW05-2 and MW06-2 when compared to the shallow bedrock leachate monitors. Although the water chemistry is considered relatively stable at these monitors, some potential increasing trends were noted.

4.2.3 Down-Gradient Groundwater Quality

Nested wells MW03, MW04, MW07, MW08, MW09, MW10, MW11, and MW12 monitor the groundwater chemistry in the areas east-southeast and hydraulically down-gradient the waste mound.

Nested wells MW03 are 10 m south of the waste mound. All LIPs at MW03-2 (overburden) were elevated compared with background water quality. Conversely, alkalinity, DOC (slight), and ammonia (slight), were the only LIPs at MW03-1 (shallow bedrock) greater than background quality. Given the proximity to the waste mound elevated LIP concentrations at these monitors were not unexpected. Only one sample was collected from MW03-2 as the well reported dry conditions during the autumn sampling event. The water quality at both monitors in 2022 was generally consistent with historical concentrations apart from manganese at MW03-1 in October. There were no apparent increasing or decreasing trends at MW03-1 or MW03-2.

Nested wells MW04 are 70 m southeast of the waste mound. The water chemistry from both monitors indicated that natural attenuation is occurring at the Site as all LIP concentrations were significantly less than those reported at leachate nest monitors MW05 and MW06. Though various LIP concentrations (e.g., arsenic, boron, magnesium, manganese, etc.) remained slightly elevated over background quality (MW13-1) at well MW04-1 (shallow bedrock). All LIPs (except for COD) decreased in concentrations similar to or better than



background quality at MW04-2 (overburden). Water quality results in 2022 remained generally consistent with historical ranges. Of note, phosphorus and COD have been elevated greater than historical ranges at monitor MW04-1 since November 2021. Furthermore, numerous metal concentrations were elevated at MW04-2 in October. There were no notable increasing or decreasing trends at either monitor.

Nested wells MW07 are about 10 m east-southeast of the waste mound. All LIPs except for barium, iron, DOC, and ammonia at MW07-1, and arsenic at MW07-2 were elevated greater than their respective background monitors (i.e., at nest well MW13). Furthermore, the water signature between MW07-1 and MW07-2 varies, where greater concentrations of arsenic, boron, iron, and COD were observed at MW07-1. Conversely, concentrations of barium, manganese, potassium, DOC, and ammonia were in greater concentration at BH07-2. Given the proximity to the waste mound elevated LIP concentrations were not unexpected. The water quality in 2022 at monitor MW07-1 was generally consistent with historical concentrations, though COD and iron were elevated in October. Conversely, the water quality at MW07-2 was highly variable in 2022 with numerous concentrations elevated greater than the historical range during either the spring or autumn sampling event. The water chemistry is considered stable at nested monitors MW07.

Nested wells MW08, MW09, MW10, and MW11 are all about 250 to 300 m down-gradient of the waste mound, to the east-southeast. These locations include wells installed in the shallow and deep bedrock aquifers. The water quality in the deep bedrock and overburden aquifer indicated minor site-related impacts as LIPs are generally greater than background concentrations (nest monitor MW13). Of note, LIP concentrations were generally greater in the deep bedrock aquifer supporting the conceptual site model which indicates that groundwater will infiltrate the bedrock aquifer near the waste mound (calculated downward gradients) and upwell from the deep bedrock aquifer into the shallow/overburden units in the vicinity of monitors MW09, MW10, and MW11 (calculated upward gradients). It should be noted that iron concentrations in overburden wells MW09-2, MW10-2, and MW11-2 were generally greater than the deep bedrock wells suggesting potential outside influence from the wetland type environment on-site. The water quality at the down-gradient monitors was considered stable;



however, in recent years magnesium at MW08-1 and MW10-1, and manganese, potassium, and sodium at MW10-1 have been decreasing in concentration. Further monitoring is required to determine if a decreasing trend will develop. The water quality in 2022 was generally consistent with historical concentrations.

Nested wells MW12 are about 105 m south and down-gradient of the waste mound and about 35 m down-gradient of nested well MW04. Monitoring wells MW12-1, MW12-2 and MW12-3 are all installed in the bedrock, with MW12-1 being the shallowest and MW12-3 the deepest. Monitor MW12-1 was completed at a slightly deeper depth than MW04-1, and MW12-2 and MW12-3 were installed at greater depths. The greatest LIP concentrations were reported from MW12-2. Vertical hydraulic gradients were upwards between all three MW12 wells, therefore leachate influences were considered to be restricted from entering the deeper bedrock aquifer at this location. Conversely, vertical hydraulic gradients were downwards at MW04 between the shallower overburden/bedrock aquifer and the deeper bedrock aquifer. Well nest MW04 is located approximately 50 m northwest of well nest MW12. These data indicate that the area between MW04 and MW12 is a transitional area where vertical hydraulic gradients change from down to up. Due to the proximity of well nest MW12 to the southwest property boundary and the potential for groundwater to discharge to surface (upward gradients), the Ministry approved a new surface water location adjacent nest well MW12 (Appendix C). (An attempt to establish a new surface water station in this area was endeavored unsuccessfully during the autumn sampling event due to dry conditions).

The water quality in 2022 was generally consistent with historical concentrations with no increasing or decreasing trends. The only exception is barium concentrations at MW12-2 which have been decreasing since May 2015.

4.2.4 Volatile Organic Compounds

Volatile Organic Compound (VOC) analyses was completed on all wells at least once in 2022. The analyzed parameters varied between wells and sampling seasons (see Table 1). There were no detectable VOC concentrations reported at any wells in 2022. Refer to Table 7 for VOC results.



4.2.5 Groundwater/Surface Water Interaction

As indicated by the Ministry in their 2014 memorandum, the shallow overburden aquifer may discharge to the wetland southeast of the landfill. As such, the groundwater from down-gradient overburden and shallow bedrock wells should be compared against the PWQO criteria (MOEE, 1994b) to determine compliance with provincially regulated surface water standards. For boron concentrations, the Canadian Water Quality Guideline (CWQG) objective for the Protection of Aquatic Life of 1,500 µg/L (CCME, 2007) which is based on more current toxicological information, was used in replacement of the PWQO criteria.

As discussed in Section 3.2.4, vertical gradients around nested wells MW08, MW09, MW10, MW11 and MW12 were upwards. The vertical gradients were noted between the shallow and deeper bedrock wells at these locations. None of the wells outlined have an accompanying shallow overburden aquifer, as such groundwater quality comparisons (from the shallow bedrock wells) to the PWQO are for reference only. Embedded Table 8 provides a summary of exceedances of federal or provincial guidelines for at least one monitoring event in 2022. Refer to Table 8 for a full comparison.

Embedded Table 8 Summary of PWQO/CWQG Exceedances at Select Monitors

Monitoring Well	Parameters
MW08-2	phosphorus
MW09-2	boron (PWQO), phosphorus, phenols, and DO
MW10-2	iron, phosphorus, and DO
MW11-2	boron (PWQO), iron, and phosphorus
MW12-1	phenols, and DO

Monitors MW08-2, MW09-2, MW10-2, MW11-2, and MW11-2 are all installed in an area where groundwater may discharge to surface for at least a portion of the year. Phosphorus (LIP) was reported at concentrations greater than PWQO criteria at each well except for MW12-1. It is noted that the concentration of phosphorus has persistently been at or greater than the PWQO criteria at background well MW13-2. These data indicate that the concentrations of phosphorus reported from the wells listed in Embedded Table 8 may be at least partially due to naturally varying conditions, and not wholly from waste related sources.



Boron (LIP) only exceeded the PWQO criteria at MW09-2 and MW11-2 during the spring monitoring event as concentrations decreased in the autumn. The average boron concentration at monitors MW09-2 and MW11-2, was 137 and 177 µg/L, respectively. This is less than the PWQO criteria (200 µg/L) and significantly less than the CWQG (1,500 µg/L) (CCME, 2007), which is based on more current toxicological information.

Iron (LIP) consistently exceeds PWQO criteria at MW10-2 and MW11-2 and is consistently elevated compared with background water quality. Iron is considered to have naturally variable concentrations which exceed the PWQO within low-lying, stagnant areas due to natural reducing conditions caused by decaying organic vegetation. The elevated iron concentrations at MW10-2 and MW11-2 may be, in part, attributed to this natural variation.

Phenols (non-LIP) concentrations have been somewhat variable at MW12-1. Either the parameter was reported below the RDL or slightly above the PWQO criteria. This was the case in 2022 where the PWQO criteria was exceeded in the spring and then concentrations decreased below the RDL in the autumn.

Due to the nature of DO in groundwater, low DO measurements are not unexpected and are not considered significant for groundwater quality comparisons. Furthermore, DO concentrations are known to fluctuate throughout the year as DO is directly related to temperature and environmental conditions.

Comparing the water quality from the shallow wells of monitors MW08, MW09, MW10, MW11 and MW12 is used as a general reference for potential impacts to surface water quality. As discussed in Section 4.2.3, an area of potential concern was identified at monitoring well MW12 near the southwest property boundary. Based on the conceptual site model, groundwater is anticipated to discharge to surface within this area. As discussed in Section 3.1, Cambium attempted to locate a new surface water station in conjunction with the autumn monitoring event. Results of the investigation indicated no defined channels indicative of a surface water course between monitors MW11 and MW12 and no surface water stations were established. Another attempt to establish a surface water monitoring station in this area will be completed in Spring 2023.



4.2.6 Groundwater Compliance Assessment

The conceptual site model indicates that groundwater may discharge to surface in the areas east of the waste mound. However, there is potential for leachate impacted groundwater to migrate laterally off the Site in the overburden and bedrock aquifers. Migration of leachate into deeper bedrock aquifers is likely restricted since there are upwards hydraulic gradients between deep and shallow bedrock wells onsite.

To ensure appropriate recognition and response to potential degradation in groundwater quality beyond an acceptable level at the down-gradient property boundary occurs, site-specific trigger values and contingency plans have been developed for the Site. These are the RUC values developed in accordance with Ministry Guideline B-7 (MOEE, 1994a). The Ministry Guideline B-7 states that, in accordance with the appropriate criteria for particular uses, a change in quality of the groundwater on an adjacent property will be accepted only as follows (Ministry Procedure B-7-1):

The quality cannot be degraded by an amount more than 50% of the difference between background and the Ontario Drinking Water Standards (ODWQS) for non-health related parameters and in excess of 25% of the difference between background and the ODWQS for health-related parameters. Background is to be the quality of the groundwater prior to any man-made contamination.



The maximum concentration of a particular contaminant that is considered acceptable in the groundwater beneath an adjacent property is calculated in accordance with the following relationship:

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

Where,

C_m is maximum concentration accepted

C_b is background concentration

C_r is maximum concentration permitted in accordance with the ODWQS

x is a constant that reduces the contamination to a level that is considered by the Ministry to have a negligible effect on water use (i.e., 0.5 for non-health related parameters and 0.25 for health-related parameters)

The RUC values were calculated using the median value of the background concentration (C_b) from a minimum of the previous five sampling events as required by Ministry Eastern Region Technical Support Section. Where background concentrations were less than the laboratory RDL, the RDL was used as the background concentration. Where the background concentrations exceeded ODWQS, the C_b value was set as the RUC value. The calculated C_m values for the Site were set as the RUC values.

The RUC values were calculated for all LIPs with an ODWQS criteria at the Site using background water quality at nested monitors MW01 and MW13 for the overburden and bedrock, respectively. RUC compliance criteria of the shallow and deep bedrock wells is assessed at MW08, MW09, MW10, MW11 and MW12.

The predominant direction of groundwater flow in the overburden was reported to be toward the southeast, away from the waste mound. There are no overburden monitoring wells installed near the property boundary, except for R1. As such R1 is referenced as the RUC compliance well for the overburden.

The following parameters exceeded the RUC criteria in the overburden aquifer at R1 in 2022 (Table 4):



- iron (October), and manganese

The following parameters exceeded the RUC criteria within the shallow bedrock wells in 2022 (Table 5):

- MW08-2: no exceedances
- MW09-2: barium (April), and manganese (April)
- MW10-2: barium, iron, and manganese
- MW11-2: barium, iron, and manganese
- MW12-1: barium

The following parameters exceeded the RUC criteria in the lower bedrock aquifer in 2022 (Table 6).

- MW08-1: no exceedances
- MW09-1: barium (October), and manganese (October)
- MW10-1: barium, and manganese (April)
- MW11-1: barium, iron, and manganese
- MW12-2: iron (October), and manganese
- MW12-3: manganese (April)

Based on the results of the RUC assessment completed in 2021 (and reflected in 2022). The Ministry Groundwater Reviewer has indicated that completing additional monitoring using Per - and Polyfluoroalkyl substances (PFAS) would assist in delineating impacts down-gradient of the waste mound and help to determine Site compliance. The proposed work is anticipated to occur in the autumn 2023. At the time of this report, discussions regarding the scope of work were on-going between the Township and the Ministry. Select proposed changes to the groundwater monitoring program, as detailed in Section 4.6, are contingent on the results of the PFAS monitoring program. Refer to Appendix C for additional information.



4.2.7 Groundwater Trigger Mechanism

Groundwater comments received in 2022 supported the discontinuation of the existing trigger mechanism which used VOCs concentrations to determine Site compliance at select wells (Appendix C). As such, compliance will be assessed using Ministry Guideline B-7. Refer to Section 4.2.6.

4.3 Residential Groundwater Quality

To ensure that residential groundwater supplies around the Site are not influenced from leachate, four residential wells are sampled as part of the monitoring program. Results of the residential monitoring program are detailed in Table 9. The following describes the residential well monitoring locations.

- R1 is within the Site boundaries about 620 m southeast of the waste mound. The original well was a stone dug well; however, was abandoned in the summer of 2019 and replaced with a monitoring well installed to a similar depth within the overburden.
- R2 is about 750 m east-southeast of the waste mound on the eastern side of 5th Line Road North Dummer.
- R3 and R4 are hydraulically up-gradient of the waste mound about 500 m southwest and 435 m west, respectively.

The only parameters to exceed the ODQWS criteria at R1 in 2022 was manganese. Historical water quality results indicate variable results for certain parameters (i.e., barium, magnesium, iron, manganese, nitrate, potassium, TDS) but similar to or better than the quality reported from wells MW08, MW09, MW10 and MW11. All parameters reported from R1 were within historical ranges, with exception of phosphorus and TKN which were significantly elevated greater than the historical range.

Residential wells R2 and R3 were unable to be sampled in 2022 as permission from the resident has yet to be obtained. The water quality at R2 and R3 has reported low but detectable concentrations of most metals and a neutral pH. The following parameters have sporadically (more than one event) exceeded the ODWQS criteria historically:



- R2: TDS, and iron
- R3: iron, lead, TDS, and manganese

Only one sample was collected from R4 in 2022 as the resident was not home during the autumn sampling event. Historical water quality indicates low but detectable concentrations of metals, sporadic exceedances of the ODWQS for chloride, and a persistent exceedance of the ODWQS for TDS. Water quality results in 2022 were consistent with historical concentrations and there were no ODWQS exceedances.

4.4 Surface Water Quality

The 2014 to 2022 surface water quality data are in Table 10. The surface water data have been compared with background water quality and historical data, and compliance was assessed using the PWQO (MOEE, 1994b).

4.4.1 Background Surface Water Quality

Historically sampling station S2 was selected to represent background surface water quality; however, chemistry results over time indicated that this station was not suitable for comparison purposes. Comments received from the Ministry's Surface Water Reviewer supported Cambium's recommendations that since the water quality at station S1 (down-gradient) was interpreted to be unimpacted, it could be used for background purposes. This is under the agreement that the data is reviewed annually to determine if a negative change in water quality has occurred. Furthermore, support was received for the implementation of a new downstream surface water location near the property boundary with the caveat that the location must be near monitoring well MW12.

Ministry comments recommended that station S2 remain in the monitoring program to determine if this station is being impacted by surface water runoff from the waste mound and/or potential groundwater discharge. Runoff generated from the waste mound generally flows in a southeastern direction; however, it is suspected that there is a component of radial flow around S2 due to a northeast-southwest trending topographical high that would deflect surface water flow in the northeastern to northwestern direction and potentially towards station



S2. Although, the water chemistry at S2 may suggest site-related impacts, the variability in the water chemistry may also suggest that the elevated concentrations may be attributed to poor sampling conditions (ponded) in an area that does not receive regular, sustained surface water flow.

Historically, phenols and copper frequently exceeded the PWQO and total phosphorus has sporadically exceeded the criteria at station S2. No samples have been collected at this location since 2020.

Station S1 is 695 m southeast of the waste mound. As mentioned above, historically S1 was used to assess downstream water quality. Given the generally low concentrations of most parameters and the infrequent PWQO exceedances, this location was deemed suitable for background purposes. The only exception is that alkalinity and TDS concentrations are slightly elevated at this station. Only one sample was collected at this station in 2022 as it was reported dry during the autumn monitoring event. The water quality results remained consistent with historical concentration ranges and there were no exceedances of the PWQO criteria.

4.4.2 Downstream Surface Water Quality

As discussed in Section 4.4.1, the Ministry agreed with Cambium's interpretation of the former background and downstream surface water monitoring locations. A new downstream surface water location was proposed in the area of monitor MW12. During the autumn 2022 site visit, Cambium staff noted that the area was dry and the reconnaissance area was expanded to determine any potential monitoring locations which would accommodate drier conditions. No new surface water stations were established in the autumn, and an attempt to find a new downstream monitoring location will be completed in the spring 2023.

4.5 Landfill Gas Monitoring

Landfill gas (LFG), specifically methane and carbon dioxide, is derived from the decomposition of organic wastes. Production of LFG from landfilled wastes normally reaches a maximum rate about two years after placement and may continue at this rate for many years. The biological



decomposition process results in the generation of LFG until some period, likely decades, after the landfilling of that waste ceases. Methane is explosive at volumes of 5% to 17% methane by volume (50,000 ppm to 170,000 ppm) in air (Werner Sölken, 2021). The 2022 LFG results are included in Table 11 and Appendix D. Landfill gas measurements for methane, and hydrogen sulphide were recorded at all groundwater monitoring wells during the spring and autumn sampling events in 2022.

Most measurements collected in 2022 were less than 0.05 % methane by volume. The only exceptions were at nested monitor MW02, and MW09-1 in October. There were no detectable concentrations of hydrogen sulphide at any monitoring wells in 2022.

Methane concentrations were below the lower explosive limit at all monitoring wells except MW02-2 where concentrations were measured at 5.0 % methane by volume. Given that MW02-2 is installed within the waste mound, high concentrations of methane were not unexpected. As there were no methane concentrations at the property boundaries greater than 2.5% by volume the Site complied with Section 4.10 of *Landfill Standards, A Guideline on the Regulatory and Approval Requirements for New and Expanding Landfilling Sites* (MOEE, 1998).

4.6 Adequacy of Monitoring Program

Numerous modifications were recommended to the groundwater and surface water monitoring programs in 2021. Following, on-going discussions between Cambium and the Ministry throughout 2022 and 2023, support has been received for a revised monitoring program as detailed in Embedded Table 9.



Embedded Table 9 2023 Monitoring Program

Location	Task	Frequency	Analytical Parameters
Groundwater			
MW01-1, MW01-2, MW02-1, MW02-2, MW05-1, MW05-2, MW06-1, MW06-2, MW08-1, MW08-2, MW09-1, MW09-2, MW10-1, MW10-2, MW11-1, MW11-2, MW12-1, MW12-2, MW12-3, MW13-1, MW13-2 R1, R2, R3, R4 3 QA/QC Duplicates	Measure groundwater levels Groundwater sampling Field measurements (pH, temperature, ORP, dissolved oxygen, conductivity)	Once Annually (Autumn)	alkalinity, ammonia, barium, boron, calcium, chloride, conductivity, iron, magnesium, nitrate, pH, sodium, TDS, sulphate, COD, DOC, phenols, arsenic, manganese, phosphorus, potassium, hardness
MW05-1, MW05-2	VOCs	Once every five years (Autumn, next in 2027)	benzene, 1,4 dichlorobenzene, dichloromethane, toluene, vinyl chloride, monochlorobenzene
All Wells	Landfill Gas Measurements	Once Annually (Autumn)	CH4 and H2S
Surface Water			
S1, S2 New Downstream SW location (S3) 1 QA/QC Duplicate	Surface water sampling Flow estimates Field measurements (pH, temperature, conductivity, dissolved oxygen)	Twice Annually (Spring & Autumn)	alkalinity, ammonia, arsenic, barium, boron, cadmium, chloride, chromium, conductivity, copper, iron, lead, dissolved mercury, nitrite, nitrate, TKN, pH, total phosphorus, TSS, TDS, sulphate, zinc, BOD, COD, phenols, hardness, unionized ammonia (field, calc)

**Dissolved mercury to be lab filtered with a 0.45 micron filter for all surface water samples. Lab to provide calculated unionized ammonia with provided field pH and temperature.*



The monitoring program detailed above is Stage 1 of a two-stage process for monitoring and report reductions. Stage 2 reductions will be contingent on the results of the supplementary PFAS monitoring program discussed in Section 4.2.7. Stage 2 reductions include the following:

- Further reductions to groundwater sample locations.
- Reductions to the reporting frequency

Ministry support has been granted to implement the monitoring program detailed in Embedded Table 9 in Spring 2023 (Appendix C). Based on the results of the supplementary monitoring program (PFAS), additional Stage 2 reductions may receive approval. Once an understanding of all the changes to the monitoring program is understood between the Ministry and the Township, then an application must be submitted to the Ministry to amend the PC of A to formally reflect the approved changes.



5.0 Site Operations

This section summarizes operations as reported by the Township for 2022. Furthermore, this section discusses the following requirements of PC of A Condition 62.

- a monthly summary of the type and quantity of all incoming and outgoing wastes, and the destination of all outgoing waste (Section 5.6.1, Table 12)
- a discussion of any operational or environmental problems encountered at the Site and corrective action taken (Section 5.3)
- any changes to the Emergency Response Plan or Design and Operations Report that have been approved by the Director since the last Annual Report (Section 5.7)
- Recommendations respecting any proposed changes in the operation of the Site (Section 5.8)

5.1 Site Access and Security

The Site is not visible from County Road 6, and Fourth Line Road as it is well screened by surrounding trees, thick vegetation, and natural topography. A lockable gate at the entrance controls access. Signs were posted at the Site entrance which detailed the hours of operation, acceptable and prohibited materials, and tipping fees.

The Site services the residents of the Township of Douro-Dummer, though signage at the gate directs contractors to use the Bensfort Road Waste Facility in Peterborough or the nearby Stoney Lake transfer station managed by Waste Connections. Ratepayers are required to show a pass for Site access. A site attendant is present during the hours of operation. The hours of operation in 2022 were:



Summer – May 1 to October 31

Monday, Wednesday, Friday, Saturday: 10:00 AM to 2:00 PM

Sunday: 10:00 AM to 6:00 PM

Winter – November 1 to April 30

Saturday, Sunday, and Wednesday: 10:00 AM to 2:00 PM

5.2 Training

Staff from the Township and Township appointed contractors operate the Site. As required by PC of A Condition 30, all employees working at the Site are properly trained for the tasks that they are expected to perform and are provided with continued on-the-job training.

- Controlling admission of authorized vehicles with acceptable wastes
- The terms and conditions of the PC of A and any relevant waste management legislation and regulation (e.g., EPA, and O. Reg. 347)
- Ensuring proper daily litter control
- Controlling collection and transport of materials by a licensed hauler
- Maintaining a daily record of all operations, which are available for inspection by the Ministry
- Emergency response procedures (e.g., spills, and first aid)
- Equipment and Site inspection procedures
- Record keeping of quantities of waste being delivered to the Site and records of all incidents of illegal dumping, complaints, and unauthorized waste disposal.

The Township reported that the Public Works Manager, Lead Hand, and the site attendant completed a training course provided by the Solid Waste Association of North America (SWANA) in December 2022. Written records of the training completed are kept on-file as required by PC of A Condition 31.



5.3 Site Inspections

This section discusses observations during site inspections conducted by Cambium and summarizes information provided by the Township in 2022.

In 2022, the Township completed regular routine site inspections to meet PC of A Condition 32. Site inspections included observations of the following:

- Waste material staging areas including: the condition of disposal bins, waste oil tank, and divertible material, and if any waste quantity exceeded the maximum allowable capacity described in PC of A Condition 20, 21, 22, and 24.
- On-site equipment, buildings, and barriers
- General housekeeping (e.g., first aid, security, personal protective equipment, etc.)

A written record of the areas inspected are maintained at the Site as required by PC of A Condition 32. The records include: the names of the trained personnel conducting the inspection, date and time, areas inspected, any maintenance completed, and recommendations for remedial action.

5.3.1 Litter Control

As noted by Cambium staff, the Site was in good condition. Minimal evidence of blown litter was observed during site visits in 2022.

The intent of good housekeeping practices is to protect on-site worker health and safety, and the surrounding environment from nuisance effects. Nuisance effects are minimized by adopting good housekeeping measures as part of the Site operations. Regular housekeeping is essential to control such nuisances as:

- Blowing and loose litter
- Odour
- Rodents and insects
- Scavenging birds



5.3.2 Roads

The access road has sufficient width at the entrance and within the Site to allow unimpeded winter travel and access for emergency and snow removal equipment. The site access roads were observed to be well maintained and graded and were reported to be regularly cleared of snow with a sand mixture applied as needed by the Township during the winter months.

5.3.3 Final Cover Integrity

The waste mound was adequately covered and there was minimal evidence of erosion observed from the areas accessed during visits in 2022. Furthermore, the waste mound was well vegetated, which is an effective erosion control measure. No seeps were noted during any site visits conducted in 2022.

5.4 Complaints and Incidents

The Township reported that there were no complaints or incidents regarding the Site in 2022.

5.5 Monitoring Well Security

As part of the 2022 groundwater monitoring program, all monitoring wells listed in Table 1 were inspected for compliance with R.R.O. 1990 Regulation 903 - Wells. Field staff noted a blockage, suspected to be bentonite, was preventing water level measurements and potential sample collection at MW02-1. As no samples have been collected from nest monitor MW02 historically, it is recommended that these wells be decommissioned. Refer to Appendix F for photographs of the monitoring wells.

5.6 Materials Summary

The following waste types are collected at the Site; refer to Figure 3 for the collection locations of each material. In 2022, the Township reported that the Site no longer accepts mattresses and box springs.

- Domestic solid, non-hazardous waste
- Blue box recycling



- Organic waste
- Scrap metal and white goods
- Freon Appliances
- Brush
- Wood waste
- Waste Electrical and Electronic Equipment (WEEE)
- Propane tanks
- Used oil

5.6.1 Site Usage

Site usage, as documented by the Township, is summarized in Embedded Table 10. The Site is equipped with a scale, such that the tonnage of waste accepted can be determined annually. Waste collected is transferred to the Peterborough Waste Management Facility (Bensfort Road Landfill). Refer to appended Table 12 for a monthly summary of materials accepted and transferred at the Site.

Embedded Table 10 Summary of Site Usage

	2022	2021
Household Garbage (tonnes)	976.90	200.51

In addition to the above, the Township reported that the Site accepted the following tonnages in 2022:

- Clean wood: 49.15 tonnes
- C&D materials: 12.42 tonnes



5.6.2 Material Diversion

Embedded Table 11 provides a summary of the materials diverted from the Site in 2022, as provided by the Township and the County of Peterborough. Blue box recyclables are hauled to the Peterborough County Material Recycling Facility – Pido Road.

Embedded Table 11 Summary of Diverted Materials

Material	tonnes	tonnes
Containers	21.59	
Fibres	27.15	
Blue Box Subtotal		48.74
Alcohol Containers		4.22
MHSW (May 28 and August 6)		3.92
Scrap Metal and White Goods		21.49
WEEE		7.25
Organics		20.25
TOTAL		105.87
Other		
Tires		283 units
Freon Appliances ¹		51 units

Notes:

1. Includes white goods quantities.

About 0.64 tonnes of paper was collected by the County during the annual paper shredding event held on May 28, 2022.

Embedded Table 12 summarizes additional waste the County manages, and reports as diverted from within the Township in 2022.



Embedded Table 12 Summary of Divertible Materials - Private and Curbside

Curbside Recyclables Pick-up (entire Township) ¹	470.87 tonnes
Depot – Leaf and Yard Waste (Warsaw) ²	96.00 tonnes
Curbside Leaf and Yard ³	31.84 tonnes
Campground Recyclables	3.65 tonnes

Notes:

- 1. Curbside and Campground recyclable materials are hauled directly to 390 Pido Road*
- 2. Leaf and Yard Waste Collected at the Warsaw Public Works Yard from Spring to Autumn*
- 3. Curbside Leaf and Yard and Organics materials are hauled to County's Harper Road Composting Facility*

5.7 Site Documentation Reviews and Updates

The following documents are maintained by the Township and updated as required. There were no changes to these documents in 2022.

- Hall's Glen Landfill Site Transfer Station: Design, Operation, Maintenance, and Closure Report (TSH, 2002)*

5.8 Operations, Equipment, and Procedures

The Township has made conscientious efforts to mitigate risk to the surrounding environment and promote a safe location for the disposal of waste for the site attendants and residents. As such, Cambium has no recommendation regarding the operation of the Site.

5.9 Compliance with Ministry Approval

The Hall's Glen transfer station was operated in compliance with all PC of A conditions in 2022. Furthermore, the Township operated the Site in compliance with all required inspection and reporting requirements contained in the PC of A.



6.0 Conclusions and Recommendations

Based on the 2022 monitoring program, Cambium makes the following conclusions regarding the Hall's Glen waste disposal site:

- The water level measurements indicated that the predominant direction of groundwater flow in all three aquifers is to the southeast.
- Natural attenuation is occurring at the Site as concentrations decreased with distance from the waste mound. Upward vertical gradients calculated at the down-gradient monitoring wells indicated that impacts were generally restricted to the overburden and upper bedrock aquifer. The down-gradient water quality suggest that non-waste related impacts may be in part influencing the water chemistry (i.e., saturated organic soils, and decaying organic vegetation).
- There were no detectable VOC concentrations at any wells in 2022.
- Groundwater samples from MW08, MW09, MW10, MW11, MW12, and R1 were used to complete the Ministry Guideline B-7 compliance assessment. Numerous parameters exceeded the RUC criteria which were attributed at least in part to non-waste related sources. As such, a supplementary monitoring program using Per- and Polyfluoroalkyl substances is anticipated to occur in autumn 2023. At the time of this report, discussions regarding the scope of work were on-going between the Township and the Ministry.
- An investigation was completed in the autumn to establish a downgradient surface water station in the area of monitor MW12. Field staff noted dry conditions in this area and no samples were collected.
- About 975 tonnes of waste accepted at the Site and transferred to the Peterborough Waste Management Facility.
- About 105 tonnes of blue box recycling, scrap metal, organics, MHSW, alcohol containers, and WEEE were collected at the Site.



- Ministry support was received for Stage 1 reductions to the groundwater monitoring program. Additional proposed reductions are contingent on the results of the supplementary per- and polyfluoroalkyl substance monitoring program.
- Other than the groundwater compliance issues, the Township operated the Site in compliance with the PC of A in 2022.

Based on the results of the 2022 monitoring program, Cambium recommends the following:

- An attempt to locate a downstream surface water sampling location in the area of monitoring well MW12 should be investigated during wetter conditions (i.e., spring).
- Nest well MW02 should be decommissioned. Field staff noted MW02-1 to be compromised during the autumn sampling event and no samples have been collected at either MW02-1 and MW02-2 since installation.
- The revised groundwater and surface water monitoring program (Stage 1) should be implemented in 2023 as detailed in Embedded Table 9.
- The supplementary monitoring program for Per- and Polyfluoroalkyl substances should be conducted in the autumn 2023 to determine compliance with Ministry Guideline B-7. Furthermore, this will assist in determining if additional reductions to the monitoring and reporting requirements are warranted.



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Glossary of Terms

- **Active Face/Area**
The portion of the landfill facility where waste is currently being deposited, spread and/or, compacted prior to the placement of cover material.
- **Adverse Environmental Impact**
Any direct or indirect undesirable effect on the environment resulting from an emission or discharge that is caused or likely to be caused by human activity.
- **Annual Report**
Report documenting the results of water quality, environmental quality, and operations monitoring for the year, or for a period as prescribed in the Certificate of Approval.
- **Approved Design and Operations Plan**
The design of a landfill site and its facilities which have been submitted along with the application documents for which formal Ministry approval has been issued through the Certificate of Approval.
- **Approved Site or Facility**
A landfill site/facility for which there is an existing and current Certificate of Approval.
- **Aquifer**
A geologic unit (soil or rock) that contains sufficient saturated permeable material to yield measurable quantities of water to wells and springs.
- **Attenuation**
Natural process through which the concentrations of landfill generated contaminants are reduced to safe levels.
- **Borehole**
A hole drilled for soil sampling purposes.
- **Buffer Area**
An area of land situated within the peripheral area surrounding an active filling area, but limited in extent to the property boundary, assigned to provide space for remedial measures, contaminant control measures, and for the reduction or elimination of adverse environmental impact caused by migrating contaminants.
- **Certificate of Approval**
The license or permit issued by the Ministry for the operation of a landfill site. Issued to the owner of the site with conditions of compliance stated therein.
- **Contaminant**
A compound, element, or physical parameter, usually resulting from human activity, or found at elevated concentrations that have or may have a harmful effect on public health or the environment.
- **Contaminant Migration Path**
Route by which a contaminant will move from the site into adjacent properties or the natural environment. Usually a route that offers the least resistance to movement.
- **Contamination Attenuation Zone**
The zone beneath the surface, located beyond the landfill site boundary, where contaminants will be naturally attenuated to predetermined levels. Also, see Reasonable Use Policy.
- **Contingency Plan**
A documented plan detailing a co-ordinated course of action to be followed to control and remediate occurrences such as a fire, explosion, or release of contaminants in an uncontrolled manner that could threaten the environment and public health.
- **Cover Material**
Material approved by the Ministry that is used to cover compacted solid waste. Usually, a soil with suitable characteristics for specific end-use.
- **Site Development Plan and Operations Report**
Development and Operations Plan or Report is a document detailing the planned sequence of activities through the landfill site's active life, the control systems, site facilities and monitoring systems that are necessary. This document is required for obtaining a Certificate of Approval.
- **Design Capacity**
The maximum amount of waste that is planned to be disposed of at a landfill site.
- **Detection Limit**
Concentration under which a parameter cannot be quantitatively measured.



- **EAA or EA Act**
Environmental Assessment Act, Revised Statutes of Ontario, 1990. One of the primary acts of legislation intended to protect, conserve, and wisely manage Ontario's environment through regulating planning and development.
- **Environmental Compliance Approval**
The license or permit issued by the Ministry for the operation of a landfill site. Issued to the owner of the site with conditions of compliance stated therein.
- **EPA**
Environmental Protection Act, Revised Status of Ontario, 1990. EPA is another of the primary pieces of Provincial legislation governing the protection of the natural environment of the Province.
- **Evapotranspiration**
The evaporation of all water from soil, snow, ice, vegetation and other surfaces, including the water absorbed by plants, that is released to the atmosphere as vapour.
- **Fill Area**
The area of a landfill site designed and designated for the disposal of waste.
- **Final Cover**
Soil material or soil in combination with synthetic membranes, overlain by vegetation in a planned landscape, placed over a waste cell that has reached the end of its active life.
- **Groundwater**
Subsurface water that occurs beneath the water table in soils and rocks that are fully saturated.
- **Hydraulic Conductivity**
The rate of flow of water through a cross-section under a specific hydraulic gradient. It is a property of the geologic formation and the fluid, in hydrogeologic applications where the fluid is water (Units of m/day or cm/s).
- **Hydraulic Gradient**
The head drop per unit distance in the direction of flow, the driving force for groundwater flow.
- **Hydrogeology**
The study of subsurface waters and related geologic aspects of surface waters.
- **Impermeable Fill**
Soil material that is placed as filling material that is sufficiently cohesive and fine grained to impede and restrict the flow of water through it.
- **In situ Testing**
Testing done on-site, in the field, of material or naturally occurring substances in their original state.
- **Landfill Gas**
Combustible gas (primarily methane and carbon dioxide) generated by the decomposition of organic waste materials.
- **Landfill Site**
A parcel of land where solid waste is disposed of in or on land for the purposes of waste management.
- **Leachate**
Water or other liquid that has been contaminated by dissolved or suspended particles due to contact with solid waste.
- **Leachate Breakout**
Location where leachate comes to the ground surfaces; a seep or spring.
- **Limit of Filling**
The outermost limit at which waste has been disposed of, or approved or proposed for disposal at a landfill.
- **Ministry**
Ontario Ministry of the Environment, Conservation and Parks.
- **Monitoring**
Regular or spontaneous procedures used to methodically inspect and collect data on the performance of a landfill site relating to environmental quality (i.e., air, leachate, gas, ground or surface water, unsaturated soils, etc.).
- **Monitoring Well**
The constructed unit of casing (riser and screen) installed in a borehole.
- **Multi-Level Monitoring Well**
More than one monitoring well installed at a given test well location.
- **Native Soil**
Soil material occurring naturally in the ground at a location.



- **Natural Attenuation**
Where contaminants are reduced to acceptable concentration levels by natural mechanisms (dilution, absorption onto the soil matrix, etc.), biological action, and chemical interaction.
- **Occupational Health and Safety Act**
The primary act of legislation enacted by Ontario Ministry of Labour to regulate and control the safety in the workplace; also Occupational Health and Safety Act, Revised Statutes of Ontario, 1990.
- **Odour Control**
Minimizing or eliminating the nuisance and undesirable impact of objectionable or unpleasant odours arising from waste disposal operations.
- **Open Burning**
Burning any matter whereby the resultant combustion products are emitted directly to the atmosphere without passing through an adequate stack, duct, or chimney.
- **Operations Plan**
A document detailing the waste disposal operations in a planned, and if necessary, a staged manner, that ensure compliance with regulatory provisions concerning the operations of a landfill site.
- **Operator (Site Operator)/Attendant**
The individual or organization who, through ownership or under contract, manages and operates a landfill site for the purpose of waste disposal.
- **Owner**
A person, persons, organization, or municipal authority who own a landfill facility or part of a landfill facility, and in whose name the Certificate of Approval for the site is issued.
- **Percolation**
The movement of infiltrating water through soil.
- **Permeability**
Often used interchangeable with hydraulic conductivity, but not strictly correct. Permeability is a property of the porous media only. Dependent upon media properties that affect flow, diameter, sphericity, roundness, and packing of the grains.
- **Piezometer**
A well that intersects a confined aquifer.
- **Provisional Certificate of Approval (Provisional C of A)**
Same as Certificate of Approval.
- **Reasonable Use Policy**
A policy developed by the Ministry to stipulate limits to the level of groundwater quality impairment that may be permitted to occur at site property boundaries, to allow the reasonable use of adjacent properties or land without adversely affecting public health and the environment.
- **Recharge Zone**
An area where precipitation or surface run-off infiltrates into the ground and then, through natural percolation enters an aquifer.
- **Recycling**
Sorting, collecting or processing waste materials that can be used as a substitute for the raw materials in a process or activity for the production of (the same or other) goods. For example, the "Blue Box" system, in-plant scrap handling, or raw material recovery systems. Recycling is also the marketing of products made from recycled or recycled materials.
- **Reduction (of waste or component of 3Rs program)**
Those actions, practices, or processes that result in the production or generation of less waste.
- **Remedial Action**
Corrective action taken to clean-up or remedy a spill, an uncontrolled discharge of a contaminant, or a breach in a facility or its operations, in order to minimize the consequent threat to public health and the environment.
- **Representative Sample**
A small portion of soil, water, etc. which can be subjected to testing and analysis, that is expected to yield results that will reliably represent the identical characteristics of the source of the material or of a larger body of material.
- **Reuse (component of 3Rs program)**
The use of an item again in its original form, for a similar purpose as originally intended, or to fulfil a different function.
- **Run-off**
The part of precipitation (rainwater, snowmelt) that flows overland and does not infiltrate the surface material (soil or rock).



- **Saturated Zone**
The zone of a subsurface soil where all voids are filled with water.
- **Sedimentation**
The deposition of fine grained soil in an undesirable location, caused by the scouring, erosion and transportation of earth materials by surface run-off.
- **Sensitive Land Use**
A land use where humans or the natural environment may experience an adverse environmental impact.
- **Settlement**
The subsidence of the top surface and underlying waste of a landfill or waste cell as a result of densification under its own weight.
- **Site Capacity**
The maximum amount of waste that is planned to be disposed (design capacity) or that has been disposed of at a landfill site.
- **Site Closure**
The planned and approved cessation or termination of landfilling activities at a landfill site upon reaching its site capacity.
- **Site Life**
The period from its inception through active period of waste disposal, to the time when a landfill site reaches its' site capacity, when it ceases to receive any further waste, including and up to closure.
- **Solid Waste**
Any waste matter that cannot be characterized by its physical properties as a liquid waste product.
- **Solid Waste Disposal Site or Facility**
A site or facility such as a landfill site where solid waste is disposed of.
- **Source Separation**
The separation of various wastes at their point of generation for the purposes of recycling or further processing.
- **Standpipe**
A monitoring well that intersects the water table aquifer.
- **Storm water**
Run-off that occurs as a direct result of a storm event or thaw.
- **Storm water Detention**
Control of storm water by the construction of impoundments of structures for the purpose of regulating storm water flows during high intensity rainfall events that would otherwise transport excessive amounts of sediment, cause soil erosion or cause flooding.
- **Stratigraphy**
The geologic sub-structuring, usually layered with different distribution, deposition and age.
- **Surface Run-off (Drainage)**
See Run-off.
- **Surface Water**
Water that occurs at the earth's surface (ponds, streams, rivers, lakes, oceans).
- **Sub-Soil**
Soil horizons below the topsoil.
- **Test hole**
A hole drilled for soil sampling purposes.
- **Topsoil**
The uppermost layer of the soil containing appreciable organic materials in mineral soils. Adequate fertility to support plant growth.
- **Unsaturated Zone**
The zone (also vadose zone) in a porous sub-soil, where the voids are not completely water-filled, but contain some air-filled voids. Limited above by the land surface and below by the water table.
- **Vector**
A disease carrier and transmitter; usually an insect or rodent.
- **VOC**
Volatile organic compounds are those compounds that will readily volatilize (convert from liquid to gas phase) at conditions normally found in the environment.



- **Waste**
Ashes, garbage, refuse, domestic waste, industrial waste, or municipal refuse and other used products as are designated or interpreted by the provisions of the Environmental Protection Act.
- **Waste Disposal Site (Facility)**
Any land or land covered by water upon, into, in or through which, or building or structure in which, waste is deposited or processed and any machinery or equipment or operation required for the treatment or disposal of waste.
- **Waste Management System**
All facilities, equipment and operations for the complete management of waste, including the collection, handling, transportation, storage, processing and disposal thereof, and may include one or more waste disposal sites.
- **Water Table**
The water level attained in a monitoring well, which screens the surficial unconfined aquifer.
- **Water Balance**
Amounts of water to various components in a system so that water entering the system equals the amount of water contained within and discharged out of a system.
- **Water Level**
The level of water in a well.
- **Well Casing**
The pipe that is used to construct a well.
- **Well Screen**
A filtering device used to keep sediment from entering a well.
- **Wetlands**
Areas where water is at, near or above the land surface long enough to be capable of supporting aquatic or hydrolytic vegetation, and which have soils indicative of wet conditions.



Abbreviations

RFP	Request For Proposal	BTU	British Thermal Unit
ha	hectare	µg	microgram
Ministry	Ontario Ministry of the Environment, Conservation and Parks	°C	temperature in degrees Celsius
tonne	metric ton	g	gram
MNR	Ontario Ministry of Natural Resources and Forestry	N/A	not available
t	metric tonne	kg	kilogram
ECA	Environmental Compliance Approval	%	percent
µS	microSiemens	L	Litre
EPA	Environmental Protection Act	cfm	cubic feet per minute
ODWQS	Ontario Drinking Water Quality Standards	mg/L	milligrams per litre
EAA	Environmental Assessment Act	ppmdv	part per million by dry volume
PC of A	Provisional Certificate of Approval	mm	millimetre
MW	monitoring well	ppmv	part per million by volume
PWQO	Provincial Water Quality Objectives	m	metre
masl	metres above sea level	ppm	part per million
TOC	Total Organic Carbon	km	kilometre
pg	picogram	min	minimum
VOC	Volatile Organic Compound	m ³	cubic metre
ng	nanogram	max	maximum
		m ²	square metre



Standard Limitations

Limited Warranty

In performing work on behalf of a client, Cambium relies on its client to provide instructions on the scope of its retainer and, on that basis, Cambium determines the precise nature of the work to be performed. Cambium undertakes all work in accordance with applicable accepted industry practices and standards. Unless required under local laws, other than as expressly stated herein, no other warranties or conditions, either expressed or implied, are made regarding the services, work or reports provided.

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The findings and results presented in reports prepared by Cambium are based on the materials and information provided by the client to Cambium and on the facts, conditions and circumstances encountered by Cambium during the performance of the work requested by the client. In formulating its findings and results into a report, Cambium assumes that the information and materials provided by the client or obtained by Cambium from the client or otherwise are factual, accurate and represent a true depiction of the circumstances that exist. Cambium relies on its client to inform Cambium if there are changes to any such information and materials. Cambium does not review, analyze or attempt to verify the accuracy or completeness of the information or materials provided, or circumstances encountered, other than in accordance with applicable accepted industry practice. Cambium will not be responsible for matters arising from incomplete, incorrect or misleading information or from facts or circumstances that are not fully disclosed to or that are concealed from Cambium during the provision of services, work or reports.

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When preparing reports, Cambium considers applicable legislation, regulations, governmental guidelines and policies to the extent they are within its knowledge, but Cambium is not qualified to advise with respect to legal matters. The presentation of information regarding applicable legislation, regulations, governmental guidelines and policies is for information only and is not intended to and should not be interpreted as constituting a legal opinion concerning the work completed or conditions outlined in a report. All legal matters should be reviewed and considered by an appropriately qualified legal practitioner.

Site Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Cambium's work or report considers any locations or times other than those from which information, sample results and data was specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those extrapolations.

Only conditions at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site chosen for study by the client, or any other matter not specifically addressed in a report prepared by Cambium, are beyond the scope of the work performed by Cambium and such matters have not been investigated or addressed.

Reliance

Cambium's services, work and reports may be relied on by the client and its corporate directors and officers, employees, and professional advisors. Cambium is not responsible for the use of its work or reports by any other party, or for the reliance on, or for any decision which is made by any party using the services or work performed by or a report prepared by Cambium without Cambium's express written consent. Any party that relies on services or work performed by Cambium or a report prepared by Cambium without Cambium's express written consent, does so at its own risk. No report of Cambium may be disclosed or referred to in any public document without Cambium's express prior written consent. Cambium specifically disclaims any liability or responsibility to any such party for any loss, damage, expense, fine, penalty or other such thing which may arise or result from the use of any information, recommendation or other matter arising from the services, work or reports provided by Cambium.

Limitation of Liability

Potential liability to the client arising out of the report is limited to the amount of Cambium's professional liability insurance coverage. Cambium shall only be liable for direct damages to the extent caused by Cambium's negligence and/or breach of contract. Cambium shall not be liable for consequential damages.

Personal Liability










The client expressly agrees that Cambium employees shall have no personal liability to the client with respect to a claim, whether in contract, tort and/or other cause of action in law. Furthermore, the client agrees that it will bring no proceedings nor take any action in any court of law against Cambium employees in their personal capacity.



Appended Figures

2022 ANNUAL REPORT
HALLS GLEN WASTE
TRANSFER STATION
 1951 County Road 6
 Hall's Glen, Ontario
 The Corporation of the
 Township of Douro – Dummer

LEGEND

-  Highway
-  Major Road
-  Railroad
-  Watercourse
-  Water Area
-  Provincial Park
-  Wooded Area
-  Built Up Area
-  Lower Tier Municipality

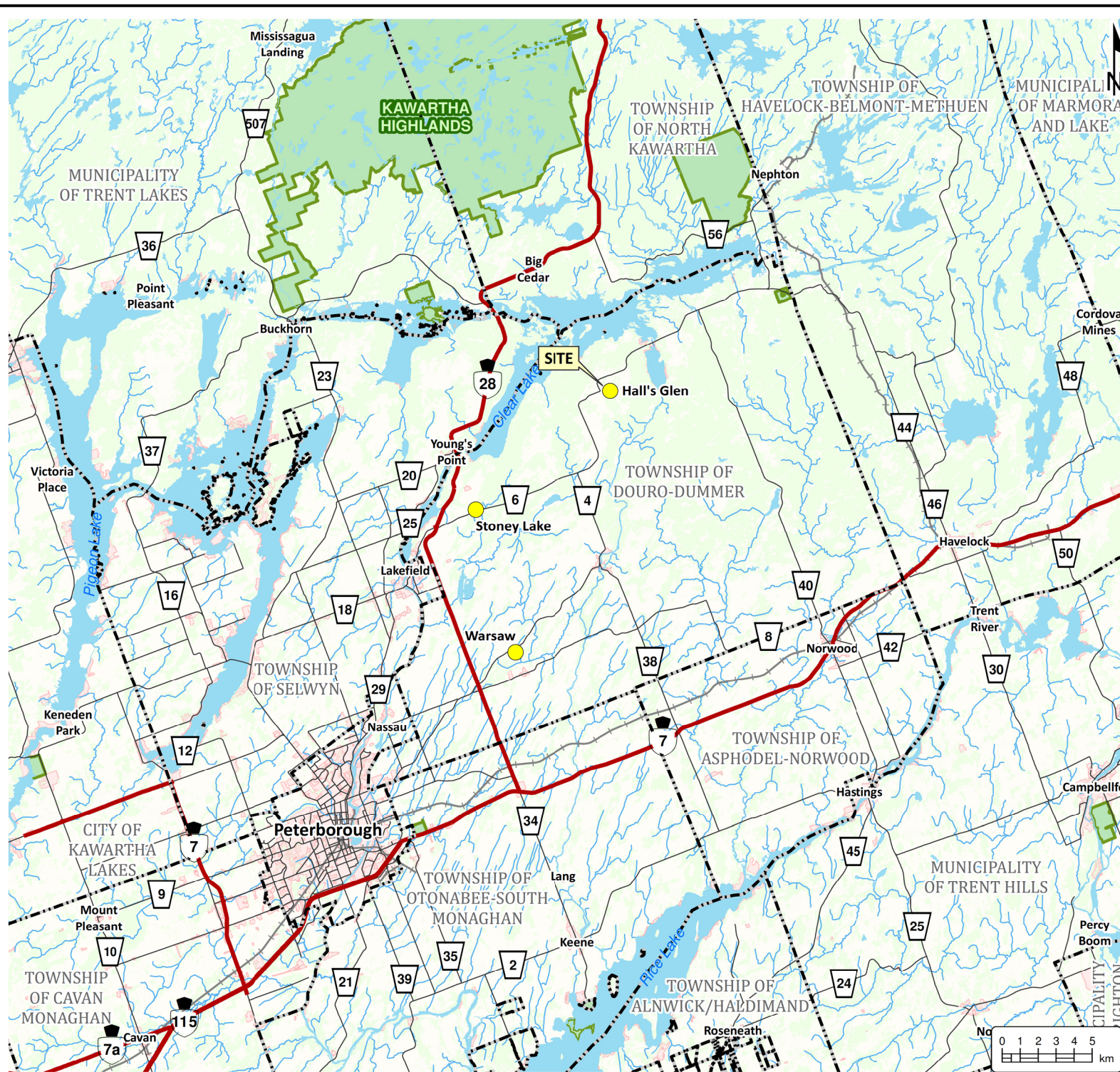
Notes:
 - Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
 - Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
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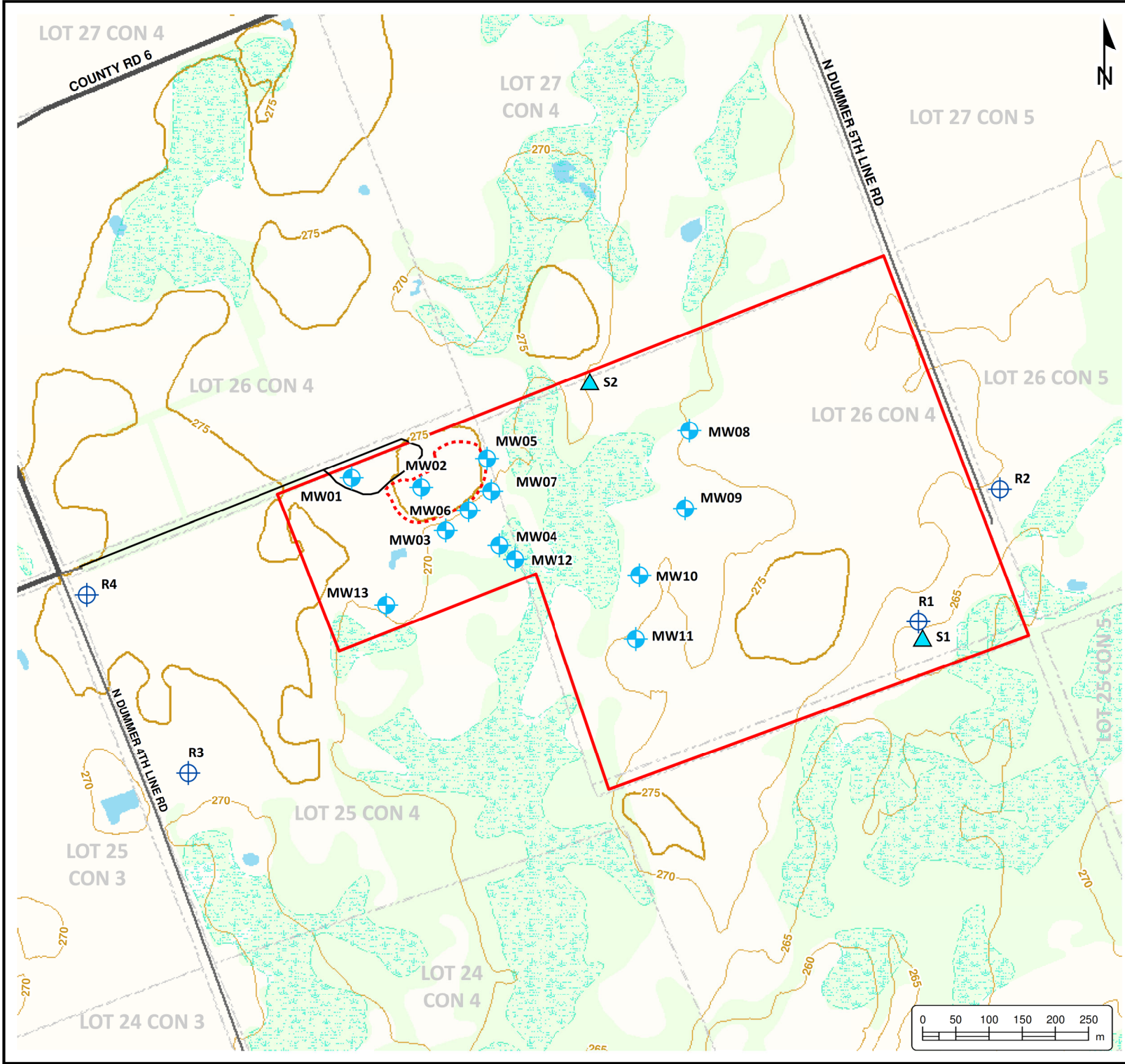
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REGIONAL LOCATION PLAN

Project No.:	12987-002	Date:	March 2023
Scale:	1:300,000	Rev.:	
Created by:	TLC	Projection:	NAD 1983 UTM Zone 17N
Checked by:	CM	Figure:	1



O:\GIS\MXDs\12987-002\TDD - Hall's Glen\2023-02-22 FIG 1 - Regional Location Plan.mxd



2022 ANNUAL REPORT
HALLS GLEN WASTE TRANSFER STATION
 1951 County Road 6
 Hall's Glen, Ontario
 The Corporation of the Township of Douro – Dummer

LEGEND

- Surface Water Location
- Residential Well
- Monitoring Well
- Major Road
- Minor Road
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Lot / Concession
- Unevaluated Wetlands
- Water Area
- Wooded Area
- Landfill Footprint
- Site (approximately 48.5 ha.)

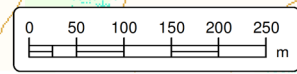
Notes:
 - Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
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SAMPLE LOCATION PLAN

Project No.:	12987-002	Date:	March 2023
Scale:	1:8,000	Rev.:	
Created by:	TLC	Projection:	NAD 1983 UTM Zone 17N
Checked by:	CM	Figure:	2





LEGEND

- Site (approximate)
- - - - - Approximate Landfill Footprint (1.0 ha)
- Topographic Contour
- ~ Approximate Treeline



Notes:
1. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.



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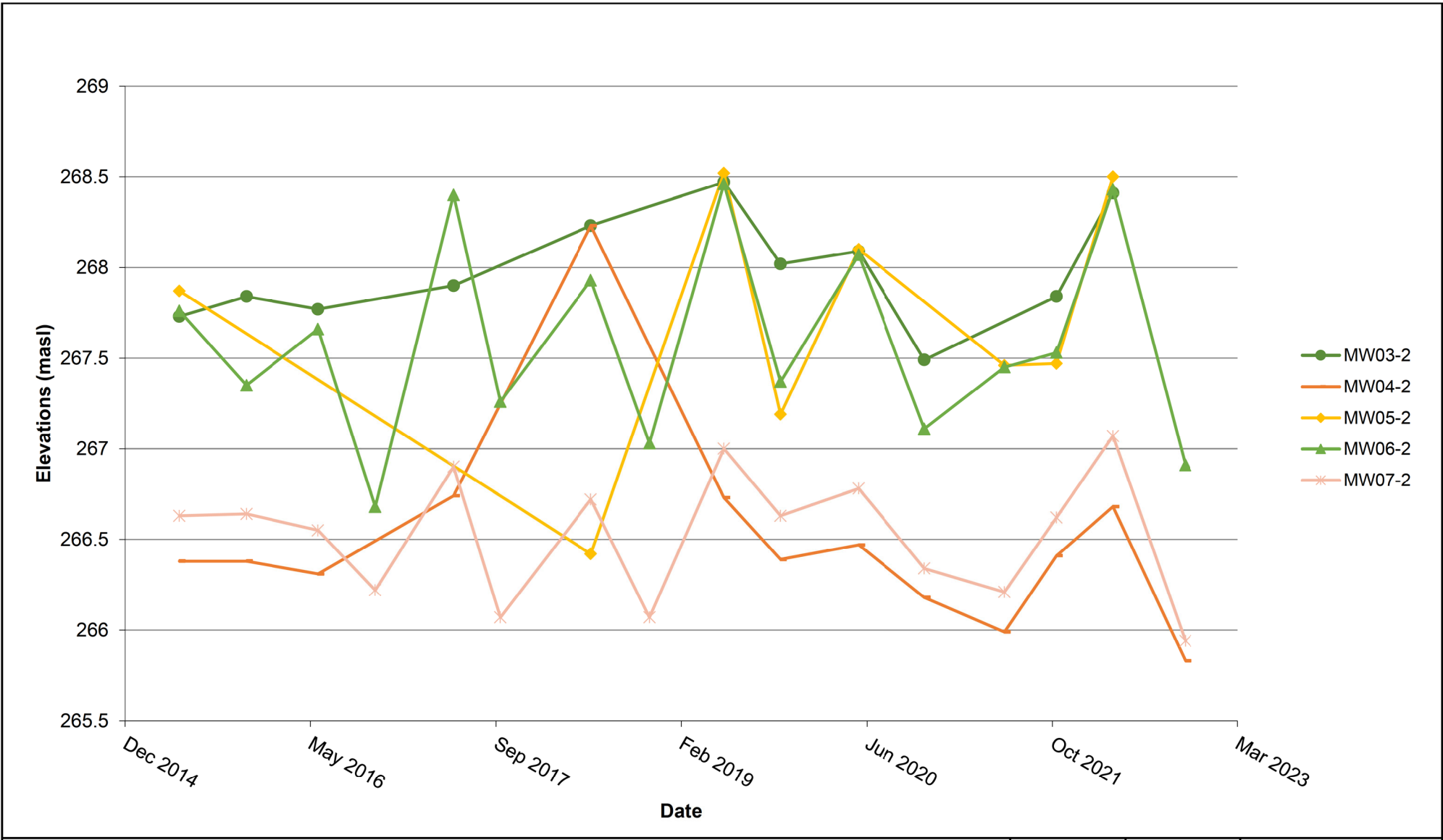
EXISTING CONDITIONS

Project No.: 12987-002	Date: March 2023
Horizontal Scale: 1:750	Rev.: UTM Zone 17N
Projection: UTM Zone 17N	Figure: 3
Drawn By: TLC	Checked By: CM

GRAPHIC SCALE
(IN METRES)



1 : 750

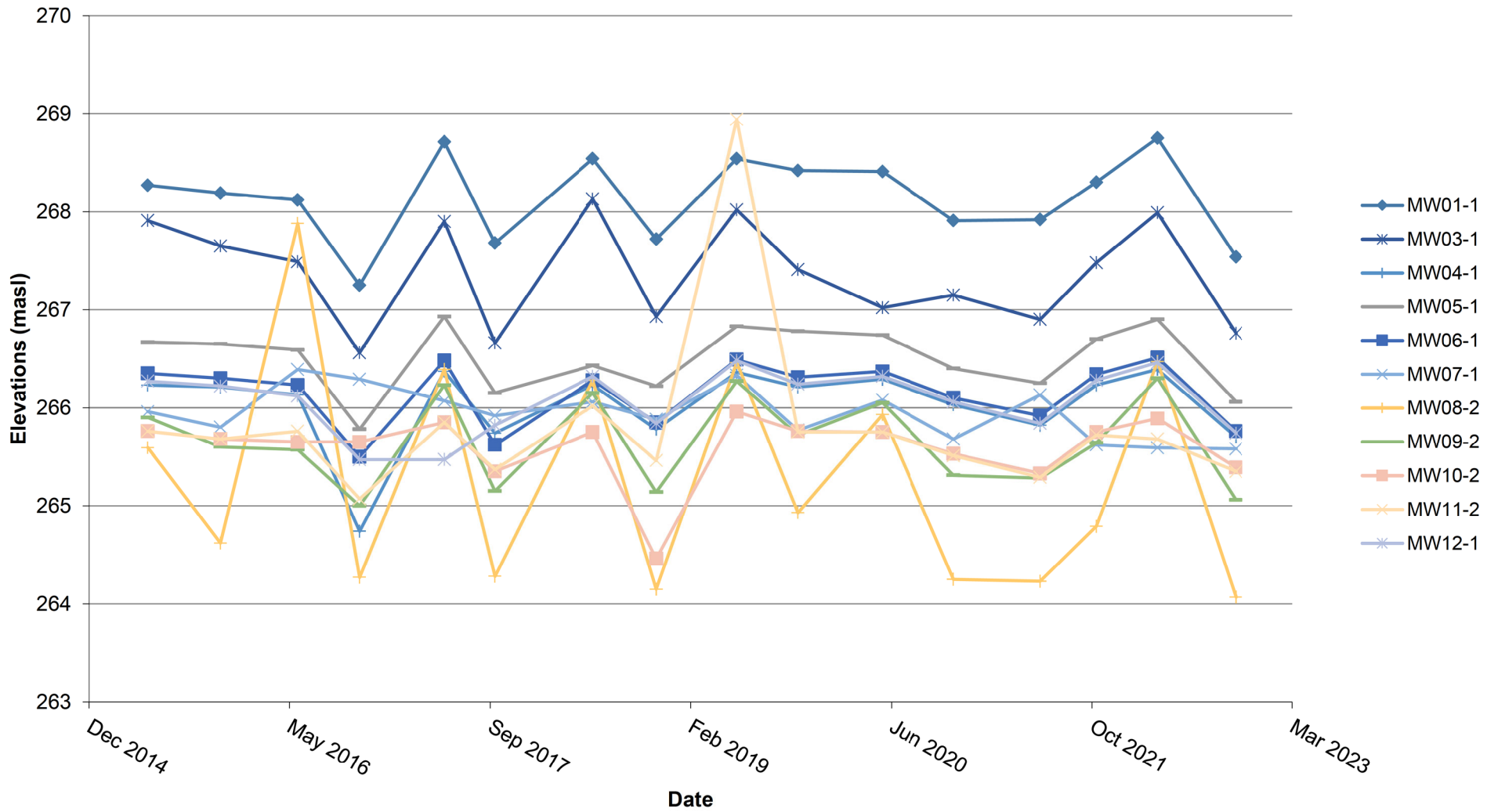


Groundwater Elevations (Overburden)

2022 Annual Report, Hall's Glen Waste Transfer Station
 1951 County Road 6, Hall's Glen
 The Corporation of the Township of Douro-Dummer

Figure:	4
Date:	24-Jan-23
Project Manager:	Cameron MacDougall
Project No.:	12987-002



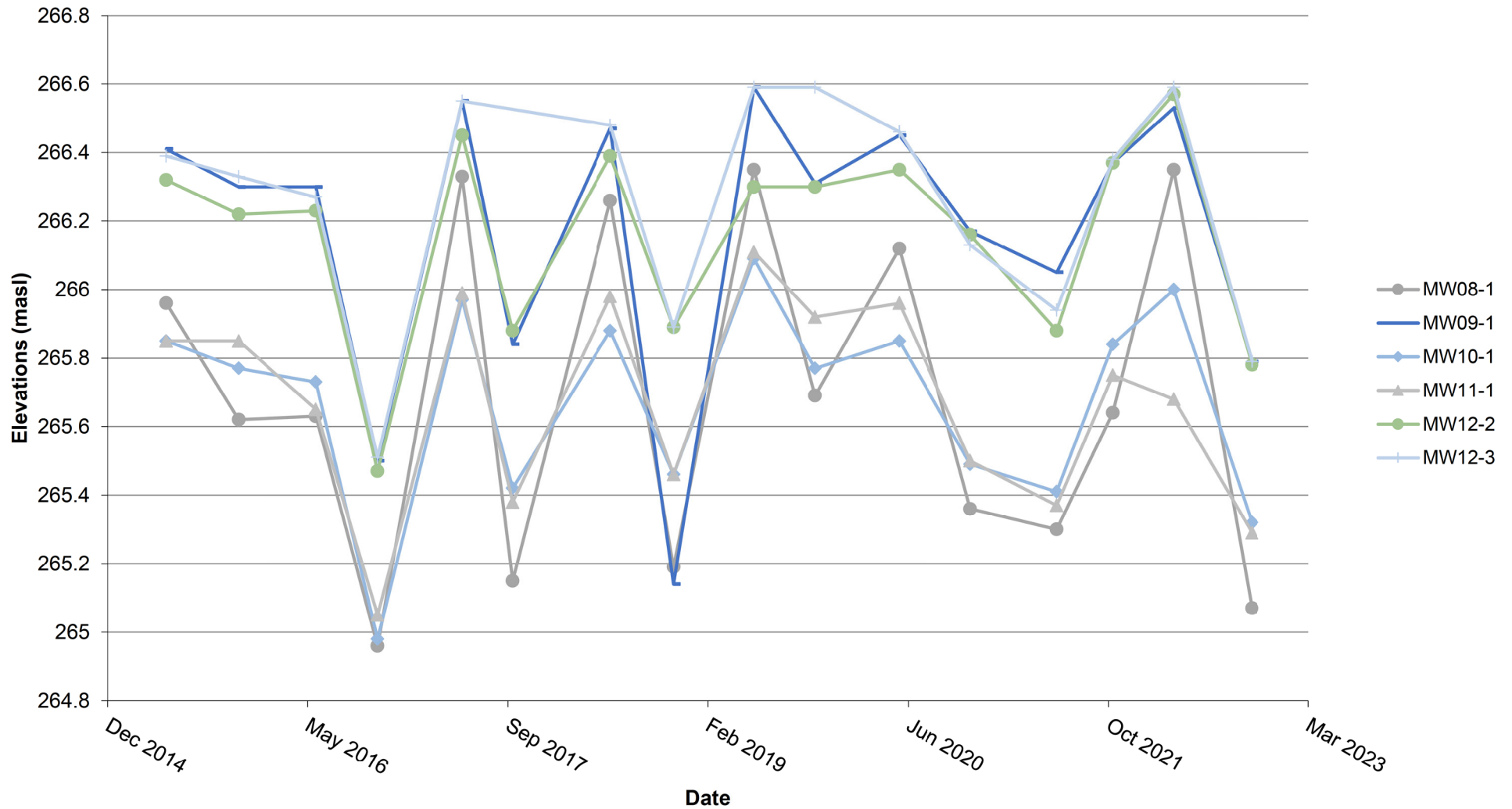


Groundwater Elevations (Shallow Bedrock)

2022 Annual Report, Hall's Glen Transfer Station
 1951 County Road 6, Hall's Glen
 The Corporation of the Township of Douro-Dummer

Figure:	5
Date:	24-Jan-23
Project Manager:	Cameron MacDougall
Project No.:	12987-002





Groundwater Elevations (Deep Bedrock)













2022 Annual Report, Hall's Glen Waste Transfer Station
 1951 County Road 6, Hall's Glen
 The Corporation of the Township of Douro-Dummer

Figure:	6
Date:	24-Jan-23
Project Manager:	Cameron MacDougall
Project No.:	12987-002



**2022 ANNUAL REPORT
HALL'S GLEN WASTE
TRANSFER STATION**
1951 COUNTY ROAD 6
HALL'S GLEN, ONTARIO
THE CORPORATION OF THE
TOWNSHIP OF DOURO-DUMMER

LEGEND

-  Overburden Monitoring Well
-  Groundwater Elevation
April 12, 2022
-  Groundwater Elevation
October 25, 2022
-  Groundwater Contour
April 12, 2022
-  Groundwater Contour
October 25, 2022
-  Topographic Contour
-  Site (approximate)
-  Approximate Landfill Footprint
(1.0 ha)
-  Approximate Treeline
-  Wetland Area
-  Groundwater Flow Direction
April 12, 2022
-  Groundwater Flow Direction
October 25, 2022

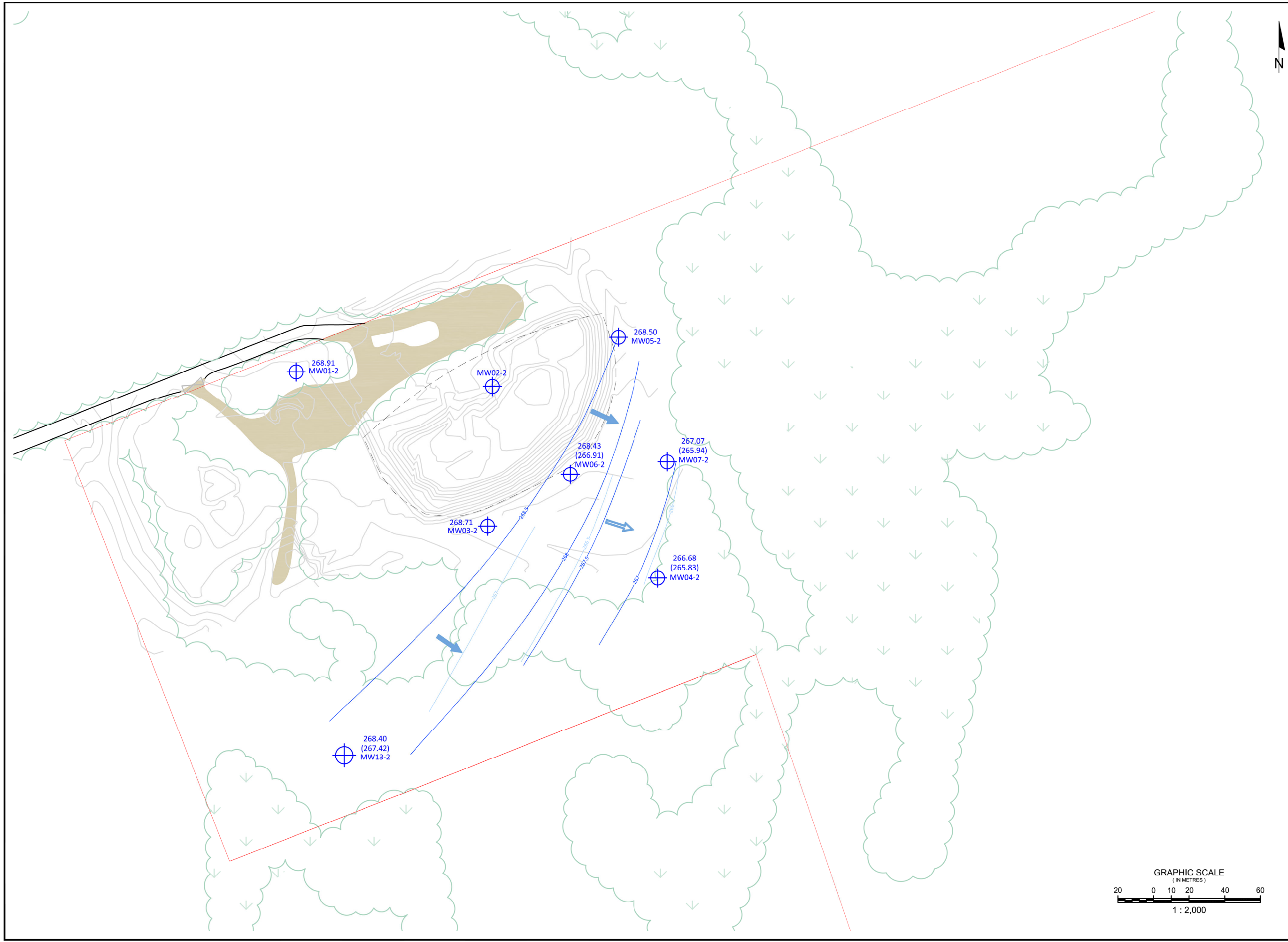
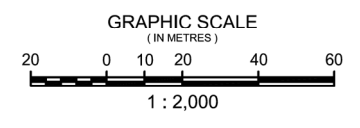
Notes:
1. Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.



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









**OVERBURDEN GROUNDWATER
CONFIGURATION**

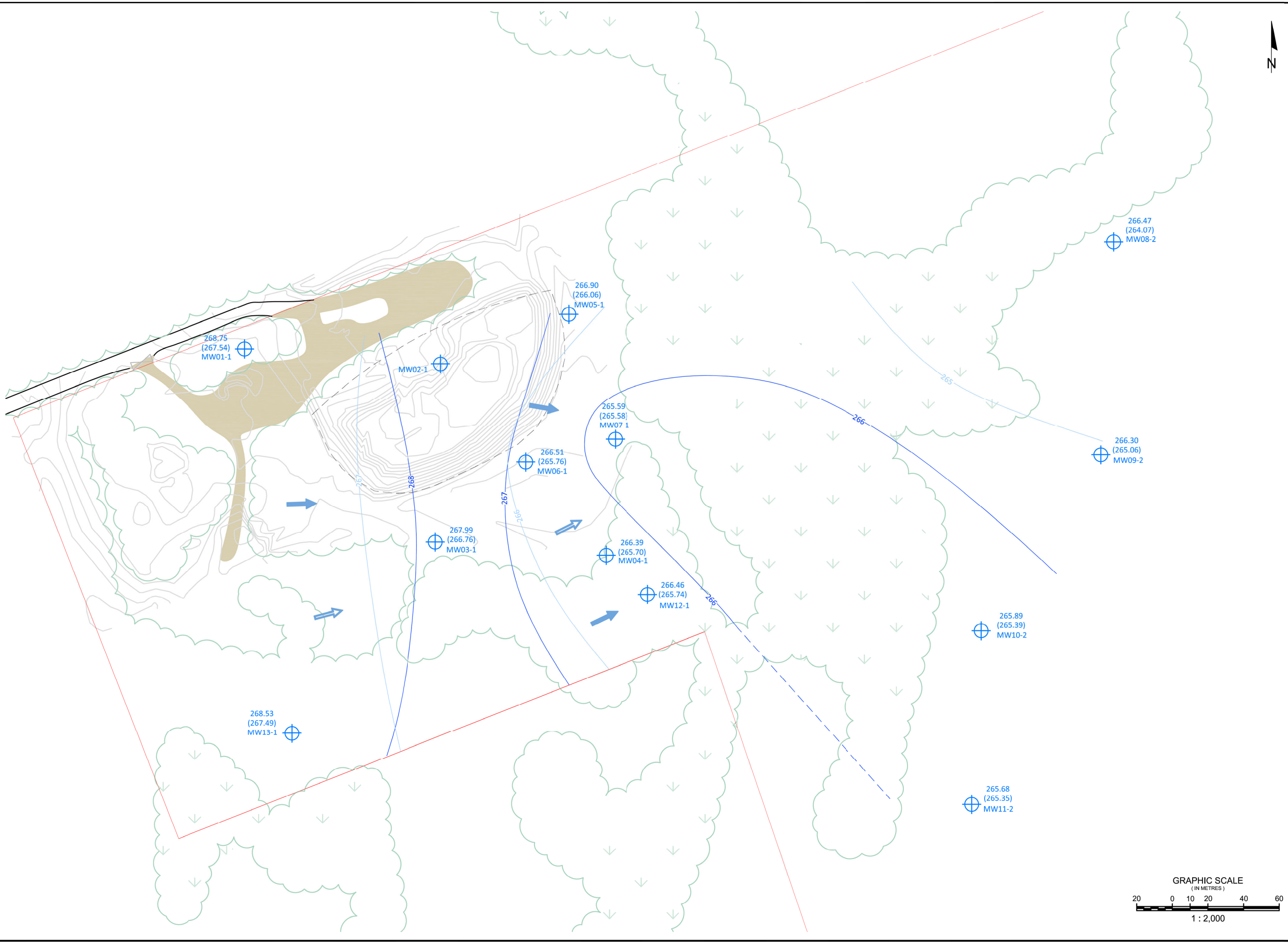
Project No.:	12987-002	Date:	March 2023
Horizontal Scale:	1:2,000	Rev.:	
Projection:	UTM Zone 17N	Figure:	7
Drawn By:	TLC	Checked By:	CM





LEGEND

-  Shallow Bedrock Monitoring Well
-  266.25 Groundwater Elevation April 12, 2022
-  (266.70) Groundwater Elevation October 25, 2022
-  Groundwater Contour April 12, 2022
-  Groundwater Contour October 25, 2022
-  Topographic Contour
-  Site (approximate)
-  Approximate Landfill Footprint (1.0 ha)
-  Approximate Treeline
-  Wetland Area
-  Groundwater Flow Direction April 12, 2022
-  Groundwater Flow Direction October 25, 2022

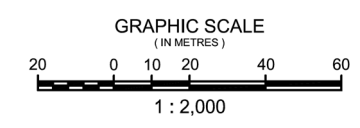


Notes:
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




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SHALLOW BEDROCK GROUNDWATER CONFIGURATION	
Project No.: 12987-002	Date: March 2023
Horizontal Scale: 1:2,000	Projection: UTM Zone 17N
Drawn By: TLC	Checked By: CM
Figure: 8	



**2022 ANNUAL REPORT
HALL'S GLEN WASTE
TRANSFER STATION**
1951 COUNTY ROAD 6
HALL'S GLEN, ONTARIO
THE CORPORATION OF THE
TOWNSHIP OF DOURO-DUMMER

LEGEND

-  Deep Bedrock Monitoring Well
-  266.25 Groundwater Elevation April 12, 2022
-  (266.70) Groundwater Elevation October 25, 2022
-  Groundwater Contour April 12, 2022
-  Groundwater Contour October 25, 2022
-  Topographic Contour
-  Site (approximate)
-  Approximate Landfill Footprint (1.0 ha)
-  Approximate Treeline
-  Wetland Area
-  Groundwater Flow Direction April 12, 2022
-  Groundwater Flow Direction October 25, 2022

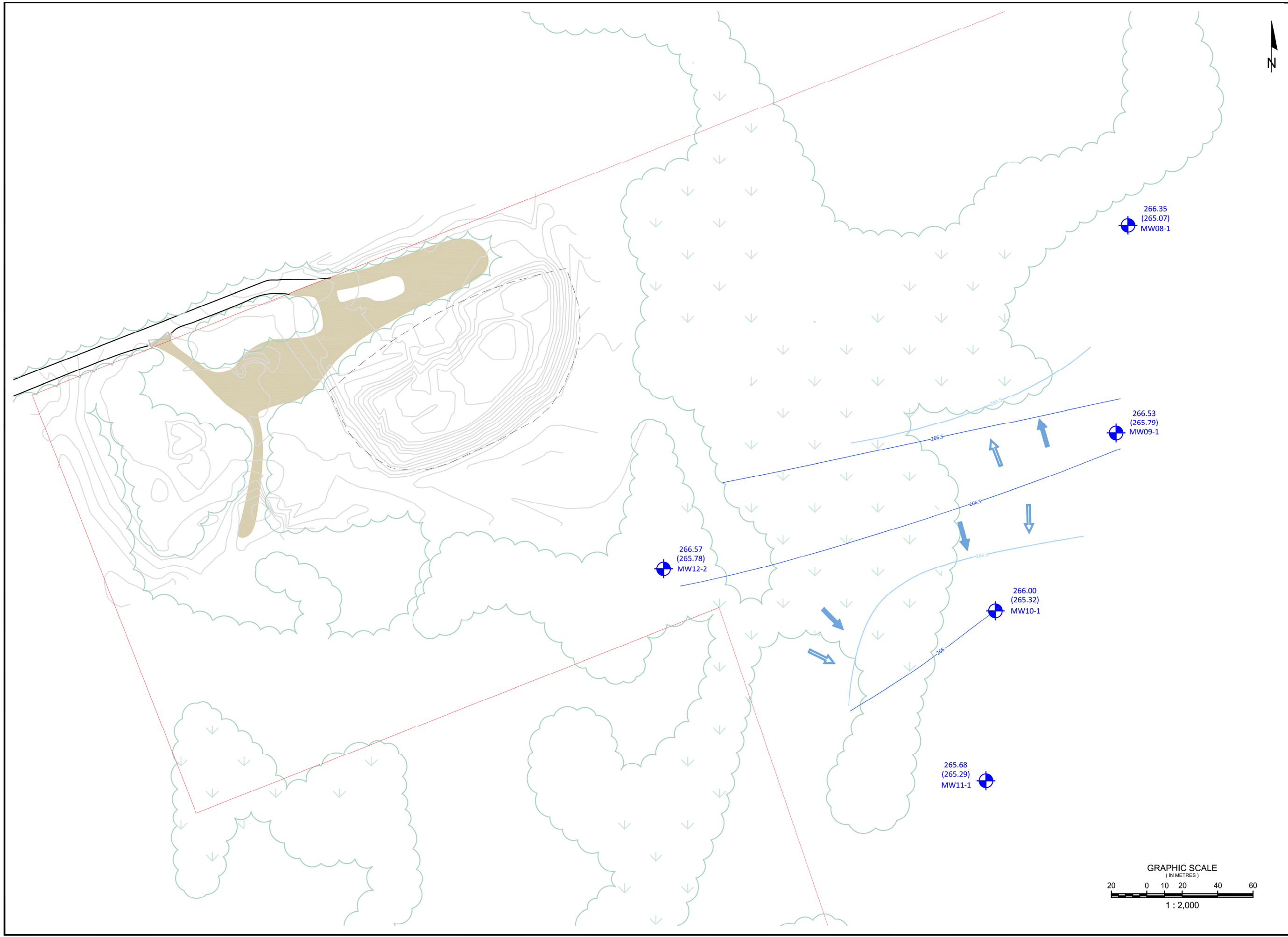
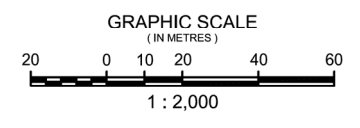
Notes:
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**DEEP BEDROCK
GROUNDWATER
CONFIGURATION**

Project No.:	12987-002	Date:	March 2023
Horizontal Scale:	1:2,000	Projection:	UTM Zone 17N
Drawn By:	TLC	Checked By:	CM
Figure:	9		



P:\12900 to 12999\12987-002 TDD - Hall's Glen\GraphicalDrawings\CAD\Hall's Glen 2022 AMR.dwg



Appended Tables



Table Notes

EQL - reported detection limit for the current year

RUC - Reasonable Use Criteria

CWQG - Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2011)

ODWQS - Ontario Drinking Water Quality Standards, O.Reg. 169/03

PWQO - Water Management, Policies, Guidelines, Provincial Water Quality Objectives
(MOEE, 1994b)

PWQO for beryllium, cadmium, copper, and lead depend on hardness

PWQO for aluminum depends on pH and background concentration

NV - No Value

"-" Parameter not analyzed or measured

Unionized ammonia calculated using total ammonia and field data for pH and temperature



Table 1 Groundwater and Surface Water Monitoring Program

Location	Task	Frequency	Analytical Parameters
Groundwater			
MW01-2, MW02-2, MW03-2, MW04-2, MW05-2, MW06-2, MW07-2, MW08-2, MW09-2, MW10-2, MW11-2, MW12-1, MW13-2 R1, R2, R3, R4 2 QA/QC Duplicates	<ul style="list-style-type: none"> • Measure groundwater levels • Groundwater sampling • Field measurements (pH, temperature, ORP, dissolved oxygen, conductivity) 	Twice Annually (Spring & Autumn)	alkalinity, ammonia, arsenic, barium, boron, cadmium, calcium, chloride, chromium, conductivity, copper, iron, lead, magnesium, manganese, mercury, nitrite, nitrate, TKN, pH, phosphorus by ICP, potassium, sodium, TDS, sulphate, zinc, COD, DOC, phenols, hardness Benzene, 1,4- Dichlorobenzene, Dichloromethane, Toluene, Vinyl Chloride, Chlorobenzene
MW01-1, MW02-1, MW03-1, MW04-1, MW05-1, MW06-1, MW07-1, MW08-1, MW09-1, MW10-1, MW11-1, MW12-2, MW12-3, MW13-1 1 QA/QC Duplicate	<ul style="list-style-type: none"> • Measure groundwater levels • Groundwater sampling • Field measurements (pH, temperature, ORP, conductivity) 	Once Annually (Spring)	alkalinity, ammonia, arsenic, barium, boron, cadmium, calcium, chloride, chromium, conductivity, copper, iron, lead, magnesium, manganese, mercury, nitrite, nitrate, TKN, pH, phosphorus by ICP, potassium, sodium, TDS, sulphate, zinc, COD, DOC, phenols, hardness Benzene, 1,4- Dichlorobenzene, Dichloromethane, Toluene, Vinyl Chloride, Chlorobenzene
MW01-1, MW02-1, MW03-1, MW04-1, MW05-1, MW06-1, MW07-1, MW08-1, MW09-1, MW10-1, MW11-1, MW12-2, MW12-3, MW13-1 1 QA/QC Duplicate	<ul style="list-style-type: none"> • Measure groundwater levels • Groundwater sampling • Field measurements (pH, temperature, ORP, conductivity) 	Once Annually (Autumn)	alkalinity, ammonia, chloride, arsenic, barium, boron, cadmium, calcium, chloride, chromium, conductivity, copper, iron, lead, magnesium, manganese, mercury, nitrate, pH, phosphorus by ICP, potassium, sodium, TDS, sulphate, COD, DOC, phenols, zinc, hardness
MW03-1, MW03-2, MW04-1, MW04-2, MW05-1, MW05-2, MW06-1, MW06-2, MW07-1, MW07-2, MW11-1, MW11-2 R1, R2, R3, R4 2 QA/QC Duplicates	<ul style="list-style-type: none"> • VOCs 	Twice Annually (Spring & Autumn)	See list below



All Wells	<ul style="list-style-type: none"> • Landfill Gas Measurements 	Twice Annually (Spring & Autumn)	CH4 and H2S
<u>Surface Water</u>			
S1, S2 1 QA/QC Duplicate	<ul style="list-style-type: none"> • Surface water sampling • Flow estimates • Field measurements (pH, temperature, conductivity, dissolved oxygen) 	Twice Annually (Spring & Autumn)	alkalinity, ammonia, arsenic, barium, boron, cadmium, chloride, chromium, conductivity, copper, iron, lead, dissolved mercury, nitrite, nitrate, TKN, pH, total phosphorus, TSS, TDS, sulphate, zinc, BOD, COD, phenols, hardness, unionized ammonia (field, calc)

**Dissolved mercury to be lab filtered with a 0.45 micron filter for all surface water samples.
 Lab to provide calculated unionized ammonia with provided field pH and temperature.*



VOCs to be analyzed

Bromodichloromethane
Bromoform
Dibromochloromethane
Bromomethane
Carbon tetrachloride
Chlorobenzene
Chloroethane
Chloroform
Chloromethane
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
1,2-Dichloropropane
trans-1,2-Dichloroethene
cis-1,2-Dichloroethene
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Ethylenedibromide
Dichloromethane
Styrene
1,1,2,2-Tetrachloroethane
Tetrachloroethene
Trichloroethylene
Vinyl Chloride
Trichlorofluoromethane
1,1,1-Trichloroethane
1,1,2-Trichloroethane
1,1,1,2-Tetrachloroethane



Table 2 Groundwater Elevation Data

Monitor	UTM (Zone 17)		Top of Casing Elevation (m)	Ground Elevation (m)	Measured Stick-Up (m)	Well Depth (mTOP)	Well Depth (m)	Screened Unit	Water Level Elevation (mASL)					
	mN	mE							22-May-15	19-Nov-15	31-May-16	01-Nov-16	31-May-17	04-Oct-17
MW01-1	4933341	728326	271.24	270.42	0.82	7.65	6.83	Limestone/Shale	268.27	268.19	268.12	267.25	268.71	267.68
MW01-2			271.24	270.42	0.82	2.74	1.92	Clay/Gravel	dry	dry	dry	dry	dry	dry
MW02-1	4933327	728431	282.49	282.27	0.22	15.33	15.11	Limestone/Shale	dry	na	dry	dry	dry	dry
MW02-2			282.53	282.32	0.21	5.45	5.24	Sand/Gravel	dry	dry	dry	dry	dry	dry
MW03-1	4933262	728468	269.23	268.80	0.66	5.51	4.85	Limestone	267.91	267.65	267.49	266.56	267.90	266.66
MW03-2			269.53	268.80	0.49	1.72	1.23	Clay/Sand/Gravel	267.73	267.84	267.77	dry	267.90	dry
MW04-1	4933239	728549	268.28	267.36	0.92	5.62	4.70	Limestone/Shale	266.23	266.21	266.13	264.74	266.37	265.74
MW04-2			268.28	267.43	0.85	2.99	2.14	Gravel/Limestone	266.38	266.38	266.31	dry	266.74	dry
MW05-1	4933370	728530	271.35	-	Below Grade	7.68	7.68	Limestone	266.67	266.65	266.59	265.78	266.93	266.15
MW05-2			271.35	271.13	0.22	4.38	4.16	Clay/Sand/Gravel	267.87	dry	dry	dry	dry	dry
MW06-1	4933292	728502	271.01	270.40	0.61	7.85	7.24	Limestone/Shale	266.35	266.30	266.23	265.50	266.48	265.62
MW06-2			271.01	270.41	0.60	5.13	4.53	Sand/Gravel	267.76	267.35	267.66	266.68	268.40	267.26
MW07-1	4933309	728559	269.03	268.24	0.79	6.98	6.19	Limestone	265.96	265.80	266.39	266.29	266.07	265.92
MW07-2			269.03	268.29	0.74	3.37	2.63	Limestone	266.63	266.64	266.55	266.22	266.90	266.07
MW08-1	4933413	728836	270.74	270.05	0.69	11.31	10.62	Limestone	265.96	265.62	265.63	264.96	266.33	265.15
MW08-2			270.74	270.04	0.70	7.70	7.00	Limestone	265.59	264.62	267.88	264.27	266.39	264.28
MW09-1	4933295	728829	267.25	266.57	0.68	9.92	9.24	Limestone	266.41	266.30	266.30	265.50	266.55	265.84
MW09-2			267.25	266.57	0.68	6.16	5.48	Limestone	265.90	265.60	265.57	265.00	266.23	265.15
MW10-1	4933194	728760	267.97	267.23	0.74	9.89	9.15	Limestone	265.85	265.77	265.73	264.98	265.97	265.42
MW10-2			267.97	267.24	0.73	6.65	5.92	Limestone	265.76	265.68	265.65	265.65	265.85	265.35
MW11-1	4933098	728755	268.50	267.80	0.70	9.96	9.26	Limestone	265.85	265.85	265.65	265.05	265.99	265.38
MW11-2			268.50	267.78	0.72	6.74	6.02	Limestone	265.76	265.68	265.76	265.07	265.85	265.37
MW12-1	4933218	728573	268.00	267.11	0.89	6.84	5.95	Limestone	266.27	266.22	266.12	265.47	265.47	265.82
MW12-2			268.00	267.09	0.91	10.21	9.30	Limestone	266.32	266.22	266.23	265.47	266.45	265.88
MW12-3			268.00	267.10	0.90	13.09	12.19	Limestone	266.39	266.33	266.27	265.51	266.55	na
MW13-1	4933149	728378	270.07	269.11	0.86	6.04	5.18	Limestone	-	-	-	-	-	-
MW13-2			269.96	269.11	0.86	3.76	2.90	Gravel/Limestone	-	-	-	-	-	-

Notes:

1. All measurements are reported relative to an assumed elevation of the site benchmark.



Table 2 Groundwater Elevation Data

Monitor	UTM (Zone 17)		Top of Casing Elevation (m)	Ground Elevation (m)	Measured Stick-Up (m)	Well Depth (mTOP)	Well Depth (m)	Screened Unit	Water Level Elevation (mASL)					
	mN	mE							June 6/7, 2018	November 11/12, 2018	30-May-19	29-Oct-19	26-May-20	20-Nov-20
MW01-1	4933341	728326	271.24	270.42	0.82	7.65	6.83	Limestone/Shale	268.54	267.72	268.54	268.42	268.41	267.91
MW01-2			271.24	270.42	0.82	2.74	1.92	Clay/Gravel	dry	dry	dry	dry	-	-
MW02-1	4933327	728431	282.49	282.27	0.22	15.33	15.11	Limestone/Shale	dry	dry	dry	dry	-	-
MW02-2			282.53	282.32	0.21	5.45	5.24	Sand/Gravel	dry	dry	dry	dry	-	-
MW03-1	4933262	728468	269.23	268.80	0.66	5.51	4.85	Limestone	268.13	266.93	268.02	267.41	267.02	267.15
MW03-2			269.53	268.80	0.49	1.72	1.23	Clay/Sand/Gravel	268.23	dry	268.47	268.02	268.09	267.49
MW04-1	4933239	728549	268.28	267.36	0.92	5.62	4.70	Limestone/Shale	266.23	265.78	266.36	266.21	266.29	266.03
MW04-2			268.28	267.43	0.85	2.99	2.14	Gravel/Limestone	268.23	dry	266.73	266.39	266.47	266.18
MW05-1	4933370	728530	271.35	-	Below Grade	7.68	7.68	Limestone	266.43	266.22	266.83	266.78	266.74	266.40
MW05-2			271.35	271.13	0.22	4.38	4.16	Clay/Sand/Gravel	266.42	dry	268.52	267.19	268.10	-
MW06-1	4933292	728502	271.01	270.40	0.61	7.85	7.24	Limestone/Shale	266.28	265.85	266.49	266.31	266.37	266.10
MW06-2			271.01	270.41	0.60	5.13	4.53	Sand/Gravel	267.93	267.03	268.46	267.37	268.07	267.11
MW07-1	4933309	728559	269.03	268.24	0.79	6.98	6.19	Limestone	266.06	265.88	266.33	265.77	266.08	265.68
MW07-2			269.03	268.29	0.74	3.37	2.63	Limestone	266.72	266.07	267.00	266.63	266.78	266.34
MW08-1	4933413	728836	270.74	270.05	0.69	11.31	10.62	Limestone	266.26	265.19	266.35	265.69	266.12	265.36
MW08-2			270.74	270.04	0.70	7.70	7.00	Limestone	266.28	264.15	266.46	264.93	265.93	264.25
MW09-1	4933295	728829	267.25	266.57	0.68	9.92	9.24	Limestone	266.47	265.14	266.59	266.31	266.45	266.17
MW09-2			267.25	266.57	0.68	6.16	5.48	Limestone	266.15	265.14	266.27	265.72	266.05	265.31
MW10-1	4933194	728760	267.97	267.23	0.74	9.89	9.15	Limestone	265.88	265.46	266.09	265.77	265.85	265.49
MW10-2			267.97	267.24	0.73	6.65	5.92	Limestone	265.75	264.46	265.96	265.76	265.75	265.53
MW11-1	4933098	728755	268.50	267.80	0.70	9.96	9.26	Limestone	265.98	265.46	266.11	265.92	265.96	265.50
MW11-2			268.50	267.78	0.72	6.74	6.02	Limestone	266.02	265.46	268.94	265.75	265.75	265.51
MW12-1	4933218	728573	268.00	267.11	0.89	6.84	5.95	Limestone	266.32	265.84	266.48	266.24	266.32	266.06
MW12-2			268.00	267.09	0.91	10.21	9.30	Limestone	266.39	265.89	266.30	266.30	266.35	266.16
MW12-3			268.00	267.10	0.90	13.09	12.19	Limestone	266.48	265.89	266.59	266.59	266.46	266.13
MW13-1	4933149	728378	270.07	269.11	0.86	6.04	5.18	Limestone	-	-	-	-	-	-
MW13-2			269.96	269.11	0.86	3.76	2.90	Gravel/Limestone	-	-	-	-	-	-

Notes:

1. All measurements are reported relative to an assumed elevation of the site benchmark.



Table 2 Groundwater Elevation Data

Monitor	UTM (Zone 17)		Top of Casing Elevation (m)	Ground Elevation (m)	Measured Stick-Up (m)	Well Depth (mTOP)	Well Depth (m)	Screened Unit	Water Level Elevation (mASL)			
	mN	mE							6/24 and 28/2021	11-Nov-21	12-Apr-22	25-Oct-22
MW01-1	4933341	728326	271.24	270.42	0.82	7.65	6.83	Limestone/Shale	267.92	268.30	268.75	267.54
MW01-2			271.24	270.42	0.82	2.74	1.92	Clay/Gravel	-	-	268.91	-
MW02-1	4933327	728431	282.49	282.27	0.22	15.33	15.11	Limestone/Shale	268.17	-	-	-
MW02-2			282.53	282.32	0.21	5.45	5.24	Sand/Gravel	-	-	-	-
MW03-1	4933262	728468	269.23	268.80	0.66	5.51	4.85	Limestone	266.90	267.48	267.99	266.76
MW03-2			269.53	268.80	0.49	1.72	1.23	Clay/Sand/Gravel	-	267.84	268.71	-
MW04-1	4933239	728549	268.28	267.36	0.92	5.62	4.70	Limestone/Shale	265.82	266.23	266.39	265.70
MW04-2			268.28	267.43	0.85	2.99	2.14	Gravel/Limestone	265.99	266.41	266.68	265.83
MW05-1	4933370	728530	271.35	-	Below Grade	7.68	7.68	Limestone	266.25	266.70	266.90	266.06
MW05-2			271.35	271.13	0.22	4.38	4.16	Clay/Sand/Gravel	267.46	267.47	268.50	-
MW06-1	4933292	728502	271.01	270.40	0.61	7.85	7.24	Limestone/Shale	265.92	266.34	266.51	265.76
MW06-2			271.01	270.41	0.60	5.13	4.53	Sand/Gravel	267.45	267.53	268.43	266.91
MW07-1	4933309	728559	269.03	268.24	0.79	6.98	6.19	Limestone	266.13	265.62	265.59	265.58
MW07-2			269.03	268.29	0.74	3.37	2.63	Limestone	266.21	266.62	267.07	265.94
MW08-1	4933413	728836	270.74	270.05	0.69	11.31	10.62	Limestone	265.30	265.64	266.35	265.07
MW08-2			270.74	270.04	0.70	7.70	7.00	Limestone	264.23	264.79	266.47	264.07
MW09-1	4933295	728829	267.25	266.57	0.68	9.92	9.24	Limestone	266.05	266.37	266.53	265.79
MW09-2			267.25	266.57	0.68	6.16	5.48	Limestone	265.28	265.64	266.30	265.06
MW10-1	4933194	728760	267.97	267.23	0.74	9.89	9.15	Limestone	265.41	265.84	266.00	265.32
MW10-2			267.97	267.24	0.73	6.65	5.92	Limestone	265.33	265.75	265.89	265.39
MW11-1	4933098	728755	268.50	267.80	0.70	9.96	9.26	Limestone	265.37	265.75	265.68	265.29
MW11-2			268.50	267.78	0.72	6.74	6.02	Limestone	265.29	265.72	265.68	265.35
MW12-1	4933218	728573	268.00	267.11	0.89	6.84	5.95	Limestone	265.84	266.28	266.46	265.74
MW12-2			268.00	267.09	0.91	10.21	9.30	Limestone	265.88	266.37	266.57	265.78
MW12-3			268.00	267.10	0.90	13.09	12.19	Limestone	265.94	266.38	266.59	265.79
MW13-1	4933149	728378	270.07	269.11	0.86	6.04	5.18	Limestone	267.93	268.25	268.53	267.49
MW13-2			269.96	269.11	0.86	3.76	2.90	Gravel/Limestone	267.94	268.22	268.40	267.42

Notes:

1. All measurements are reported relative to an assumed elevation of the site benchmark.



Table 3 Vertical Hydraulic Gradients

Monitor	Geologic Unit in Which Screen is Completed	Difference in Elevation of Bottom of Screen	Vertical Gradient (+ downward gradient, - upward gradient)					
			26-May-20	20-Nov-20	6/24 and 28/2021	11-Nov-21	12-Apr-22	25-Oct-22
MW01-1	Limestone/Shale	-4.91	-	-	-	-	0.03	-
MW01-2	Clay/Gravel							
MW02-1	Limestone/Shale	-9.92	-	-	-	-	-	-
MW02-2	Sand/Gravel							
MW03-1	Limestone	-3.79	0.28	0.09	-	0.09	0.11	-
MW03-2	Clay/Sand/Gravel							
MW04-1	Limestone/Shale	-2.63	0.07	0.06	0.06	0.07	0.11	0.07
MW04-2	Gravel/Limestone							
MW05-1	Limestone	-3.30	0.41	-	0.37	0.23	0.48	-
MW05-2	Clay/Sand/Gravel							
MW06-1	Limestone/Shale	-2.72	0.62	0.37	0.56	0.44	0.71	0.62
MW06-2	Sand/Gravel							
MW07-1	Limestone	-3.61	0.19	0.18	0.02	0.28	0.41	0.19
MW07-2	Clay/Gravel							
MW08-1	Limestone	-3.61	-0.05	-0.31	-0.30	-0.24	0.03	-0.05
MW08-2	Gravel/Sand							
MW09-1	Limestone	-3.76	-0.11	-0.23	-0.20	-0.19	-0.06	-0.11
MW09-2	Gravel							
MW10-1	Limestone	-3.24	-0.03	0.01	-0.02	-0.03	-0.03	-0.03
MW10-2	Gravel							
MW11-1	Limestone	-3.22	-0.07	0.00	-0.02	-0.01	0.00	-0.07
MW11-2	Gravel							
MW12-1	Gravel	-3.37	-0.01	-0.03	-0.01	-0.03	-0.03	-0.01
MW12-2	Limestone							
MW12-1	Gravel	-6.25	-0.02	-0.01	-0.02	-0.02	-0.02	-0.02
MW12-3	Limestone							
MW12-2	Limestone	-2.88	0.04	-0.01	-0.02	0.00	-0.01	-0.04
MW12-3	Limestone							
MW13-1	Gravel	-2.17	-	-	-0.01	0.01	0.06	0.03
MW13-2	Limestone							



Table 4 Groundwater Quality - Overburden

	Unit	EQL	RUC	ODWQS	MW01-2 12 Apr 2022	MW03-2 01 Nov 2011	MW03-2 24 May 2012	MW03-2 12 Jun 2013	MW03-2 05 Nov 2013	MW03-2 25 Jun 2014	MW03-2 11 Nov 2014	MW03-2 22 May 2015
Metals												
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.1	-	-	-	-	-	1.3	0.7
Barium (filtered)	µg/L	0.01	353	1,000	171	598	576	455	480	375	596	494
Boron (filtered)	µg/L	0.2	2,522	5,000	6	315	343	326	324	355	397	420
Calcium (filtered)	µg/L	10			112,000	241,000	193,000	177,000	183,000	122,000	235,000	192,000
Cadmium (filtered)	µg/L	0.003		5	<0.015	-	-	-	-	-	0.003	0.009
Chloride	µg/L	200	153,350	250,000	26,600	35,000	17,000	12,000	18,000	28,000	28,000	26,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	<1	-	-	-	-	-	0.22	0.18
Copper (filtered)	µg/L	0.02		1,000	4.1	-	-	-	-	-	1.28	1.70
Iron (filtered)	µg/L	2	158	300	8	25,500	22,300	19,300	7,270	7,850	14,600	9,160
Lead (filtered)	µg/L	0.01		10	0.08	-	-	-	-	-	0.04	0.01
Magnesium (filtered)	µg/L	1			1,720	31,000	26,700	22,200	26,800	18,300	26,600	23,200
Manganese (filtered)	µg/L	0.01	25.93	50	1	-	-	-	-	-	6,210	4,860
Mercury (filtered)	µg/L	0.01		1	<0.02	-	-	-	-	-	-	-
Phosphorus (filtered)	ug/L	100			-	-	-	-	-	-	-	-
Phosphorus total (P2O5)	µg/L	3			1,150	-	-	-	-	-	-	<30
Potassium (filtered)	µg/L	2			200	-	-	-	-	-	24,800	20,000
Sodium (filtered)	µg/L	10	118,100	200,000	19,500	43,200	34,600	45,400	88,100	126,000	29,500	65,800
Zinc (filtered)	µg/L	2		5,000	6	-	-	-	-	-	2	3
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2	285	500	270	685	650	615	772	689	717	655
Hardness (as CaCO3) (filtered)	mg/L	1	425	500	287	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	3	459	500	311	849	760	786	920	830	851	809
Chemical Oxygen Demand	mg/L	5			127	70	48	44	22	28	27	33
Total Suspended Solids	mg/L	2			-	47	-	-	-	-	-	26
Dissolved Organic Carbon (filtered)	mg/L	0.2	4.05	5	4.4	4.4	11.3	4.0	10.0	11.5	8.9	-
Biochemical Oxygen Demand	mg/L	2			-	<2	-	-	-	-	-	<4
Phenols (4AAP)	mg/L	0.001			<0.001	-	-	-	-	-	-	0.002
Sulphate (filtered)	mg/L	0.2	259	500	3	17	24	59	23	95	50	80
Ammonia as N	mg/L	0.01			0.09	1.0	2.3	0.8	0.6	2.5	2.5	3.2
Nitrate (as N)	mg/L	0.05	3.34	10	0.18	<0.05	0.59	<0.06	0.19	<0.06	0.32	0.09
Nitrite (as N)	mg/L	0.03		1	<0.05	<0.06	-	-	-	-	-	<0.03
Total Kjeldahl Nitrogen	mg/L	0.1			7.5	-	-	-	-	-	-	3.4
pH (Lab)	-	0.05		6.5-8.5	8.17	7.82	7.51	7.59	7.85	7.47	7.99	7.89
Electrical Conductivity (Lab)	µS/cm	1			599	1,350	1,220	1,230	1,470	1,360	1,360	1,280
Field												
DO (Field)	mg/L				10.56	-	-	-	-	-	-	-
Redox (Field)	mV				25	-	-	-	-	-	-	-
Temperature (Field)	oC				6.9	-	-	-	-	-	-	-
Conductivity (field)	µS/cm				519	-	-	-	-	-	-	-
pH (Field)	-			6.5-8.5	6.9	-	-	-	-	-	-	-



Table 4 Groundwater Quality - Overburden

	Unit	EQL	RUC	ODWQS	MW03-2 19 Nov 2015	MW03-2 30 May 2016	MW03-2 30 May 2019	MW03-2 29 Oct 2019	MW03-2 26 May 2020	MW03-2 18 Nov 2020	MW03-2 11 Nov 2021	MW03-2 12 Apr 2022
Metals												
Arsenic (filtered)	µg/L	0.1	6.4	25	1.0	0.4	0.2	0.3	0.3	0.3	0.3	0.2
Barium (filtered)	µg/L	0.01	353	1,000	475	402	175	237	157	240	320	264
Boron (filtered)	µg/L	0.2	2,522	5,000	305	303	563	827	466	408	550	445
Calcium (filtered)	µg/L	10			229,000	191,000	246,000	325,000	222,000	296,000	296,000	257,000
Cadmium (filtered)	µg/L	0.003		5	0.013	0.004	0.018	0.03	0.039	0.078	0.057	0.024
Chloride	µg/L	200	153,350	250,000	28,000	12,000	37,000	100,000	54,000	59,000	67,700	21,200
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.22	0.54	0.19	0.3	0.32	0.58	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.74	1.75	1.1	3.1	2	6.1	2	1.9
Iron (filtered)	µg/L	2	158	300	4,410	4,820	132	20	28	1,390	147	248
Lead (filtered)	µg/L	0.01		10	0.16	0.07	0.02	0.03	0.01	1.27	0.06	0.05
Magnesium (filtered)	µg/L	1			22,300	21,600	22,000	24,400	27,200	24,100	28,500	27,600
Manganese (filtered)	µg/L	0.01	25.93	50	4,530	3,180	3,240	52	822	1,010	1,400	2,820
Mercury (filtered)	µg/L	0.01		1	<0.01	0.01	<10	<10	20	<10	<0.02	<0.02
Phosphorus (filtered)	ug/L	100			-	-	-	-	-	-	-	-
Phosphorus total (P2O5)	µg/L	3			<30	8	-	110	270	560	90	80
Potassium (filtered)	µg/L	2			20,100	19,100	16,900	21,100	22,900	26,600	25,100	19,800
Sodium (filtered)	µg/L	10	118,100	200,000	26,600	57,700	38,300	43,300	107,000	45,700	59,200	45,200
Zinc (filtered)	µg/L	2		5,000	3	4	3	4	<2	5	<5	<5
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2	285	500	380	286	536	559	674	841	745	694
Hardness (as CaCO3) (filtered)	mg/L	1	425	500	-	-	-	-	-	-	857	756
Total Dissolved Solids	mg/L	3	459	500	671	389	677	1,120	814	900	907	771
Chemical Oxygen Demand	mg/L	5			35	26	11	20	26	<8	40	26
Total Suspended Solids	mg/L	2			29	10	713	183	379	1,200	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	4.05	5	-	-	-	-	-	-	10.1	11.8
Biochemical Oxygen Demand	mg/L	2			<4	<4	<4	<4	14	5	-	-
Phenols (4AAP)	mg/L	0.001			<0.002	0.004	<0.001	0.002	<0.001	<0.001	<0.002	<0.001
Sulphate (filtered)	mg/L	0.2	259	500	84	35	70	210	89	62	51	31
Ammonia as N	mg/L	0.01			0.6	1.9	0.7	0.1	0.6	1.5	0.62	0.54
Nitrate (as N)	mg/L	0.05	3.34	10	1.23	0.12	1.01	5.39	1.76	5.18	0.42	1.4
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	0.33	0.03	0.05	0.49	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			0.6	2.3	0.6	<0.5	1.3	2.2	1.7	1.1
pH (Lab)	-	0.05		6.5-8.5	7.46	7.86	7.42	7.58	7.36	7.63	7.53	7.56
Electrical Conductivity (Lab)	µS/cm	1			1,120	710	1,110	1,630	1,360	1,360	1,660	1,420
Field												
DO (Field)	mg/L				-	-	3.7	-	-	7.2	4.28	2.97
Redox (Field)	mV				-	-	86	-	-	29	85	4
Temperature (Field)	oC				-	-	11.3	-	13.6	10	9.7	7.2
Conductivity (field)	µS/cm				-	-	490	-	-	973	671	1,236
pH (Field)	-			6.5-8.5	-	-	7	-	6.9	7.1	6.78	6.81



Table 4 Groundwater Quality - Overburden

	Unit	EQL	RUC	ODWQS	MW04-2	MW04-2	MW04-2	MW04-2	MW04-2	MW04-2	MW04-2	MW04-2	MW04-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	0.1	<0.1	<0.1	0.1
Barium (filtered)	µg/L	0.01	353	1,000	177	87.7	156	90	128	136	160	101	223
Boron (filtered)	µg/L	0.2	2,522	5,000	45	34	36	22	34	33	41	24	49
Calcium (filtered)	µg/L	10			128,000	92,900	120,000	90,800	115,000	122,000	121,000	95,100	160,000
Cadmium (filtered)	µg/L	0.003		5	0.007	0.003	0.004	<0.003	0.004	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	153,350	250,000	70,000	2,000	34,000	5,000	53,000	26,200	31,400	9,700	92,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.24	0.13	0.18	0.2	0.25	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.96	0.2	1.4	0.7	0.8	4	1.7	2.7	3.1
Iron (filtered)	µg/L	2	158	300	<7	<7	<7	<7	11	135	<5	8	250
Lead (filtered)	µg/L	0.01		10	<0.01	<0.01	0.02	0.01	0.04	0.28	0.04	0.02	0.52
Magnesium (filtered)	µg/L	1			4,240	2,200	3,750	2,640	3,240	4,040	3,960	3,000	5,200
Manganese (filtered)	µg/L	0.01	25.93	50	1.13	0.41	0.99	0.73	2.54	20	2	1	37
Mercury (filtered)	µg/L	0.01		1	<10	<10	<10	20	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	ug/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			<30	-	390	550	520	420	1,270	580	600
Potassium (filtered)	µg/L	2			2,170	729	1,560	911	1,280	1,600	2,000	800	2,400
Sodium (filtered)	µg/L	10	118,100	200,000	26,000	5,320	24,400	7,430	16,100	16,300	26,000	10,000	41,100
Zinc (filtered)	µg/L	2		5,000	<2	<2	2	<2	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	285	500	302	218	287	382	490	263	270	226	299
Hardness (as CaCO3) (filtered)	mg/L	1	425	500	-	-	-	-	-	322	319	250	422
Total Dissolved Solids	mg/L	3	459	500	463	186	374	251	406	308	334	251	470
Chemical Oxygen Demand	mg/L	5			<8	<8	<8	10	<8	42	13	50	60
Total Suspended Solids	mg/L	2			5	653	1,130	3,020	1,420	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	4.05	5	-	-	-	-	-	3.4	1.7	2.5	0.4
Biochemical Oxygen Demand	mg/L	2			10	<4	<4	4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			<0.001	<0.001	<0.001	0.001	<0.001	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	259	500	13	<2	6	4	13	13	10	7	14
Ammonia as N	mg/L	0.01			<0.1	<0.1	<0.1	<0.1	<0.1	0.02	0.03	0.01	0.01
Nitrate (as N)	mg/L	0.05	3.34	10	0.68	<0.06	0.45	<0.06	1.49	0.55	0.49	0.16	1.44
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			<0.5	<0.5	<0.5	<0.5	<0.5	0.3	0.5	0.4	0.4
pH (Lab)	-	0.05		6.5-8.5	7.94	7.77	7.93	7.79	7.76	7.8	7.75	7.55	7.78
Electrical Conductivity (Lab)	µS/cm	1			769	320	705	415	680	594	644	485	887
Field													
DO (Field)	mg/L				-	8.6	10.5	-	8.5	9.71	7.53	7.32	5.98
Redox (Field)	mV				-	-23	134	-	32	145	28	45	-141
Temperature (Field)	oC				-	10.3	10.3	13	10.6	9	9.5	5.8	13
Conductivity (field)	µS/cm				-	295	565	-	458	569	277	412	841
pH (Field)	-			6.5-8.5	-	7.8	8.1	7.6	7.6	7.53	7.1	7.11	7.13



Table 4 Groundwater Quality - Overburden

	Unit	EQL	RUC	ODWQS	MW06-2 19 Nov 2015	MW06-2 30 May 2016	MW06-2 01 Nov 2016	MW06-2 04 Oct 2017	MW06-2 30 May 2019	MW06-2 29 Oct 2019	MW06-2 26 May 2020	MW06-2 18 Nov 2020	MW06-2 24 Jun 2021	MW06-2 11 Nov 2021	MW06-2 12 Apr 2022	MW06-2 25 Oct 2022
Metals																
Arsenic (filtered)	µg/L	0.1	6.4	25	0.8	0.6	1.4	1.4	1.6	1.2	0.6	1	2.4	1.7	1.4	3
Barium (filtered)	µg/L	0.01	353	1,000	399	403	499	529	685	467	544	401	699	540	502	635
Boron (filtered)	µg/L	0.2	2,522	5,000	551	589	876	688	831	753	739	557	1,080	833	625	921
Calcium (filtered)	µg/L	10			276,000	319,000	271,000	344,000	372,000	322,000	342,000	305,000	310,000	268,000	300,000	248,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	0.015	0.011	0.005	0.012	0.016	0.014	0.014	<0.029	<0.015	0.018	<0.029
Chloride	µg/L	200	153,350	250,000	74,000	62,000	140,000	130,000	80,000	110,000	92,000	140,000	167,000	98,800	34,900	115,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.60	0.96	1.40	1.81	1.18	0.8	1.13	1.04	2	8	1	1
Copper (filtered)	µg/L	0.02		1,000	3.01	2.29	1.81	4.18	5.4	8.7	5.1	14.5	7.4	1.6	3.4	1.2
Iron (filtered)	µg/L	2	158	300	1,960	3,110	4,360	8,920	15,600	3,860	7,210	4,590	21,700	9,810	13,100	12,200
Lead (filtered)	µg/L	0.01		10	0.05	0.07	0.03	0.02	0.2	0.01	0.02	0.09	0.46	0.04	0.06	<0.09
Magnesium (filtered)	µg/L	1			34,100	32,200	43,000	43,400	48,000	30,800	42,400	33,100	47,100	35,700	37,300	39,500
Manganese (filtered)	µg/L	0.01	25.93	50	6,730	6,390	7,320	10,500	8,400	5,340	8,490	6,340	8,580	7,250	7,750	6,840
Mercury (filtered)	µg/L	0.01		1	<0.01	0.01	0.01	<10	<10	20	40	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	ug/L	100			-	-	-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			<30	72	23	<30	-	60	80	40	40	30	130	220
Potassium (filtered)	µg/L	2			42,500	36,400	48,400	36,000	40,300	33,900	38,400	33,400	51,400	43,700	34,400	49,400
Sodium (filtered)	µg/L	10	118,100	200,000	73,400	76,600	135,000	107,000	109,000	101,000	90,800	91,000	158,000	101,000	62,200	125,000
Zinc (filtered)	µg/L	2		5,000	2	4	6	<2	5	<2.00000	3	3	6	<5	<5	<5
Inorganics																
Alkalinity (total) as CaCO3	mg/L	2	285	500	938	971	1,050	1,048	792	951	1,090	973	1,120	876	825	969
Hardness (as CaCO3) (filtered)	mg/L	1	425	500	-	-	-	-	-	-	-	-	969	817	903	783
Total Dissolved Solids	mg/L	3	459	500	1,190	1,310	1,300	1,710	1,010	1,240	1,370	1,200	1,350	1,100	986	1,180
Chemical Oxygen Demand	mg/L	5			58	69	82	99	70	68	102	98	119	73	100	125
Total Suspended Solids	mg/L	2			3	17	11	29	228	110	115	92	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	4.05	5	-	-	-	-	-	-	-	-	22.3	17.7	20	11.1
Biochemical Oxygen Demand	mg/L	2			<4	<4	<4	<4	<4	21	6	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			0.003	0.003	0.002	0.005	0.006	0.006	0.005	<0.001	<0.002	<0.002	<0.001	0.004
Sulphate (filtered)	mg/L	0.2	259	500	87	150	55	210	170	61	150	64	83	65	95	25
Ammonia as N	mg/L	0.01			21.1	17.0	25.4	18.7	22.1	23.3	31.8	27	43	28.4	23.1	37
Nitrate (as N)	mg/L	0.05	3.34	10	<0.06	0.10	<0.06	0.08	<0.06	3.72	<0.06	0.14	0.06	<0.05	<0.05	0.25
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	0.04	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			21.9	17.5	26.2	22.6	22.5	25.4	32.8	28.7	48	30.8	25	44.3
pH (Lab)	-	0.05		6.5-8.5	7.50	7.47	7.31	7.25	6.98	7.6	7.25	7.67	7.54	7.64	7.51	7.37
Electrical Conductivity (Lab)	µS/cm	1			1,940	2,090	2,170	2,490	1,640	2,010	2,190	1,940	2,440	1,990	1,800	2,140
Field																
DO (Field)	mg/L				-	-	-	-	3.3	11.8	-	7.4	8.96	8.02	5.44	5.75
Redox (Field)	mV				-	-	-	-	-88	55	-	-72	162	102	-50	-150
Temperature (Field)	oC				-	-	-	-	11.7	10.9	12.9	10.6	10	9.7	8.7	11.8
Conductivity (field)	µS/cm				-	-	-	-	1,953	832	-	973	2,433	788	1,691	17
pH (Field)	-			6.5-8.5	-	-	-	-	6.9	6.7	6.6	7	7.29	6.83	6.68	6.72



Table 4 Groundwater Quality - Overburden

	Unit	EQL	RUC	ODWQS	MW07-2	MW07-2	MW07-2	MW07-2	MW07-2	MW07-2	MW07-2	MW07-2	MW07-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	0.4	<0.2	<0.2	0.2	0.2	0.2	0.2
Barium (filtered)	µg/L	0.01	353	1,000	375	87.6	211	83.8	183	416	364	175	643
Boron (filtered)	µg/L	0.2	2,522	5,000	260	55	138	46	62	324	294	110	550
Calcium (filtered)	µg/L	10			190,000	72,100	130,000	74,600	134,000	200,000	177,000	106,000	211,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	0.003	0.003	<0.003	<0.003	<0.015	<0.015	0.018	0.022
Chloride	µg/L	200	153,350	250,000	76,000	6,000	35,000	10,000	53,000	104,000	80,300	35,200	118,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.78	0.17	0.3	0.19	0.34	<1	9	<1	<1
Copper (filtered)	µg/L	0.02		1,000	3.72	0.7	3.1	0.6	1.5	4.6	3.9	3.5	8.6
Iron (filtered)	µg/L	2	158	300	12	8	<7	<7	16	51	31	129	11
Lead (filtered)	µg/L	0.01		10	0.01	0.02	0.03	<0.01	0.07	0.25	0.3	0.69	0.07
Magnesium (filtered)	µg/L	1			16,100	3,710	10,100	3,180	7,130	21,300	16,900	9,810	27,000
Manganese (filtered)	µg/L	0.01	25.93	50	1.16	0.92	0.29	0.3	2.94	22	7	42	218
Mercury (filtered)	µg/L	0.01		1	<10	<10	20	20	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	ug/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			180	-	60	90	60	80	50	190	390
Potassium (filtered)	µg/L	2			8,690	1,330	5,410	631	2,600	10,300	8,200	3,900	18,700
Sodium (filtered)	µg/L	10	118,100	200,000	50,200	17,300	29,800	12,600	17,000	82,800	69,900	36,800	105,000
Zinc (filtered)	µg/L	2		5,000	<2	2	<2	<2	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	285	500	530	191	322	212	397	510	474	291	593
Hardness (as CaCO3) (filtered)	mg/L	1	425	500	-	-	-	-	-	588	511	304	639
Total Dissolved Solids	mg/L	3	459	500	791	209	451	223	611	659	659	372	871
Chemical Oxygen Demand	mg/L	5			23	<8	<8	10	<8	33	33	17	99
Total Suspended Solids	mg/L	2			<2	148	178	264	323	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	4.05	5	-	-	-	-	-	9.1	6.7	5.6	5.8
Biochemical Oxygen Demand	mg/L	2			7	<4	<4	<4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			0.001	<0.001	<0.001	0.002	<0.001	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	259	500	47	11	15	5	19	37	29	18	38
Ammonia as N	mg/L	0.01			0.4	<0.1	<0.1	<0.1	<0.1	0.39	0.06	0.03	2.21
Nitrate (as N)	mg/L	0.05	3.34	10	0.19	0.08	1.36	<0.06	1.62	0.48	4.96	0.59	10.9
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			<0.5	<0.5	<0.5	<0.5	<0.5	0.9	0.7	0.5	4
pH (Lab)	-	0.05		6.5-8.5	7.81	7.84	7.92	7.95	7.78	7.72	7.8	7.59	7.75
Electrical Conductivity (Lab)	µS/cm	1			1,240	331	691	383	840	1,220	1,220	717	1,590
Field													
DO (Field)	mg/L				-	9.8	9.8	-	10.2	6.88	7.35	9.28	5.43
Redox (Field)	mV				-	63	86	-	31	132	135	36	-151
Temperature (Field)	oC				-	11.3	11.1	14.4	9.4	11.1	9	7.8	11.4
Conductivity (field)	µS/cm				-	370	1,662	-	579	1,048	503	648	1,525
pH (Field)	-			6.5-8.5	-	7.7	6.7	7.1	8	7.51	6.98	7.33	6.8



Table 4 Groundwater Quality - Overburden

	Unit	EQL	RUC	ODWQS	MW13-2	MW13-2	MW13-2	MW13-2	MW13-2	MW13-2	MW13-2	MW13-2	MW13-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	28 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	0.3	<0.2	<0.2	0.1	0.1	0.1	0.1
Barium (filtered)	µg/L	0.01	353	1,000	132	137	155	158	113	135	168	190	108
Boron (filtered)	µg/L	0.2	2,522	5,000	38	51	46	49	50	27	46	77	27
Calcium (filtered)	µg/L	10			118,000	139,000	144,000	149,000	126,000	123,000	143,000	165,000	95,400
Cadmium (filtered)	µg/L	0.003		5	0.011	0.004	0.007	0.024	0.006	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	153,350	250,000	70,000	51,000	58,000	85,000	38,000	70,300	56,700	79,000	31,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.69	0.15	0.22	0.26	0.31	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.88	0.7	2	1.6	1	1.6	1.4	1.6	0.7
Iron (filtered)	µg/L	2	158	300	71	27	19	16	46	6	<5	<5	41
Lead (filtered)	µg/L	0.01		10	<0.01	0.03	0.04	0.08	0.05	0.08	0.03	0.03	0.02
Magnesium (filtered)	µg/L	1			3,750	4,420	4,680	5,680	3,550	3,930	4,390	6,690	3,020
Manganese (filtered)	µg/L	0.01	25.93	50	137	1.44	2.27	1.27	3.28	<1	<1	<1	4
Mercury (filtered)	µg/L	0.01		1	<10	<10	<10	20	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	ug/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			50	-	100	30	40	70	20	30	310
Potassium (filtered)	µg/L	2			3,990	3,480	3,640	4,010	2,970	3,200	4,500	4,500	2,900
Sodium (filtered)	µg/L	10	118,100	200,000	38,200	30,000	36,500	46,800	25,600	43,700	36,500	43,600	23,600
Zinc (filtered)	µg/L	2		5,000	2	3	4	12	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	285	500	285	230	331	318	314	268	318	345	250
Hardness (as CaCO3) (filtered)	mg/L	1	425	500	-	-	-	-	-	324	375	440	251
Total Dissolved Solids	mg/L	3	459	500	454	329	474	526	391	399	436	527	311
Chemical Oxygen Demand	mg/L	5			<8	10	<8	15	10	<5	10	8	46
Total Suspended Solids	mg/L	2			<2	28	69	56	45	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	4.05	5	-	-	-	-	-	3.3	2.7	3.8	1.3
Biochemical Oxygen Demand	mg/L	2			5	<4	<4	<4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			<0.001	0.002	<0.001	0.003	<0.001	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	259	500	13	18	26	22	12	12	23	22	10
Ammonia as N	mg/L	0.01			0.2	0.4	<0.1	0.2	<0.1	0.02	0.02	0.16	0.03
Nitrate (as N)	mg/L	0.05	3.34	10	0.52	0.65	2.36	1.27	1.12	1.71	1.28	2.42	0.4
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			<0.5	0.8	<0.5	<0.5	<0.5	0.2	0.2	0.5	0.5
pH (Lab)	-	0.05		6.5-8.5	7.47	7.51	7.82	7.41	7.77	7.68	7.72	7.4	7.72
Electrical Conductivity (Lab)	µS/cm	1			774	569	833	862	666	763	827	989	599
Field													
DO (Field)	mg/L				-	7.1	8.7	-	4.8	6.56	2.51	2.45	4.53
Redox (Field)	mV				-	129	10	-	38	131	45	39	-142
Temperature (Field)	oC				-	8.9	10.8	16.6	12.6	12.4	10.1	6.5	12
Conductivity (field)	µS/cm				-	292	502	-	485	715	353	859	575
pH (Field)	-			6.5-8.5	-	7.9	7.6	7.5	7.6	7.23	6.9	6.72	7.24



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW01-1	MW01-1	MW01-1	MW01-1	MW01-1	MW01-1	MW01-1	MW01-1	MW01-1	MW01-1	MW01-1
					01 Nov 2016	31 May 2017	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals															
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	271	269	248	282	278	243	227	233	245	284	301
Boron (filtered)	µg/L	0.2	2,538	5,000	149	134	114	93	105	98	102	73	93	84	84
Calcium (filtered)	µg/L	10			159,000	169,000	158,000	175,000	178,000	178,000	177,000	165,000	156,000	191,000	185,000
Cadmium (filtered)	µg/L	0.003		5	0.005	0.003	<0.003	<0.003	0.003	0.009	0.003	<0.015	<0.015	<0.015	<0.012
Chloride	µg/L	200	197,500	250,000	160,000	170,000	170,000	180,000	170,000	190,000	180,000	175,000	153,000	216,000	221,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.63	0.63	0.6	0.17	0.17	0.19	0.87	4	1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	1.83	1.26	1.26	0.9	1.4	1.9	1.6	1.3	1.2	2	1.1
Iron (filtered)	µg/L	2	153	300	<7	14	<7	<7	<7.00000	<7	<7	<5	<5	<5	<5
Lead (filtered)	µg/L	0.01		10	0.16	0.03	<0.01	0.01	0.14	0.02	0.01	0.13	0.09	<0.04	<0.04
Magnesium (filtered)	µg/L	1	25.15	50	14,500	15,600	14,600	15,000	14,200	17,500	15,200	13,700	14,900	15,100	14,300
Manganese (filtered)	µg/L	0.01		50	12.9	0.15	6.28	0.03	1.85	0.02	1.09	<1	<1	<1	2
Mercury (filtered)	µg/L	0.01		1	<0.01	<10	-	<10	-	10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			-	<30	-	-	-	-	-	60	880	110	2,370
Potassium (filtered)	µg/L	2			5,780	5,150	4,920	5,560	5,450	5,000	5,170	4,500	5,600	5,000	5,200
Sodium (filtered)	µg/L	10	136,650	200,000	79,100	72,800	68,900	73,000	69,400	87,800	75,500	83,300	83,800	102,000	96,200
Zinc (filtered)	µg/L	2		5,000	4	5	8	<2	<2.00000	2	3	<5	<5	<5	<5
Inorganics															
Alkalinity (total) as CaCO3	mg/L	2	283	500	322	317	302	272	261	297	304	313	292	331	333
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	-	-	469	451	540	522
Total Dissolved Solids	mg/L	3	647	500	737	771	834	711	666	746	737	680	627	798	800
Chemical Oxygen Demand	mg/L	5			<8	<8	<8	<8	<8.0	<8	<8	<5	16	9	116
Total Suspended Solids	mg/L	2			-	-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	2	2	2	-	<1.0	2	2	2.2	1.1	1.6	0.3
Biochemical Oxygen Demand	mg/L	2			-	-	-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	<0.002	-	0.006	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	81	81	81	79	74	90	87	79	63	74	73
Ammonia as N	mg/L	0.01			0.2	<0.1	<0.1	<0.1	<0.1000	<0.1	<0.1	0.04	0.06	<0.01	0.03
Nitrate (as N)	mg/L	0.05	4.31	10	3.37	2.24	-	2.29	2.4	2.92	2.84	2.54	1.85	2.52	2.51
Nitrite (as N)	mg/L	0.03		1	-	<0.03	2.63	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	<0.5	-	<0.5	-	<0.5	-	0.3	-	0.4	2.8
pH (Lab)	-	0.05		6.5-8.5	7.90	7.91	7.69	7.53	7.98	7.79	7.81	7.73	7.85	7.7	7.59
Electrical Conductivity (Lab)	µS/cm	1			1,300	1,180	1,220	1,150	1,150	1,210	1,250	1,260	1,170	1,470	1,470
Field															
DO (Field)	mg/L				-	-	-	6.4	6.6	-	9.6	5.17	9.03	7.78	8.5
Redox (Field)	mV				-	-	-	164	75	-	2	151	173	43	-160
Temperature (Field)	oC				-	-	-	8.9	10.8	16.3	10.7	10.9	10.7	7.5	11.6
Conductivity (field)	µS/cm				-	-	-	767	9	-	885	1,216	435	1,240	1,442
pH (Field)	-				-	-	-	7.7	6.5	7.5	7.5	7.04	7.18	6.79	6.79



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW03-1	MW03-1	MW03-1	MW03-1	MW03-1	MW03-1	MW03-1	MW03-1	MW03-1	MW03-1
					01 Nov 2016	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals														
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	203	82.9	83.6	118	120	105	112	186	88	188
Boron (filtered)	µg/L	0.2	2,538	5,000	87	33	25	50	107	40	29	54	18	69
Calcium (filtered)	µg/L	10			205,000	92,600	106,000	137,000	120,000	118,000	132,000	169,000	97,600	165,000
Cadmium (filtered)	µg/L	0.003		5	0.025	0.006	<0.003	0.012	0.016	0.007	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	110,000	32,000	24,000	56,000	57,000	43,000	73,800	104,000	27,700	87,100
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.54	0.83	0.18	0.19	0.24	0.75	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.98	1.1	0.4	1.6	0.5	1.2	1.2	0.7	1.4	0.8
Iron (filtered)	µg/L	2	153	300	10	12	<7	<7.00000	8	<7	16	<5	<5	299
Lead (filtered)	µg/L	0.01		10	0.12	0.01	0.01	0.05	0.01	0.01	0.07	<0.04	<0.02	0.02
Magnesium (filtered)	µg/L	1			5,780	3,280	2,960	3,350	5,100	4,130	4,190	5,140	3,050	6,050
Manganese (filtered)	µg/L	0.01	25.15	50	32.8	6.11	0.24	6.2	21.9	3.96	1	4	<1	175
Mercury (filtered)	µg/L	0.01		1	<0.01	-	<10	-	20	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			-	-	-	-	-	-	20	30	40	130
Potassium (filtered)	µg/L	2			4,780	4,170	2,860	3,590	5,120	4,750	3,300	5,100	3,200	5,600
Sodium (filtered)	µg/L	10	136,650	200,000	57,300	16,500	21,100	43,000	30,400	30,200	25,200	59,500	19,600	44,600
Zinc (filtered)	µg/L	2		5,000	5	4	7	4	2	<2	<5	<5	<5	<5
Inorganics														
Alkalinity (total) as CaCO3	mg/L	2	283	500	406	278	248	330	364	343	266	347	227	361
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	-	347	443	257	438
Total Dissolved Solids	mg/L	3	647	500	849	394	294	534	480	451	378	558	288	530
Chemical Oxygen Demand	mg/L	5			8	<8	<8	<8.0	14	<8	<5	11	<5	15
Total Suspended Solids	mg/L	2			-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	5	2	-	2	6	2	2.9	2.5	2.5	1.8
Biochemical Oxygen Demand	mg/L	2			-	-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	-	<0.001	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	39	9	9	20	24	14	11	27	7	17
Ammonia as N	mg/L	0.01			<0.1	0.3	<0.1	<0.1000	3.1	<0.1	<0.01	0.01	0.03	0.03
Nitrate (as N)	mg/L	0.05	4.31	10	2.97	-	1.41	2.51	1.22	1.26	1.48	1.64	1.02	2.02
Nitrite (as N)	mg/L	0.03		1	-	1.74	<0.03	-	0.07	-	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	-	<0.5	-	3.3	-	0.2	0.4	0.3	1
pH (Lab)	-	0.05		6.5-8.5	7.59	7.51	7.34	7.9	7.5	7.39	7.74	7.68	7.57	7.67
Electrical Conductivity (Lab)	µS/cm	1			1,300	666	526	920	876	772	726	1,040	555	993
Field														
DO (Field)	mg/L				-	-	3.7	9.5	-	4.8	9.56	5.73	7.27	7.39
Redox (Field)	mV				-	-	29	49	-	28	132	69	18	-144
Temperature (Field)	oC				-	-	11.7	10.9	13.1	10.5	10	10.1	7.8	13.7
Conductivity (field)	µS/cm				-	-	729	621	-	514	653	378	511	5
pH (Field)	-				-	-	7.4	6.7	7	7.6	7.84	6.99	7.06	6.9



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW04-1	MW04-1	MW04-1	MW04-1	MW04-1	MW04-1	MW04-1	MW04-1	MW04-1	MW04-1
					01 Nov 2016	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals														
Arsenic (filtered)	µg/L	0.1	6.4	25	0.8	<0.2	<0.2	0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	114	131	115	193	125	143	124	174	109	154
Boron (filtered)	µg/L	0.2	2,538	5,000	563	63	69	79	81	49	66	81	60	81
Calcium (filtered)	µg/L	10			28,600	131,000	118,000	214,000	124,000	157,000	125,000	166,000	113,000	139,000
Cadmium (filtered)	µg/L	0.003		5	0.012	0.017	0.006	0.045	0.017	0.006	0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	42,000	75,000	51,000	90,000	47,000	57,000	54,000	96,200	36,000	69,400
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.54	0.7	0.13	0.13	0.18	0.96	<1	5	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.45	0.65	0.5	0.9	0.8	1	1.3	0.5	2	0.9
Iron (filtered)	µg/L	2	153	300	<7	21	12	125	50	21	34	<5	65	<5
Lead (filtered)	µg/L	0.01		10	0.05	0.1	0.01	0.02	0.03	0.02	0.14	<0.04	0.13	0.03
Magnesium (filtered)	µg/L	1			6,610	5,280	4,940	7,480	6,270	5,310	5,530	6,510	4,790	5,920
Manganese (filtered)	µg/L	0.01	25.15	50	3.25	175	168	69.4	212	50.9	147	106	63	21
Mercury (filtered)	µg/L	0.01		1	<0.01	-	<10	-	10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			-	-	-	-	-	-	20	4,780	1,160	1,090
Potassium (filtered)	µg/L	2			2,230	5,090	5,640	5,670	4,740	4,750	4,800	5,800	4,400	4,300
Sodium (filtered)	µg/L	10	136,650	200,000	146,000	32,100	37,000	49,200	35,100	36,000	31,400	52,800	27,700	39,900
Zinc (filtered)	µg/L	2		5,000	4	2	3	<2.00000	<2	<2	<5	<5	<5	<5
Inorganics														
Alkalinity (total) as CaCO3	mg/L	2	283	500	325	325	291	378	329	390	296	351	279	332
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	-	335	441	302	373
Total Dissolved Solids	mg/L	3	647	500	463	500	434	597	389	469	392	541	363	470
Chemical Oxygen Demand	mg/L	5			<8	8	<8	<8.0	8	<8	<5	157	35	85
Total Suspended Solids	mg/L	2			-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	<1	2	-	3	2	2	4	2.8	3.1	1.3
Biochemical Oxygen Demand	mg/L	2			-	-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	-	0.002	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	31	14	22	42	15	12	15	26	15	17
Ammonia as N	mg/L	0.01			<0.1	0.6	1.2	0.4	1	0.4	0.8	0.92	0.64	0.19
Nitrate (as N)	mg/L	0.05	4.31	10	0.12	-	1.19	2.14	1.1	2.65	1.56	0.64	1.44	1.27
Nitrite (as N)	mg/L	0.03		1	-	1.17	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	-	1.1	-	1.2	-	1	-	1.7	1.4
pH (Lab)	-	0.05		6.5-8.5	8.20	7.44	8.08	7.57	7.52	7.26	7.63	7.58	7.5	7.71
Electrical Conductivity (Lab)	µS/cm	1			798	841	713	1,050	725	862	750	1,010	698	887
Field														
DO (Field)	mg/L				-	-	4.1	7.5	-	5.2	4.06	4	3.54	2.64
Redox (Field)	mV				-	-	-9	138	-	-7	140	45	35	-139
Temperature (Field)	oC				-	-	8.5	10	12.9	9.2	8	9	6.6	12.2
Conductivity (field)	µS/cm				-	-	477	723	-	547	735	431	579	832
pH (Field)	-			6.5-8.5	-	-	7.6	7.9	7.2	7.5	7.87	6.8	6.88	6.93



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW05-1	MW05-1	MW05-1	MW05-1	MW05-1	MW05-1	MW05-1	MW05-1	MW05-1	MW05-1
					01 Nov 2016	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals														
Arsenic (filtered)	µg/L	0.1	6.4	25	3.1	3.2	1.1	3.5	0.4	2.1	3	2.3	2.7	1.9
Barium (filtered)	µg/L	0.01	423	1,000	541	469	434	664	504	512	911	612	749	512
Boron (filtered)	µg/L	0.2	2,538	5,000	430	303	213	340	276	304	502	359	390	315
Calcium (filtered)	µg/L	10			223,000	243,000	203,000	249,000	230,000	225,000	255,000	215,000	234,000	151,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	<0.003	<0.003	0.003	0.007	0.009	<0.015	<0.015	<0.015	<0.012
Chloride	µg/L	200	197,500	250,000	150,000	87,000	29,000	120,000	83,000	110,000	147,000	80,700	57,600	94,900
Chromium (III+VI) (filtered)	µg/L	0.03		50	1.06	1.05	0.33	0.9	0.54	1.11	1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.52	0.23	0.3	1.1	1.8	0.6	0.2	1	0.5	0.3
Iron (filtered)	µg/L	2	153	300	23,100	21,400	11,100	32,600	3,740	25,000	44,500	32,000	39,100	26,400
Lead (filtered)	µg/L	0.01		10	0.03	<0.01	0.02	0.05	0.01	0.03	0.11	0.13	0.05	0.04
Magnesium (filtered)	µg/L	1			19,000	20,200	15,500	22,900	22,700	20,000	26,500	20,000	22,100	15,500
Manganese (filtered)	µg/L	0.01	25.15	50	1,960	1,720	1,170	2,680	2,590	2,000	3,120	2,310	2,980	1,990
Mercury (filtered)	µg/L	0.01		1	<0.01	-	<10	-	20	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			-	-	-	-	-	-	1,100	260	1,510	950
Potassium (filtered)	µg/L	2			24,800	19,800	16,100	32,200	21,800	25,100	30,000	25,500	25,300	24,300
Sodium (filtered)	µg/L	10	136,650	200,000	69,700	58,100	36,500	80,200	55,100	64,300	85,000	57,900	51,800	52,400
Zinc (filtered)	µg/L	2		5,000	15	2	2	2	<2	2	<5	<5	<5	<5
Inorganics														
Alkalinity (total) as CaCO3	mg/L	2	283	500	619	738	536	653	609	661	757	588	674	480
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	-	746	620	676	442
Total Dissolved Solids	mg/L	3	647	500	934	1,000	574	874	711	823	946	761	787	669
Chemical Oxygen Demand	mg/L	5			40	36	17	47	39	49	134	80	129	137
Total Suspended Solids	mg/L	2			-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	14	19	-	14	14	12	13.4	10.6	13.5	4.3
Biochemical Oxygen Demand	mg/L	2			-	-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	-	0.002	-	0.005	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	10	21	12	7	13	10	8	10	11	9
Ammonia as N	mg/L	0.01			14.3	9.7	5.8	14.5	6.9	11.3	16.4	13.6	14.1	14.5
Nitrate (as N)	mg/L	0.05	4.31	10	0.62	-	0.71	0.24	0.24	0.53	0.09	0.12	<0.05	0.09
Nitrite (as N)	mg/L	0.03		1	-	0.24	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	-	6.2	-	6.4	-	21.5	-	18.3	19.6
pH (Lab)	-	0.05		6.5-8.5	7.22	7.25	7.44	7.21	7.48	7.31	7.35	7.38	7.23	7.3
Electrical Conductivity (Lab)	µS/cm	1			1,570	1,660	980	1,510	1,200	1,470	1,730	1,400	1,450	1,240
Field														
DO (Field)	mg/L				-	-	7.2	9	-	5.2	1.58	4.76	2.09	3.51
Redox (Field)	mV				-	-	-72	44	-	-66	96	123	-90	-152
Temperature (Field)	oC				-	-	10.2	11.3	12.8	9.1	9	8.6	8.1	10.3
Conductivity (field)	µS/cm				-	-	958	1,124	-	973	1,747	600	1,352	1,175
pH (Field)	-			6.5-8.5	-	-	7.1	6.1	6.9	7.4	7.08	6.55	6.57	6.75



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW06-1	MW06-1	MW06-1	MW06-1	MW06-1	MW06-1	MW06-1	MW06-1	MW06-1	MW06-1
					01 Nov 2016	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals														
Arsenic (filtered)	µg/L	0.1	6.4	25	0.6	0.4	0.2	0.4	0.3	0.4	0.3	0.2	0.3	0.4
Barium (filtered)	µg/L	0.01	423	1,000	331	268	402	337	330	278	233	262	215	286
Boron (filtered)	µg/L	0.2	2,538	5,000	263	198	246	227	207	176	87	79	122	227
Calcium (filtered)	µg/L	10			191,000	151,000	198,000	217,000	172,000	172,000	151,000	189,000	125,000	140,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	0.003	<0.003	0.005	0.006	<0.003	<0.015	<0.015	<0.015	<0.012
Chloride	µg/L	200	197,500	250,000	120,000	94,000	130,000	120,000	92,000	120,000	124,000	167,000	84,000	86,100
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.66	0.83	0.31	0.29	0.26	0.8	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.37	0.17	0.3	1.4	0.3	1.8	1.4	0.4	0.8	0.3
Iron (filtered)	µg/L	2	153	300	2,320	1,320	684	1,340	410	1,630	717	1,100	424	2,110
Lead (filtered)	µg/L	0.01		10	0.14	0.18	0.2	0.26	0.13	0.15	0.15	0.08	0.09	0.1
Magnesium (filtered)	µg/L	1			12,100	10,100	13,800	11,000	13,900	11,500	8,040	8,340	8,230	11,500
Manganese (filtered)	µg/L	0.01	25.15	50	1,270	1,150	1,530	1,460	1,720	1,380	698	721	767	1,400
Mercury (filtered)	µg/L	0.01		1	<0.01	-	<10	-	20	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			-	-	-	-	-	-	280	400	800	1,110
Potassium (filtered)	µg/L	2			15,000	12,000	18,300	16,400	16,800	14,600	8,600	8,300	11,200	16,900
Sodium (filtered)	µg/L	10	136,650	200,000	68,300	62,200	71,400	60,900	75,100	63,500	64,200	74,300	59,700	63,600
Zinc (filtered)	µg/L	2		5,000	2	5	3	4	<2	3	<5	<5	<5	<5
Inorganics														
Alkalinity (total) as CaCO3	mg/L	2	283	500	485	490	468	429	470	454	342	347	307	392
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	-	411	508	346	396
Total Dissolved Solids	mg/L	3	647	500	754	654	749	671	617	749	544	694	496	575
Chemical Oxygen Demand	mg/L	5			17	17	25	11	16	19	31	51	104	368
Total Suspended Solids	mg/L	2			-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	8	6	-	6	7	5	4.1	1.6	2.9	3.1
Biochemical Oxygen Demand	mg/L	2			-	-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	-	0.006	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	49	37	44	43	37	33	29	47	26	40
Ammonia as N	mg/L	0.01			4.4	4.5	6.6	9	7.3	6.7	2.84	3.19	4.01	6.86
Nitrate (as N)	mg/L	0.05	4.31	10	0.26	-	0.65	0.5	<0.06	0.12	1.5	1.55	0.53	0.2
Nitrite (as N)	mg/L	0.03		1	-	0.11	0.28	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	-	6.6	-	6.8	-	4.7	-	6	27.7
pH (Lab)	-	0.05		6.5-8.5	7.63	7.45	7.21	7.94	7.6	7.49	7.59	7.62	7.55	7.44
Electrical Conductivity (Lab)	µS/cm	1			1,350	1,180	1,260	1,210	1,130	1,300	1,020	1,280	934	1,070
Field														
DO (Field)	mg/L				-	-	4.2	10.1	-	5.3	4.72	3.61	5.5	5.47
Redox (Field)	mV				-	-	-60	-	-	-20	143	83	-2	-149
Temperature (Field)	oC				-	-	11.2	10.8	13.8	9.8	10.2	9.4	9.5	11.2
Conductivity (field)	µS/cm				-	-	918	919	-	1,407	1,023	553	838	1,000
pH (Field)	-			6.5-8.5	-	-	7.2	6.9	7	7.5	6.97	6.78	6.89	7.02



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW07-1	MW07-1	MW07-1	MW07-1	MW07-1	MW07-1	MW07-1	MW07-1	MW07-1	MW07-1
					01 Nov 2016	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals														
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	0.8	0.5	0.8	0.6	0.7	0.5	1.1	0.5	0.3
Barium (filtered)	µg/L	0.01	423	1,000	148	119	136	128	133	130	162	24	182	213
Boron (filtered)	µg/L	0.2	2,538	5,000	79	483	516	445	482	432	533	571	526	519
Calcium (filtered)	µg/L	10			153,000	32,000	34,000	40,100	32,300	35,400	36,900	34,500	48,100	45,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	0.016	0.003	0.016	0.004	0.011	<0.015	0.053	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	100,000	46,000	47,000	45,000	51,000	48,000	53,600	53,100	51,600	49,200
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.61	0.68	0.13	0.17	0.12	0.81	<1	4	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.81	0.45	<0.2	0.5	0.5	0.9	1.5	4.5	1.6	0.5
Iron (filtered)	µg/L	2	153	300	12	108	7	9	<7	<7	88	<5	292	614
Lead (filtered)	µg/L	0.01		10	0.04	0.28	0.03	0.03	0.02	0.06	0.26	14.9	1.02	0.04
Magnesium (filtered)	µg/L	1			5,520	7,020	7,590	7,520	8,370	7,820	8,900	9,390	10,300	10,900
Manganese (filtered)	µg/L	0.01	25.15	50	8.70	24.9	0.76	8.31	0.21	2.71	6	1	21	49
Mercury (filtered)	µg/L	0.01		1	<0.01	-	<10	-	10	-	<0.02	0.04	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			-	-	-	-	-	-	1,910	1,050	1,790	2,090
Potassium (filtered)	µg/L	2			3,910	2,240	2,250	2,550	2,160	2,290	2,300	2,900	2,300	3,200
Sodium (filtered)	µg/L	10	136,650	200,000	47,800	141,000	151,000	152,000	163,000	143,000	157,000	163,000	140,000	129,000
Zinc (filtered)	µg/L	2		5,000	3	6	2	<2	3	7	<5	<5	<5	<5
Inorganics														
Alkalinity (total) as CaCO3	mg/L	2	283	500	322	337	370	328	359	367	336	316	299	310
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	-	129	125	163	157
Total Dissolved Solids	mg/L	3	647	500	569	489	474	469	489	466	421	433	422	412
Chemical Oxygen Demand	mg/L	5			<8	<8	65	<8	<8	<8	125	76	75	182
Total Suspended Solids	mg/L	2			-	-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	3	2	-	2	1	1	4.5	2.4	2.2	1.8
Biochemical Oxygen Demand	mg/L	2			-	-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	-	0.002	-	0.003	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	17	31	34	33	32	29	31	30	29	29
Ammonia as N	mg/L	0.01			<0.1	0.1	<0.1	0.1	<0.1	<0.1	0.04	0.06	0.03	0.05
Nitrate (as N)	mg/L	0.05	4.31	10	1.67	-	0.13	0.25	0.17	0.23	0.19	0.19	0.32	0.16
Nitrite (as N)	mg/L	0.03		1	-	0.07	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	-	<0.5	-	<0.5	-	1.3	-	1.8	1.9
pH (Lab)	-	0.05		6.5-8.5	7.75	8.27	7.92	8.12	8.08	8.08	8.16	8.16	8.19	7.98
Electrical Conductivity (Lab)	µS/cm	1			979	816	808	844	790	808	802	822	804	785
Field														
DO (Field)	mg/L				-	-	6	10.6	-	5.4	9.94	6.7	11.6	6.41
Redox (Field)	mV				-	-	56	51	-	22	138	121	8	-152
Temperature (Field)	oC				-	-	10.1	10.3	12.8	9.4	11.1	9.3	8.4	10.8
Conductivity (field)	µS/cm				-	-	590	597	-	524	800	354	706	751
pH (Field)	-			6.5-8.5	-	-	8	7.3	7.4	8.1	8.71	7.73	7.88	7.68



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	148	53.1	158	81.1	162	135	168	95	181
Boron (filtered)	µg/L	0.2	2,538	5,000	31	14	50	26	23	15	28	6	27
Calcium (filtered)	µg/L	10			118,000	103,000	127,000	80,100	145,000	114,000	119,000	85,300	123,000
Cadmium (filtered)	µg/L	0.003		5	0.005	0.003	0.005	0.025	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	68,000	3,000	69,000	9,000	120,000	65,500	67,500	35,700	69,900
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.67	0.27	0.25	0.26	0.31	73	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.87	0.3	0.8	1.4	1.1	0.8	1	0.8	1.1
Iron (filtered)	µg/L	2	153	300	<7	7	10	24	15	19	<5	<5	<5
Lead (filtered)	µg/L	0.01		10	<0.01	0.02	0.03	0.09	0.04	0.13	0.03	<0.02	0.02
Magnesium (filtered)	µg/L	1			4,140	2,820	3,820	2,680	5,280	4,060	4,140	2,880	4,600
Manganese (filtered)	µg/L	0.01	25.15	50	1.89	0.74	4.33	4.34	0.97	4	2	<1	3
Mercury (filtered)	µg/L	0.01		1	<10	<10	<10	10	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			<30	-	30	<30	<30	100	110	50	60
Potassium (filtered)	µg/L	2			1,370	472	1,400	738	1,210	1,000	1,800	700	1,600
Sodium (filtered)	µg/L	10	136,650	200,000	36,500	3,740	36,800	23,500	29,400	38,300	44,000	26,800	44,100
Zinc (filtered)	µg/L	2		5,000	<2	2	3	9	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	300	235	272	235	283	276	275	215	277
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	302	316	225	326
Total Dissolved Solids	mg/L	3	647	500	443	257	434	240	480	364	389	283	428
Chemical Oxygen Demand	mg/L	5			<8	<8	<8	16	<8	7	10	<5	12
Total Suspended Solids	mg/L	2			<2	23	37	20	22	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	-	-	-	-	-	3.7	2.7	3	0.9
Biochemical Oxygen Demand	mg/L	2			5	<4	<4	<4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			<0.001	0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	10	7	12	6	10	9	10	5	<10
Ammonia as N	mg/L	0.01			<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.05	4.31	10	0.35	<0.06	0.66	0.15	0.67	0.74	0.41	0.05	0.62
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.5
Total Kjeldahl Nitrogen	mg/L	0.1			<0.5	<0.5	<0.5	<0.5	<0.5	0.4	0.3	0.2	0.3
pH (Lab)	-	0.05		6.5-8.5	7.63	7.66	8.12	7.85	7.81	7.94	8.27	7.57	7.93
Electrical Conductivity (Lab)	µS/cm	1			781	429	748	452	838	700	744	547	814
Field													
DO (Field)	mg/L				-	3.4	8.8	-	11.3	13.26	2.49	7.65	6.06
Redox (Field)	mV				-	196	79	-	135	140	-73	-54	-140
Temperature (Field)	oC				-	8.5	13.4	16.4	6.2	9.3	9.2	8.8	13
Conductivity (field)	µS/cm				-	419	803	-	486	652	334	473	722
pH (Field)	-			6.5-8.5	-	7.7	6.1	8.1	8.6	8.78	7.27	7.35	7.21



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW09-2	MW09-2	MW09-2	MW09-2	MW09-2	MW09-2	MW09-2	MW09-2	MW09-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	28 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	0.3	0.3	<0.2	0.4	<0.2	0.2	0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	258	158	184	285	176	210	203	846	229
Boron (filtered)	µg/L	0.2	2,538	5,000	84	26	65	143	39	40	45	567	47
Calcium (filtered)	µg/L	10			107,000	105,000	121,000	80,800	126,000	124,000	119,000	51,100	122,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	0.003	0.003	0.007	0.01	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	70,000	66,000	73,000	50,000	77,000	88,500	70,500	15,100	79,700
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.71	0.15	0.16	0.23	0.28	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.4	0.8	1.4	<0.2	4.2	0.6	0.4	<0.1	0.8
Iron (filtered)	µg/L	2	153	300	205	293	38	302	15	87	43	13	26
Lead (filtered)	µg/L	0.01		10	<0.01	0.02	0.02	0.01	0.04	0.03	<0.02	<0.02	0.03
Magnesium (filtered)	µg/L	1			5,780	3,890	3,820	8,760	4,270	4,640	4,550	21,900	4,730
Manganese (filtered)	µg/L	0.01	25.15	50	15.9	29.1	4.64	33.2	3.31	3	3	47	2
Mercury (filtered)	µg/L	0.01		1	<10	<10	<10	<10	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			<30	-	<30	<30	<30	40	20	40	20
Potassium (filtered)	µg/L	2			2,600	2,160	2,570	2,740	2,650	2,300	2,700	5,300	2,600
Sodium (filtered)	µg/L	10	136,650	200,000	45,700	42,900	46,500	44,400	44,600	55,600	48,200	51,300	57,700
Zinc (filtered)	µg/L	2		5,000	<2	3	3	2	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	274	241	260	233	295	271	280	249	278
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	329	315	218	324
Total Dissolved Solids	mg/L	3	647	500	420	214	414	311	437	432	409	316	425
Chemical Oxygen Demand	mg/L	5			10	<8	<8	<8	<8	<5	11	38	7
Total Suspended Solids	mg/L	2			<2	66	2	6	2	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	-	-	-	-	-	3.3	2.4	2.4	0.7
Biochemical Oxygen Demand	mg/L	2			<4	<4	<4	<4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			<0.001	0.003	<0.001	<0.001	<0.001	<0.002	<0.002	0.048	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	14	16	11	10	10	13	13	37	14
Ammonia as N	mg/L	0.01			0.1	<0.1	<0.1	<0.1	<0.1	0.03	0.03	0.69	0.02
Nitrate (as N)	mg/L	0.05	4.31	10	0.37	<0.06	0.93	<0.06	1.17	1.21	0.73	<0.05	1
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			<0.5	<0.5	<0.1	<0.5	<0.5	0.2	0.2	0.7	0.2
pH (Lab)	-	0.05		6.5-8.5	7.57	8	8.11	7.9	7.91	7.69	7.66	7.7	7.71
Electrical Conductivity (Lab)	µS/cm	1			719	653	737	591	791	821	780	609	809
Field													
DO (Field)	mg/L				-	3.6	4.1	-	5	2.63	2.91	2.32	5.39
Redox (Field)	mV				-	-125	-86	-	60	160	30	-36	-140
Temperature (Field)	oC				-	10.3	14.1	1.7	7.4	10.7	9.8	7.4	13.7
Conductivity (field)	µS/cm				-	404	655	-	471	792	332	496	801
pH (Field)	-			6.5-8.5	-	7.7	7.4	7.6	8	7.08	7.01	7.01	7.06



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW10-2	MW10-2	MW10-2	MW10-2	MW10-2	MW10-2	MW10-2	MW10-2	MW10-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	0.2	<0.2	<0.2	<0.2	0.3	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	506	626	580	491	416	510	574	542	603
Boron (filtered)	µg/L	0.2	2,538	5,000	131	118	145	106	96	109	125	95	135
Calcium (filtered)	µg/L	10			104,000	117,000	129,000	98,500	99,900	118,000	119,000	118,000	112,000
Cadmium (filtered)	µg/L	0.003		5	0.004	0.003	0.003	<0.003	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	51,000	48,000	48,000	54,000	53,000	59,600	56,700	54,700	50,300
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.59	0.14	0.12	0.16	0.22	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.15	0.3	<0.2	0.4	0.8	1.2	0.6	0.8	0.5
Iron (filtered)	µg/L	2	153	300	3,370	6,910	4,030	886	3,290	<5	5,280	3,750	4,080
Lead (filtered)	µg/L	0.01		10	<0.01	0.12	0.01	<0.01	0.04	0.46	<0.02	<0.02	0.03
Magnesium (filtered)	µg/L	1			11,000	11,200	10,900	12,700	10,400	11,400	11,300	11,300	11,000
Manganese (filtered)	µg/L	0.01	25.15	50	60.1	171	54.4	95.1	58	38	42	39	28
Mercury (filtered)	µg/L	0.01		1	<10	<10	<10	10	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			30	-	60	40	80	110	90	420	60
Potassium (filtered)	µg/L	2			2,600	2,420	2,690	2,460	2,600	2,000	2,500	1,900	2,400
Sodium (filtered)	µg/L	10	136,650	200,000	6,070	7,470	5,540	9,830	6,930	6,100	6,500	6,100	5,900
Zinc (filtered)	µg/L	2		5,000	<2	5	<2	2	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	233	243	245	243	258	260	250	222	254
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	342	343	341	326
Total Dissolved Solids	mg/L	3	647	500	406	334	354	389	351	343	351	336	341
Chemical Oxygen Demand	mg/L	5			<8	<8	<8	8	<8	53	9	7	11
Total Suspended Solids	mg/L	2			10	50	55	42	56	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	-	-	-	-	-	2.8	2.6	3	0.9
Biochemical Oxygen Demand	mg/L	2			4	<4	<4	4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			<0.001	<0.001	<0.001	<0.001	0.001	<0.002	0.013	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	9	8	7	10	6	10	9	11	7
Ammonia as N	mg/L	0.01			1	0.8	1.1	0.9	1	0.93	1.04	0.8	1.04
Nitrate (as N)	mg/L	0.05	4.31	10	<0.06	0.08	0.08	<0.06	<0.06	0.07	<0.05	0.4	0.18
Nitrite (as N)	mg/L	0.03		1	<0.03	0.07	0.04	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			1.1	0.7	1.1	0.8	1	1	1.1	1.2	1.2
pH (Lab)	-	0.05		6.5-8.5	7.67	7.54	8.03	7.83	7.79	7.83	7.68	7.48	7.85
Electrical Conductivity (Lab)	µS/cm	1			631	599	621	618	623	660	675	647	657
Field													
DO (Field)	mg/L				-	3.6	4	-	4.2	2.87	2.81	2.44	1.62
Redox (Field)	mV				-	-109	-115	-	-148	-15	19	-117	-143
Temperature (Field)	oC				-	10.6	13.8	15.1	6.7	9	10.3	7.9	13.3
Conductivity (field)	µS/cm				-	442	518	-	364	665	297	615	630
pH (Field)	-			6.5-8.5	-	7.6	7.6	7.7	7.9	8.45	7.38	7.18	7.22



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW11-2	MW11-2	MW11-2	MW11-2	MW11-2	MW11-2	MW11-2	MW11-2	MW11-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	0.7	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	449	381	40.8	504	358	528	528	466	632
Boron (filtered)	µg/L	0.2	2,538	5,000	123	85	176	150	164	127	143	219	169
Calcium (filtered)	µg/L	10			93,800	96,600	147,000	102,000	93,400	117,000	113,000	90,600	110,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	0.003	0.005	0.005	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	36,000	14,000	33,000	21,000	43,000	52,000	41,000	25,300	28,200
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.53	0.59	0.2	0.18	0.21	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.19	<0.2	1.1	0.5	0.4	0.8	0.3	0.5	0.1
Iron (filtered)	µg/L	2	153	300	2,130	1,550	124	2,130	1,060	3,030	2,750	1,670	2,150
Lead (filtered)	µg/L	0.01		10	0.01	0.01	0.02	0.03	0.04	0.06	<0.02	<0.02	<0.02
Magnesium (filtered)	µg/L	1			8,590	7,400	22,100	12,700	12,300	11,300	11,100	14,000	12,400
Manganese (filtered)	µg/L	0.01	25.15	50	29.6	24.5	14.7	31.4	19.8	35	33	35	33
Mercury (filtered)	µg/L	0.01		1	<10	<10	<10	30	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			40	-	40	<30	30	80	80	40	40
Potassium (filtered)	µg/L	2			2,280	1,990	7,590	2,860	3,720	2,300	2,800	3,600	3,100
Sodium (filtered)	µg/L	10	136,650	200,000	5,300	6,300	76,700	8,390	6,200	7,300	6,700	8,400	6,800
Zinc (filtered)	µg/L	2		5,000	3	4	4	8	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	255	224	242	227	242	271	250	233	244
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	339	329	284	326
Total Dissolved Solids	mg/L	3	647	500	391	274	320	274	343	342	329	300	294
Chemical Oxygen Demand	mg/L	5			8	<8	<8	13	<8	<5	8	11	<5
Total Suspended Solids	mg/L	2			3	5	6	8	17	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	-	-	-	-	-	4.4	2.2	3.1	1.3
Biochemical Oxygen Demand	mg/L	2			<4	<4	<4	7	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			<0.001	<0.001	<0.001	0.002	0.001	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	7	6	10	17	9	11	10	15	11
Ammonia as N	mg/L	0.01			0.9	0.5	0.9	0.7	0.9	0.95	0.96	0.7	0.99
Nitrate (as N)	mg/L	0.05	4.31	10	<0.06	<0.06	0.18	0.13	<0.06	0.07	<0.05	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			0.9	<0.5	1	0.6	0.8	1	1.1	1	1.1
pH (Lab)	-	0.05		6.5-8.5	7.63	8.09	8.1	7.76	7.77	7.81	7.8	7.56	7.87
Electrical Conductivity (Lab)	µS/cm	1			603	465	584	520	547	659	633	578	568
Field													
DO (Field)	mg/L				-	4	5.7	-	6.4	1.55	7.98	5.38	8.75
Redox (Field)	mV				-	-93	-122	-	-60	136	15	114	-148
Temperature (Field)	oC				-	9.1	12.5	15.1	4.9	7.7	9	9.1	13.7
Conductivity (field)	µS/cm				-	345	528	-	350	672	286	527	644
pH (Field)	-			6.5-8.5	-	7.8	7.7	7.6	8.3	7.26	7.37	7.13	7.33



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1
					01 Nov 2016	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals														
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	0.8	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	723	152	713	230	621	311	743	994	694	1,080
Boron (filtered)	µg/L	0.2	2,538	5,000	153	83	104	99	106	110	121	156	118	167
Calcium (filtered)	µg/L	10			102,000	122,000	126,000	117,000	115,000	113,000	116,000	106,000	109,000	93,500
Cadmium (filtered)	µg/L	0.003		5	0.004	<0.003	0.003	0.003	<0.003	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	42,000	54,000	51,000	44,000	55,000	44,000	40,700	39,400	41,300	37,500
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.39	0.58	0.16	0.13	0.13	0.28	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	1.79	0.16	<0.2	0.5	0.3	0.4	<0.1	<0.1	<0.1	0.1
Iron (filtered)	µg/L	2	153	300	20	18	10	19	20	24	<5	<5	<5	15
Lead (filtered)	µg/L	0.01		10	0.03	<0.01	<0.01	0.01	0.01	0.03	0.09	<0.02	<0.02	0.02
Magnesium (filtered)	µg/L	1			11,800	6,760	11,500	7,580	12,900	9,820	13,400	14,300	12,400	15,200
Manganese (filtered)	µg/L	0.01	25.15	50	4.94	15.6	3.52	20.1	5.18	16.4	3	3	3	10
Mercury (filtered)	µg/L	0.01		1	<0.01	<10	<10	<10	30	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			<3	<30	-	<30	<30	<30	20	10	30	30
Potassium (filtered)	µg/L	2			3,290	2,100	3,280	2,250	3,340	2,780	3,100	3,500	3,300	3,400
Sodium (filtered)	µg/L	10	136,650	200,000	11,200	12,300	13,700	12,000	16,900	11,200	11,700	10,600	13,600	9,500
Zinc (filtered)	µg/L	2		5,000	4	<2	3	3	2	<2	<5	<5	<5	<5
Inorganics														
Alkalinity (total) as CaCO3	mg/L	2	283	500	250	283	284	265	278	253	271	241	254	241
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	-	345	325	323	296
Total Dissolved Solids	mg/L	3	647	500	360	460	403	403	397	351	338	336	353	321
Chemical Oxygen Demand	mg/L	5			9	<8	<8	<8	<8	<8	7	13	6	8
Total Suspended Solids	mg/L	2			<2	<2	42	38	8	8	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	-	-	-	-	-	-	2.2	1.9	2.3	0.7
Biochemical Oxygen Demand	mg/L	2			8	<4	<4	<4	5	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001			<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.004	0.006	0.002	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	20	24	22	28	23	25	20	26	23	25
Ammonia as N	mg/L	0.01			0.1	0.1	0.1	<0.1	<0.1	0.1	0.14	0.16	0.14	0.16
Nitrate (as N)	mg/L	0.05	4.31	10	0.18	<0.06	<0.06	<0.06	<0.06	<0.06	0.08	<0.05	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		1	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.2	0.2	0.2	0.2
pH (Lab)	-	0.05		6.5-8.5	7.86	7.8	7.42	7.92	7.71	7.91	7.85	7.91	7.56	7.76
Electrical Conductivity (Lab)	µS/cm	1			616	710	675	649	684	595	650	647	680	618
Field														
DO (Field)	mg/L				-	-	3	5.9	-	6.5	2.83	3.6	2.29	2.96
Redox (Field)	mV				-	-	-92	-149	-	-128	-38	11	175	-141
Temperature (Field)	oC				-	-	8.5	9.9	14.4	8.6	9.4	9.4	7.2	10.8
Conductivity (field)	µS/cm				-	-	457	477	-	388	651	280	589	586
pH (Field)	-			6.5-8.5	-	-	7.6	7.6	7.3	8.1	7.2	7.45	7.08	7.37



Table 5 Groundwater Quality - Shallow Bedrock

	Unit	EQL	RUC	ODWQS	MW13-1	MW13-1	MW13-1	MW13-1	MW13-1	MW13-1	MW13-1	MW13-1	MW13-1
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	28 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	0.1	0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	147	118	82.4	110	71.6	132	138	117	121
Boron (filtered)	µg/L	0.2	2,538	5,000	42	21	19	17	23	20	23	13	24
Calcium (filtered)	µg/L	10			117,000	132,000	96,500	108,000	79,100	114,000	125,000	124,000	104,000
Cadmium (filtered)	µg/L	0.003		5	0.006	<0.003	0.003	0.009	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	140,000	57,000	21,000	140,000	21,000	124,000	115,000	105,000	102,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.64	0.16	0.23	0.2	0.73	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.64	0.4	0.5	1.1	0.7	1.2	3.8	1.1	0.9
Iron (filtered)	µg/L	2	153	300	<7	<7	<7.00000	<7	<7	<5	<5	<5	<5
Lead (filtered)	µg/L	0.01		10	0.03	0.04	0.02	0.06	<0.01	0.08	0.14	0.04	0.03
Magnesium (filtered)	µg/L	1			3,340	3,110	2,590	3,020	2,220	3,270	3,500	3,640	3,410
Manganese (filtered)	µg/L	0.01	25.15	50	0.1	0.15	0.13	0.07	0.12	<1	<1	<1	1
Mercury (filtered)	µg/L	0.01		1	-	<10	-	10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3			-	-	-	-	-	20	90	30	740
Potassium (filtered)	µg/L	2			3,000	1,880	2,240	2,510	2,160	2,600	2,600	1,900	2,900
Sodium (filtered)	µg/L	10	136,650	200,000	87,600	38,200	28,400	70,300	34,000	91,500	87,000	53,900	84,700
Zinc (filtered)	µg/L	2		5,000	3	2	3	4	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	290	249	250	251	245	262	309	243	277
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	298	328	325	274
Total Dissolved Solids	mg/L	3	647	500	566	394	286	503	294	484	532	463	474
Chemical Oxygen Demand	mg/L	5			<8	<8	<8.0	8	<8	17	56	<5	5
Total Suspended Solids	mg/L	2			-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	3	-	1	2	1	2.4	2	1.6	0.4
Biochemical Oxygen Demand	mg/L	2			-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	0.003	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	21	10	8	10	7	11	11	12	15
Ammonia as N	mg/L	0.01			<0.1	<0.1	<0.1000	<0.1	<0.1	<0.01	<0.01	<0.01	0.03
Nitrate (as N)	mg/L	0.05	4.31	10	-	2.42	0.26	<0.06	0.35	0.9	2.55	3.35	1.42
Nitrite (as N)	mg/L	0.03		1	0.53	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	<0.5	-	<0.5	-	0.2	-	0.2	0.2
pH (Lab)	-	0.05		6.5-8.5	7.83	8.1	7.89	7.77	7.76	7.73	7.64	7.53	7.68
Electrical Conductivity (Lab)	µS/cm	1			1,020	628	534	884	517	913	998	875	895
Field													
DO (Field)	mg/L				-	9.9	10.3	-	8.2	7.01	5.2	8.75	5.93
Redox (Field)	mV				-	158	13	-	28	135	57	48	-142
Temperature (Field)	oC				-	9.1	9.6	12.8	12.8	10.1	10.6	6.7	11.7
Conductivity (field)	µS/cm				-	385	652	-	370	848	412	765	337
pH (Field)	-			6.5-8.5	-	7.9	7.8	7.3	7.6	7.23	7	7	7.27



Table 6 Groundwater Quality - Deep Bedrock

	Unit	EQL	RUC	ODWQS	MW08-1	MW08-1	MW08-1	MW08-1	MW08-1	MW08-1	MW08-1	MW08-1	MW08-1
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	28 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	0.6	<0.2	<0.2	<0.2	<0.2	0.4	0.3	0.3	0.3
Barium (filtered)	µg/L	0.01	423	1,000	105	106	106	94.8	97.6	109	119	109	153
Boron (filtered)	µg/L	0.2	2,538	5,000	105	114	102	101	99	79	63	43	42
Calcium (filtered)	µg/L	10			108,000	125,000	121,000	105,000	111,000	115,000	118,000	106,000	117,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	<0.003	0.009	<0.003	0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	79,000	83,000	78,000	86,000	85,000	84,100	72,100	69,400	73,700
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.66	0.12	0.16	0.17	0.77	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.36	0.9	0.9	0.8	1.2	2.2	0.5	2	1.1
Iron (filtered)	µg/L	2	153	300	881	16	18	17	19	10	885	30	52
Lead (filtered)	µg/L	0.01		10	<0.01	0.01	0.14	<0.01	<0.01	0.08	0.02	0.02	0.05
Magnesium (filtered)	µg/L	1			11,200	11,700	11,300	12,000	11,400	10,200	8,050	6,100	5,670
Manganese (filtered)	µg/L	0.01	25.15	50	156	5.23	83.7	4.05	56.4	17	260	11	21
Mercury (filtered)	µg/L	0.01		1	-	<10	-	10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	10			-	-	-	-	-	50	60	180	60
Potassium (filtered)	µg/L	2			3,410	3,770	3,640	3,150	3,580	3,000	2,900	2,300	2,200
Sodium (filtered)	µg/L	10	136,650	200,000	44,200	48,400	45,900	52,100	48,500	53,400	49,700	46,100	51,300
Zinc (filtered)	µg/L	2		5,000	2	3	3	4	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	294	284	274	290	287	273	277	271	283
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	329	328	290	315
Total Dissolved Solids	mg/L	3	647	500	460	489	454	451	440	433	408	405	417
Chemical Oxygen Demand	mg/L	5			8	<8	<8	<8	<8	<5	16	13	6
Total Suspended Solids	mg/L				-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	2	-	<1	2	1	2.8	2.2	2.9	0.8
Biochemical Oxygen Demand	mg/L				-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	0.001	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	16	18	19	19	18	20	12	13	14
Ammonia as N	mg/L	0.01			0.1	<0.1	0.2	<0.1	<0.1	0.02	0.01	0.03	0.04
Nitrate (as N)	mg/L	0.05	4.31	10	-	<0.06	<0.06	<0.06	<0.06	0.22	0.46	0.23	0.32
Nitrite (as N)	mg/L	0.03		1	0.11	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	<0.5	-	<0.5	-	0.2	-	0.4	0.3
pH (Lab)	-	0.05		6.5-8.5	7.83	7.53	7.94	7.84	7.73	7.77	7.92	7.61	7.8
Electrical Conductivity (Lab)	µS/cm	1			814	795	801	794	791	822	778	774	795
Field													
DO (Field)	mg/L				-	4.8	3.7	-	7.7	3.15	2.3	3.23	1.88
Redox (Field)	mV				-	198	21	-	119	221	-72	-70	-135
Temperature (Field)	oC				-	9.2	12.2	15.2	5.8	11.1	9	9.8	11
Conductivity (field)	µS/cm				-	570	695	-	460	792	335	626	776
pH (Field)	-				-	7.7	6.4	7.7	8.4	7.04	7.24	7.12	7.09



Table 6 Groundwater Quality - Deep Bedrock

	Unit	EQL	RUC	ODWQS	MW09-1	MW09-1	MW09-1	MW09-1	MW09-1	MW09-1	MW09-1	MW09-1	MW09-1
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	28 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	772	688	570	689	612	768	897	141	914
Boron (filtered)	µg/L	0.2	2,538	5,000	549	590	491	531	468	571	569	19	615
Calcium (filtered)	µg/L	10			56,900	58,700	55,700	53,000	57,500	51,600	53,700	90,900	50,800
Cadmium (filtered)	µg/L	0.003		5	<0.003	<0.003	<0.003	<0.003	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	28,000	16,000	18,000	16,000	15,000	15,200	16,200	20,500	14,900
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.63	0.15	0.16	0.17	0.67	7	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	<0.02	<0.2	<0.2	0.4	<0.2	<0.1	<0.1	1.1	0.3
Iron (filtered)	µg/L	2	153	300	9	<7	8	15	<7	40	<5	37	<5
Lead (filtered)	µg/L	0.01		10	<0.01	0.01	0.01	<0.01	<0.01	0.07	<0.02	<0.02	<0.02
Magnesium (filtered)	µg/L	1			22,000	22,700	18,900	24,400	20,800	22,900	22,100	3,430	22,500
Manganese (filtered)	µg/L	0.01	25.15	50	90.4	82	70	69.9	58.3	64	41	2	50
Mercury (filtered)	µg/L	0.01		1	-	<10	-	<10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	10			-	-	-	-	-	60	40	10	50
Potassium (filtered)	µg/L	2			5,380	6,170	5,320	5,330	5,420	5,400	5,600	1,800	5,700
Sodium (filtered)	µg/L	10	136,650	200,000	50,000	51,700	42,600	56,200	47,000	54,400	52,500	32,200	55,700
Zinc (filtered)	µg/L	2		5,000	<2	<2	<2	<2	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	292	271	241	258	335	236	239	250	268
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	223	225	241	220
Total Dissolved Solids	mg/L	3	647	500	366	391	323	337	320	315	326	296	322
Chemical Oxygen Demand	mg/L	5			34	34	24	37	35	33	35	<5	57
Total Suspended Solids	mg/L				-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	2	-	<1	1	1	2.6	1.8	3.5	0.9
Biochemical Oxygen Demand	mg/L				-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	<0.001	-	0.003	-	0.009	0.013	<0.001	0.016
Sulphate (filtered)	mg/L	0.2	283	500	53	41	42	63	66	55	46	7	44
Ammonia as N	mg/L	0.01			0.7	0.7	0.7	0.6	0.7	0.65	0.64	<0.01	0.63
Nitrate (as N)	mg/L	0.05	4.31	10	-	<0.06	<0.06	<0.06	<0.06	<0.05	<0.05	0.17	<0.05
Nitrite (as N)	mg/L	0.03		1	<0.06	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	0.5	-	0.6	-	0.7	-	0.2	0.8
pH (Lab)	-	0.05		6.5-8.5	8.02	7.41	7.23	7.73	8.24	7.84	7.82	7.46	7.98
Electrical Conductivity (Lab)	µS/cm	1			617	605	561	592	598	607	628	571	621
Field													
DO (Field)	mg/L				-	3.7	2.8	-	3.7	6.1	3.33	1.25	5.57
Redox (Field)	mV				-	-195	-220	-	-288	119	-96	-	-139
Temperature (Field)	oC				-	10.5	13.2	14.8	7.3	10.8	9.4	6.8	13.6
Conductivity (field)	µS/cm				-	420	533	-	361	622	271	498	560
pH (Field)	-				-	7.9	7.6	7.5	7.7	7.83	7.82	7.46	7.87



Table 6 Groundwater Quality - Deep Bedrock

	Unit	EQL	RUC	ODWQS	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1	MW10-1
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	823	839	803	848	662	944	888	980	929
Boron (filtered)	µg/L	0.2	2,538	5,000	217	260	273	221	201	184	193	150	169
Calcium (filtered)	µg/L	10			98,400	103,000	91,900	90,900	96,300	105,000	98,500	103,000	86,900
Cadmium (filtered)	µg/L	0.003		5	<0.003	<0.003	<0.003	<0.003	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	53,000	51,000	49,000	53,000	51,000	54,200	48,400	45,100	38,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.65	0.13	0.14	0.18	0.71	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.16	<0.2	<0.2	0.2	0.3	0.1	<0.1	0.2	0.1
Iron (filtered)	µg/L	2	153	300	10	85	14	48	23	18	17	26	<5
Lead (filtered)	µg/L	0.01		10	<0.01	0.01	0.01	<0.01	0.02	0.05	<0.02	<0.02	<0.02
Magnesium (filtered)	µg/L	1			18,300	20,700	20,500	21,500	20,100	17,700	17,400	14,500	12,100
Manganese (filtered)	µg/L	0.01	25.15	50	137	173	136	119	124	62	102	26	10
Mercury (filtered)	µg/L	0.01		1	-	<10	-	20	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	10			-	-	-	-	-	30	<10	<10	20
Potassium (filtered)	µg/L	2			4,000	4,690	4,590	3,870	4,460	3,500	3,700	2,900	2,900
Sodium (filtered)	µg/L	10	136,650	200,000	11,600	13,200	13,000	14,100	12,900	11,200	11,500	9,200	7,900
Zinc (filtered)	µg/L	2		5,000	<2	4	<2	6	3	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	223	245	232	233	241	251	236	238	241
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	335	317	317	267
Total Dissolved Solids	mg/L	3	647	500	414	400	334	377	351	336	337	339	320
Chemical Oxygen Demand	mg/L	5			8	<8	<8	<8	<8	<5	10	<5	8
Total Suspended Solids	mg/L				-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	1	-	<1	1	1	2.8	1.4	2	1.1
Biochemical Oxygen Demand	mg/L				-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	0.002	-	<0.002	-	<0.002	0.002	0.003	0.003
Sulphate (filtered)	mg/L	0.2	283	500	31	25	23	25	25	23	20	19	20
Ammonia as N	mg/L	0.01			0.3	0.2	0.2	0.2	0.3	0.15	0.18	0.15	0.18
Nitrate (as N)	mg/L	0.05	4.31	10	-	<0.06	<0.06	<0.06	<0.06	<0.05	<0.05	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		1	<0.06	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	<0.5	-	<0.5	-	0.1	-	0.2	0.3
pH (Lab)	-	0.05		6.5-8.5	7.77	7.74	8.16	7.8	7.91	7.76	7.8	7.54	7.85
Electrical Conductivity (Lab)	µS/cm	1			643	616	608	623	631	648	649	653	616
Field													
DO (Field)	mg/L				-	4	3.6	-	3.4	2.59	2.07	2	1.06
Redox (Field)	mV				-	-70	-126	-	-238	-118	15	-172	-146
Temperature (Field)	oC				-	10.2	13.2	14.1	6.6	8.9	9.4	9.1	12
Conductivity (field)	µS/cm				-	447	556	-	373	648	284	564	545
pH (Field)	-				-	7.8	7.5	7.7	8.1	8.15	7.32	6.98	7.37



Table 6 Groundwater Quality - Deep Bedrock

	Unit	EQL	RUC	ODWQS	MW11-1	MW11-1	MW11-1	MW11-1	MW11-1	MW11-1	MW11-1	MW11-1	MW11-1
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	434	460	446	683	1,740	570	748	498	587
Boron (filtered)	µg/L	0.2	2,538	5,000	511	362	396	331	438	610	442	446	395
Calcium (filtered)	µg/L	10			99,900	101,000	90,600	90,300	101,000	79,200	91,900	90,300	93,200
Cadmium (filtered)	µg/L	0.003		5	<0.003	<0.003	<0.003	0.005	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	33,000	29,000	35,000	34,000	28,000	27,900	35,700	35,200	36,000
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.77	0.18	0.18	0.41	0.67	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.18	<0.2	<0.2	0.4	<0.2	<0.1	<0.1	0.3	<0.1
Iron (filtered)	µg/L	2	153	300	16	42	19	14	<7	116	48	232	172
Lead (filtered)	µg/L	0.01		10	<0.01	0.03	0.08	0.02	<0.01	0.07	<0.02	<0.02	<0.02
Magnesium (filtered)	µg/L	1			25,800	19,400	20,700	22,800	27,300	34,400	25,600	26,300	22,700
Manganese (filtered)	µg/L	0.01	25.15	50	86.4	62.9	85.3	68	64.3	86	55	80	71
Mercury (filtered)	µg/L	0.01		1	-	<10	-	10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	10			-	-	-	-	-	180	170	190	90
Potassium (filtered)	µg/L	2			4,600	4,260	4,230	3,880	5,000	5,400	4,500	4,500	4,300
Sodium (filtered)	µg/L	10	136,650	200,000	14,600	12,600	12,300	14,700	15,900	19,800	15,800	16,100	14,300
Zinc (filtered)	µg/L	2		5,000	2	3	<2	7	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	263	260	248	241	290	271	243	253	260
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	339	335	334	326
Total Dissolved Solids	mg/L	3	647	500	409	400	334	391	346	346	360	369	353
Chemical Oxygen Demand	mg/L	5			10	9	11	11	10	65	58	45	19
Total Suspended Solids	mg/L				-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	2	-	<1	2	<1	3	2.3	2.5	1.4
Biochemical Oxygen Demand	mg/L				-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	<0.001	-	<0.002	-	<0.002	0.008	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	54	37	29	43	64	62	49	51	41
Ammonia as N	mg/L	0.01			1	0.7	0.9	0.8	0.8	0.88	1.03	0.82	0.89
Nitrate (as N)	mg/L	0.05	4.31	10	-	<0.06	<0.06	<0.06	<0.06	<0.05	<0.05	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		1	<0.06	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	0.5	-	0.9	-	1.6	-	1.4	1.4
pH (Lab)	-	0.05		6.5-8.5	7.84	7.78	8.22	7.83	8.09	7.91	7.69	7.9	7.96
Electrical Conductivity (Lab)	µS/cm	1			663	643	598	607	657	666	693	710	679
Field													
DO (Field)	mg/L				-	3.8	4.4	-	3.6	12.42	9.36	7.05	9.19
Redox (Field)	mV				-	-95	-125	-	-235	5	15	-93	-149
Temperature (Field)	oC				-	9.5	12.9	14.5	6.2	8.3	9	9.4	14.4
Conductivity (field)	µS/cm				-	435	589	-	386	655	294	615	649
pH (Field)	-				-	7.8	7.7	7.7	8	8.76	7.8	7.25	7.62



Table 6 Groundwater Quality - Deep Bedrock

	Unit	EQL	RUC	ODWQS	MW12-2	MW12-2	MW12-2	MW12-2	MW12-2	MW12-2	MW12-2	MW12-2	MW12-2
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	0.6	4.8	0.7	1.5
Barium (filtered)	µg/L	0.01	423	1,000	183	252	204	195	180	195	130	115	94
Boron (filtered)	µg/L	0.2	2,538	5,000	429	609	548	621	566	674	175	119	99
Calcium (filtered)	µg/L	10			96,100	111,000	115,000	82,300	86,000	78,000	102,000	100,000	104,000
Cadmium (filtered)	µg/L	0.003		5	<0.003	<0.003	<0.003	<0.003	<0.003	<0.015	0.021	0.018	<0.01
Chloride	µg/L	200	197,500	250,000	41,000	38,000	37,000	34,000	32,000	32,200	43,200	39,500	43,800
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.59	0.35	0.23	0.2	0.58	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.13	<0.2	<0.2	0.3	<0.2	<0.1	1.1	1	0.5
Iron (filtered)	µg/L	2	153	300	33	143	7	38	15	<5	917	12	565
Lead (filtered)	µg/L	0.01		10	<0.01	0.46	0.1	0.01	<0.01	1.7	8.15	0.08	0.12
Magnesium (filtered)	µg/L	1			21,500	24,700	26,800	31,200	27,000	29,100	18,800	15,800	13,500
Manganese (filtered)	µg/L	0.01	25.15	50	164	139	148	110	96.81	114	292	214	269
Mercury (filtered)	µg/L	0.01		1	-	<10	-	10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	10			-	-	-	-	-	170	1,010	170	740
Potassium (filtered)	µg/L	2			3,200	3,750	4,160	3,560	3,700	3,500	2,000	1,200	1,100
Sodium (filtered)	µg/L	10	136,650	200,000	36,700	41,400	45,700	47,900	39,000	46,800	45,700	32,000	25,600
Zinc (filtered)	µg/L	2		5,000	<2	4	3	3	4	<5	7	8	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	264	294	285	303	291	300	284	263	273
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	315	331	315	316
Total Dissolved Solids	mg/L	3	647	500	457	463	417	394	431	399	390	371	365
Chemical Oxygen Demand	mg/L	5			<8	8	18	23	<8	16	98	11	80
Total Suspended Solids	mg/L				-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	1	-	<1	1	1	3.9	1.6	2.3	0.9
Biochemical Oxygen Demand	mg/L				-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	0.001	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	71	72	78	75	80	79	33	42	25
Ammonia as N	mg/L	0.01			0.3	0.3	0.4	0.4	0.4	0.44	0.31	0.11	0.19
Nitrate (as N)	mg/L	0.05	4.31	10	-	<0.06	<0.06	<0.06	<0.06	0.06	<0.05	<0.05	0.23
Nitrite (as N)	mg/L	0.03		1	<0.06	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	<0.5	-	<0.5	-	0.6	-	0.3	0.6
pH (Lab)	-	0.05		6.5-8.5	8.03	7.62	7.95	7.73	7.79	7.92	7.93	7.69	7.81
Electrical Conductivity (Lab)	µS/cm	1			750	740	730	732	708	763	746	714	703
Field													
DO (Field)	mg/L				-	4.1	6.5	-	5.4	6.76	5.98	8.49	9.05
Redox (Field)	mV				-	-55	-106	-	-151	-4	43	38	-139
Temperature (Field)	oC				-	9.1	9.2	12.9	10.3	8.1	8.9	6.8	10.2
Conductivity (field)	µS/cm				-	501	576	-	486	748	331	606	655
pH (Field)	-				-	7.7	7.5	7.3	7.6	7.87	7.2	7.09	7.25



Table 6 Groundwater Quality - Deep Bedrock

	Unit	EQL	RUC	ODWQS	MW12-3	MW12-3	MW12-3	MW12-3	MW12-3	MW12-3	MW12-3	MW12-3	MW12-3
					04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals													
Arsenic (filtered)	µg/L	0.1	6.4	25	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01	423	1,000	29.1	39.9	66.4	34	29.2	31	30	33	58
Boron (filtered)	µg/L	0.2	2,538	5,000	79	90	143	77	69	83	83	87	88
Calcium (filtered)	µg/L	10			134,000	162,000	140,000	127,000	134,000	133,000	127,000	129,000	122,000
Cadmium (filtered)	µg/L	0.003		5	0.004	<0.003	<0.003	0.003	0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200	197,500	250,000	60,000	55,000	51,000	52,000	47,000	48,600	44,500	43,800	42,700
Chromium (III+VI) (filtered)	µg/L	0.03		50	0.55	0.26	0.15	0.09	0.72	<1	4	<1	<1
Copper (filtered)	µg/L	0.02		1,000	0.13	<0.2	<0.2	0.4	0.3	0.1	<0.1	0.2	0.2
Iron (filtered)	µg/L	2	153	300	13	54	99	<7	56	19	44	21	<5
Lead (filtered)	µg/L	0.01		10	0.03	0.26	0.03	0.02	<0.01	0.08	0.08	0.04	<0.02
Magnesium (filtered)	µg/L	1			5,500	6,180	8,910	5,490	5,370	5,830	5,430	5,430	5,600
Manganese (filtered)	µg/L	0.01	25.15	50	11.1	14.5	50.23	62.7	19.3	34	24	38	9
Mercury (filtered)	µg/L	0.01		1	-	<10	-	10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100			-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	10			-	-	-	-	-	40	730	100	40
Potassium (filtered)	µg/L	2			1,710	1,940	2,060	1,650	1,660	1,600	1,800	1,600	1,700
Sodium (filtered)	µg/L	10	136,650	200,000	14,400	15,700	18,800	16,100	13,200	16,000	16,200	16,900	15,600
Zinc (filtered)	µg/L	2		5,000	3	8	<2.00000	<2	<2	<5	<5	<5	<5
Inorganics													
Alkalinity (total) as CaCO3	mg/L	2	283	500	277	290	272	296	334	283	263	264	271
Hardness (as CaCO3) (filtered)	mg/L	1	445	500	-	-	-	-	-	356	340	345	328
Total Dissolved Solids	mg/L	3	647	500	486	443	391	403	394	362	361	363	357
Chemical Oxygen Demand	mg/L	5			<8	<8	<8	<8	<8	<5	32	17	9
Total Suspended Solids	mg/L				-	-	-	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2	3.5	5	1	-	1	1	1	3.5	1.6	3.1	0.9
Biochemical Oxygen Demand	mg/L				-	-	-	-	-	-	-	-	-
Phenols (4AAP)	mg/L	0.001			-	0.001	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	283	500	25	26	24	23	21	23	23	22	23
Ammonia as N	mg/L	0.01			<0.1	<0.1	<0.1000	<0.1	<0.1	0.02	0.05	0.02	0.02
Nitrate (as N)	mg/L	0.05	4.31	10	-	<0.06	<0.060000	<0.06	<0.06	<0.05	<0.05	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		1	<0.06	<0.03	-	<0.03	-	<0.05	-	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1			-	<0.5	-	<0.5	-	0.2	-	0.3	0.1
pH (Lab)	-	0.05		6.5-8.5	7.77	8.06	7.75	7.68	7.7	7.75	7.72	7.54	7.71
Electrical Conductivity (Lab)	µS/cm	1			737	711	694	681	663	696	694	699	687
Field													
DO (Field)	mg/L				-	5.7	10.8	-	4.5	3.52	2.63	1.99	2.07
Redox (Field)	mV				-	147	-51	-	-59	-5	12	-50	-139
Temperature (Field)	oC				-	10.1	9.5	14.1	9.6	7.2	8.7	7.3	10.6
Conductivity (field)	µS/cm				-	510	572	-	446	694	300	610	564
pH (Field)	-			6.5-8.5	-	7.7	7.7	7.4	7.5	7.48	7.15	6.34	7.12



Table 8 Groundwater Quality - PWQO

	Unit	EQL	PWQO	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2	MW08-2
				04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals												
Arsenic (filtered)	µg/L	0.1	5	<0.2	<0.2	<0.2	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01		148	53.1	158	81.1	162	135	168	95	181
Boron (filtered)	µg/L	0.2	200	31	14	50	26	23	15	28	6	27
Calcium (filtered)	µg/L	10		118,000	103,000	127,000	80,100	145,000	114,000	119,000	85,300	123,000
Cadmium (filtered)	µg/L	0.003	0.1..0.5 ^{#1}	0.005	0.003	0.005	0.025	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200		68,000	3,000	69,000	9,000	120,000	65,500	67,500	35,700	69,900
Chromium (III+VI) (filtered)	µg/L	0.03	1 ^{#2}	0.67	0.27	0.25	0.26	0.31	73	<1	<1	<1
Copper (filtered)	µg/L	0.02	1..5 ^{#1}	0.87	0.3	0.8	1.4	1.1	0.8	1	0.8	1.1
Iron (filtered)	µg/L	2	300	<7	7	10	24	15	19	<5	<5	<5
Lead (filtered)	µg/L	0.01	1..5 ^{#1}	<0.01	0.02	0.03	0.09	0.04	0.13	0.03	<0.02	0.02
Magnesium (filtered)	µg/L	1		4,140	2,820	3,820	2,680	5,280	4,060	4,140	2,880	4,600
Manganese (filtered)	µg/L	0.01		1.89	0.74	4.33	4.34	0.97	4	2	<1	3
Mercury (filtered)	µg/L	0.01	0.2	<10	<10	<10	10	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100	30	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3	30	<30	-	30	<30	<30	100	110	50	60
Potassium (filtered)	µg/L	2		1,370	472	1,400	738	1,210	1,000	1,800	700	1,600
Sodium (filtered)	µg/L	10		36,500	3,740	36,800	23,500	29,400	38,300	44,000	26,800	44,100
Zinc (filtered)	µg/L	2	20	<2	2	3	9	<2	<5	<5	<5	<5
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2		300	235	272	235	283	276	275	215	277
Hardness (as CaCO3) (filtered)	mg/L	1		-	-	-	-	-	302	316	225	326
Total Dissolved Solids	mg/L	3		443	257	434	240	480	364	389	283	428
Chemical Oxygen Demand	mg/L	5		<8	<8	<8	16	<8	7	10	<5	12
Total Suspended Solids	mg/L	2		<2	23	37	20	22	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2		-	-	-	-	-	3.7	2.7	3	0.9
Biochemical Oxygen Demand	mg/L	2		5	<4	<4	<4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2		10	7	12	6	10	9	10	5	<10
Ammonia as N	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.05		0.35	<0.06	0.66	0.15	0.67	0.74	0.41	0.05	0.62
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.5
Total Kjeldahl Nitrogen	mg/L	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	0.4	0.3	0.2	0.3
pH (Lab)	-	0.05	6.5-8.5	7.63	7.66	8.12	7.85	7.81	7.94	8.27	7.57	7.93
Electrical Conductivity (Lab)	µS/cm	1		781	429	748	452	838	700	744	547	814
Field												
DO (Field)	mg/L		5	-	3.4	8.8	-	11.3	13.26	2.49	7.65	6.06
Redox (Field)	mV			-	196	79	-	135	140	-73	-54	-140
Temperature (Field)	oC			-	8.5	13.4	16.4	6.2	9.3	9.2	8.8	13
Conductivity (field)	µS/cm			-	419	803	-	486	652	334	473	722
pH (Field)	-		6.5-8.5	-	7.7	6.1	8.1	8.6	8.78	7.27	7.35	7.21



Table 8 Groundwater Quality - PWQO

	Unit	EQL	PWQO	MW09-2 04 Oct 2017	MW09-2 30 May 2019	MW09-2 29 Oct 2019	MW09-2 26 May 2020	MW09-2 18 Nov 2020	MW09-2 28 Jun 2021	MW09-2 11 Nov 2021	MW09-2 12 Apr 2022	MW09-2 25 Oct 2022
Metals												
Arsenic (filtered)	µg/L	0.1	5	0.3	0.3	<0.2	0.4	<0.2	0.2	0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01		258	158	184	285	176	210	203	846	229
Boron (filtered)	µg/L	0.2	200	84	26	65	143	39	40	45	567	47
Calcium (filtered)	µg/L	10		107,000	105,000	121,000	80,800	126,000	124,000	119,000	51,100	122,000
Cadmium (filtered)	µg/L	0.003	0.1..0.5 ^{#1}	<0.003	0.003	0.003	0.007	0.01	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200		70,000	66,000	73,000	50,000	77,000	88,500	70,500	15,100	79,700
Chromium (III+VI) (filtered)	µg/L	0.03	1 ^{#2}	0.71	0.15	0.16	0.23	0.28	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02	1..5 ^{#1}	0.4	0.8	1.4	<0.2	4.2	0.6	0.4	<0.1	0.8
Iron (filtered)	µg/L	2	300	205	293	38	302	15	87	43	13	26
Lead (filtered)	µg/L	0.01	1..5 ^{#1}	<0.01	0.02	0.02	0.01	0.04	0.03	<0.02	<0.02	0.03
Magnesium (filtered)	µg/L	1		5,780	3,890	3,820	8,760	4,270	4,640	4,550	21,900	4,730
Manganese (filtered)	µg/L	0.01		15.9	29.1	4.64	33.2	3.31	3	3	47	2
Mercury (filtered)	µg/L	0.01	0.2	<10	<10	<10	<10	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100	30	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3	30	<30	-	<30	<30	<30	40	20	40	20
Potassium (filtered)	µg/L	2		2,600	2,160	2,570	2,740	2,650	2,300	2,700	5,300	2,600
Sodium (filtered)	µg/L	10		45,700	42,900	46,500	44,400	44,600	55,600	48,200	51,300	57,700
Zinc (filtered)	µg/L	2	20	<2	3	3	2	<2	<5	<5	<5	<5
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2		274	241	260	233	295	271	280	249	278
Hardness (as CaCO3) (filtered)	mg/L	1		-	-	-	-	-	329	315	218	324
Total Dissolved Solids	mg/L	3		420	214	414	311	437	432	409	316	425
Chemical Oxygen Demand	mg/L	5		10	<8	<8	<8	<8	<5	11	38	7
Total Suspended Solids	mg/L	2		<2	66	2	6	2	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2		-	-	-	-	-	3.3	2.4	2.4	0.7
Biochemical Oxygen Demand	mg/L	2		<4	<4	<4	<4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001	0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.002	<0.002	0.048	<0.001
Sulphate (filtered)	mg/L	0.2		14	16	11	10	10	13	13	37	14
Ammonia as N	mg/L	0.01		0.1	<0.1	<0.1	<0.1	<0.1	0.03	0.03	0.69	0.02
Nitrate (as N)	mg/L	0.05		0.37	<0.06	0.93	<0.06	1.17	1.21	0.73	<0.05	1
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1		<0.5	<0.5	<0.1	<0.5	<0.5	0.2	0.2	0.7	0.2
pH (Lab)	-	0.05	6.5-8.5	7.57	8	8.11	7.9	7.91	7.69	7.66	7.7	7.71
Electrical Conductivity (Lab)	µS/cm	1		719	653	737	591	791	821	780	609	809
Field												
DO (Field)	mg/L		5	-	3.6	4.1	-	5	2.63	2.91	2.32	5.39
Redox (Field)	mV			-	-125	-86	-	60	160	30	-36	-140
Temperature (Field)	oC			-	10.3	14.1	1.7	7.4	10.7	9.8	7.4	13.7
Conductivity (field)	µS/cm			-	404	655	-	471	792	332	496	801
pH (Field)	-		6.5-8.5	-	7.7	7.4	7.6	8	7.08	7.01	7.01	7.06



Table 8 Groundwater Quality - PWQO

	Unit	EQL	PWQO	MW10-2 04 Oct 2017	MW10-2 30 May 2019	MW10-2 29 Oct 2019	MW10-2 26 May 2020	MW10-2 18 Nov 2020	MW10-2 24 Jun 2021	MW10-2 11 Nov 2021	MW10-2 12 Apr 2022	MW10-2 25 Oct 2022
Metals												
Arsenic (filtered)	µg/L	0.1	5	<0.2	0.2	<0.2	<0.2	<0.2	0.3	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01		506	626	580	491	416	510	574	542	603
Boron (filtered)	µg/L	0.2	200	131	118	145	106	96	109	125	95	135
Calcium (filtered)	µg/L	10		104,000	117,000	129,000	98,500	99,900	118,000	119,000	118,000	112,000
Cadmium (filtered)	µg/L	0.003	0.1..0.5 ^{#1}	0.004	0.003	0.003	<0.003	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200		51,000	48,000	48,000	54,000	53,000	59,600	56,700	54,700	50,300
Chromium (III+VI) (filtered)	µg/L	0.03	1 ^{#2}	0.59	0.14	0.12	0.16	0.22	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02	1..5 ^{#1}	0.15	0.3	<0.2	0.4	0.8	1.2	0.6	0.8	0.5
Iron (filtered)	µg/L	2	300	3,370	6,910	4,030	886	3,290	<5	5,280	3,750	4,080
Lead (filtered)	µg/L	0.01	1..5 ^{#1}	<0.01	0.12	0.01	<0.01	0.04	0.46	<0.02	<0.02	0.03
Magnesium (filtered)	µg/L	1		11,000	11,200	10,900	12,700	10,400	11,400	11,300	11,300	11,000
Manganese (filtered)	µg/L	0.01		60.1	171	54.4	95.1	58	38	42	39	28
Mercury (filtered)	µg/L	0.01	0.2	<10	<10	<10	10	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100	30	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3	30	30	-	60	40	80	110	90	420	60
Potassium (filtered)	µg/L	2		2,600	2,420	2,690	2,460	2,600	2,000	2,500	1,900	2,400
Sodium (filtered)	µg/L	10		6,070	7,470	5,540	9,830	6,930	6,100	6,500	6,100	5,900
Zinc (filtered)	µg/L	2	20	<2	5	<2	2	<2	<5	<5	<5	<5
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2		233	243	245	243	258	260	250	222	254
Hardness (as CaCO3) (filtered)	mg/L	1		-	-	-	-	-	342	343	341	326
Total Dissolved Solids	mg/L	3		406	334	354	389	351	343	351	336	341
Chemical Oxygen Demand	mg/L	5		<8	<8	<8	8	<8	53	9	7	11
Total Suspended Solids	mg/L	2		10	50	55	42	56	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2		-	-	-	-	-	2.8	2.6	3	0.9
Biochemical Oxygen Demand	mg/L	2		4	<4	<4	4	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.002	0.013	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2		9	8	7	10	6	10	9	11	7
Ammonia as N	mg/L	0.01		1	0.8	1.1	0.9	1	0.93	1.04	0.8	1.04
Nitrate (as N)	mg/L	0.05		<0.06	0.08	0.08	<0.06	<0.06	0.07	<0.05	0.4	0.18
Nitrite (as N)	mg/L	0.03		<0.03	0.07	0.04	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1		1.1	0.7	1.1	0.8	1	1	1.1	1.2	1.2
pH (Lab)	-	0.05	6.5-8.5	7.67	7.54	8.03	7.83	7.79	7.83	7.68	7.48	7.85
Electrical Conductivity (Lab)	µS/cm	1		631	599	621	618	623	660	675	647	657
Field												
DO (Field)	mg/L		5	-	3.6	4	-	4.2	2.87	2.81	2.44	1.62
Redox (Field)	mV			-	-109	-115	-	-148	-15	19	-117	-143
Temperature (Field)	oC			-	10.6	13.8	15.1	6.7	9	10.3	7.9	13.3
Conductivity (field)	µS/cm			-	442	518	-	364	665	297	615	630
pH (Field)	-		6.5-8.5	-	7.6	7.6	7.7	7.9	8.45	7.38	7.18	7.22



Table 8 Groundwater Quality - PWQO

	Unit	EQL	PWQO	MW11-2 04 Oct 2017	MW11-2 30 May 2019	MW11-2 29 Oct 2019	MW11-2 26 May 2020	MW11-2 18 Nov 2020	MW11-2 24 Jun 2021	MW11-2 11 Nov 2021	MW11-2 12 Apr 2022	MW11-2 25 Oct 2022
Metals												
Arsenic (filtered)	µg/L	0.1	5	<0.2	<0.2	0.7	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01		449	381	40.8	504	358	528	528	466	632
Boron (filtered)	µg/L	0.2	200	123	85	176	150	164	127	143	219	169
Calcium (filtered)	µg/L	10		93,800	96,600	147,000	102,000	93,400	117,000	113,000	90,600	110,000
Cadmium (filtered)	µg/L	0.003	0.1..0.5 ^{#1}	<0.003	0.003	0.005	0.005	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200		36,000	14,000	33,000	21,000	43,000	52,000	41,000	25,300	28,200
Chromium (III+VI) (filtered)	µg/L	0.03	1 ^{#2}	0.53	0.59	0.2	0.18	0.21	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02	1..5 ^{#1}	0.19	<0.2	1.1	0.5	0.4	0.8	0.3	0.5	0.1
Iron (filtered)	µg/L	2	300	2,130	1,550	124	2,130	1,060	3,030	2,750	1,670	2,150
Lead (filtered)	µg/L	0.01	1..5 ^{#1}	0.01	0.01	0.02	0.03	0.04	0.06	<0.02	<0.02	<0.02
Magnesium (filtered)	µg/L	1		8,590	7,400	22,100	12,700	12,300	11,300	11,100	14,000	12,400
Manganese (filtered)	µg/L	0.01		29.6	24.5	14.7	31.4	19.8	35	33	35	33
Mercury (filtered)	µg/L	0.01	0.2	<10	<10	<10	30	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100	30	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3	30	40	-	40	<30	30	80	80	40	40
Potassium (filtered)	µg/L	2		2,280	1,990	7,590	2,860	3,720	2,300	2,800	3,600	3,100
Sodium (filtered)	µg/L	10		5,300	6,300	76,700	8,390	6,200	7,300	6,700	8,400	6,800
Zinc (filtered)	µg/L	2	20	3	4	4	8	<2	<5	<5	<5	<5
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2		255	224	242	227	242	271	250	233	244
Hardness (as CaCO3) (filtered)	mg/L	1		-	-	-	-	-	339	329	284	326
Total Dissolved Solids	mg/L	3		391	274	320	274	343	342	329	300	294
Chemical Oxygen Demand	mg/L	5		8	<8	<8	13	<8	<5	8	11	<5
Total Suspended Solids	mg/L	2		3	5	6	8	17	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2		-	-	-	-	-	4.4	2.2	3.1	1.3
Biochemical Oxygen Demand	mg/L	2		<4	<4	<4	7	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001	0.001	<0.001	<0.001	<0.001	0.002	0.001	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2		7	6	10	17	9	11	10	15	11
Ammonia as N	mg/L	0.01		0.9	0.5	0.9	0.7	0.9	0.95	0.96	0.7	0.99
Nitrate (as N)	mg/L	0.05		<0.06	<0.06	0.18	0.13	<0.06	0.07	<0.05	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1		0.9	<0.5	1	0.6	0.8	1	1.1	1	1.1
pH (Lab)	-	0.05	6.5-8.5	7.63	8.09	8.1	7.76	7.77	7.81	7.8	7.56	7.87
Electrical Conductivity (Lab)	µS/cm	1		603	465	584	520	547	659	633	578	568
Field												
DO (Field)	mg/L		5	-	4	5.7	-	6.4	1.55	7.98	5.38	8.75
Redox (Field)	mV			-	-93	-122	-	-60	136	15	114	-148
Temperature (Field)	oC			-	9.1	12.5	15.1	4.9	7.7	9	9.1	13.7
Conductivity (field)	µS/cm			-	345	528	-	350	672	286	527	644
pH (Field)	-		6.5-8.5	-	7.8	7.7	7.6	8.3	7.26	7.37	7.13	7.33



Table 8 Groundwater Quality - PWQO

	Unit	EQL	PWQO	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1	MW12-1
				04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	24 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals												
Arsenic (filtered)	µg/L	0.1	5	<0.2	<0.2	0.8	<0.2	<0.2	<0.1	<0.1	<0.1	<0.1
Barium (filtered)	µg/L	0.01		152	713	230	621	311	743	994	694	1,080
Boron (filtered)	µg/L	0.2	200	83	104	99	106	110	121	156	118	167
Calcium (filtered)	µg/L	10		122,000	126,000	117,000	115,000	113,000	116,000	106,000	109,000	93,500
Cadmium (filtered)	µg/L	0.003	0.1..0.5 ^{#1}	<0.003	0.003	0.003	<0.003	<0.003	<0.015	<0.015	<0.015	<0.01
Chloride	µg/L	200		54,000	51,000	44,000	55,000	44,000	40,700	39,400	41,300	37,500
Chromium (III+VI) (filtered)	µg/L	0.03	1 ^{#2}	0.58	0.16	0.13	0.13	0.28	<1	<1	<1	<1
Copper (filtered)	µg/L	0.02	1..5 ^{#1}	0.16	<0.2	0.5	0.3	0.4	<0.1	<0.1	<0.1	0.1
Iron (filtered)	µg/L	2	300	18	10	19	20	24	<5	<5	<5	15
Lead (filtered)	µg/L	0.01	1..5 ^{#1}	<0.01	<0.01	0.01	0.01	0.03	0.09	<0.02	<0.02	0.02
Magnesium (filtered)	µg/L	1		6,760	11,500	7,580	12,900	9,820	13,400	14,300	12,400	15,200
Manganese (filtered)	µg/L	0.01		15.6	3.52	20.1	5.18	16.4	3	3	3	10
Mercury (filtered)	µg/L	0.01	0.2	<10	<10	<10	30	<10	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100	30	-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	3	30	<30	-	<30	<30	<30	20	10	30	30
Potassium (filtered)	µg/L	2		2,100	3,280	2,250	3,340	2,780	3,100	3,500	3,300	3,400
Sodium (filtered)	µg/L	10		12,300	13,700	12,000	16,900	11,200	11,700	10,600	13,600	9,500
Zinc (filtered)	µg/L	2	20	<2	3	3	2	<2	<5	<5	<5	<5
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2		283	284	265	278	253	271	241	254	241
Hardness (as CaCO3) (filtered)	mg/L	1		-	-	-	-	-	345	325	323	296
Total Dissolved Solids	mg/L	3		460	403	403	397	351	338	336	353	321
Chemical Oxygen Demand	mg/L	5		<8	<8	<8	<8	<8	7	13	6	8
Total Suspended Solids	mg/L	2		<2	42	38	8	8	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	0.2		-	-	-	-	-	2.2	1.9	2.3	0.7
Biochemical Oxygen Demand	mg/L	2		<4	<4	<4	5	<4	-	-	-	-
Phenols (4AAP)	mg/L	0.001	0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.004	0.006	0.002	<0.001
Sulphate (filtered)	mg/L	0.2		24	22	28	23	25	20	26	23	25
Ammonia as N	mg/L	0.01		0.1	0.1	<0.1	<0.1	0.1	0.14	0.16	0.14	0.16
Nitrate (as N)	mg/L	0.05		<0.06	<0.06	<0.06	<0.06	<0.06	0.08	<0.05	<0.05	<0.05
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	0.2	0.2	0.2	0.2
pH (Lab)	-	0.05	6.5-8.5	7.8	7.42	7.92	7.71	7.91	7.85	7.91	7.56	7.76
Electrical Conductivity (Lab)	µS/cm	1		710	675	649	684	595	650	647	680	618
Field												
DO (Field)	mg/L		5	-	3	5.9	-	6.5	2.83	3.6	2.29	2.96
Redox (Field)	mV			-	-92	-149	-	-128	-38	11	175	-141
Temperature (Field)	oC			-	8.5	9.9	14.4	8.6	9.4	9.4	7.2	10.8
Conductivity (field)	µS/cm			-	457	477	-	388	651	280	589	586
pH (Field)	-		6.5-8.5	-	7.6	7.6	7.3	8.1	7.2	7.45	7.08	7.37



Table 9 Residential Wells

	Unit	EQL	ODWQS	R1	R1	R1	R1	R1	R1	R1	R1	R1
				31 May 2017	04 Oct 2017	29 Oct 2019	26 May 2020	18 Nov 2020	28 Jun 2021	11 Nov 2021	12 Apr 2022	25 Oct 2022
Metals												
Arsenic (filtered)	µg/L	0.1	25	<0.2	<0.2	0.5	<0.2	<0.2	0.3	0.2	0.1	0.2
Barium (filtered)	µg/L	0.01	1,000	63.6	92.9	262	76.8	175	165	144	68	226
Boron (filtered)	µg/L	0.2	5,000	13	38	100	13	33	20	12	5	34
Calcium (filtered)	µg/L	10		85,300	107,000	111,000	83,300	131,000	123,000	112,000	80,700	122,000
Cadmium (filtered)	µg/L	0.003	5	0.01	0.026	0.131	0.015	0.005	0.054	0.02	<0.015	0.014
Chloride	µg/L	200	250,000	50,000	46,000	55,000	58,000	92,000	51,700	70,900	37,200	58,100
Chromium (III+VI) (filtered)	µg/L	0.03	50	0.73	0.69	1.59	0.17	0.89	1	<1	<1	<1
Copper (filtered)	µg/L	0.02	1,000	0.84	0.87	4.4	0.9	1.1	2.5	0.8	1.7	0.8
Iron (filtered)	µg/L	2	300	<7	102	664	<7	22	577	150	44	202
Lead (filtered)	µg/L	0.01	10	0.03	1.81	1.34	0.02	0.03	0.83	0.26	0.09	0.03
Magnesium (filtered)	µg/L	1		2,600	3,920	7,540	2,980	4,910	4,640	3,750	2,770	5,090
Manganese (filtered)	µg/L	0.01	50	0.3	27.1	3,270	0.33	3.43	940	726	132	1,390
Mercury (filtered)	µg/L	0.01	1	<10	-	-	<10	-	<0.02	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100		-	-	-	-	-	-	-	-	<100
Phosphorus total (P2O5)	µg/L	10		<30	-	-	<30	-	960	2,070	9,480	10,200
Potassium (filtered)	µg/L	2		897	1,460	4,300	870	1,920	1,500	1,000	400	2,200
Sodium (filtered)	µg/L	10	200,000	35,900	30,400	31,000	36,000	45,900	36,500	45,200	26,600	39,100
Zinc (filtered)	µg/L	2	5,000	5	12	10	4	3	<5	<5	<5	<5
Inorganics												
Alkalinity (total) as CaCO3	mg/L	2	500	207	299	273	1,710	298	254	259	204	287
Hardness (as CaCO3) (filtered)	mg/L	1	500	-	-	-	-	-	327	295	213	326
Total Dissolved Solids	mg/L	3	500	326	403	423	337	460	353	382	270	405
Chemical Oxygen Demand	mg/L	5		<8	10	<8	<8	<8	450	82	342	355
Dissolved Organic Carbon (filtered)	mg/L	0.2	5	2	4	1	3	1	3.7	2.8	2.9	2
Phenols (4AAP)	mg/L	0.001		<0.002	-	-	<0.002	-	<0.002	<0.002	<0.001	<0.001
Sulphate (filtered)	mg/L	0.2	500	5	5	18	4	15	10	10	7	13
Ammonia as N	mg/L	0.01		<0.1	0.2	<0.1	<0.1	<0.1	0.08	<0.01	0.07	0.23
Nitrate (as N)	mg/L	0.05	10	0.29	0.68	1.43	0.09	1.78	1.58	0.39	0.14	1.7
Nitrite (as N)	mg/L	0.03	1	<0.03	-	-	<0.03	-	<0.05	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1		<0.5	-	-	<0.5	-	1.1	2.4	13.8	15.3
pH (Lab)	-	0.05	6.5-8.5	7.88	7.61	7.93	8.03	8.14	7.74	8.03	7.54	7.79
Electrical Conductivity (Lab)	µS/cm	1		546	680	721	611	864	679	732	521	773
Field												
DO (Field)	mg/L			-	-	-	-	-	4.89	4.1	4.48	5.97
Redox (Field)	mV			-	-	-	-	-	125	8	81	-148
Temperature (Field)	°C			-	-	-	-	-	10.4	9.4	8	11.6
Conductivity (field)	µS/cm			-	-	-	-	-	678	319	456	727
pH (Field)	-		6.5-8.5	-	-	-	-	-	7.18	7.06	7.24	7.06



Table 9 Residential Wells

	Unit	EQL	ODWQS	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4	R4
				18 May 2012	23 Oct 2012	10 Jun 2013	25 Nov 2013	26 Jun 2014	22 May 2015	19 Nov 2015	30 May 2016	31 Oct 2016	31 May 2017	04 Oct 2017	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	28 Jun 2021	11 Nov 2021	12 Apr 2022
Metals																					
Arsenic (filtered)	µg/L	0.1	25	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2	0.1	0.2	0.2
Barium (filtered)	µg/L	0.01	1,000	144	163	115	123	178	112	119	140	180	118	152	117	141	114	125	128	122	126
Boron (filtered)	µg/L	0.2	5,000	19.7	34.1	21.0	22.9	23.9	19.9	47.5	20	24	18	32	16	29	16	31	20	26	12
Calcium (filtered)	µg/L	10		128,000	132,000	108,000	111,000	140,000	114,000	114,000	148,000	161,000	109,000	133,000	128,000	120,000	116,000	126,000	127,000	113,000	120,000
Cadmium (filtered)	µg/L	0.003	5	-	-	-	-	-	0.007	0.010	0.007	0.059	0.004	0.005	0.004	0.011	0.007	0.007	<0.015	<0.015	<0.015
Chloride	µg/L	200	250,000	180,000	270,000	130,000	55,000	300,000	44,000	130,000	250,000	380,000	50,000	280,000	52,000	210,000	210,000	220,000	183,000	126,000	85,200
Chromium (III+VI) (filtered)	µg/L	0.03	50	-	-	-	-	-	0.20	0.12	0.51	4.23	0.66	0.85	0.25	0.58	0.29	1.23	2	<1	<1
Copper (filtered)	µg/L	0.02	1,000	-	-	-	-	-	223	97.1	19.4	302	92.6	19.76	109	86.2	70.5	169	117	96.2	285
Iron (filtered)	µg/L	2	300	48	22	12	77	9	4	<7	23	25	<7	19	<7	14	11	8	6	<5	<5
Lead (filtered)	µg/L	0.01	10	-	-	-	-	-	3.93	1.73	0.66	7.70	263	0.64	9	1.43	1.56	2.69	2.32	2.6	3.22
Magnesium (filtered)	µg/L	1		4,170	4,180	3,560	3,600	4,420	3,830	3,310	4,270	4,500	2,840	4,200	3,290	3,290	3,750	3,290	3,870	3,200	3,280
Manganese (filtered)	µg/L	0.01	50	-	-	-	-	-	0.20	0.79	0.88	0.85	0.07	0.73	0.1	0.61	0.42	0.22	<1	<1	<1
Mercury (filtered)	µg/L	0.01	1	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02
Phosphorus (filtered)	µg/L	100		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus total (P2O5)	µg/L	10		-	-	-	-	-	40	-	60	-	<30	-	-	<30	-	-	10	30	40
Potassium (filtered)	µg/L	2		-	-	-	-	-	6,810	3,130	3,230	2,970	4,840	3,120	3,260	3,220	2,950	3,160	2,800	2,700	4,300
Sodium (filtered)	µg/L	10	200,000	105,000	180,000	64,600	49,100	143,000	25,800	110,000	121,000	261,000	28,900	186,000	34,600	153,000	138,000	165,000	121,000	123,000	54,500
Zinc (filtered)	µg/L	2	5,000	-	-	-	-	-	53	26	73	441	21	14	2.29	37	31	30	45	28	71
Inorganics																					
Alkalinity (total) as CaCO3	mg/L	2	500	284	337	185	98	316	298	361	285	348	259	403	288	336	304	347	267	338	251
Hardness (as CaCO3) (filtered)	mg/L	1	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	333	294	313
Total Dissolved Solids	mg/L	3	500	606	846	526	734	854	403	637	731	1,050	406	880	411	726	629	797	605	563	429
Chemical Oxygen Demand	mg/L	5		16	<8	<8	<8	<8	10	<8	8	<8	<8	9	25	<8	<8	18	<5	8	7
Dissolved Organic Carbon (filtered)	mg/L	0.2	5	2.1	2.3	2.8	3.7	3.2	3.1	2.4	2.5	5	4	3	5	1	2	4	2	2.1	2.5
Phenols (4AAP)	mg/L	0.001		-	-	-	-	-	<0.002	-	0.004	-	0.002	-	<0.002	-	0.002	-	<0.002	<0.002	<0.001
Sulphate (filtered)	mg/L	0.2	500	11	19	9.8	12	13	11	24	130	20	17	18	13	17	10	14	12	10	13
Ammonia as N	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01
Nitrate (as N)	mg/L	0.05	10	0.49	3.46	0.78	1.57	0.68	1.11	5.12	0.62	3.50	1.93	0.61	3.15	1.59	0.56	2.12	1.38	0.97	3.6
Nitrite (as N)	mg/L	0.03	1	-	-	-	-	-	<0.03	-	<0.03	-	<0.03	-	<0.03	-	<0.03	-	<0.05	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1		-	-	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	<0.5	-	0.2	0.2	0.3
pH (Lab)	-	0.05	6.5-8.5	7.99	8.06	8.03	6.88	7.98	7.99	7.69	7.98	7.83	7.79	7.39	8.01	7.75	7.72	7.85	7.87	8.21	7.69
Electrical Conductivity (Lab)	µS/cm	1		1,110	1,570	908	993	1,500	699	1,100	1,261	1,960	666	1,610	743	1,290	1,130	1,340	1,130	1,050	815
Field																					
DO (Field)	mg/L			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.86	8.16	2.15
Redox (Field)	mV			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	145	17	139
Temperature (Field)	°C			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.4	19.1	21.1
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,046	425	714
pH (Field)	-		6.5-8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.36	7.22	7.12



Table 10 Surface Water Quality

	Unit	EQL	PWQO	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1	S1
				01 Nov 2011	18 May 2012	10 Jun 2013	04 Nov 2013	26 Jun 2014	06 Nov 2014	22 May 2015	19 Nov 2015	16 May 2016	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020	11 Nov 2021	12 Apr 2022
Metals																		
Arsenic	µg/L	0.1	5	-	-	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	0.3	-	<0.2	0.1	0.1
Barium	µg/L	0.02		-	-	-	-	-	137	82.2	137	78.7	76.4	115	-	132	94	67
Boron	µg/L	0.2	200	-	-	-	-	-	20.0	14.8	23.0	13	17	25	-	52	24	<5
Calcium	µg/L	10		-	-	-	-	-	-	97,000	121,000	101,000	96,700	98,700	-	117,000	-	-
Cadmium	µg/L	0.003	0.1..0.5 ^{#1}	-	-	-	-	-	0.008	0.006	0.010	0.005	0.005	0.03	-	0.008	<0.015	<0.015
Chloride	µg/L	200		75,000	52,000	48,000	50,000	50,000	72,000	59,000	64,000	61,000	56,000	33,000	-	63,000	71,800	38,300
Chromium (III+VI)	µg/L	0.03	1 ^{#2}	-	-	-	-	-	<0.03	0.06	0.20	0.53	0.16	0.16	-	0.46	<1	<1
Copper	µg/L	0.02	1.5 ^{#1}	-	-	-	-	-	0.58	0.68	1.12	0.58	0.7	3.9	-	0.9	0.6	0.5
Iron	µg/L	2	300	36	42	5	9	<2	12	43	26	23	10	42	-	68	27	32
Lead	µg/L	0.01	1.5 ^{#1}	-	-	-	-	-	0.05	0.01	0.07	0.04	<0.01	0.29	-	0.07	0.03	0.03
Magnesium	µg/L	1		-	-	-	-	-	-	3,350	4,300	3,490	3,270	3,850	-	4,590	-	-
Manganese	µg/L	0.01		-	-	-	-	-	-	0.80	1.07	0.74	3.06	29.9	-	13	-	-
Mercury (filtered)	µg/L	0.01	0.2	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<10	<10	-	<10	<0.02	<0.02
Phosphorus total (P2O5)	µg/L	3	30	90	<30	80	<30	<30	60	12	<30	<30	6	48	-	9	20	20
Potassium	µg/L	2		-	-	-	-	-	-	941	1,660	1,010	1,510	2,290	-	1,730	-	-
Sodium	µg/L	10		-	-	-	-	-	-	34,400	36,500	35,500	35,300	22,200	-	33,700	-	-
Zinc	µg/L	2	20	-	-	-	-	-	2	4	3	5	3	12	-	3	<5	<5
Inorganics																		
Alkalinity (total) as CaCO3	mg/L	2		262	231	225	218	271	288	253	273	225	240	245	-	267	277	202
Hardness (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-	-	-	-	-	-	275	211
Total Dissolved Solids	mg/L	3		474	337	360	329	360	440	374	431	383	366	354	-	406	385	257
Chemical Oxygen Demand	mg/L	5		11	<8	<8	8	<8	12	9	10	<8	<8	16	-	<8	13	23
Total Suspended Solids	mg/L	2		<2	6	2	<2	<2	<2	4	<2	<2	5	2	-	4	<3	14
Biochemical Oxygen Demand	mg/L	2		<2	<4	<4	<4	<2	<4	<4	<4	<4	<4	16	-	<4	<3	<3
Phenols (4AAP)	mg/L	0.001	0.001	<0.001	0.002	<0.001	<0.001	0.002	<0.001	<0.001	0.001	<0.001	0.004	0.01	-	<0.001	<0.001	0.001
Sulphate (filtered)	mg/L	0.2		30	5.2	3.1	23	2.9	16	<1	15	6	4	17	-	17	8	6
Ammonia as N	mg/L	0.01		0.3	<0.1	0.3	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	0.01	<0.01
Nitrate (as N)	mg/L	0.05		1.00	0.48	0.59	0.34	0.82	0.64	0.32	0.54	0.44	0.18	1	-	2.24	0.23	<0.05
Nitrite (as N)	mg/L	0.03		<0.06	<0.06	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	<0.03	<0.05	<0.05
Total Kjeldahl Nitrogen	mg/L	0.1		1.5	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	0.3	0.3
Ammonia, Unionized	mg/L	0.01	0.02	-	-	-	-	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01
pH (Lab)	-	0.05	6.5-8.5	8.06	8.00	7.91	8.19	8.08	8.00	7.92	7.79	8.10	8.09	7.85	-	7.61	7.99	7.96
Electrical Conductivity (Lab)	µS/cm	1		774	601	595	625	656	749	642	746	651	603	587	-	717	738	496
Field																		
DO (Field)	mg/L		5	-	-	-	-	-	-	-	-	-	5.9	5.71	8.29	10.2	6.58	10.57
Redox (Field)	mV			-	-	-	-	-	-	-	-	-	-	180	145	120	10	87
Temperature (Field)	°C			-	-	-	-	-	-	-	-	-	13.8	12.2	18	2.7	8.8	12.5
Conductivity (field)	µS/cm			-	-	-	-	-	-	-	-	-	505	441	517	375	324	456
pH (Field)	-		6.5-8.5	-	-	-	-	-	-	-	-	-	7.75	7.92	7.55	8.81	7.22	7.45



Table 10 Surface Water Quality

	Unit	EQL	PWQO	S2	S2	S2	S2	S2	S2	S2	S2
				06 Nov 2014	22 May 2015	19 Nov 2015	16 May 2016	30 May 2019	29 Oct 2019	26 May 2020	18 Nov 2020
Metals											
Arsenic	µg/L	0.1	5	0.5	<0.2	0.6	0.2	<0.2	0.5	-	0.8
Barium	µg/L	0.02		110	108	109	91.5	59.3	115	-	106
Boron	µg/L	0.2	200	19.7	17.9	16.5	16	13	30	-	52
Calcium	µg/L	10		-	97,800	107,000	95,500	89,500	106,000	-	111,000
Cadmium	µg/L	0.003	0.1..0.5 ^{#1}	0.015	0.006	0.022	0.006	0.003	0.071	-	0.111
Chloride	µg/L	200		98,000	34,000	84,000	29,000	67,000	36,000	-	33,000
Chromium (III+VI)	µg/L	0.03	1 ^{#2}	<0.03	0.05	0.15	0.48	0.12	0.32	-	0.65
Copper	µg/L	0.02	1.5 ^{#1}	0.69	1.02	1.65	1.40	0.7	4.4	-	5
Iron	µg/L	2	300	30	42	51	44	20	25	-	316
Lead	µg/L	0.01	1.5 ^{#1}	0.06	<0.01	0.08	0.07	<0.01	0.17	-	0.48
Magnesium	µg/L	1		-	3,830	4,030	3,480	2,900	4,670	-	4,800
Manganese	µg/L	0.01		-	15.2	30.8	7.05	14.3	28.6	-	63.5
Mercury (filtered)	µg/L	0.01	0.2	<0.01	<0.01	<0.01	<0.01	<10	<10	-	<10
Phosphorus total (P2O5)	µg/L	3	30	50	21	<30	<30	8	404	-	136
Potassium	µg/L	2		-	2,330	2,690	1,940	1,070	6,100	-	7,130
Sodium	µg/L	10		-	22,100	54,600	19,400	42,800	20,300	-	15,500
Zinc	µg/L	2	20	4	5	8	7	3	9	-	15
Inorganics											
Alkalinity (total) as CaCO3	mg/L	2		257	269	251	222	235	168	-	220
Hardness (as CaCO3)	mg/L	1		-	-	-	-	-	-	-	-
Total Dissolved Solids	mg/L	3		483	351	446	346	363	489	-	423
Chemical Oxygen Demand	mg/L	5		38	9	18	<8	11	60	-	58
Total Suspended Solids	mg/L	2		6	<2	3	2	<2	28	-	34
Biochemical Oxygen Demand	mg/L	2		4	<4	<4	<4	<4	23	-	10
Phenols (4AAP)	mg/L	0.001	0.001	<0.001	0.001	0.002	0.001	0.003	0.011	-	0.002
Sulphate (filtered)	mg/L	0.2		42	2	26	9	7	89	-	54
Ammonia as N	mg/L	0.01		<0.1	<0.1	<0.1	<0.1	<0.1	0.3	-	<0.1
Nitrate (as N)	mg/L	0.05		<0.06	<0.06	0.13	0.21	<0.06	10.3	-	0.49
Nitrite (as N)	mg/L	0.03		<0.03	<0.03	<0.03	<0.03	<0.03	1.16	-	0.05
Total Kjeldahl Nitrogen	mg/L	0.1		0.7	<0.5	<0.5	<0.5	<0.5	1.1	-	0.7
Ammonia, Un-ionized	mg/L	0.01	0.02	-	-	-	-	<0.005	<0.005	<0.005	<0.005
pH (Lab)	-	0.05	6.5-8.5	8.07	7.98	7.88	8.24	7.7	7.72	-	7.72
Electrical Conductivity (Lab)	µS/cm	1		793	591	779	551	638	675	-	604
Field											
DO (Field)	mg/L		5	-	-	-	-	7.3	5.06	6.04	10.5
Redox (Field)	mV			-	-	-	-	-	190	151	100
Temperature (Field)	°C			-	-	-	-	14.9	13.9	18.1	0.4
Conductivity (field)	µS/cm			-	-	-	-	555	648	498	305
pH (Field)	-		6.5-8.5	-	-	-	-	7.52	7.74	7.5	9.36



Table 12 Monthly Summary of Accepted Materials

	Waste (tonnes)	C&D Materials (tonnes)	Containers (tonnes)	Fibres (tonnes)	Alcohol Containers (tonnes)	CFC Appliances (Units)	MHSW (tonnes)	Organics (tonnes)	Scrap Metal (tonnes)	Tires (Units)	WEEE (tonnes)	Wood Waste (tonnes)
January	221.28	-	1.12	1.86	-	2	-	1.20	-	10	-	-
February		-	1.25	1.21	-	1	-	0.98	-	6	-	4.08
March		-	1.24	1.78	0.34	-	-	-	1.95	3.13	-	-
April	250.55	-	1.11	1.64	-	3	-	1.55	-	14	1.98	2.45
May		3.56	1.50	2.55	0.19	7	-	1.03	5.95	37	-	8.95
June		-	1.80	2.79	0.37	6	-	-	2.60	2.94	47	1.61
July	289.17	4.18	3.47	2.99	0.85	9	-	1.86	3.82	17	-	3.67
August		-	3.86	3.57	1.34	2	-	-	1.41	9	-	4.12
September		2.26	2.41	2.35	0.44	5	-	-	3.69	5.65	28	1.93
October	215.9	2.42	1.43	2.93	0.47	9	-	2.10	-	68	1.73	-
November		-	0.96	1.39	0.22	5	-	-	-	24	-	-
December		-	1.43	2.10	-	2	-	-	1.88	-	23	-
Total	976.90	12.42	21.59	27.15	4.22	51	3.92	20.25	21.49	283	7.25	49.15



Appendices



Appendices

The following appendices are available in Part II – Appendices.

- Appendix A Monitoring and Screening Checklist**
- Appendix B Provisional Compliance Approval No. A341004**
- Appendix C Correspondence**
- Appendix D Field and Precipitation Data**
- Appendix E Laboratory Certificates of Analysis**
- Appendix F Photographs**
- Appendix G Borehole Logs**
- Appendix H Ministry Well Records**