

ALMA Guelph Phase 2

Preliminary Hydrogeological Investigation

Project Location: 601 Scottsdale Drive, Guelph, ON

Prepared for: Forum 601 Scottsdale LP 181 Bay Street, Toronto, ON

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Engineers, Scientists, Surveyors.



Contents

1.0	Intro	oduction	1
1.1	S	cope and Methodology	1
1.	.1.1	Background Review	1
1.	.1.2	Field Investigation	1
1.	.1.3	Preliminary Analysis and Reporting	1
1.	.1.4	Ongoing Monitoring and Report Update	2
2.0	Site	Description	2
3.0	Fiel	d Program	2
3.1	В	orehole Advancement and Monitoring Well Construction	2
3.2	N	Ionitoring Well Development	2
3.3	G	Groundwater Levels	3
3.4	G	broundwater Quality	3
4.0	Reg	gional Geology and Hydrogeology	3
4.1	Ρ	hysiography	3
4.2	G	uaternary Geology	3
4.3	Ρ	aleozoic Geology	4
4.4	R	egional Groundwater Flow	4
4.5	V	/ater Well Record Search	4
4.6	S	ource Water Protection	4
5.0	Loc	al Hydrogeologic Setting	5
5.1	G	eological Cross-Section	5
5.2	G	roundwater Elevations and Flow Direction	5
5.3	Н	lydraulic Conductivity	5
5.	.3.1	In-Situ Hydraulic Conductivity Testing	5
5.	.3.2	Grain Size	6
5.	.3.3	Hydraulic Conductivity Results	6
5.4	A	verage Linear Groundwater Velocity	6
5.5	G	Broundwater Quality	6
6.0	Pre	liminary Design Considerations	7
6.1	D	ewatering	7
7.0	Cor	clusions and Recommendations	8
8.0	Lim	itations	9
9.0	Ref	erences1	0

Figures

- Figure 1 Site Location Map
- Figure 2 Existing Features
- Figure 3 Physiographic Landforms
- Figure 4 Quaternary Geology
- Figure 5 MECP Water Well Location
- Figure 6 Wellhead Protection Areas
- Figure 7 Geological Cross-Section A-A'
- Figure 8 Interpreted Groundwater Flow Map (June 7, 2023)

Tables

- Table 1Groundwater Elevations
- Table 2
 MECP Water Well Record Summary
- Table 3Hydraulic Conductivity Summary
- Table 4Groundwater Quality Summary

Appendices

- Appendix A Site Concept Plan
- Appendix B Borehole Logs
- Appendix C Hydrographs
- Appendix D AquiferTest Results
- Appendix E Particle Size Distribution and Hydraulic Conductivity Estimates
- Appendix F Laboratory Certificates of Analysis

1.0 Introduction

MTE Consultants Inc. (MTE) was retained by Forum 601 Scottsdale LP to conduct a Preliminary Hydrogeological Investigation for a proposed residential development at 601 Scottsdale Drive, Guelph, Ontario (herein referred to as the 'Site'). **Figure 1** illustrates the Site location.

The Site currently consists of a student residence building with asphalt-surfaced parking areas and access driveways on the east half of the Site, and a vacant grass field on the west half of the Site. MTE understands that the proposed development includes two 7-storey student residence buildings, and a single-storey common hub area. The development is proposed to have one level of underground parking. Further, it is understood that new asphalt-surfaced parking and access driveways will be constructed at the Site, including reworking some of the existing asphalt areas. The Site will be municipally serviced for water supply and wastewater. On-Site infiltration may be considered within the western portion of the Site in the vicinity of the north drive entrance to the underground parking.

- 1.1 Scope and Methodology
- 1.1.1 Background Review
 - Topography, physiography, geological and hydrogeological mapping on file with the City of Guelph, Grand River Conservation Authority, the Ontario Geological Survey, and the Ministry of Natural Resources and Forestry (MNRF).
 - Available nearby well records on file with the Ministry of the Environment, Conservation and Parks (MECP).
- 1.1.2 Field Investigation
 - Installation of three monitoring wells installed during the concurrent geotechnical investigation.
 - Development and collection of stabilized water levels from newly constructed monitoring wells.
 - In-situ single well hydraulic response testing (slug testing) of two representative monitoring wells to determine the hydraulic conductivity of the saturated soils on-Site.
 - Collection of two unfiltered groundwater samples for analysis of a suite of parameters and compared to the City of Guelph Storm and Sanitary Sewer By-Laws.
 - Installation of electronic data loggers to monitor groundwater on a continuous basis in two newly constructed monitoring wells.

1.1.3 Preliminary Analysis and Reporting

Summarize findings in a letter report to be reviewed and signed by a Professional Geoscientist or Engineer licensed to practice in Ontario. The report will address the following items:

- The topography, physiography, and geology of the subsurface soils.
- A hydrogeologic characterization of the Site including groundwater levels, gradients, flow direction, and hydraulic conductivity.
- Assessment of potential for construction dewatering and required permitting/approvals.
- Preliminary assessment of groundwater quality for potential discharge to local storm and/or sanitary sewer should construction dewatering be required.

- Summary of identified groundwater receptors and discussion of the potential for the proposed development to impact these receptors.
- Recommendations for additional work, groundwater monitoring and/or mitigation, as appropriate.

1.1.4 Ongoing Monitoring and Report Update

This Preliminary Hydrogeological Investigation Report is based on data collected at the time of the field investigation and includes water levels that represent a limited duration of time. To support final design, an addendum to this report will be prepared that will include a longer monitoring time period, which will also evaluate the seasonal high groundwater level based on continuous monitoring at the Site.

2.0 Site Description

The Site is approximately 6 acres in size, currently consisting of a student residence building with asphalt-surfaced parking areas and access driveways on the east half of the Site, and a vacant grass field on the west half of the Site. The Site is bordered by Stone Road West to the south, the Halon Parkway to the west, adjacent properties to the north, and Scottdale Drive to the east. The ground surface at the Site generally slopes down from the northeast end of the Site to the southwest end of the Site. Ground surface elevations measured at the borehole locations vary from Elevation 333.9 to 326.7 m above mean sea level (amsl). The Site features are shown on **Figure 2**.

A Preliminary Concept Plan for the proposed development is provided in **Appendix A**. The plan includes two 7-storey student residence buildings, a single-storey common hub area, and associated surface parking.

3.0 Field Program

3.1 Borehole Advancement and Monitoring Well Construction

In conjunction with the Geotechnical investigation, boreholes were advanced and monitoring wells installed across the Site. Between February 21 and 27, 2023, London Soil Test Ltd. used a track-mounted D50 Turbo drill rig to complete the advancement and installation of monitoring wells BH102-23 to BH107-23, MW108-23, BH109-23, BH110-23 and BH112-23 to BH116-23. On March 8, 2023, Direct Environmental Drilling Inc. used a track-mounted Geoprobe 7822DT drill rig to advance boreholes and install monitoring wells MW101-23 and MW111-23. Boreholes and monitoring wells were advanced to depths ranging from 3.5 m to 11.9 m below ground surface (bgs).

The monitoring wells at the Site were surveyed by MTE to a geodetic benchmark. Borehole and monitoring well locations are illustrated on **Figure 2**. Borehole logs are provided in **Appendix B**.

3.2 Monitoring Well Development

The monitoring wells were developed on March 22, 2023 using Waterra[™] Surge Blocks to remove any accumulated sediments from the bottom of the well and to remove fine materials from the well screen and sand pack. Monitoring well development included the removal of three well volumes and/or purging the well dry on three occasions. Monitoring well development was completed prior to the installation of the data loggers.

3.3 Groundwater Levels

Manual groundwater levels were collected from on-Site monitoring wells on five occasions between March 22 and June 30, 2023. Manually measured groundwater levels and elevations within on-Site monitoring wells are presented in **Table 1**. In addition, data loggers were installed in two of the on-Site monitoring wells (MW101-23 and MW108-23). Data loggers measure the pressure of water (in cm) above the logger, which can then be compensated for atmospheric pressure to determine a groundwater level. The continuous hourly groundwater level information collected by data loggers allows for an assessment of seasonal groundwater trends and responses to precipitation events.

Hydrographs 1 and **2** (**Appendix C**) present groundwater elevation information from the data loggers installed within monitoring wells MW101-23 & MW108-23. Precipitation data (Environment Canada Guelph Turfgrass Station) is also presented on the hydrographs to illustrate the relationship between the shallow groundwater table and precipitation events. The gap in continuous data on **Hydrograph 2** between May 12 and June 7, 2023 is a result of the data logger memory becoming full. The datalogger was subsequently reset on June 7, 2023.

3.4 Groundwater Quality

Groundwater samples were collected from MW101-23 and MW108-23 on March 23, 2023. Prior to sampling, all monitoring wells were either purged a minimum of three standing well volumes or purged dry three times to ensure representative samples were collected from the shallow groundwater flow system. Following purging, groundwater samples were collected using dedicated Waterra tubing and foot valves, placed into laboratory supplied bottles and shipped under chain-of-custody, in an ice packed cooler to ALS Laboratory Group in Waterloo, ON. The groundwater analytical results for the Site were compared to the City of Guelph Storm and Sanitary Sewer Use By-Law (1996)-15202

4.0 Regional Geology and Hydrogeology

4.1 Physiography

The Site is located within the broad physiographic region known as the Guelph Drumlin Field. The Guelph Drumlin Field occupies an approximate area of 830 km² and these drumlins are generally broad and oval in shape. The drumlins mainly consist of loamy and calcareous till derived from the dolostone of the Amabel Formation. Within this physiographic region the materials encountered are stony tills which are sand rich based on grain sizes (Chapman and Putnam, 1984).

The Site is located in the physiographic landform known as till plains (drumlinized). The physiographic landforms are presented on **Figure 3** (Chapman and Putnam, 1984).

4.2 Quaternary Geology

Geology throughout the City of Guelph is generally comprised of three distinct till units identified from youngest to oldest as the Wentworth Till, the Middle Maryhill Till and the Catfish Creek Till, overlying bedrock. The Wentworth Till is described as a coarse-grained sandy to silty sand till which is often bouldery or stony (Karrow, 1968). This unit is generally found at ground surface throughout the City of Guelph and includes glacial features such as drumlins, found within the Guelph Drumlin Field, and the Galt and Paris moraines. The till thickness is described as variable, ranging between 15 to 30 m below drumlins and moraines, while thicknesses are much lower within low-lying areas.

Quaternary geology mapping (**Figure 4**) indicates that the surficial geology beneath the Site is mapped as glaciofluvial outwash and ice stratified deposits. The glaciofluvial outwash deposits are described as gravel and sand, including proglacial river and deltaic deposits (*Ontario Geologic Survey*, 2010).

4.3 Paleozoic Geology

The Site is underlain by the Upper Silurian dolomite of the Guelph Formation. The Guelph formation is described as tan to brown, fine- to medium-crystalline, fossiliferous, dolostone that is locally biohermal (Armstrong and Carter, 2010). Bedrock was not encountered during the geotechnical drilling program.

Based on water well records in the area, the bedrock surface is expected to be encountered at depths of approximately 25 m to 50 m bgs. The water well records also indicate that the primary water supply aquifer in the area is bedrock.

4.4 Regional Groundwater Flow

Regional shallow groundwater elevations, provided by the Grand River Conservation Authority (GRCA) (published 2009), indicate that the regional shallow groundwater elevations in the vicinity of the Site are approximately 310 m amsl. In addition, the regional shallow groundwater flow direction is interpreted as westerly towards the Speed River, located approximately 1.3 km west of the Site.

4.5 Water Well Record Search

Hydrogeological data related to private water supply wells within 500 m of the Site were obtained from water well records on-file with the Ministry of the Environment, Conservation and Parks (MECP). A total of 57 water well records were located within 500 m of the Site (**Figure 5**). Of the 57 water well records, the following primary use was listed on the water well record:

- 33 water supply wells;
- 14 monitoring/observation wells or test holes;
- 5 records with no use specified; and
- 4 abandonment records.

MECP water well records are summarized in **Table 2**. Based on the available water well records, there are private water supply wells within the Study Area that are used for Domestic water supply. According to the water well records, these wells are completed into the underlying bedrock.

4.6 Source Water Protection

The closest municipal well to the Site is the University well, located approximately 700 m northeast of the Site. This municipal well is completed into the deep bedrock aquifer and is approximately 80 m deep. The Site is located in Wellhead Protection Area (WHPA) B which is the two to five-year time of travel capture zone (**Figure 6**), with a vulnerability score of 6 to 8. The Site is also located within a mapped Significant Groundwater Recharge Area (SGRA) and an Issue Contributing Area (ICA) for trichloroethylene.

5.0 Local Hydrogeologic Setting

5.1 Geological Cross-Section

Boreholes and monitoring wells installed for this investigation were used to interpret local hydrostratigraphic units and generate one geological cross-section. The location of the cross-section is provided on **Figure 2**; the geological cross-section is presented in **Figure 7**.

Geological Cross-Section A-A' (Figure 7):

- Extends approximately 225 m from southwest to northeast.
- Topography slopes from southwest to northeast from approximately 327 to 334 m amsl.
- The Site is underlain by fill materials that range in thickness from approximately 1 to 3 m.
- The fill material is underlain by a sand deposit, consisting of gravelly sand to silty sand, extending to approximately 320 m amsl on the southwest and 331 m amsl on the northeast.
- The sand deposit is underlain by sandy silt deposits extending to the depth of the investigation.

The stratigraphy consists of a surficial layer of shallow fill above sand and sandy silt deposits. Bedrock was not encountered in the boreholes to the depths explored (up to 12 m bgl). The sand and sandy silt deposits are consistent with glaciofluvial outwash deposits.

5.2 Groundwater Elevations and Flow Direction

Daily precipitation data was plotted on the hydrographs presented in **Appendix C** to determine how the water table responds to precipitation events. The precipitation data was obtained from the Government of Canada website as reported from the Guelph Turfgrass weather station. As shown on the hydrographs, the monitoring wells do not show noticeable responses to precipitation events.

Groundwater levels at the Site appear to still be rising since drilling and well development activities. Continuous monitoring of groundwater elevation data will allow for the assessment of static and seasonal fluctuations of the water table and provide additional information on the short-term responses to precipitation events.

Groundwater elevations were observed to be the highest with 321.5m amsl at MW108-23 in June 2023.

Groundwater flow mapping was created for the Site using groundwater levels measured on June 7, 2023. Interpreted shallow groundwater elevation contours are illustrated on **Figure 8**. MTE notes that on-Site monitoring wells were only completed on the western half of the Site, as such the groundwater elevation on the eastern half of the Site may differ from that shown on **Figure 8**. Groundwater on the western half of the Site is interpreted to flow from east to west.

5.3 Hydraulic Conductivity

5.3.1 In-Situ Hydraulic Conductivity Testing

MTE conducted single well hydraulic response tests (SWRT) on two monitoring wells (MW101-23 and MW111-23) in March and June 2023. SWRTs typically involve the rapid introduction and/or removal of a slug of known displacement to raise and/or lower the water level in a monitoring well. The response of this rapid change is measured over time and used to calculate hydraulic conductivity. In wells with a water level reported within the screened interval, the response to the introduction of a solid slug can be influenced by the sand pack around the well

screen. As the water level within MW101-23 on the day of testing was noted to be within the screened interval, MW101-23 was purged dry and the rate of recovery was recorded using a data logger programmed to collect a water level every second.

A representative test from each well was analyzed using the Bouwer and Rice methodology using AquiferTest© Pro Software (Waterloo Hydrogeologic Inc., 2020). A copy of the AquiferTest© data sheets are located in **Appendix D**.

5.3.2 Grain Size

Selected soil samples obtained during drilling activities were submitted for gradation and hydrometer analysis, as part of the geotechnical investigation. Particle size distribution reports are provided in **Appendix E**.

5.3.3 Hydraulic Conductivity Results

Based on review of the borehole logs and grain size analyses, sediment types generally range from silt to gravelly silty sand, trace clay. Altogether, five samples were analyzed with the results summarized in **Table 3**. The hydraulic conductivities of the tested soils (silt to gravelly silty sand) across the Site ranges from 1.2×10^{-8} m/sec to 1.5×10^{-9} m/sec. These results are consistent with average published values for silt and till soils (Freeze and Cherry, 1979).

The hydraulic conductivity results from the in-situ hydraulic response tests completed at MW101-23 and MW111-23 were $9.9x10^{-7}$ m/sec and $8.4x10^{-7}$ m/sec, respectively, with the estimated geometric hydraulic conductivity value of $9.1x10^{-7}$ m/sec.

5.4 Average Linear Groundwater Velocity

The horizontal hydraulic gradient, based on the June 7, 2023 groundwater elevations (**Figure 8**), is calculated to be 0.02 m/m.

The average linear groundwater velocity can be calculated using Darcy's Law, as follows:

 $q = (Ki)/n_e$

Where:

q = average linear groundwater velocity (m/sec)

K = hydraulic conductivity (9.1x10⁻⁷ m/sec (SWRT geometric mean))

i = horizontal hydraulic gradient (0.02 m/m)

 n_e = effective sediment porosity (0.26 based on the calculations in Appendix E)

Using the above values, the average linear groundwater velocity at the Site is estimated to be approximately 2.4 m/year.

5.5 Groundwater Quality

Groundwater samples were analyzed for the City of Guelph Storm and Sanitary Sewer Use By-Law (1996)-15202 criterion. Analytical results have been compared to the City of Guelph Sewer Use By-Law criterion and are presented in the appended **Table 4**. Unabbreviated laboratory certificates of analysis are presented in **Appendix F**.

Tables 5.5.1 and **5.5.2** below indicate which parameters exceeded either the City of Guelph's Storm and/or Sanitary Sewer Use By-Law.

Parameter	Storm Sewer Limit (mg/L)	MW101-23 (mg/L)	MW108-23 (mg/L)
TSS	15	738	12500
Copper	0.01	0.0122	0.118
Lead	0.05	0.00826	0.0731
Nickel	0.05	0.00749	0.111
Zinc	0.05	0.0836	0.368

Table 5.5.1 – City of Guelph Storm Sewer Exceedances for Total Suspended Solids (TSS) and Total Metals

Table 5.5.2 – City of Guelph Sanitary Sewer Exceedances for Total Suspended Solids (TSS) and Total Metals

Parameter	Sanitary Sewer Limit (mg/L)	MW101-23 (mg/L)	MW108-23 (mg/L)
TSS	350	738	12500
Iron	50	4.58	94.4

6.0 Preliminary Design Considerations

6.1 Dewatering

The shallowest elevation to water measured by MTE in on-Site monitoring wells to date is 321.5m amsl. The current concept plan for the Site includes one level of underground parking with a proposed finished floor elevation (FFE) of 325.6m amsl. The current separation between the shallowest water level measured and the proposed FFE is approximately four metres. Based on the estimated separation, it is not anticipated that dewatering of groundwater will be required. MTE recommends continuous groundwater monitoring occur during the Site plan approval process, as well as during final design to track seasonal changes in groundwater elevations on-Site.

7.0 Conclusions and Recommendations

Based on this hydrogeological investigation, MTE offers the following findings:

- The stratigraphy consists of a surficial layer of shallow fill above sand and sandy silt deposits. Bedrock was not encountered in the boreholes to the depths explored.
- The shallow groundwater flow direction beneath the Site is interpreted to be westerly.
- The horizontal hydraulic gradient of the groundwater table beneath the Site was estimated at 0.02 based on the June 7, 2023 groundwater contours (**Figure 8**).
- Hydraulic conductivity of the underlying materials on-Site is estimated to range from 9.9x10⁻⁷ m/sec to 8.4x10⁻⁷ m/sec with a geometric mean of 9.1x10⁻⁷ m/sec.
- Based on a review of on-Site groundwater elevations and the proposed FFE there is approximately four metres of separation, as such at this time dewatering is not anticipated to be required at the Site.

Recommendations

- Continuous groundwater monitoring to occur during the Site plan approval process, as well as during final design to track seasonal changes in groundwater elevations on-Site.
- During the development application process, existing on-Site groundwater monitoring wells should be maintained.
- Should on-Site infiltration be considered, MTE recommends completing on-Site In-situ infiltration testing.
- Upon monitoring well decommissioning, monitoring wells are to be decommissioned in accordance with Ontario Regulation 903 (as amended).
- If, upon final confirmation of building and servicing design, it is anticipated that the water table may be intercepted during construction activities, a dewatering assessment should be completed.

8.0 Limitations

Services performed by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering & Consulting profession. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of MTE and the Client. The assignment was carried out in accordance with the Scope of Work described in Section 1.1 as reviewed with and agreed to by the Client. MTE makes no representation that the present report has dealt with all of the important environmental issues, except as provided in the Scope of Work. This report is not intended to be exhaustive in scope or to imply a risk-free facility. As such, this report may not deal with <u>all</u> issues potentially applicable to the Site and may omit aspects which are or may be of interest to the reader.

In addition, it should be recognized that a soil sample or groundwater level measurement represents one discrete portion of the Site at the time it is collected, and that the findings of this report are based on conditions as they existed during the time period of the investigation.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by another party as a result of decisions made or actions taken, based upon this report. Others with interest in the Site should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because environmental conditions of a property can change, along with regulatory requirements. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may determine whether it affects the contents of this report.

All of which is respectfully submitted,

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Ministry of the Environment and Climate Change Source Protection Information Atlas:

https://www.google.ca/search?q=moecc+source+water+protection+information+atlas&rlz=1C1G GRV_enCA751CA751&oq=moecc+source&aqs=chrome.1.69i57j35i39j0l4.3688j0j4&sourceid=c hrome&ie=UTF-8&safe=active&ssui=on

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Date September 2023	/*	Date September 2023	8	





Table 1: Groundwater Elevations (m amsl)



Date	MW101-23	MW108-23	MW111-23
GSE	326.73	328.44	327.64
22-Mar-23	317.91	319.48	dry
23-Mar-23	317.90	319.54	nm
7-Jun-23	319.57	321.24	320.42
29-Jun-23	319.68	321.32	320.50
30-Jun-23	319.69	321.33	320.55

Notes:

m amsl = metres above mean sea level GSE = ground surface elevation

	MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Material 1	Material 2	Material 3
															1.8	Gravel	Clay	
9 9															9.1	Medium Sand	Stones	
961093 961093 961094 96109															24.4	Medium Sand		
670140 670140 6701 <td>6700935</td> <td>561096.3</td> <td>4818426</td> <td>1967</td> <td>101.6</td> <td>56 7</td> <td>Cable Tool</td> <td>Water Supply</td> <td>Domestic</td> <td>Fresh</td> <td>51.8</td> <td>56 69</td> <td>13 7</td> <td>68.2</td> <td>33.8 Grey</td> <td>Clay</td> <td></td> <td></td>	6700935	561096.3	4818426	1967	101.6	56 7	Cable Tool	Water Supply	Domestic	Fresh	51.8	56 69	13 7	68.2	33.8 Grey	Clay		
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6701469 68198.0 68198.0 68198 78198 <td></td> <td>50.3 Blue</td> <td>Limestone</td> <td></td> <td></td>															50.3 Blue	Limestone		
6701469 681596.3 4816522 1965 127 47.2 Gale Tool Water Supply Paresh Fresh 88.1 47.2 6.6 1.00															51.8 Black	Limestone		
6701469 56150.3 481852 1955 127 47.2 Cable Tool Water Supply Presh 86.1 47.2 107 Gravel Medium Sand															56.7 Grey			
6701469 56159.3 481852 1955 127 47.2 Cable Tool Water Supply Domesic Fresh 38.1 47.2 10.7 Graveled Medium Sand															0.6	I opsoil		
6701469 66196.3 481852 1955 127 47.2 Cable Tool Water Supply Water Supply Parameter Fresh 88.1 47.24 10.7 Circle (10.7) Medium Sand (15.5) Medium Sand Medium															4.9	Medium Sand	Ma dia ma Carad	
6701469 561596.3 4816522 1955 127 47.2 Gable Tool Water Supply Domesice Fresh 38.1 47.2 10.7 1.32 Odd Medium Sand 1.42 Calay Sources 1.42 Calay Sources 1.42 Calay Sources 1.42 <															10.7	Gravel	Medium Sand	
6701469 661596.3 431852 1955 127 47.2 Cable Tool Water Supply Domesto Fresh 38.1 47.2 10.7 10.5 Medium Gand Images and															15.7	Ciay Modium Sond	wealum Sana	
6701469 561596.3 481852 1955 127 47.2 Cable Tool Water Supply Domestic Fresh 38.1 47.24 10.7 31.8 17.4 Coarse Sand Image: Coarse Sa															16.5	Hardnan		
6701470 560954.3 4818359 1955 101.6 47.2 Logue Logue Logue Sociese Logue Logue <td< td=""><td>6701469</td><td>561596.3</td><td>4818522</td><td>1955</td><td>127</td><td>47.2</td><td>Cable Tool</td><td>Water Supply</td><td>Domestic</td><td>Fresh</td><td>38.1</td><td>47.24</td><td>10.7</td><td>31.8</td><td>17.4</td><td>Coarse Sand</td><td></td><td></td></td<>	6701469	561596.3	4818522	1955	127	47.2	Cable Tool	Water Supply	Domestic	Fresh	38.1	47.24	10.7	31.8	17.4	Coarse Sand		
6701470 560954.3 4818359 1955 101.6 47.2 Cabe Tool Water Supply Water Supply Domestic Domestic Fresh 21.3 47.2.4 0.1 Clay (10,7) Stones 1 6701470 560954.3 4818359 1955 101.6 47.2 Cabe Tool Water Supply Domestic Fresh 21.3 47.2.4 9.1 36.6 Clay (10,7) Medium Sand (10,7) Med															21.6	Hardpan	Medium Sand	
6701470 560954.3 481839 1955 101.6 47.2 Cable Tool Nume Num Num <td></td> <td>24.4</td> <td>Clav</td> <td>Stones</td> <td></td>															24.4	Clav	Stones	
Image: here in the image: he															33.5 Brown	Limestone		
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6701470 560954.3 4818359 1955 101.6 47.2 Gable Tool Water Supply Domestic Fresh 21.3 47.24 9.1 36.4 10.7 Medium Sand Medium Sand Cable Tool Water Supply Domestic Fresh 21.3 47.24 9.1 36.4 10.7 Medium Sand Medium Sand Cable Tool Water Supply Domestic Fresh 21.3 47.24 9.1 36.4 10.7 Medium Sand (10.7															47.2 Black	Limestone		
6701470 560954.3 4818359 1955 101.6 47.2 Cable Tool Water Supply Domestic Fresh 21.3 47.2 47.2 Medium Sand Clavel 10.7 Medium Sand 10.7 10.7 Medium Sand </td <td></td> <td>0.3</td> <td>Topsoil</td> <td></td> <td></td>															0.3	Topsoil		
6701470 680954.3 4818359 1955 101.6 47.2 Cable Tool Water Supply Domestic Fresh 47.24 9.1 47.24 9.1 10.7 Medium Sand Gravel 10.0 Clay 10.0 Clay 10.0 Clay 10.0 Clay 10.0 Clay 10.0 Medium Sand Medium Sand 10.0 Medium Sand Medium S															4.9	Medium Sand		
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6701470 560954.3 4818359 1955 101.6 47.2 Cable Tool Water Supply Domestic Fresh 21.3 47.2 9.1 36.4 16.2 Medium Sand Images in the s															13.7	Medium Sand	Clay	
6701470 560954.3 4818359 1955 101.6 47.2 Cable Tool Water Supply Domestic Fresh 21.3 47.2 9.1 36.4 18.3 Hardpan Image and															16.2	Medium Sand		
6701470 500304.3 4810303 100.3 47.2 Cable 100 Water Outply Demestic 110.4 21.3 47.2 50.4 19.5 Fine Sand Image: Sand	6701470	560054 3	1818350	1055	101.6	17.2	Cable Tool	Water Supply	Domestic	Fresh	21.3	17 21	0.1	36 /	18.3	Hardpan		
6701471 561152.3 4818359 1956 101.6 54.3 Cable Tool Sulphur 45.1 54.25 12.8 68.27 Greyu Limestone Imestone <	0701470	500354.5	4010009	1955	101.0	47.2			Domestic	116311	21.0	47.24	5.1	50.4	19.5	Fine Sand		
Fire the target in targ															28.7 Brown	Limestone		
6701471 561152.3 4818359 1956 101.6 54.3 Cable Tool Water Supply Domestic Fresh 30.2 30.18 3.7 45.5 30.2 Grey Limestone Imestone Im															32 Grey	Limestone		
Image: Region of the state															39.6 Black	Limestone		
Image: height in the stand in the															45.7 Grey	Limestone		
6701471 561152.3 4818359 1956 101.6 54.3 Cable Tool Water Supply Domestic Sulphur 45.1 54.25 12.8 68.2															47.2 Brown	Limestone		
6701471 561152.3 4818359 1956 101.6 54.3 Cable Tool Water Supply Domestic Sulphur 45.1 54.25 12.8 68.2 12.2 Gravel Medium Sand Clay 6701471 56036.3 4818404 1957 101.6 30.2 Cable Tool Water Supply Domestic Fresh 30.2 30.18 3.7 45.5 9.8 Fine Sand Imestone Imestone <td></td> <td>0.6</td> <td>lopsoil</td> <td></td> <td></td>															0.6	lopsoil		
6701471 561152.3 4818359 1956 101.6 54.3 Cable Tool Water Supply Domestic Sulphur 45.1 54.25 12.8 68.2															12.2	Gravel	Medium Sand	
6701471 561152.3 4818359 1956 101.6 54.3 Cable Tool Water Supply Domestic Sulphur 45.1 54.25 12.8 68.2 68.2 61.2 Clay Gravel Complexity Complexity Complexity Complexity Cable Tool Water Supply Domestic Sulphur 45.1 54.25 12.8 68.2 </td <td></td> <td>24.7</td> <td>Medium Sand</td> <td>Gravel</td> <td>Clay</td>															24.7	Medium Sand	Gravel	Clay
6701471 561152.3 4818359 1956 101.6 54.3 Cable 1001 Water Supply Domestic Supnur 45.1 54.25 12.8 68.2 33.2 Clay Gravel Gravel 6701471 560936.3 4818404 1957 101.6 30.2 Cable Tool Water Supply Domestic Supnur 45.1 54.25 12.8 68.2 33.2 Clay Gravel	0704474	564450.0	4040050	1050	101.0	54.0		Mater Cumple	Domostia	Culmbur	45 4	E4 0E	10.0	<u> </u>	29.0	Gravel	Orrevial	
Image: here Imag	0/014/1	201122.3	4010359	1900	0.101	54.3		vvaler Supply	Domestic	Suipnur	45.1	54.25	12.8	00.2	30.2 31 1	Ulay Medium Sand	Glavel	
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $															42.4 15.1 Brown	Limestone		
6701472 560936.3 4818404 1957 101.6 30.2 Cable Tool Water Supply Domestic Fresh 30.2 30.18 3.7 45.5 30.2 Grey Linestone															54 3 Grov	Limestone		
6701472 560936.3 4818404 1957 101.6 30.2 Cable Tool Water Supply Domestic Fresh 30.2 30.18 3.7 45.5 30.2 Grev Limestone															9.8	Fine Sand		
	6701472	560936.3	4818404	1957	101.6	30.2	Cable Tool	Water Supply	Domestic	Fresh	30.2	30.18	3.7	45.5	30.2 Grev	Limestone		



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Material 1	Material 2	Material 3
6701/73	560878 3	1818130	1057	101.6	33.5	Cable Tool	Water Supply	Domestic	Fresh	33.5	33 53	1	27.3	10.4	Fine Sand		
0/014/3	500070.5	4010433	1907	101.0	55.5			Domestic	116311	55.5	55.55	4	21.5	33.5 Grey	Limestone		
														0.6	Topsoil		
														5.2	Medium Sand	Gravel	
														9.1	Gravel		
														16.5	Medium Sand	Clay	
														18.3	Gravel	Medium Sand	
6701474	561166 3	4818484	1958	101.6	51.2	Cable Tool	Water Supply	Domestic	Fresh	43 3	51 21	13 7	68 2	29.3 Grey	Clay	Gravel	
0.0.11	00110010	1010101	1000	10110	02		mater eappry	Benneedle	1 room	10.0	01.21		00.2	32 Brown	Clay	Gravel	
														37.8 Grey	Clay		
														39.3	Coarse Sand		
														42.7	Gravel		
														44.5	Limestone		
														51.2 Grey	Limestone		
														12.2	Fine Sand		
														12.8	Gravel		
6701478	561136.3	4818437	1964	101.6	41.5	Cable Tool	Water Supply	Domestic	Fresh	24.4	41.45	9.1	45.5	15.5	Fine Sand		
														24.4 Brown	Limestone		
														41.5 Black	Limestone		
						<u> </u>				.		.		12.8	Gravel	Medium Sand	
6701486	560711.3	4818379	1964	101.6	31.1	Cable I ool	Water Supply	Domestic	Fresh	31.1	31.09	9.1	18.2	29 Grey	Limestone		
														31.1 Brown	Limestone		
6701490	560712.3	4818364	1964	101.6	29.6	Cable Tool	Water Supply	Domestic	Fresh	29.6	29.57	9.1	27.3	12.8	Gravel		
							,							29.6 Grey	Limestone		
6701491	560709.3	4818379	1958	101.6	27.7	Cable Tool	Water Supply	Domestic	Fresh	27.7	27.74	8.2	45.5	8.8	Gravel		
														27.7 Grey	Limestone		
6701492	560751.3	4818410	1963	101.6	29.3	Cable Tool	Water Supply	Domestic	Fresh	29.3	29.26	9.1	18.2	11.3 20.2 Droum	Gravel		
														29.3 Brown	Limestone		
														1.2	10psoli Madium Sand	Craval	
														0.4		Graver Modium Sond	
6701505	560744 2	4010400	1056	107	25.0	Cable Teel	Water Supply	Domostio	Freeb	24.4	25.01	10		0.0	Ciay Fina Sand	Medium Sanu	
0701505	000744.5	4010409	1950	127	20.9	Cable 100	water Supply	Domestic	Flesh	24.4	20.91	4.9	40.0	10.1			
														14.3 DIOWII	Limestone		
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6701506	561120 3	4818108	1058	101.6	28	Cable Tool	Water Supply	Domostic	Freeb	24.4	28.04	61	15 5	9.0 13.7 \\/bito		Glavel	
0701300	301120.3	4010100	1950	101.0	20		Water Suppry	Domestic	TIESH	24.4	20.04	0.1	45.5	28 Brown	Limestone		
														Q 1	Gravel		
6701507	560787.3	4818312	1958	101.6	28.7	Cable Tool	Water Supply	Domestic	Fresh	28.7	28.65	7.6	45.5	28.7 Grev	Limestone		
														12 2	Gravel		
6701509	560712.3	4818361	1961	101.6	30.8	Cable Tool	Water Supply	Domestic	Fresh	30.8	30.78	7.6	45.5	30.8 Grev	Limestone		
														50.0 Grey	LITICSLUIC		



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
														10.7		Gravel		
6701510	560710.2	4010200	1061	101.6	20	Coble Tool	Water Supply	Domostio	Freeb	20	20.06	7.0	26.4	12.5		Medium Sand		
0/01510	500712.5	4010309	1901	101.0	29	Cable 100	water Supply	Domestic	Flesh	29	20.90	7.9	30.4	24.4	Grey	Limestone		
														29	Brown	Limestone		
														6.7		Gravel		
6701511	560783.3	4818447	1959	101.6	28.7	Cable Tool	Water Supply	Domestic	Fresh	28.7	28.65	9.1	31.8	9.4		Fine Sand		
														28.7	Brown	Limestone		
6701513	560781.3	4818450	1965	101.6	29.6	Cable Tool	Water Supply	Domestic	Fresh	29.6	29.57	7	45 5	12.2		Gravel	Stones	
0/01010	000701.0	4010400	1000	101.0	20.0			Domestic	TICSH	20.0	20.01	'	40.0	29.6	Brown	Limestone		
														0.6		Topsoil		
														2.4		Gravel		
														4.3		Medium Sand	Gravel	
6701515	561024.3	4818195	1953	101.6	25.6	Cable Tool	Water Supply	Domestic	Fresh	22.3	25.6	4.3	18.2	8.5		Clay		
	00102110	1010100	1000	10110	20.0		mater cappij	Denneeue	110011		20.0		10.2	9.1		Gravel		
														17.7	White	Limestone		
														22.3	Yellow	Medium Sand	Limestone	
														25.6	Grey	Limestone		
														0.6		Topsoil		
														2.7		Gravel		
														4.3		Medium Sand	Gravel	
6701516	560963.3	4818259	1953	101.6	27.4	Cable Tool	Water Supply	Domestic	Fresh	19.5	27.43	5.2	22.7	8.8		Clay		
														9.8	A /1 - 1/	Gravel	Medium Sand	
														19.5	White	Limestone		
														23.2	Yellow	Limestone		
														27.4	Grey	Limestone		
														22.9	C rest	Medium Sand		
6701517	560064 2	4010201	1056	101.6	51.0	Coble Tool	Water Supply	Domostia	Freeb	51 0	E1 01	11	15 5	30.1 20.7	Grey	Ciay		
0/01517	000004.0	4010391	1950	101.0	51.Z	Cable 100	water Supply	Domestic	Flesh	51.2	31.21	11	40.0	30.7	Plack			
														49.1 51.2	Grov	Limestone		
														0.0	Gley	Tonsoil		
														0.9		Gravel	Stones	
														73			Stories	
														7.5 8.8		Medium Sand	Gravel	
														21.0		Clay	Hardnan	
														21.3		Medium Sand	Gravel	
6701519	561088.3	4818053	1953	101.6	61.6	Cable Tool	Water Supply	Domestic	Sulphur	54.9	61.57	14.3	22.7	23.0		Gravel		
														36		Clav	Medium Sand	
														47 Q		Clav		
														50.3		Fine Sand		
														51.2		Hardpan		
														61.6	Black	Limestone		
		1			1		1	1						0.10				



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
														1.2		Fill		
														5.5		Gravel		
6701520	5610793	4818168	1955	101.6	39.6	Cable Tool	Water Supply	Domestic	Fresh	39.6	39.62	8.5	31.8	16.8		Clay	Medium Sand	
0101020	001010.0	1010100	1000	10110	0010		Water Cappiy	Donnootio	110011	0010	00.02	0.0	0110	25.9		Gravel		
														38.7		Clay	Stones	
														39.6		Gravel	_	
														2.7		Fill	Stones	
														7.6		Clay	Stones	
														9.1		Hardpan		
0704504	504000 0	4047005	4057	101.0	04.0			D	F	57.0	04 57	11.0	54.0	24.4		Silt		
6701521	561082.3	4817965	1957	101.6	61.6	Cable I ool	Water Supply	Domestic	Fresh	57.9	61.57	11.3	54.6	30.5		Gravel		
														31.7		Medium Sand		
														46.9	Diask	Haropan		
														59.4	Black	Limestone		
														01.0	DIOWII	Topsoil		
														0.9 6.7		Medium Sand	Gravel	
														8.2		Gravel	Glaver	
														15.8		Silt		
6701522	561159.3	4818192	1958	101.6	41.8	Cable Tool	Water Supply	Domestic	Fresh	41.8	41.76	11.6	45.5	22.9		Clav	Gravel	
														24.4		Medium Sand		
														41.1		Clay	Stones	
														41.8		Medium Sand	Gravel	
														2.1		Previously Dug		
														3.7		Gravel		
														16.5		Clay	Medium Sand	
6701502	560067.2	1010167	1062	101.6	115	Cable Taal	Matar Supply	Domostio	Freeb	44.2	11 E	11	15 F	17.1		Boulders		
0701525	500907.5	4010107	1902	101.0	44.0	Cable 100	water Supply	Domestic	FIESH	44.Z	44.5		45.5	21.3		Clay	Gravel	
														24.4		Gravel		
														30.5	Brown	Limestone		
														44.5	Black	Limestone		
														0.6		Fill		
														2.4		Stones		
														4.9		Fine Sand		
6702405	561327 3	4818192	1960	101.6	42 4	Cable Tool	Water Supply	Domestic	Fresh	38 1	42 37	85	45 5	6.7		Clay	Gravel	
0.02+00	50 / OE / .0	1010102	1000	101.0	1 2 . T			2 0110000		50.1	.2.01	0.0	10.0	20.4	_	Gravel		
														24.4	Grey	Clay		
														40.2	Brown	Limestone		
														42.4	Black	Limestone		



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
														0.3		Topsoil		
														6.1		Medium Sand	Gravel	
														13.7	Grey	Clay	Gravel	
														18.3	Grey	Clay	Stones	
6702406	561355.3	4818216	1962	101.6	43.6	Cable Tool	Water Supply	Domestic	Fresh	43	43.59	7.6	22.7	20.7		Gravel	Stones	
														22.9		Medium Sand		
														41.1	Brown	Limestone		
														43.3	Grey	Limestone		
														43.6	Black	Limestone		
														13.7	0	Gravel	Medium Sand	
6702407	561413.3	4818236	1962	101.6	42.7	Cable Tool	Water Supply	Domestic	Fresh	42.7	42.67	6.1	31.8	18.3	Grey		Stones	
														41.1	Brown	Limestone		
														42.7	ыаск	Limesione		
6702409	561200.2	1919060	1062	150 /	21 /	Cable Teel	Water Supply	Domostia	Freeb	20	21 20	0.9	00.0	0.1			Modium Sond	
0702400	501299.5	4010009	1902	152.4	51.4	Cable 100	water Suppry	Domestic	FIESH	29	51.59	9.0	90.9	21.3		Limestone	Medium Sanu	
														61		Gravel		
6703289	560694 3	4818313	1968	101.6	22.9	Cable Tool	Water Supply	Domestic	Fresh	15.2	22.86	82	68.2	10.1		Medium Sand		
0705205	000004.0	+010010	1300	101.0	22.5		water ouppry	Domestic	TICSH	10.2	22.00	0.2	00.2	22.9	Brown	l imestone		
														9.8	BIOWII	Gravel	Medium Sand	
6703584	560704.3	4818373	1969	101.6	15.2	Cable Tool	Water Supply	Domestic	Fresh	17.1	17.07	7.9	45.5	17.1		Limestone		
						Other	Observation							10.7	Brown	Silt	Clav	Till
6715151	560932	4818353	2004	50.8	76.2	Method	Wells	-	-	-	79.25	-	-	79.2	Red	Rock		
														0.2	Black	Topsoil		
														1.8	Brown	Gravel	Clay	
														5.5	Brown	Sand	Clay	Gravel
						Determi								6.7	Brown	Clay	-	
6715259	561360	4818047	2004	1500	20	Rotary	-	Not Used	-	-	19.5	-	-	7.9	Brown	Gravel		
						(Convent.)								8.2	Red	Clay	Gravel	
														10.7	Grey	Clay	Gravel	Boulders
														15.5	Grey	Clay	Stones	
														19.5	Grey	Silt	Clay	Gravel
							Observation							0.2	Black			
6715306	561461	4818271	2005	50	7.6	Boring	Wells	-	-	10.6	13.6	-	-	4.5	Brown	Sand		
														13.6	Brown	Sand		
							Observation							8	Brown	Silt	Gravel	
6715372	561437	4818306	2005	51	7.5	Boring	Wells	-	-	10.5	13.68	-	-	10.1	Brown	Silt	Coarse Gravel	
														13.7	Brown	Silt	Coarse Gravel	
0745700	504400	4040004	0000	54	0.4	D .	Observation		- 1	0.7	10.1			4.5	Brown	Sand	Gravel	0
6/15/93	561492	4818334	2006	51	6.1	Boring	Wells	-	⊢resh	9.7	12.1	-	-	9.7	Brown		Sand	Gravel
														12.1	Grey	SIII	Sand	Gravel
7140047		4040000	2000	EA	0.4	Denia -	Observation	Maritania		0	10 F			0.5	Brown	Sand	Gravel	
/11861/	501453	4818292	2008	51	9.1	Boring	Wells	wonitoring	-	ŏ	13.5	-	-	10	Brown	Sand	Cilt	
														13.5	Grey	Sand	SIIT	



MECP Well No.	Easting	Northing	Year Drilled	Nominal Casing Diameter (mm)	Casing End (mBGS)	Drilling Method	Well Status	Well Use	Water Quality	First Water Found (mBGS)	Total Depth (mBGS)	Static Level (mBGS)	Rate (LPM)	Depth to Unit Base (m)	Colour	Material 1	Material 2	Material 3
							Ohaamustian							1.5	Brown	Sand	Gravel	Fill
7118618	561451	4818261	2008	51	8.2	Boring	Observation	Monitoring	-	9	13.6	-	-	6	Brown	Sand		
						_	vvens							13.6	Brown	Sand	Silt	
							Observation							1.5	Brown	Sand	Gravel	
7118619	561431	4818290	2008	51	7.6	Boring	Wells	Monitoring	-	8	12	-	-	7.6	Brown	Sand		
							VV CIIS							12	Brown	Sand	Silt	
7118620	561388	4818232	2008	-	-	Boring	Abandoned- Supply	-	-	-	-	-	-					
7118621	561422	4818226	2008	-	-	Boring	Abandoned- Supply	-	-	-	-	-	-					
							Observation							0.5	Brown	Sand	Gravel	
7118622	561459	4818221	2008	51	15.1	Boring	Wells	Monitoring	-	14	16.1	-	-	12	Brown	Sand		
							VV ello							16.1	Grey	Sand	Silt	
														1.5	Brown	Sand	Gravel	
7118623	561454	4818261	2008	51	13.2	Boring	Observation	Test Hole	_	75	13.2	_	_	6	Brown	Sand		
1110020	001101	1010201	2000	01	10.2	Doning	Wells	100011010		1.0	10.2			10	Brown	Sand	Gravel	
														13.2	Grey	Sand	Silt	
														1.5	Brown	Sand	Gravel	
7118624	561360	4818320	2008	51	6	Boring	Observation	Monitoring	-	-	12	-	-	6	Brown	Sand		
						Ū	vvelis							7.6	Brown	Sand	Gravel	
														12	Brown	Sand	Silt	F :11
							Observation							1.5	Brown	Sand	Gravei	FIII
7118625	561402	4818258	2008	51	6	Boring	Wells	Monitoring	Untested	8	12	-	-	76	Brown	Sand	Gravel	
							VV CIIS							12	Brown	Sand	Silt	
7223568	561486	/818211	2014											12	DIOWII	Cana	Ont	
1220000	001400	4010211	2014	_	_	Rotary	Observation	_		_	_		_	4 6	Brown	Sand	Gravel	Dense
7232304	561203	4818347	2014	50.8	7.6	(Reverse)	Wells	Monitoring	-	5.5	9.14	-	-	9.1	Grev	Silt	Gravel	Dense
						()								3	Brown	Clay	Silt	Soft
7044000	504470	1010110	0045	54	4 5	. .		-			7.0			5.4	Brown	Silt	Sand	Packed
7244083	561470	4818148	2015	51	4.5	Boring	l est Hole	l est Hole	Untested	6.9	7.6	-	-	6.9	Brown	Sand	Silt	
														7.6	Brown	Sand		Dense
7249783	561474	4818312	2015	-	-	-	Abandoned- Other	-	-	-	-	-	-					
7249852	561466	4818503	2015	-	-	-	-	-	-	-	-	-	-					
7249891	561489	4818292	2015	-	-	-		-	-	-	-	-	-					
7251638	561488	4818300	2015	-	-	-	-	-	-	-	-	-	-					
7269451	561203	4818347	2016	-	-	-	Abandoned- Other	Monitoring	-	-	-	-	-					
7328109	561626	4818819	2018	50.8	4.3	Auger	Observation Wells	Monitoring	-	-	6.1	-	-	6.1	Brown	Sand	Gravel	
7404590	561526	4818469	2021	-	-	-	-	-	-	-	-	-	-					
7405425	561512	4818610	2021	-	-	-	-	-	-	-	-	-	-					



Table 3: Hydraulic Conductivity Summary (m/sec)



In-Situ Hydraulic Conductivity						
Monitoring Well	Ground Surface Elevation	Screened Interval (m bgs/ m amsl)	Soil Description	Hydraulic Conductivity (m/sec)	Method	Calculation
MW101-23	326.70	9.9 - 11.4 316.8 - 315.3	Gravelly Silty SAND, some Clay	9.9 X 10 ⁻⁷	Recovery	Bouwer & Rice
MW111-23	327.70	5.7 - 7.2 322.0 - 320.5	SILT, some Clay, trace Sand	8.4 X 10 ⁻⁷	Rising Head	Bouwer & Rice

Particle Size Distribution						
Monitoring Well / Borehole Name	Ground Surface Elevation	Sample Identification and Depth (m bgs)	Screened Interval (m bgs/ m amsl)	Soil Description	Hydraulic Conductivity Range (m/sec)	Formula
MW101-23	326.70	SS-11 10.7-11.1	9.9 - 11.4 316.8 - 315.3	Gravelly Silty SAND, some Clay	3.0 x 10 ⁻⁹	Kozeny Carmen
MW108-23	328.50	SS-8 9.1- 9.8	9.7 - 11.2 318.8 - 317.3	SILT, some Clay, trace Sand	1.5 x 10 ⁻⁹	Kozeny Carmen
MW111-23	327.70	SS-5 3.0-3.7	5.7 - 7.2 322.0 - 320.5	SILT, some Clay and Gravel, trace Sand	1.6 x 10 ⁻⁹	Kozeny Carmen
MW111-23	327.70	SS-9 7.6-8.2	5.7 - 7.2 322.0 - 320.5	SILT, some Clay, trace Sand	3.7 x 10 ⁻⁹	Kozeny Carmen
BH115-23	333.70	SS-3 1.5-2.1	NA	Gravelly Silty SAND, trace Clay	1.2 x 10 ⁻⁸	Kozeny Carmen

Notes: In-Situ testing not completed at MW108-23 due to lack of water

Table 4: Groundwater Quality Summary City of Guelph Sewer Use By-Law



Client Sample ID					MW/101 23	MM/108 23	
	Chefit Oa				101001-23	10100-23	
Date Sampled					23-Mar-2023	23-Mar-2023	
	ALS Sample ID			WT2307174-001	WT2307174-002		
Parameter	Detection Limit	City of Guelph Sewer Use Limit		Units	Water	Water	
		Sanitary	Storm				
	•	Physical T	ests				
Hq	0.10	5.5-9.5	6.0-9.0	pH units	7.78	7.71	
Total Suspended Solids	2.0	350	15	ma/L	738	12500	
	•	Anions and N	utrients	· · ·			
Chloride (Cl)	0.50	1500	-	ma/L	193	404	
Fluoride (F)	0.020	10	-	mg/L	<0.100	<0.100	
Total Kieldahl Nitrogen	0.15	100	-	mg/L	0.422	0.646	
Phosphorus, Total	0.0030	10	-	mg/L	0.141	1.24	
Sulfate (SQ.)	0.30	1500	· .	mg/l	16.9	41.6	
	0.00	Bacteriologic	al Tosts	iiig/L	10.0	11.0	
Fecal Coliforms	0	Dacteriologica	200	CELI/100ml	0	0	
r ecar comornis	0	Cvanide	200	CI 0/100IIIL	0	Ū	
Cvanide, Total	0.002	2 2	-	ma/l	<0.0020	<0.0020	
Oyanide, Total	0.002	Z Total Met	als -	IIIg/L	\$0.0020	~0.0020	
Aluminum (Al)-Total	0.010	50		ma/l	2.03	/7 0	
Antimony (Sh)-Total	0.010	5		mg/L	<0.0010	<0.0010	
	0.00010	1	-	mg/L	0.00156	0.0010	
Bismuth (Bi)-Total	0.00010	5	-	mg/L	<0.00130	0.0210	
Cadmium (Cd)-Total	0.000030	1	0.001	mg/L	0.0000	0.000332	
Chromium (Cr)-Total	0.00050	5	0.001	mg/L	0.000200	0.000032	
Cobalt (Co)-Total	0.00000	5	0:2	mg/L	0.00007	0.004	
Copper (Cu)-Total	0.00010	3	0.01	mg/L	0.0022	0.118	
Iron (Fe)-Total	0.050	50	0.01	mg/L	4.58	94.4	
Lead (Pb)-Total	0.00010	5	0.05	mg/L	0.00826	0.0731	
Manganese (Mn)-Total	0.00010	5	0.00	mg/L	0.00020	4 93	
Mercury (Ha)- Total	<0.00000	0.1	0.001	mg/L	<0.000	0.000061	
Molybdenum (Mo)-Total	0.000050	5	0.001	mg/L	<0.000000	0.00108	
Nickel (Ni)-Total	0.00050	3	0.05	mg/L	0.00749	0 111	
Selenium (Se)-Total	0.00050	5	-	mg/L	< 0.0005	0.000512	
Silver (Ag)-Total	0.00050	5	-	mg/L	<0.0010	0.000228	
Tin (Sn)-Total	0.00010	5	-	mg/L	0.00298	0.00389	
Titanium (Ti)-Total	0.00050	5	-	ma/L	0.107	1.66	
Vanadium (V)-Total	0.00050	5	-	mg/L	0.00648	0.109	
Zinc (Zn)-Total	0.0030	3	0.05	mg/L	0.0836	0.368	
Aggregate Organics							
BOD Carbonaceous 3.0 300 15 mg/l <3.0 <5.0							
Oil and Grease, Total	5.0		-	ma/L	<5.0	<5.0	
Animal/Veg Oil & Grease	5.0	100	<u> </u>	mg/L	<5.0	<5.0	
Mineral Oil and Grease	2.5	15	-	mg/L	<5.0	<5.0	
	0.0010	10	-	mg/L			
FILEHUIS (4AAP)	0.0010	I		IIIQ/L	~0.0050	<u>\0.0050</u>	

Notes:

Results highlighted yellow and **bold** exceed City of Guelph Sanitary Sewer Use By-Law (1996)
 Results highlighted blue and **bold** exceed City of Guelph Storm Sewer Use By-Law (1996)

3. Cells highlighted in grey indicate parameter was not analyzed



Site Concept Plan





ALMA GUELPH - PHASE 2

601 SCOTTSDALE DR, GUELPH, ON, CANADA

23-09-15 11:46:50 AM

DRAWING NOT TO BE SCALED

Contractor must check and verify all dimensions on the job and report any discrepancies to the architect before proceeding with the work.

This drawing shall not be used for construction purposes until signed by the consultant responsible. This drawing, as an instrument of service, is provided by and is the property of Sweeny & Co. Architects.

ISSUED

23-08-24Issued for UofG Board Meeting23-09-15Issued for OPA & ZBA



134 PETER STREET | SUITE 1601 TORONTO, ONTARIO | M5V 2H2 | CANADA P: 416-971-6252 | F: 416-971-5420 E: info@sweenyandco.com | www.sweenyandco.com

PROJ. NAME ALMA GUELPH Phase 2 601 Scottsdale Dr Guelph, ON

owner **Forum**

DWG TITLE Cover Page

 DATE:
 08/24/23

 SCALE :
 NTS

 DRAWN :
 BJS

 CHECKED :
 JG/AJH

 PROJ. No. :
 2305



ZONING MATRIX

Provision	SC.1-40 Zone	MUC-2(PA)	Provided	Compliance
	(1995-14864)	(Draft CZBE)		
Permitted Uses	'Apartment Building'*	'Apartment Building'*	'Apartment Building'	~
	'Residential Suites'*	'Residential Suites'*	'Residential Suites'	
Minimum Lot Area	N/A	7,500 m²	2.2 ha	~
Minimum Lot Frontage	30 m	50 m	122 M	\checkmark
Maximum Density	150 UPH*	150 UPH* 300 UPH		Amendment Requested – both by-laws
Front Yard	6 m	3 – 13 m	24 M	~
Minimum Interior Side Yard	6 m or ½ building height, whichever is greater = 14.5 m	3 m	14 m	Yes for new by-law, Amendment for current by-law
Minimum Exterior Side Yard	6 m	3 – 13 m	16.27 M	√
Minimum Rear Yard	½ building height but not less than 6 m = 14.5 m	7.5 m	N/A, lot has three street frontages and an interior side yard. Setback to Highway 6 is 15.4 m	N/A
Maximum Building Height	8 storeys*	8 storeys*	7 storeys	✓
Minimum First Storey Height	N/A	4.5 m	6.5 m	\checkmark
First Storey Transparency	N/A	40% of the surface area of the first storey of a building up to 4.5 m from the ground when the building is within 15 m of an arterial or collector road	Not applicable. Building is not located within 15 m of an arterial road	N/A
Angular Plane	N/A	45 degrees from interior and rear lot lines when adjacent to an institutional or medium density zone, measured 10.5 m above the average elevation of the grade at the required setback from the property line	interior and rear lot 58 degrees nt to an institutional ity zone, measured average elevation of equired setback from perty line	
Maximum Building Length	N/A	75 m for buildings within 15 m of a street	Not applicable, building is not located within 15 m of a street	N/A
Minimum Distance Between Buildings	N/A	½ building height to a maximum of 15 m and a minimum of 5 m	15.3 M	\checkmark
Minimum Common Amenity Area	1,300 m²*	1,300 m²*	1,300+ m²	~
Minimum Common Amenity Area Location	N/A	Aggregated into areas not less than 50 m2 with length not exceeding 4x the width	1,300+ m2	✓

SC.1-40 Zone	
(1995-14864)	(
10% of lot area	20
1/unit + 0.1/unit visitor*	Ара
= 654 × 1.1	First 20 U
= 720 parking stalls	21+ unit
	20
	= 20
	= 82
2	1 + 3% of tot of Ty
	=
2.75 m x 5.5 m*	2.75 m
	3.4 m x 5.5
	2.4 × 5.5 r
N/A	The minimur
	SC.1-40 Zone (1995-14864) 10% of lot area 1 / unit + 0.1 / unit visitor* = 654 × 1.1 = 720 parking stalls 2 2.75 m × 5.5 m*








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PROJ. No. : 2305



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	DRAWING NOT TO BE SCALED Contractor must check and verify all dimensions on the job and report any discrepancies to the architect before proceeding with the work. This drawing shall not be used for construction purposes until signed by the consultant responsible. This drawing, as an instrument of service, is provided by and is the property of Sweeny & Co. Architects ISSUED 23-08-24 Issued for UofG Board Meeting 23-09-15 Issued for OPA & ZBA
4 AZ402	
ALMA Guelph Existing Phase 1	
	Sacasta and a constraint of the second state and state and a constraint of the second state
	owner Forum Dwg title
	FIGOR PIANS_LEVELTYPICALDATE:08/24/23SCALE :1 : 250DRAWN :BJSCHECKED :JG/AJHPROJ. № :2305DWG №.AZ2022











Block A - North Elevation

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361560	MPH Roof			 						
356560	Level 08	_	 			 		,		
352900	Level 07									I
349540	Level 06									
346180	Level 05									
342820	Level 04									
339460	Level 03									
336100	Level 02									
329600	Phase 2 Level 01	<u> </u>	4U		1		<u> </u>	لــــــــــــــــــــــــــــــــــــــ	μ	μ]





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PROJ. NAME ALMA GUELPH Phase 2 601 Scottsdale Dr Guelph, ON

OWNER Forum

DWG TITLE Building Elevations_Block A

YY-MM-DD DATE: SCALE : 1 : 250 Author DRAWN : CHECKED : Checker PROJ. No. : 2305

DWG No.





MPH Roof 361560 Level 08 356560 Level 07 352900 Level 06 349540 Level 05 346180 Level 04 342820 Level 03 339460 ┉╓╙╫╵╓╢╢╢╢╢╢╢╢╢╢╢╢╢╢ Level 02 336100 Phase 2 Level 01 329600

MPH Roof	361560
Level 08	356560
	352900
Level 06	349540
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Level 04	342820
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Level 02	336100
Phase 2 Level 01	329600

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Level 08				
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Level 06 /				
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Level 04				
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Evel 02				
Phase 2 Level 01				

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PROJ. NAME ALMA GUELPH Phase 2 601 Scottsdale Dr Guelph, ON

owner Forum

DWG TITLE Building Elevations_Block B

YY-MM-DD DATE: 1 : 250 SCALE : Author DRAWN : CHECKED : Checker PROJ. No. : 2305

DWG No. AZ402







APRIL 21 - 3:00 PM EDT

Contractor n the job and r bet	nust check and verify all dimensions on eport any discrepancies to the architec fore proceeding with the work.
This draw purposes un This drawing, by and is th	ing shall not be used for construction til signed by the consultant responsible as an instrument of service, is provide e property of Sweeny & Co. Architects.
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PROJ. NAME ALMA GUELPH Phase 2 601 Scottsdale Dr Guelph, ON

owner **Forum**

DWG TITLE Shadow Studies April

YY-MM-DD DATE: SCALE : DRAWN : Author CHECKED : Checker PROJ. No. : 2305

DWG No. AZ1101





JUNE 21 - 10:00 AM EDT



JUNE 21 - 2:00 PM EDT



JUNE 21 - 6:00 PM EDT



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the job and re	sport any discrepancies to the architect ore proceeding with the work.
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134 PETER ST TORONTO, OI P: 416-971-629	Image: FREET SUITE 1601 NTARIO M5V 2H2 CANADA 52 F: 416-971-5420 Synandae com / www.superprivation.com
	.,andoo.com www.sweenyanuco.com
ALMA C	UELPH Phase 2
601 Scottsda Guelph, ON	ale Dr
TOTUIT	
Shadow	Studies June
D	
DATE: SCALE :	ҮҮ-ММ-ДД
DRAWN :	Author

CHECKED : Checker PROJ. No. : 2305

DWG No.

AZ1102



SEPTEMBER 21 - 5:00 PM EDT



SEPTEMBER 21 - 11:00 AM EDT



SEPTEMBER 21 - 3:00 PM EDT

SEPTEMBER 21 - 12:00 PM EDT

SEPTEMBER 21 - 4:00 PM EDT

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PROJ. NAME ALMA GUELPH Phase 2 601 Scottsdale Dr Guelph, ON

owner **Forum**

DWG TITLE Shadow Studies September

YY-MM-DD DATE: SCALE : DRAWN : Author CHECKED : Checker PROJ. No. : 2305

DWG No. AZ1103



DECEMBER 21 - 10:00 AM EST

DECEMBER 21 - 11:00 AM EST



DECEMBER 21 - 2:00 PM EST

DECEMBER 21 - 3:00 PM EST





DECEMBER 21 - 12:00 PM EST



DRAWING NOT TO BE SCALED

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23-09-15 Issued for OPA & ZBA

DECEMBER 21 - 1:00 PM EST





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PROJ. NAME ALMA GUELPH Phase 2 601 Scottsdale Dr Guelph, ON

owner **Forum**

DWG TITLE Shadow Studies December

07/28/23 DATE: SCALE : DRAWN : Author CHECKED : Checker PROJ. No. : 2305

DWG No. **AZ1104**



Borehole Logs



ID No.: MW101-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 3/8/2023

Drilling Contractor: Direct Environmental Drilling

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup

			Subsurface Profile		Sar	nple									
Depth		Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type		Standard Penetration 20 40 60 80	Shear Strength (PP)	W a • 1	nter C % 0 20	Content 6 • 0 30	Gr Ob and	oundwat servatio I Standp Details	ter ns ipe
ft m	۱ ۵		Ground Surface	326.7									_		
րեռեղերերերերեր 2 4 4 6 8	2		FILL very loose brown sandy silt (topsoil), trace organics and rootlets, frozen sand, some gravel, trace silt, occasional cobbles, very moist compact, moist some silt SAND	0.0 325.9 0.8 325.2 <u>1.5</u> 324.4 2.3	1 2 3 4	SS SS SS	4	15		۔ ٤	13 10		lite Concrete		
			compact brown sand, trace silt and gravel, moist		4	33							enton		
			damp		5	SS		16		2			Be		
	4			322.1	6	SS		25		4					
16 16 18 18			dense, some gravel, occasional cobbles, moist	4.6	7	SS		39			9			•	
20	6			320.6				12				21		Zise	
			SANDY SILT compact brown sandy silt, trace gravel and clay, saturated	0.1	8	SS								mm PVC F	
				319.1				10				10		5	
26	8		trace to some clay	7.0	9	SS	-				•				
30					10	~~~		20			_1	8			
32	10					33									
34	10			316.0									^D ack		
36			SILTY SAND compact brown gravelly silty sand, some clay, saturated	10.7	11	SS		121			9		Sand F	otted Sc	
38				314.8	12	SS		/ 15			1 2			n Si	
40	12		Drilling Terminated	11.9										51mr	

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 320.6 masl) during drilling. Water measured at 9.8 mbgs (Elevation 316.9 masl) on March 22, 2023

ID No.: BH102-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

	Subsurface Profile																			
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type		Dynamic Cone × × Standard Penetration 20 40 60 80			Dynamic Cone × × Standard Penetration 20 40 60 80			ynamic Cone Standard Penetration 20 40 60 80			Shear Strength (PP)			Content % • 20 30	Groundwater Observations and Standpipe Details
0 ft m 0 − 0	<u> </u>	Ground Surface	327.3																	
$ \begin{array}{c} - \\ \hline m \\ 0 \\ 2 \\ \hline m \\ 2 \\ 2 \\ 4 \\ 4 \\ 6 \\ 8 \\ 10 \\ 12 \\ 12 \\ 14 \\ 16 \\ 18 \\ 20 \\ 22 \\ 24 \\ 26 \\ 28 \\ 30 \\ 32 \\ 10 \\ 12 \\ 14 \\ 16 \\ 18 \\ 20 \\ 22 \\ 24 \\ 26 \\ 28 \\ 30 \\ 32 \\ 10 \\ 12 \\ 14 \\ 16 \\ 18 \\ 20 \\ 22 \\ 24 \\ 26 \\ 28 \\ 30 \\ 32 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 1$		Ground Surface FILL loose dark brown sandy silt (topsoil), trace organics and rootlets, wet compact brown gravelly sand, trace silt, numerous cobbles, moist sandy silt, trace to some gravel, very moist sand, some silt, trace to some gravel SANDY SILT compact brown sandy silt, trace to some clay, moist to wet SAND dense brown sand, some gravel, trace silt, numerous cobbles, damp SANDY SILT compact sandy silt, trace to some gravel, trace silt, numerous cobbles, damp SANDY SILT compact sandy silt, trace to some gravel, saturated, occasional gravelly sand seams SILT compact brown silt, some sand, trace clay, saturated Drilling Terminated	327.3 0.0 326.5 0.8 325.8 1.5 325.0 2.3 324.3 3.0 322.7 4.6 321.2 6.1 319.5 7.8	1 2 3 4 5 6 7 7 8	SS SS		3 14 12 13 12 13 12 12 16								9 9 11 9 9	20 20 20 20	 Cuttings Bentonite Wet Cave 			
34 34 36 36																				
38 11 40 12																				

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.2 masl) during drilling.

ID No.: BH103-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sar	nple					
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type		Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content % 10 20 30	Groundwater Observations and Standpipe Details
ft m		Ground Surface	327.2							
		FILL loose brown sandy silt (topsoil), trace organics and rootlets, frozen compact brown gravelly sand, trace	0.0 <u>326.4</u> 0.8	1	SS SS	٩	5		_22 7	
4 6 6 2		silt, occasional cobbles, moist loose	<u>325.7</u> 1.5	3	SS		9			 Cuttings
8 10 10			<u>324.2</u> 3.0	4	SS		10		• ⁶	
12 12 14 14 14		compact brown silty fine sand, trace gravel and clay, very moist		5	SS					
		CAND	322.6				74		3	- Bentonite
16 18 18		very dense brown sand, some gravel, trace silt, numerous cobbles, damp	321.1	6	SS					
20 mining 0 22 mining 1 22 mining 1		SANDY SILT compact brown sandy silt, trace to some clay, saturated	6.1	7	SS		12		28	
24 11111 26 1111 8				8	SS		17		19	₩et Cave
28 11 30 11 11 11		grey	318.1 9.1 317.6	9	SS		15		_25	
32 10 34 10 34 10 36 10 38 10 11 12 40 10		Drilling Terminated	9.6					Image: state		

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.1 masl) during drilling.

ID No.: BH104-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sar	nple				
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content • % • 10 20 30	Groundwater Observations and Standpipe Details
ft m		Ground Surface	327.0						
$ \begin{array}{c} \mathbf{a} \\ 0 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$		Ground Surface FILL loose dark brown sandy silt (topsoil), trace organics, wet sandy silt, trace gravel SANDY SILT compact brown sandy silt, trace gravel, very moist loose, occasional saturated sand seams, wet compact GRAVELLY SAND compact brown gravelly sand, some silt, occasional cobbles, wet SANDY SILT compact brown gravelly sand, some silt, occasional cobbles, wet SANDY SILT compact brown sandy silt, trace gravel, saturated Drilling Terminated Drilling Terminated	<u>ш</u> <u>327.0</u> 0.0 <u>326.2</u> 0.8 <u>325.5</u> <u>1.5</u> <u>324.7</u> <u>2.3</u> <u>324.7</u> <u>324.7</u> <u>324.6</u> <u>322.4</u> <u>4.6</u> <u>320.9</u> <u>6.1</u> <u>317.9</u> <u>9.1</u> <u>317.4</u> <u>9.6</u>	2 1 3 4 5 5 6 7 7 8 8 9	SS SS SS SS SS SS SS SS SS SS			21 28 13 19 20 20 21 28 13 20 20 20 20 20 20 20 20 20 20	Cuttings Bentonite Wet Cave
36 11 38 38 11 40									

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 320.9 masl) during drilling.

ID No.: BH105-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sai	mple				
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content % • 10 20 30	Groundwater Observations and Standpipe Details
ft m		Ground Surface	326.4						
		FILL loose dark brown sandy silt (topsoil), trace organics and rootlets, wet	0.0 325.6	1	SS	7		17	
4 4 6 2		SILTY SAND loose brown silty sand, trace gravel, moist to wet	0.0	2	SS SS	9		• 19	← Cuttings
			324.1						
8		compact, damp	2.3	4	SS	14		 	
		SAND compact brown sand, some silt and gravel_damp		5	SS	23		2	
12 14 14 14		gioro, danp	321.8	_					
		SILTY SAND dense brown silty sand, trace gravel, damp	4.6	6	SS	31		4	Bentonite
20 1 6 22 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		SANDY SILT loose to compact brown sandy silt, trace gravel, saturated	<u>320.3</u> 6.1	7	SS	8		 25	₩et Cave
						19		22	
26118			318.3	8	SS	10			
26 28 28 30 30 31 32 32 34 36 38 36 38 38 40 40		Drilling Terminated	<u>318.3</u> 8.1	8	55		Image: select		

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 320.3 masl) during drilling.

ID No.: BH106-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sar	nple					
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type		Dynamic Cone × × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content % • 10 20 30	Groundwater Observations and Standpipe Details
ft m		Ground Surface	327.5							
		FILL loose dark brown sandy silt (topsoil), trace organics, wet	0.0	1	SS SS		6 7		17 19	
4 1 6 1 1 1 1 1 1 2		compact, occasional cobbles and rootlets	326.0 1.5 325.2	3	SS		12		_15	← Cuttings
8		SILTY SAND compact brown silty sand, very moist	2.3	4	SS		20		15	
		SANDY SILT compact brown sandy silt, wet, occasional saturated sand seams	3.0	5	SS		14		18	
		trace gravel esturated	322.9				18		8	- Bentonite
16 18 18 20 18 18 18 18 18 18 18 18 18 18 18 18 18		ado gravo, oddrada		6	SS		16		21	- Wet Cave
22										
26 8			319.4	8	SS	_	14		_23	-
28 30 32 32 34 34 36 38 38 40 40		Drilling Terminated	8.1					Image: selection of the		

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 4.6 mbgs (Elevation 322.9 masl) during drilling.

ID No.: BH107-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sar	nple				
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content % 10 20 30	Groundwater Observations and Standpipe Details
ft m	~~~	Ground Surface	327.0						
1 1 1 1 1 1 1 1		Ground Surface FILL loose brown sandy silt (topsoil), trace organics, very moist SANDY SILT compact brown sandy silt, trace gravel, occasional cobbles, moist GRAVELLY SAND compact brown gravelly sand, some silt, damp SANDY SILT dense brown sandy silt, some gravel, occasional cobbles, moist compact, trace gravel and clay, saturated	327.0 0.0 326.2 0.8 325.5 1.5 320.9 6.1 319.4 7.6	1 2 3 4 5 6 7 7 8	F SS SS	9 12 13 12 10 18 33 /10			 Cuttings Bentonite Wet Cave
32111111111111111111111111111111111111		Drilling Terminated	<u>317.4</u> 9.6	9	SS				
38 12 40 12									

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 7.6 mbgs (Elevation 319.4 masl) during drilling.

ID No.: MW108-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 3/8/2023

Drilling Contractor: London Soil Test

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup

			Subsurface Profile		Sar	nple													
Depth		Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type		Dynar × Sta Pene 20 4	nic Co Indarc etratic 0 60	one × I on 80	Shear Shear 50	Stren kPa Stren kPa 100 1	gth (PP gth (FV 50 200)) Wa 1	ater (Content % • 20 30	G Ol an	round bserv d Sta Deta	lwater ations ndpipe ails
0 ft m	N		Ground Surface	328.5															
չ պետեր 21-րդ 4-ր			FILL loose dark brown sandy silt (topsoil), trace organics and rootlets, frozen SILTY SAND	0.0 <u>327.7</u> 0.8	1	SS SS	•	7							1	23 17	Concrete		
			trace gravel, frozen	327.0			_	20						4					
6 8 8 8 1 1 1 1 1 1 1			SAND compact brown sand, some gravel, trace to some silt, occasional cobbles, damp	325.5	3	SS											ntonite		
10		1.1.	SILTY SAND	3.0	4	ss		20						3			Bel		
12 11 12 14 14 14			compact to dense brown silty fine sand, trace to some gravel, occasional cobbles, moist to wet																
16 16					5	SS			46					•	7				
18 18 20															11				Riser
22 11					6	SS									•••				m PVC I
24				320 0															m 10
			SILT compact brown silt, some clay, trace sand wet	7.6	7	SS		2	9						_1	7			
				319.4															
			saturated	9.1	8	SS		/14								21		Ĭ	
	0			317.8													Pack 7		creen
			loose to compact, grey	10.7	9	SS		8								23	Sand F		otted Sr
			Drilling Terminated	<u>316.8</u> 11.7	10	SS		• • •											nm Sl
	2																		51m

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 9.1 mbgs (Elevation 319.4 masl) during drilling. Water measured at 9.6 mbgs (Elevation 318.9 masl) on March 22, 2023

ID No.: BH109-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sai	mple				
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content % • 10 20 30	Groundwater Observations and Standpipe Details
ft m		Ground Surface	328.0						
° ուհուհուկուլ 2 ուհուկուկուկուկուկուկու 4 ուհու		ASPHALT 75 mm GRANULAR FILL compact brown sand and gravel, some silt, moist	0.0 327.2 0.8	1	SS SS			20	
		gravelly sand, occasional cobbles		3	ss	18		_22	 Cuttings
		FILL loose to compact dark brown sandy silt, wet	<u>325.7</u> 2.3	4	SS	22		3	
		compact brown gravelly sand, some silt, occasional cobbles, damp	<u>325.0</u> 3.0	5	SS	21		6	
12 - 4 - 4 - 14 - 14		SILTY SAND compact brown silty sand, trace gravel, moist	323.4						Bentenite
16		GRAVELLY SAND very dense brown gravelly sand, some silt, occasional cobbles, damp	4.6	6	SS	63		4	- Bentonite
	•••		321.9						
2011-0 2211-1 2211-1 241-1 241-1		SANDY SILT compact brown sandy silt, trace to some gravel, saturated, occasional silty sand seams	6.1 320.4	7	SS			22	
	•	grey	7.6	8	SS	17		_23	
			318.4	9	SS			11	
32 10 34 10 36 10 38 10	unanomol.	Drilling Terminated	9.6						
40 12									

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.9 masl) during drilling.

ID No.: BH110-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Subsurfa	ace Profile	:	San	nple				
os Symbol	Il Description (masl)	Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content • % • 10 20 30	Groundwater Observations and Standpipe Details
tage org 0 ft 0 ft 2 ASPHALT 75 mm GRANULAR compact brow compact brow some silt, mo gravely sand, 6 FILL 10 SANDY SILT 10 SANDY SILT 10 SILTY SAND compact brow gravel, wet SILTY SAND compact brow gravel, wet SILTY SAND compact brow gravel, wet Siltry SAND compact brow gravel, wet Siltry Sand 16 17 18 19 10 10 30 11 30 11 31 32 10 34	round Surface 328 0. 700 FILL vn sand and gravel, ist occasional cobbles 0. 0. 0. 0. 327 0. 328 2. 0. 328 2. 0. 328 2. 3. 2. 3. 2. 3. 2. 3. 3. 1. 3. 2. 3. 3. 3. 3. 3. 3. 3. 3. 3. 3	5.7 .3 5.0 0.4.5 .5 .5	30000000000000000000000000000000000000	SS SS SS SS SS		kPa 50 100 100 150	10 20 30 8 19 10 20 11 20 12 20 15 10 15 10 10 10 10 10 10 10 19 10 15 10 15 10 15 10 10	Cuttings Try Cave
36 38 38 40 40								

Field Technician: HXS

Drafted by: KRD



ID No.: MW111-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 3/8/2023

Drilling Contractor: Direct Environmental Drilling

Drill Rig: Geoprobe 7822DT

Drill Method: Hollow Stem Augers

Protective Cover: Stickup

		Subsurface Profile		Sar	mple							
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	W •	ater Co % 10 20	ontent 30	Gro Obs and I	undwater ervations Standpipe Details
ft m		Ground Surface	327.7								_	
0 2 4 4		FILL loose dark brown sandy silt (topsoil), trace organics, frozen wet	0.0 <u>326.9</u> 0.8	1	SS SS	6			1	9 30	Concrete	
6 6 1 1 1 1 2		brown	325.9 1.8 325.4	3	SS	6				_27		
	, , , ,	GRAVELLY SAND compact brown gravelly sand, some silt_occasional cobbles_damp	2.3 324.7	4	SS	26		3			entonite	
		SILT compact brown silt, some clay and gravel_trace sand_moist	3.0	5	SS	/12			10		Be	
			323.1	6	SS				14			
16 11 18		occasional silty sand seams, very moist	4.0	7	SS				•13			
20 1 6	• • • • •	some gravel, occasional cobbles	321.6 6.1	8	SS	26			12			/C Riser
		saturated	200.4									1 mm P/
26 1 8		some clay, trace sand	7.6	9	SS	14				2 5	nd Pack	
											Sa	ed Scree
30 H		Drilling Terminated	<u>318.1</u> 9.6	10	SS					21		m Slotte
34 36 36 38 40 40 40												51m

Field Technician: HXS

Drafted by: KRD

Reviewed by: DG



Groundwater encountered at 6.1 mbgs (Elevation 321.6 masl) during drilling. Dry conditions measured on March 22, 2023

ID No.: BH112-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

Subsurface Profile		Sa	mple				
Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content • % • 10 20 30	Groundwater Observations and Standpipe Details
6 Ground Surface	328.0						Ι
0 ft m Ground Surface 0 ASPHALT 90 mm 2 GRANULAR FILL compact brown sand and gravel, some silt, moist 4 Gravelly sand, occasional cobbles 6 2 8 GRAVELLY SAND 10 GRAVELLY SAND 10 GRAVELLY SAND 10 Ground Surface 11 Ground Surface 12 GRAVELLY SAND 13 Compact brown gravelly sand, some silt, occasional cobbles, moist 12 Drilling Terminated 14 6 20 6 21 8 24 8 28 8	328.0 0.0 327.2 0.8 325.7 2.3 324.5 3.5	Z 1 1 2 3 4 5 5	⊢ SS SS SS SS SS SS				 Cuttings Dry Cave
30 31 32 32 34 34 34 34 36 36 38 38 38 38 38 38 38 38 38 38					Image: Sector	Image: Sector	

Field Technician: HXS

Drafted by: KRD



ID No.: BH113-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sa	mple				
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content % 10 20 30	Groundwater Observations and Standpipe Details
0 1 0	* *	Ground Surface	328.1			40		10	
	***	ASPHALI	0.0	1	SS			16	
		GRANULAR FILL	0.8	2	22	20		6	
4		some silt, wet		2					
6		gravelly sand, occasional cobbles		3	SS	/9		_12	
		compact to loose dark brown sandy	325.8			10		5	
		Silt, trace gravel, moist to very moist	2.0	4	SS			•	
10	۹.	compact brown silty gravelly sand,	324 6	5	ss	10		_14	Dry Cave
12		moist	3.5						
14 = 4		Drilling Terminated							
16									
18									
20 6									
22 -									
24									
26 8									
28-									
30									
32									
34									
30									
38									
40 12									
									l

Field Technician: HXS

Drafted by: KRD



ID No.: BH114-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

	Subsurface Profile		Sai	mple				
Depth Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content % • 10 20 30	Groundwater Observations and Standpipe Details
$\begin{array}{c} ft & m \\ 0 \\ 2 \\ 10 \\ 12 \\ 10 \\ 12 \\ 10 \\ 12 \\ 10 \\ 12 \\ 10 \\ 12 \\ 10 \\ 11 \\ 12 \\ 10 \\ 11 \\ 12 \\ 10 \\ 11 \\ 12 \\ 10 \\ 11 \\ 10 \\ 12 \\ 10 \\ 11 \\ 10 \\ 12 \\ 10 \\ 11 \\ 10 \\ 10$	Ground Surface ASPHALT 75 mm GRANULAR FILL compact brown sand and gravel, some silt, moist gravely sand, occasional cobbles FILL loose dark brown sandy silt, trace gravel, wet SILTY SAND loose brown silty sand, trace gravel, moist SANDY SILT compact to dense brown sandy silt, trace gravel, occasional cobbles, moist Drilling Terminated	330.6 0.0 329.8 0.8 329.1 1.5 328.3 2.3 327.1 3.5	1 2 3 4 5	SS SS SS SS SS				 Cuttings Dry Cave

Field Technician: HXS

Drafted by: KRD



ID No.: BH115-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A



Field Technician: HXS

Drafted by: KRD



ID No.: BH116-23

Project Name: ALMA Guelph Phase 2

MTE File No.: 49791-200

Client: Forum 601 Scottsdale LP

Site Location: 601 Scottsdale Drive, Guelph, Ontario

Date Completed: 2/27/2023

Drilling Contractor: London Soil Test

Drill Rig: D50 Turbo

Drill Method: Hollow Stem Augers

Protective Cover: N/A

		Subsurface Profile		Sa	mple				
Depth	Symbol	Soil Description	Elevation (masl) Depth (m)	Number	Type	Dynamic Cone × × Standard Penetration 20 40 60 80	Shear Strength (PP)	Water Content • % • 10 20 30	Groundwater Observations and Standpipe Details
$ \begin{array}{c} 0 \\ 0 \\ 2 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1$		Ground Surface ASPHALT 190 mm GRANULAR FILL compact brown sand and gravel, some silt, moist FILL compact brown sandy silt, trace gravel, moist GRAVELLY SAND compact to dense brown gravelly sand, some silt, occasional cobbles, damp to moist Drilling Terminated	333.9 0.0 333.1 0.8 330.4 3.5	1 2 3 4 5	SS SS SS SS SS			9 4 4 4 4 4 4 4 4 4 4 4 4 4	 Cuttings Dry Cave

Field Technician: HXS

Drafted by: KRD





Hydrographs





Hydrograph 1: Groundwater Elevations (m amsl) - MW101-23

Preliminary Hydrogeological Assessment 601 Scottsdale Drive City of Guelph





Hydrograph 2: Groundwater Elevations (m amsl) - MW108-23

Preliminary Hydrogeological Assessment 601 Scottsdale Drive City of Guelph





AquiferTest Results









Particle Size Distribution and Hydraulic Conductivity Estimates





Particle Size Distribution Analysis Test Results

Date Sampled: Feb. 21 to Mar. 8, 2023

Date Tested: March 20 to 22, 2023

MTE File No.: 49791-200

101

For specific tests as listed on www.ccil.com

Table No:

Project Name: Geotechnical Investigation Client: Forum Asset Management Project Location: 601 Scottsdale Drive, Guelph, Ontario

Sieve Opening In Inches US Standard Sieve Numbers 3" 3/4" #10 #200 #4 #20 #40 #60 100 0 10 90 20 80 30 70 60 40 % Passing by Weight 50 50 40 60 30 70 20 80 90 10 100 0 10.000 Particle Size (mm) 0.100 0.010 0.001 100.000 1.000 Coarse Fine Coarse Medium Fine Silt Clay % Gravel % Sand % Fines

Unified Soil Classification

Symbol Sample Depth Description Borehole ID Sample # MW101-23 10.7 - 11.1 mbgs Gravelly Silty SAND, some Clay -SS-11 **CERTIFIED BY** _ MW108-23 SS-8 9.1 - 9.8 mbgs SILT, some Clay, trace Sand MW111-23 SS-5 3.0 - 3.7 mbgs SILT, some Clay and Gravel, trace Sand MW111-23 SS-9 7.6 - 8.2 mbgs SILT, some Clay, trace Sand BH115-23 SS-3 Gravelly Silty SAND, trace Clay -----1.5 - 2.1 mbgs Canadian Council of Independent Laboratories

NOTES:

Hydraulic Conductivity, Porosity, and Infiltration Rate Estimated from Particle Distribution Analysis

Well ID	Depth Top (m)	Depth Bottom (m)	Dominant Soil	Grain Size at which 10% is finer (mm)	which 60% is finer (mm)	% passing .02mm sieve %	% passing .06mm sieve %	Hazen Coefficient (-)	Uniformity Index ¹ (-)	Porosity ² (-)		Hydr	aulic Cono (m/sec	luctivity ³)			Infiltration Rate ⁵
			туре	d ₁₀	d ₆₀	P ₁	P ₂	с	$C_{u} = d_{60}/d_{10}$	n=0.255(1+0.83 ^{Cu})	Hazen ³	Beyer ³	Kozeny- Carmen ³	Wang ³	Kaubisch ⁴	Geometric Mean	(mm/hr)
MW101-23	10.7	11.1	Gravelly Silty SAND, some Clay	0.0015	0.24	27	37	-	160.0	0.255	N/A	N/A	3.0E-09	N/A	4.5E-08	1.2E-08	0
MW108-23	9.1	9.8	SILT, some Clay, trace Sand	0.001	0.02	60	95	-	20.0	0.261	N/A	N/A	1.5E-09	N/A	N/A	1.5E-09	0
MW111-23	3.0	3.7	SILT, some Clay and Gravel, trace Sand	0.001	0.017	67	78	-	17.0	0.266	N/A	N/A	1.6E-09	N/A	N/A	1.6E-09	0
MW111-23	7.6	8.2	SILT, some Clay, trace Sand	0.0015	0.024	51	95	-	16.0	0.268	N/A	N/A	3.7E-09	N/A	N/A	3.7E-09	0
BH115-23	1.5	2.1	Gravelly Silty SAND, trace Clay	0.003	0.31	27	38	-	103.3	0.255	N/A	N/A	1.2E-08	N/A	3.7E-08	2.1E-08	0
													1				

 $\ensuremath{\mathsf{N/A}}$ The entry is not appropriate to use for grain size distribution of the sample

Hazen Formula:

$$= Cd_{10}^{2}$$

Where:	
K	Hydraulic conductivity (cm/sec)
d ₁₀	Grain size at which 10% is finer (cm)
C	Coefficient as follows:
	Very fine sand, poorly sorted
	Fine sand with appreciable fines
	Medium sand, well sorted
	Coarse sand, poorly sorted
	Coarse sand, well sorted

Applicability: where 0.1 < d₁₀ < 3.0 mm

K

Wang Et Al. Formula:

$$K = 2.9 \times 10^{-3} \frac{g}{v} \left(\log \frac{g d_{60}^3}{v^2} \right)^{-1} d_{10}^2$$

Where:

ł

- K Hydraulic conductivity (m/sec)
- g Gravitational acceleration (9.8 m/s²)
- v Kinematic viscosity of water(1.2 x 10^{-6} m²/s)
- d_{10} Grain size at which 10% is finer (m)
- $\mathsf{d}_{\rm 60}$ Grain size at which60% is finer (m)
- Applicability: where 0.05 < d_{10} < 0.83 mm, 0.09 < d_{60} < 4.29 mm, AND 1.3 < CU < 18.3%

Beyer Formula:

$$\overline{K} = 6 \times 10^{-4} \frac{g}{v} ln\left(\frac{500}{Cu}\right) d_{10}^2$$

 Where:

 K Hydraulic conductivity (m/sec)

 g Gravitational acceleration (9.8 m/s²)

 v Kinematic viscosity of water(1.2 x 10⁻⁶ m²/s)

 d₁₀ Grain size at which 10% is finer (m)

Applicability: where $0.06 < d_{10} < 0.6 \text{ mm}$ AND $C_u <= 20$

Kaubisch Formula:

$$K = 10^{0.0005P_2^2 - 0.12P_2 - 3.59}$$

Applicability: where $5 < C_u < 400 \text{ AND } 10\% < P_2 > 60\%$

¹ Craig, R.F. 1992. "Soil Mechanics, Fifth Edition". Chapman and Hill.

² Vukovic, M., and Soro, A. 1992. "Determination of Hydraulic Conductivity of Porous Media from Grain-Size Composition"

³ Duffield, G.M. "Representative Values of Hydraulic Properties" http://www.aqtesolv.com/aquifer-tests/aquifer_properties.htm

40-80

40-80

80-120

80-120

120-150

⁴ Cai, Jialiang, Taute, Thomas, Hamann, Enrico, and Schneider, Michael. 2013. " An Integrated Laboratory Method to Measure and Verify Directional Hydraulic conductivity in Fine-to-Medium Sandy Sediments". Groundwater. ⁵ Sustainable Technologies Evaluation Program (STEP), 2020.

Kozeny-Carmen Formula:

$$K = \frac{1}{180} \frac{g}{v} \left(\frac{n^3}{(1-n)^2} \right) d_{10}^2$$

Applicability: silts, sands, gravelly sands





Laboratory Certificates of Analysis



ALS Canada Ltd.



CERTIFICATE OF ANALYSIS (GUIDELINE EVALUATION)

Work Order	: WT2307174	Page	: 1 of 6
Client	: MTE Consultants Inc.	Laboratory	: Waterloo - Environmental
Contact	: Fraser Cummings	Account Manager	Emily Hansen
Address	: 520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: 519 743 6500	Telephone	: +1 519 886 6910
Project	: 49791-200	Date Samples Received	: 23-Mar-2023 12:35
PO	:	Date Analysis Commenced	: 23-Mar-2023
C-O-C number	: 20-1048805	Issue Date	: 03-Apr-2023 13:41
Sampler	:		
Site	:		
Quote number	: Standing Offer 2023		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Guideline Comparison

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	Position	Laboratory Department
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Microbiology, Waterloo, Ontario
Cynthia Bauer	Organic Supervisor	Organics, Calgary, Alberta
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Metals, Waterloo, Ontario
Marsha Calero	Laboratory Assistant	Organics, Calgary, Alberta
Nguyen Tran	Laboratory Analyst	Organics, Calgary, Alberta
General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guidelines are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Key : LOR: Limit of Reporting (detection limit).

Unit	Description
CFU/100mL	colony forming units per hundred millilitres
mg/L	milligrams per litre
pH units	pH units
>: greater than.	

<: less than.

Red shading is applied where the result is greater than the Guideline Upper Limit or the result is lower than the Guideline Lower Limit. For drinking water samples, Red shading is applied where the result for E.coli, fecal or total coliforms is greater than or equal to the Guideline Upper Limit .

Qualifiers

olume of sample
/ Electrical
test analyte(s).
nterference,



Analytical Results

			Client sample ID	MW101-23					
Sub-Matrix: Water		Sa	ampling date/time	23-Mar-2023					
(Matrix: Water)				10:35					
Analyte	Method	LOR	Unit	WT2307174-001		GUESUB	GUESUB		
						SAN	STM		
Physical Tests									
рН	E108	0.10	pH units	7.78		5.5 - 9.5 pH units	6 - 9 pH units	 	
Solids, total suspended [TSS]	E160	3.0	mg/L	738	DLHC	350 mg/L	15 mg/L	 	
Anions and Nutrients									
Chloride	E235.Cl	0.50	mg/L	193	DLDS	1500 mg/L		 	
Fluoride	E235.F	0.020	mg/L	<0.100	DLDS	10 mg/L		 	
Kjeldahl nitrogen, total [TKN]	E318	0.050	mg/L	0.422		100 mg/L		 	
Phosphorus, total	E372-U	0.0020	mg/L	0.141	DLM	10 mg/L		 	
Sulfate (as SO4)	E235.SO4	0.30	mg/L	16.9	DLDS	1500 mg/L		 	
Cyanides									
Cyanide, strong acid	E333	0.0020	mg/L	<0.0020		2 mg/L		 	
dissociable (Total)									
Microbiological Tests									
Coliforms, thermotolerant	E012.FC	1	CFU/100mL	Not Detected			200	 	
[fecal]							CFU/100mL		
Total Metals									
Aluminum, total	E420	0.0030	mg/L	2.93	DLHC	50 mg/L		 	
Antimony, total	E420	0.00010	mg/L	<0.00100	DLHC	5 mg/L		 	
Arsenic, total	E420	0.00010	mg/L	0.00156	DLHC	1 mg/L		 	
Bismuth, total	E420	0.000050	mg/L	<0.000500	DLHC	5 mg/L		 	
Cadmium, total	E420	0.0000050	mg/L	0.000208	DLHC	1 mg/L	0.001 mg/L	 	
Chromium, total	E420	0.00050	mg/L	0.00567	DLHC	5 mg/L	0.2 mg/L	 	
Cobalt, total	E420	0.00010	mg/L	0.00220	DLHC	5 mg/L		 	
Copper, total	E420	0.00050	mg/L	0.0122	DLHC	3 mg/L	0.01 mg/L	 	
Iron, total	E420	0.010	mg/L	4.58	DLHC	50 mg/L		 	
Lead, total	E420	0.000050	mg/L	0.00826	DLHC	5 mg/L	0.05 mg/L	 	
Manganese, total	E420	0.00010	mg/L	0.159	DLHC	5 mg/L		 	
Mercury, total	E508	0.0000050	mg/L	<0.0000050		0.1 mg/L	0.001 mg/L	 	
Molybdenum, total	E420	0.000050	mg/L	<0.000500	DLHC	5 mg/L		 	
Nickel, total	E420	0.00050	mg/L	0.00749	DLHC	3 mg/L	0.05 mg/L	 	
Selenium, total	E420	0.000050	mg/L	<0.000500	DLHC	5 mg/L		 	
Silver, total	E420	0.000010	mg/L	<0.000100	DLHC	5 mg/L		 	

Page	:	4 of 6
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Analyte	Method	LOR	Unit	WT2307174-001 (Continued)	GUESUB SAN	GUESUB STM			
Total Metals - Continued									
Tin, total	E420	0.00010	mg/L	0.00298 DI	^{HC} 5 mg/L			 	
Titanium, total	E420	0.00030	mg/L	0.107 DI	^{HC} 5 mg/L			 	
Vanadium, total	E420	0.00050	mg/L	0.00648 DI	^{HC} 5 mg/L			 	
Zinc, total	E420	0.0030	mg/L	0.0836 DI	HC 3 mg/L	0.05 mg/L		 	
Aggregate Organics	Aggregate Organics								
Carbonaceous biochemical oxygen demand [CBOD]	E555	2.0	mg/L	<3.0 BO	DL 300 mg/L	15 mg/L		 	
Oil & grease (gravimetric)	E567	5.0	mg/L	<5.0				 	
Oil & grease, animal/vegetable (gravimetric)	EC567A.SG	5.0	mg/L	<5.0	100 mg/L			 	
Oil & grease, mineral (gravimetric)	E567SG	5.0	mg/L	<5.0	15 mg/L			 	
Phenols, total (4AAP)	E562	0.0010	mg/L	<0.0050	^{LM} 1 mg/L			 	

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
MW101-23	Water	Solids, total suspended [TSS]		GUESUB	SAN	738 mg/L	350 mg/L
	Water	Solids, total suspended [TSS]		GUESUB	STM	738 mg/L	15 mg/L
	Water	Copper, total		GUESUB	STM	0.0122 mg/L	0.01 mg/L
	Water	Zinc, total		GUESUB	STM	0.0836 mg/L	0.05 mg/L

Key:

GUESUB	Ontario Guelph Sanitary and Storm Sewer By-Law 15202 (1996)
SAN	Ontario City of Guelph Sanitary Sewer Use By-Law 15202
STM	Ontario City of Guelph Storm Sewer Use By-Law 15202



Analytical Results

			Client sample ID	MW108-23					
Sub-Matrix: Water		Sa	ampling date/time	23-Mar-2023					
(Matrix: Water)				10:25					
Analyte	Method	LOR	Unit	WT2307174-002		GUESUB	GUESUB		
						SAN	STM		
Physical Tests									
рН	E108	0.10	pH units	7.71		5.5 - 9.5 pH units	6 - 9 pH units	 	
Solids, total suspended [TSS]	E160	3.0	mg/L	12500	DLHC	350 mg/L	15 mg/L	 	
Anions and Nutrients									
Chloride	E235.Cl	0.50	mg/L	404	DLDS	1500 mg/L		 	
Fluoride	E235.F	0.020	mg/L	<0.100	DLDS	10 mg/L		 	
Kjeldahl nitrogen, total [TKN]	E318	0.050	mg/L	0.646		100 mg/L		 	
Phosphorus, total	E372-U	0.0020	mg/L	1.24	DLM	10 mg/L		 	
Sulfate (as SO4)	E235.SO4	0.30	mg/L	41.6	DLDS	1500 mg/L		 	
Cyanides									
Cyanide, strong acid	E333	0.0020	mg/L	<0.0020		2 mg/L		 	
dissociable (Total)									
Microbiological Tests									
Coliforms, thermotolerant	E012.FC	1	CFU/100mL	Not Detected	DLM		200	 	
[fecal]							CFU/100mL		
Total Metals									
Aluminum, total	E420	0.0030	mg/L	47.9	DLHC	50 mg/L		 	
Antimony, total	E420	0.00010	mg/L	<0.00100	DLHC	5 mg/L		 	
Arsenic, total	E420	0.00010	mg/L	0.0216	DLHC	1 mg/L		 	
Bismuth, total	E420	0.000050	mg/L	0.000532	DLHC	5 mg/L		 	
Cadmium, total	E420	0.0000050	mg/L	0.000892	DLHC	1 mg/L	0.001 mg/L	 	
Chromium, total	E420	0.00050	mg/L	0.0840	DLHC	5 mg/L	0.2 mg/L	 	
Cobalt, total	E420	0.00010	mg/L	0.0468	DLHC	5 mg/L		 	
Copper, total	E420	0.00050	mg/L	0.118	DLHC	3 mg/L	0.01 mg/L	 	
Iron, total	E420	0.010	mg/L	94.4	DLHC	50 mg/L		 	
Lead, total	E420	0.000050	mg/L	0.0731	DLHC	5 mg/L	0.05 mg/L	 	
Manganese, total	E420	0.00010	mg/L	4.93	DLHC	5 mg/L		 	
Mercury, total	E508	0.0000050	mg/L	0.0000061		0.1 mg/L	0.001 mg/L	 	
Molybdenum, total	E420	0.000050	mg/L	0.00108	DLHC	5 mg/L		 	
Nickel, total	E420	0.00050	mg/L	0.111	DLHC	3 mg/L	0.05 mg/L	 	
Selenium, total	E420	0.000050	mg/L	0.000512	DLHC	5 mg/L		 	
Silver, total	E420	0.000010	mg/L	0.000228	DLHC	5 mg/L		 	

Page	:	6 of 6
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Analyte	Method	LOR	Unit	WT2307174-002 (Continued)		GUESUB SAN	GUESUB STM		
Total Metals - Continued									
Tin, total	E420	0.00010	mg/L	0.00389	DLHC	5 mg/L		 	
Titanium, total	E420	0.00030	mg/L	1.66	DLHC	5 mg/L		 	
Vanadium, total	E420	0.00050	mg/L	0.109	DLHC	5 mg/L		 	
Zinc, total	E420	0.0030	mg/L	0.368	DLHC	3 mg/L	0.05 mg/L	 	
Aggregate Organics									
Carbonaceous biochemical oxygen demand [CBOD]	E555	2.0	mg/L	<3.0	BODL	300 mg/L	15 mg/L	 	
Oil & grease (gravimetric)	E567	5.0	mg/L	<5.0				 	
Oil & grease, animal/vegetable (gravimetric)	EC567A.SG	5.0	mg/L	<5.0		100 mg/L		 	
Oil & grease, mineral (gravimetric)	E567SG	5.0	mg/L	<5.0		15 mg/L		 	
Phenols, total (4AAP)	E562	0.0010	mg/L	<0.0050	DLM SP	1 mg/L		 	

Please refer to the General Comments section for an explanation of any qualifiers detected.

Summary of Guideline Breaches by Sample

SampleID/Client ID	Matrix	Analyte	Analyte Summary	Guideline	Category	Result	Limit
MW108-23	Water	Solids, total suspended [TSS]		GUESUB	SAN	12500 mg/L	350 mg/L
	Water	Iron, total		GUESUB	SAN	94.4 mg/L	50 mg/L
	Water	Solids, total suspended [TSS]		GUESUB	STM	12500 mg/L	15 mg/L
	Water	Copper, total		GUESUB	STM	0.118 mg/L	0.01 mg/L
	Water	Lead, total		GUESUB	STM	0.0731 mg/L	0.05 mg/L
	Water	Nickel, total		GUESUB	STM	0.111 mg/L	0.05 mg/L
	Water	Zinc, total		GUESUB	STM	0.368 mg/L	0.05 mg/L

Key:

GUESUB	Ontario Guelph Sanitary and Storm Sewer By-Law 15202 (1996)
SAN	Ontario City of Guelph Sanitary Sewer Use By-Law 15202
STM	Ontario City of Guelph Storm Sewer Use By-Law 15202



	QUALITY CONTROL INTERPRETIVE REPORT						
Work Order	: WT2307174	Page	: 1 of 11				
Client	MTE Consultants Inc.	Laboratory	: Waterloo - Environmental				
Contact	: Fraser Cummings	Account Manager	: Emily Hansen				
Address	520 Bingemans Centre Drive Kitchener ON Canada N2B 3X9	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8				
Telephone	: 519 743 6500	Telephone	: +1 519 886 6910				
Project	:49791-200	Date Samples Received	: 23-Mar-2023 12:35				
PO	:	Issue Date	: 03-Apr-2023 13:41				
C-O-C number	: 20-1048805						
Sampler							

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Quote number

No. of samples received

No. of samples analysed

Site

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO: Data Quality Objective.

LOR: Limit of Reporting (detection limit).

· ____

:2

:2

: Standing Offer 2023

RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers **Outliers : Quality Control Samples**

No Method Blank value outliers occur.

- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

<u>No</u> Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches) • • No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

• Quality Control Sample Frequency Outliers occur - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: Water

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Total Metals	QC-874409-002		Nickel, total	7440-02-0	E420	123 % ^{MES}	80.0-120%	Recovery greater than upper control limit
Result Qualifiers								
Qualifier Descrip	tion							
MES Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).								

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Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: Water					Ev	aluation: × =	Holding time excee	edance ; 🔹	= Within	Holding Time
Analyte Group	Method	Sampling Date	Ext	raction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holding	g Times	Eval	Analysis Date	Holding	Times	Eval
			Date	Rec	Actual			Rec	Actual	
Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day										
HDPE [BOD HT-4d]										
MW108-23	E555	23-Mar-2023					24-Mar-2023	4 days	1 days	✓
Aggregate Organics : Biochemical Oxygen Demand (Carbonaceous) - 5 day										
HDPE [BOD HT-4d]										
MW101-23	E555	23-Mar-2023					27-Mar-2023	4 days	4 days	1
Aggregate Organics : Mineral Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid)										
MW101-23	E567SG	23-Mar-2023	27-Mar-2023	28	4 days	~	28-Mar-2023	40 days	1 days	~
				days						
Aggregate Organics : Mineral Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid)	55070.0					,		10.1		,
MW108-23	E567SG	23-Mar-2023	27-Mar-2023	28	4 days	*	28-Mar-2023	40 days	1 days	*
				days						
Aggregate Organics : Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid)	FFG7	02 Mar 2002	07 Мак 0000		4		07 Мак 0000	10 davia	0 dava	1
MW 101-23	E307	23-IVIAI-2023	27-11/121-2023	28 dava	4 days	•	27-10121-2023	40 days	0 days	•
				uays						
Aggregate Organics : Oil & Grease by Gravimetry										
Amber glass (hydrochloric acid)	E567	23 Mar 2023	27 Mar 2023	20	1 days	1	27 Mar 2023	40 days	0 days	1
19199-23	2307	23-Iviai-2023	27-IVIAI-2023	28 dave	4 uays	•	27-IVIAI-2023	40 uays	0 uays	
				uays						
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulturic acid)	E562	23-Mar-2023	24-Mar-2023				24-Mar-2023	28 dave	1 dave	1
	LJ02	20-iviai-2023	27-1VIA1-2023				2+-iviai-2023	20 uays	i uays	•



Matrix: Water					Ev	aluation: × =	Holding time exce	edance ; 🔹	= Within	Holding Time
Analyte Group	Method	Sampling Date	Ext	traction / Pr	eparation			Analys	is	
Container / Client Sample ID(s)			Preparation Date	Holding Rec	g Times Actual	Eval	Analysis Date	Holding Rec	Times Actual	Eval
Aggregate Organics : Phenols (4AAP) in Water by Colorimetry										
Amber glass total (sulfuric acid) MW108-23	E562	23-Mar-2023	24-Mar-2023				24-Mar-2023	28 days	1 days	1
Anions and Nutrients : Chloride in Water by IC					1 1					
HDPE [ON MECP] MW101-23	E235.Cl	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	1
Anions and Nutrients : Chloride in Water by IC										
HDPE [ON MECP] MW108-23	E235.CI	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	4
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] MW101-23	E235.F	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	1
Anions and Nutrients : Fluoride in Water by IC										
HDPE [ON MECP] MW108-23	E235.F	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	4
Anions and Nutrients : Sulfate in Water by IC										
HDPE [ON MECP] MW101-23	E235.SO4	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	1
Anions and Nutrients : Sulfate in Water by IC								·		
HDPE [ON MECP] MW108-23	E235.SO4	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	1
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW101-23	E318	23-Mar-2023	27-Mar-2023				27-Mar-2023	28 days	4 days	4
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW108-23	E318	23-Mar-2023	27-Mar-2023				27-Mar-2023	28 days	4 days	*



Matrix: Water					Ev	aluation: × =	Holding time exce	edance ; 🔹	<pre>/ = Within</pre>	Holding Time
Analyte Group	Method	Sampling Date	Ext	traction / Pr	reparation			Analys	sis	
Container / Client Sample ID(s)			Preparation Date	Holdin Rec	g Times Actual	Eval	Analysis Date	Holding Rec	g Times Actual	Eval
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) MW101-23	E372-U	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	1
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)					1 1					
Amber glass total (sulfuric acid) MW108-23	E372-U	23-Mar-2023	24-Mar-2023				27-Mar-2023	28 days	4 days	1
Cyanides : Total Cyanide					1					
HDPE - total (sodium hydroxide) MW101-23	E333	23-Mar-2023	30-Mar-2023				30-Mar-2023	14 days	7 days	1
Cyanides : Total Cyanide										
HDPE - total (sodium hydroxide) MW108-23	E333	23-Mar-2023	30-Mar-2023				30-Mar-2023	14 days	7 days	1
Microbiological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)										
Sterile HDPE (Sodium thiosulphate) [ON MECP] MW101-23	E012.FC	23-Mar-2023					24-Mar-2023	48 hrs	24 hrs	1
Microbiological Tests : Thermotolerant (Fecal) Coliform (MF-mFC)					1 1					
Sterile HDPE (Sodium thiosulphate) [ON MECP] MW108-23	E012.FC	23-Mar-2023					24-Mar-2023	48 hrs	24 hrs	1
Physical Tests : pH by Meter					1 1					
HDPE [ON MECP] MW101-23	E108	23-Mar-2023	24-Mar-2023				26-Mar-2023	14 days	3 days	V
Physical Tests : pH by Meter										
HDPE [ON MECP] MW108-23	E108	23-Mar-2023	24-Mar-2023				26-Mar-2023	14 days	3 days	~
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP] MW101-23	E160	23-Mar-2023					24-Mar-2023	7 days	1 days	~



Matrix: Water					E	valuation: × =	Holding time exce	edance ; 🔹	<pre>/ = Within</pre>	Holding Time
Analyte Group	Method	Sampling Date	Ext	traction / Pi	reparation			Analys	is	
Container / Client Sample ID(s)			Preparation	Holdin	g Times	Eval	Analysis Date	Holding	, Times	Eval
			Date	Rec	Actual			Rec	Actual	
Physical Tests : TSS by Gravimetry										
HDPE [ON MECP]										
MW108-23	E160	23-Mar-2023					24-Mar-2023	7 days	1 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
MW101-23	E508	23-Mar-2023	24-Mar-2023				24-Mar-2023	28 days	1 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
MW108-23	E508	23-Mar-2023	24-Mar-2023				24-Mar-2023	28 days	1 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
MW101-23	E420	23-Mar-2023	23-Mar-2023				24-Mar-2023	180	2 days	✓
								days		
Total Metals : Total metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
MW108-23	E420	23-Mar-2023	23-Mar-2023				24-Mar-2023	180	2 days	✓
								days		

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Page	:	8 of 11
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: Water	Evaluation: \star = QC frequency outside specification; \star = QC frequency within specification.						
Quality Control Sample Type			Co	unt	Frequency (%)		
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation
Laboratory Duplicates (DUP)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	874985	2	34	5.8	5.0	\checkmark
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✓
pH by Meter	E108	875263	1	16	6.2	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✓
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	874957	0	2	0.0	5.0	x
Total Cyanide	E333	881027	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✓
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✓
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	875240	1	19	5.2	4.7	✓
Laboratory Control Samples (LCS)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	874985	2	34	5.8	5.0	✓
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	877188	1	18	5.5	5.0	✓
Oil & Grease by Gravimetry	E567	877187	1	18	5.5	5.0	✓
pH by Meter	E108	875263	1	16	6.2	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✓
Total Cyanide	E333	881027	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✓
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✓
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	875240	1	19	5.2	4.7	✓
Method Blanks (MB)							
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555	874985	2	34	5.8	5.0	✓
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✓
Mineral Oil & Grease by Gravimetry	E567SG	877188	1	18	5.5	5.0	~
Oil & Grease by Gravimetry	E567	877187	1	18	5.5	5.0	✓
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✓

Page	:	9 of 11
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Matrix: Water	Evaluation: \star = QC frequency outside specification; \checkmark = QC frequency within specification.							
Quality Control Sample Type			Со	unt	Frequency (%)			
Analytical Methods	Method	QC Lot #	QC	Regular	Actual	Expected	Evaluation	
Method Blanks (MB) - Continued								
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✓	
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	874957	1	2	50.0	5.0	✓	
Total Cyanide	E333	881027	1	11	9.0	5.0	✓	
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✓	
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✓	
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	1	20	5.0	5.0	✓	
TSS by Gravimetry	E160	875240	1	19	5.2	4.7	✓	
Matrix Spikes (MS)								
Chloride in Water by IC	E235.Cl	875267	1	17	5.8	5.0	✓	
Fluoride in Water by IC	E235.F	875264	1	14	7.1	5.0	✓	
Phenols (4AAP) in Water by Colorimetry	E562	874756	1	13	7.6	5.0	✓	
Sulfate in Water by IC	E235.SO4	875268	1	16	6.2	5.0	✓	
Total Cyanide	E333	881027	1	11	9.0	5.0	✓	
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	874759	1	13	7.6	5.0	✓	
Total Mercury in Water by CVAAS	E508	874693	1	19	5.2	5.0	✓	
Total metals in Water by CRC ICPMS	E420	874409	1	17	5.8	5.0	✓	
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	874757	1	20	5.0	5.0	1	



Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Thermotolerant (Fecal) Coliform (MF-mFC)	E012.FC	Water	APHA 9222 D (mod)	Following filtration (0.45 μm), and incubation at 44.5 $\pm 0.2^\circ C$ for 22-26 hours, colonies exhibiting characteristic morphology of the target organism are enumerated and
	Waterloo -			confirmed.
	Environmental			
pH by Meter	E108	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally $20 \pm 5^{\circ}$ C). For high accuracy test results,
	Waterloo -			pH should be measured in the field within the recommended 15 minute hold time.
	Environmental			
TSS by Gravimetry	E160	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at $104 \pm 1^{\circ}$ C, with gravimetric measurement of the
	Waterloo -			filtered solids. Samples containing very high dissolved solid content (i.e. seawaters,
	Environmental			brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC	E235.Cl	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and /or UV detection.
	Waterloo -			
	Environmental			
Fluoride in Water by IC	E235.F	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and /or UV detection.
	Waterloo -			
	Environmental			
Sulfate in Water by IC	E235.SO4	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and /or UV detection.
	Waterloo -			
	Environmental			
Total Kjeldahl Nitrogen by Fluorescence (Low	E318	Water	Method Fialab 100,	TKN in water is determined by automated continuous flow analysis with membrane
Level)			2018	diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde).
	Waterloo -			This method is approved under US EPA 40 CFR Part 136 (May 2021).
	Environmental			
Total Cyanide	E333	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis.
	Waterloo -			
	Environmental			Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up
				to 0.5% of SCN concentration).
Total Phosphorus by Colourimetry (0.002	E372-U	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated
mg/L)				persulfate digestion of the sample.
	Waterloo -			
	Environmental			

Page	:	11 of 11
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total metals in Water by CRC ICPMS	E420 Waterloo -	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
	Environmental			Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
	Waterloo - Environmental			
Biochemical Oxygen Demand (Carbonaceous) - 5 day	E555 Waterloo - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Nitrification inhibitor is added to samples to prevent nitrogenous compounds from consuming oxygen resulting in only carbonaceous oxygen demand being reported by this method.
				Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Phenols (4AAP) in Water by Colorimetry	E562	Water	EPA 9066	This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide (K3Fe(CN)6) and 4-amino-antipyrine (4-AAP) to
	Waterloo - Environmental			form a red complex which is measured colorimetrically.
Oil & Grease by Gravimetry	E567 Calgary - Environmental	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane and the extract is evaporated to dryness. The residue is then weighed to determine Oil and Grease.
Mineral Oil & Grease by Gravimetry	E567SG	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane, followed by silica gel treatment after which the extract is evaporated to dryness. The residue is then weighed to determine Minarel Oil and Crasse
Animal & Vegetable Oil & Grease by Gravimetry	EC567A.SG	Water	APHA 5520 (mod)	Animal & vegetable oil and grease is calculated as follows: Oil & Grease (gravimetric) minus Mineral Oil & Grease (gravimetric)
	Caigary - Environmentai			
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for TKN in water	EP318	water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the
	Waterloo - Environmental			analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
Digestion for Total Phosphorus in water	EP372	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
	Environmental			
Oil & Grease Extraction for Gravimetry	EP567	Water	BC MOE Lab Manual (Oil & Grease) (mod)	The entire water sample is extracted with hexane by liquid-liquid extraction.
	Caigary - Environmental			

ALS Canada Ltd.



QUALITY CONTROL REPORT Work Order Page WT2307174 : 1 of 10 : MTE Consultants Inc. Laboratory : Waterloo - Environmental Account Manager : Emily Hansen : Fraser Cummings Address : 520 Bingemans Centre Drive : 60 Northland Road, Unit 1 Kitchener ON Canada N2B 3X9 Waterloo, Ontario Canada N2V 2B8 Telephone Telephone :+1 519 886 6910 :49791-200 Date Samples Received :23-Mar-2023 12:35 Date Analysis Commenced :23-Mar-2023 :----C-O-C number Issue Date :20-1048805 :03-Apr-2023 13:41 :----519 743 6500

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

· ____

: 2

2

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Standing Offer 2023

Signatories

Client

Contact

Address

Project

Sampler

Quote number

No. of samples received

No. of samples analysed

PO

Site

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	Position	Laboratory Department
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Microbiology, Waterloo, Ontario
Cynthia Bauer	Organic Supervisor	Calgary Organics, Calgary, Alberta
Greg Pokocky	Supervisor - Inorganic	Waterloo Inorganics, Waterloo, Ontario
Greg Pokocky	Supervisor - Inorganic	Waterloo Metals, Waterloo, Ontario
Marsha Calero	Laboratory Assistant	Calgary Organics, Calgary, Alberta
Nguyen Tran	Laboratory Analyst	Calgary Organics, Calgary, Alberta

Page	:	2 of 10
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.

CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.

DQO = Data Quality Objective.

LOR = Limit of Reporting (detection limit).

RPD = Relative Percent Difference

= Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "----" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Page	:	3 of 10
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: Water							Labora	tory Duplicate (D	UP) Report		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC	Lot: 875240)										
WT2307157-001	Anonymous	Solids, total suspended [TSS]		E160	3.0	mg/L	30.5	30.7	0.654%	20%	
Physical Tests (QC	Lot: 875263)										
HA2300093-001	Anonymous	рН		E108	0.10	pH units	6.03	6.07	0.661%	4%	
Anions and Nutrient	ts (QC Lot: 874757)										
WT2306672-002	Anonymous	Phosphorus, total	7723-14-0	E372-U	0.0200	mg/L	6.87	6.83	0.617%	20%	
Anions and Nutrien	ts (QC Lot: 874759)										
WT2306908-027	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	0.050	mg/L	0.863	0.909	5.19%	20%	
Anions and Nutrient	ts (QC Lot: 875264)										
WT2307133-001	Anonymous	Fluoride	16984-48-8	E235.F	0.100	mg/L	1.59	1.61	0.793%	20%	
Anions and Nutrient	ts (QC Lot: 875267)										
WT2307133-001	Anonymous	Chloride	16887-00-6	E235.CI	2.50	mg/L	5.98	5.80	0.17	Diff <2x LOR	
Anions and Nutrient	ts (QC Lot: 875268)										
WT2307133-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	1490	1500	0.439%	20%	
Cyanides (QC Lot:	881027)										
WT2307170-001	Anonymous	Cyanide, strong acid dissociable (Total)		E333	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	
Total Metals (QC Lo	ot: 874409)										
WT2307055-001	Anonymous	Aluminum, total	7429-90-5	E420	0.0300	mg/L	4.97	4.94	0.556%	20%	
		Antimony, total	7440-36-0	E420	0.00100	mg/L	0.00126	0.00126	0.000003	Diff <2x LOR	
		Arsenic, total	7440-38-2	E420	0.00100	mg/L	0.00360	0.00378	0.00018	Diff <2x LOR	
		Bismuth, total	7440-69-9	E420	0.000500	mg/L	<0.000500	<0.000500	0	Diff <2x LOR	
		Cadmium, total	7440-43-9	E420	0.0000500	mg/L	0.000108	0.000110	0.0000021	Diff <2x LOR	
		Chromium, total	7440-47-3	E420	0.00500	mg/L	0.0873	0.0868	0.615%	20%	
		Cobalt, total	7440-48-4	E420	0.00100	mg/L	0.00436	0.00442	0.00006	Diff <2x LOR	
		Copper, total	7440-50-8	E420	0.00500	mg/L	0.0304	0.0302	0.00013	Diff <2x LOR	
		Iron, total	7439-89-6	E420	0.100	mg/L	7.16	7.19	0.492%	20%	
		Lead, total	7439-92-1	E420	0.000500	mg/L	9.38 µg/L	0.00936	0.182%	20%	
		Manganese, total	7439-96-5	E420	0.00100	mg/L	0.255	0.256	0.466%	20%	
		Molybdenum, total	7439-98-7	E420	0.000500	mg/L	0.0145	0.0146	0.629%	20%	
		Nickel, total	7440-02-0	E420	0.00500	mg/L	0.0135	0.0137	0.00017	Diff <2x LOR	

Page	:	4 of 10
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Sub-Matrix: Water	Matrix: Water				Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Total Metals (QC Lo	t: 874409) - continued										
WT2307055-001	Anonymous	Selenium, total	7782-49-2	E420	0.000500	mg/L	0.000821	0.000709	0.000112	Diff <2x LOR	
		Silver, total	7440-22-4	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	
		Tin, total	7440-31-5	E420	0.00100	mg/L	0.00177	0.00182	0.00005	Diff <2x LOR	
		Titanium, total	7440-32-6	E420	0.00300	mg/L	0.209	0.210	0.632%	20%	
		Vanadium, total	7440-62-2	E420	0.00500	mg/L	0.0176	0.0173	0.00030	Diff <2x LOR	
		Zinc, total	7440-66-6	E420	0.0300	mg/L	0.0509	0.0527	0.0018	Diff <2x LOR	
Total Metals (QC Lo	t: 874693)										
TY2302290-001	Anonymous	Mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	
Aggregate Organics	(QC Lot: 874756)										
TY2302280-001	Anonymous	Phenols, total (4AAP)		E562	0.0500	mg/L	1.44	1.51	4.64%	20%	
Aggregate Organics	(QC Lot: 874985)										
WT2307173-003	Anonymous	Carbonaceous biochemical oxygen demand [CBOD]		E555	2.0	mg/L	<2.0	<2.0	0.0%	30%	
Aggregate Organics	(QC Lot: 877034)										
WT2307174-001	MW101-23	Carbonaceous biochemical oxygen demand [CBOD]		E555	3.0	mg/L	<3.0	<3.0	0.0%	30%	

Page	:	5 of 10
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water						
Analyte	CAS Number	r Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 875240)						
Solids, total suspended [TSS]		E160	3	mg/L	<3.0	
Anions and Nutrients (QCLot: 874757)						
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	
Anions and Nutrients (QCLot: 874759)						
Kjeldahl nitrogen, total [TKN]		E318	0.05	mg/L	<0.050	
Anions and Nutrients (QCLot: 875264)						
Fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	
nions and Nutrients (QCLot: 875267)						
Chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	
Anions and Nutrients (QCLot: 875268)						
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	
yanides (QCLot: 881027)						
Cyanide, strong acid dissociable (Total)		E333	0.002	mg/L	<0.0020	
licrobiological Tests (QCLot: 874957)						
Coliforms, thermotolerant [fecal]		E012.FC	1	CFU/100mL	<1	
otal Metals (QCLot: 874409)						
Aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	
Antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	
Arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	
Bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	
Cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.000050	
Chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	
Cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	
Copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	
Iron, total	7439-89-6	E420	0.01	mg/L	<0.010	
Lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	
Manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	
Nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	
Selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	
Silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	
Tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	
			1	I	1	

Page	:	6 of 10
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 874409) - continued						
Titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	
Vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	
Zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	
Total Metals (QCLot: 874693)						
Mercury, total	7439-97-6	E508	0.000005	mg/L	<0.000050	
Aggregate Organics (QCLot: 874756)						
Phenols, total (4AAP)		E562	0.001	mg/L	<0.0010	
Aggregate Organics (QCLot: 874985)						
Carbonaceous biochemical oxygen demand [CBOD]		E555	2	mg/L	<2.0	
Aggregate Organics (QCLot: 877034)						
Carbonaceous biochemical oxygen demand [CBOD]		E555	2	mg/L	<2.0	
Aggregate Organics (QCLot: 877187)						
Oil & grease (gravimetric)		E567	5	mg/L	<5.0	
Aggregate Organics (QCLot: 877188)						
Oil & grease, mineral (gravimetric)		E567SG	5	mg/L	<5.0	



Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: Water				Laboratory Control Sample (LCS) Report					
					Spike	Recovery (%)	Recovery	Limits (%)	
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 875240)									
Solids, total suspended [TSS]		E160	3	mg/L	150 mg/L	110	85.0	115	
Physical Tests (QCLot: 875263)									
рН		E108		pH units	7 pH units	101	98.0	102	
Anions and Nutrients (QCLot: 874757)									
Phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.845 mg/L	98.9	80.0	120	
Anions and Nutrients (QCLot: 874759)									
Kjeldahl nitrogen, total [TKN]		E318	0.05	mg/L	4 mg/L	101	75.0	125	
Anions and Nutrients (QCLot: 875264)									
Fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	101	90.0	110	
Anions and Nutrients (QCLot: 875267)									
Chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	103	90.0	110	
Anions and Nutrients (QCLot: 875268)									
Sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	
Cyanides (QCLot: 881027)									
Cyanide, strong acid dissociable (Total)		E333	0.002	mg/L	0.25 mg/L	93.6	80.0	120	
Aluminum, total	7429-90-5	E420	0.003	mg/L	0.1 mg/L	104	80.0	120	
Antimony, total	7440-36-0	E420	0.0001	mg/L	0.05 mg/L	106	80.0	120	
Arsenic, total	7440-38-2	E420	0.0001	mg/L	0.05 mg/L	111	80.0	120	
Bismuth, total	7440-69-9	E420	0.00005	mg/L	0.05 mg/L	106	80.0	120	
Cadmium, total	7440-43-9	E420	0.000005	mg/L	0.005 mg/L	108	80.0	120	
Chromium, total	7440-47-3	E420	0.0005	mg/L	0.0125 mg/L	106	80.0	120	
Cobalt, total	7440-48-4	E420	0.0001	mg/L	0.0125 mg/L	108	80.0	120	
Copper, total	7440-50-8	E420	0.0005	mg/L	0.0125 mg/L	106	80.0	120	
Iron, total	7439-89-6	E420	0.01	mg/L	0.05 mg/L	109	80.0	120	
Lead, total	7439-92-1	E420	0.00005	mg/L	0.025 mg/L	108	80.0	120	
Manganese, total	7439-96-5	E420	0.0001	mg/L	0.0125 mg/L	108	80.0	120	
Molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.0125 mg/L	106	80.0	120	
Nickel, total	7440-02-0	E420	0.0005	mg/L	0.025 mg/L	# 123	80.0	120	MES
Selenium, total	7782-49-2	E420	0.00005	mg/L	0.05 mg/L	105	80.0	120	

Page	:	8 of 10
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	:	49791-200



Sub-Matrix: Water	Laboratory Control Sample (LCS) Report										
					Spike	Recovery (%)	Recovery	Limits (%)			
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier		
Total Metals (QCLot: 874409) - continue	ed										
Silver, total	7440-22-4	E420	0.00001	mg/L	0.005 mg/L	103	80.0	120			
Tin, total	7440-31-5	E420	0.0001	mg/L	0.025 mg/L	106	80.0	120			
Titanium, total	7440-32-6	E420	0.0003	mg/L	0.0125 mg/L	105	80.0	120			
Vanadium, total	7440-62-2	E420	0.0005	mg/L	0.025 mg/L	108	80.0	120			
Zinc, total	7440-66-6	E420	0.003	mg/L	0.025 mg/L	107	80.0	120			
Total Metals (QCLot: 874693)											
Mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	94.7	80.0	120			
Aggregate Organics (QCLot: 874756)											
Phenols, total (4AAP)		E562	0.001	mg/L	0.02 mg/L	105	85.0	115			
Aggregate Organics (QCLot: 874985)											
Carbonaceous biochemical oxygen demand [CBOD]		E555	2	mg/L	198 mg/L	96.3	85.0	115			
Aggregate Organics (QCLot: 877034)											
Carbonaceous biochemical oxygen demand [CBOD]		E555	2	mg/L	198 mg/L	100	85.0	115			
Aggregate Organics (QCLot: 877187)											
Oil & grease (gravimetric)		E567	5	mg/L	100 mg/L	84.1	70.0	130			
Aggregate Organics (QCLot: 877188)											
Oil & grease, mineral (gravimetric)		E567SG	5	mg/L	50 mg/L	85.5	70.0	130			
Qualifiers				1	ı	1		1	1		
Qualifier	Description										
MES	Data Quality Objective wa	s marginally exceeded (by	/ < 10% absolu	ite) for < 10% of a	nalytes in a Multi-Eleme	ent Scan / Multi-Par	rameter Scan (cor	sidered			

acceptable as per OMOE & CCME).



Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: Water			Matrix Spike (MS) Report									
					Spike		Recovery (%)	Recovery	Limits (%)			
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier		
Anions and Nutri	ients (QCLot: 874757)											
WT2306672-002	Anonymous	Phosphorus, total	7723-14-0	E372-U	ND mg/L	0.1 mg/L	ND	70.0	130			
Anions and Nutri	ients (QCLot: 874759)											
WT2306908-027	Anonymous	Kjeldahl nitrogen, total [TKN]		E318	2.78 mg/L	2.5 mg/L	111	70.0	130			
Anions and Nutri	ients (QCLot: 875264)											
WT2307133-001	Anonymous	Fluoride	16984-48-8	E235.F	5.08 mg/L	5 mg/L	102	75.0	125			
Anions and Nutri	ients (QCLot: 875267)											
WT2307133-001	Anonymous	Chloride	16887-00-6	E235.CI	506 mg/L	500 mg/L	101	75.0	125			
Anions and Nutri	ients (QCLot: 875268)											
WT2307133-001	Anonymous	Sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	500 mg/L	ND	75.0	125			
Cyanides (QCLo	Cyanides (QCLot: 881027)											
WT2307170-001	Anonymous	Cyanide, strong acid dissociable (Total)		E333	0.242 mg/L	0.25 mg/L	96.8	75.0	125			
Total Metals (QC	CLot: 874409)											
WT2307055-002	Anonymous	Aluminum, total	7429-90-5	E420	ND mg/L	0.1 mg/L	ND	70.0	130			
		Antimony, total	7440-36-0	E420	0.0535 mg/L	0.05 mg/L	107	70.0	130			
		Arsenic, total	7440-38-2	E420	0.0547 mg/L	0.05 mg/L	109	70.0	130			
		Bismuth, total	7440-69-9	E420	0.0508 mg/L	0.05 mg/L	102	70.0	130			
		Cadmium, total	7440-43-9	E420	0.00519 mg/L	0.005 mg/L	104	70.0	130			
		Chromium, total	7440-47-3	E420	ND mg/L	0.0125 mg/L	ND	70.0	130			
		Cobalt, total	7440-48-4	E420	0.0131 mg/L	0.0125 mg/L	105	70.0	130			
		Copper, total	7440-50-8	E420	0.0126 mg/L	0.0125 mg/L	100	70.0	130			
		Iron, total	7439-89-6	E420	0.052 mg/L	0.05 mg/L	103	70.0	130			
		Lead, total	7439-92-1	E420	0.0257 mg/L	0.025 mg/L	103	70.0	130			
		Manganese, total	7439-96-5	E420	ND mg/L	0.0125 mg/L	ND	70.0	130			
		Molybdenum, total	7439-98-7	E420	ND mg/L	0.0125 mg/L	ND	70.0	130			
		Nickel, total	7440-02-0	E420	0.0256 mg/L	0.025 mg/L	102	70.0	130			
		Selenium, total	7782-49-2	E420	0.0515 mg/L	0.05 mg/L	103	70.0	130			
		Silver, total	7440-22-4	E420	0.00478 mg/L	0.005 mg/L	95.6	70.0	130			
		Tin, total	7440-31-5	E420	0.0259 mg/L	0.025 mg/L	104	70.0	130			
		Titanium, total	7440-32-6	E420	0.0122 mg/L	0.0125 mg/L	97.7	70.0	130			
	1	Vanadium, total	7440-62-2	E420	0.0269 mg/L	0.025 mg/L	107	70.0	130			

Page	:	10 of 10
Work Order	:	WT2307174
Client	:	MTE Consultants Inc.
Project	÷	49791-200



Matrix Spike (MS) Report Sub-Matrix: Water Recovery (%) Recovery Limits (%) Spike Laboratory sample Analyte Method Client sample ID CAS Number MS Qualifier Concentration Target Low High ID Total Metals (QCLot: 874409) - continued WT2307055-002 Anonymous Zinc, total E420 7440-66-6 ND mg/L 0.025 mg/L ND 70.0 130 ----Total Metals (QCLot: 874693) TY2302290-002 Anonymous Mercury, total 0.0001 mg/L 7439-97-6 E508 0.0000982 mg/L 98.2 70.0 130 ----Aggregate Organics (QCLot: 874756) TY2302280-001 Anonymous Phenols, total (4AAP) E562 ----ND mg/L 0.02 mg/L ND 75.0 125 ----

Chain of Custody (COC) / Analytical Request Form

COC Number: 2 Environmental Division

ALS)	www.alsglobal.com									Page									WT2307174					
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